To: President Mark Hamilton, Research Advisory Council Members, Chancellors, Vice Chancellors, Provosts, and Vice Presidents

From: Craig Dorman and Pat Pitney

Date: January 29, 2007

Re: Report on State-Funded Research Investments

Attached please find the final report, “State-Funded Programs of Support for University Research.” The report describes the methods other states have used to make significant investments to enhance competitive university research and corresponding expectations of success for those major investments. It details 20 state funded university research enhancement programs in 15 different states with investments ranging from $15 million to $1 billion. The report provides an overview of program purpose, program size, state size, state starting position (i.e. research maturity), activities funded, funding sources, discipline emphasis, governance, and most importantly, success criteria. Of the programs reviewed, some are recent state investments like Wyoming and Texas while others are mature programs with demonstrable results including Georgia and Kentucky. The information in this report can help UA leaders, legislators and state administrators to understand the mechanisms and value of establishing a major research investment program.

Below are recommended next steps to bring reality to the idea of a major Alaska research investment program:

- Circulate and present the report to the Research Advisory Council (RAC). Based on RAC recommendations and direction create a small working team to develop an initial straw-man proposal.
- Circulate the report to SAC, BC and Presidents Cabinet for review and comment. Keep these groups apprised of progress on a straw-man proposal.
- Present this report and a straw-man research investment program proposal to
  - The State Committee on Research (SCoR)
  - Interested legislators to help inform research investment legislation, and
  - Interested advocates including municipal economic development organizations.

The following ideas should be considered in developing a program structure.
- Emphasize the SCoR as an appropriate entity to help define, champion, and provide governance for an Alaska research investment program. SCoR includes the broad base constituent group necessary to embrace a successful proposal encompassing Legislative, State Administration, Business and University representatives.
• The focus of any program should be on Alaska’s strength in competitive research with a long term goal of encouraging broader spin-off, business and economic applications.

• Assure any program proposal be of significant magnitude and incorporate expected results and appropriate monitoring mechanisms.

In addition to the formal report “State Funded Programs of Support for University Research,” the attached documents include a follow-up memo with additional information from Florida, Maryland and Ohio. There are also several detailed references on specific programs available on the web at http://www.alaska.edu/swoir/research/.
State-Funded Programs of Support for University Research

Conducted for the University of Alaska by David C. Maddox

January 19, 2007
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Introduction

While the Federal government clearly plays the primary role in public funding of research, many states have programs that complement Federal and other funding sources. In general there are two primary purposes underlying state-funded initiatives: 1. commercialization of intellectual content and promotion of technology-based economic development, and 2. promotion of university excellence.

1. The **commercialization** emphasis expresses itself most directly in programs that fund efforts to convert scientific discoveries into a form that can be commercialized, promote cooperation between universities and companies on research, bring new technologies to market, and build companies. These programs may make funds available to private businesses as well as to universities, or stress university-corporate partnerships. Some of the programs with this focus are managed by a commission rather than the normal university governance structure. An example of a major program with a strong commercialization focus is Ohio’s Third Frontier Foundation.

2. **University enhancement** programs provide funds to improve the overall quality and prominence of the state’s universities and the strength of their research programs. Funding under these programs will be restricted to universities. The focus will fall more on the purely intellectual merits and reputation of the research conducted and on increasing the amount of research done, the level of extramural funding received, or quality measures such as citations—all performance measures internal to the university. However, in most cases the rationale for this investment in the university includes, significantly, the view that a strong higher education system has a positive impact on the state’s economic and social development. Examples of programs focused on bolstering universities include the Kentucky’s Strategic Investment and Incentive Trust Funds and Arizona’s Technology and Research Initiative Fund.

It is not the purpose of this report to assess whether these funding initiatives are a trend, but to describe the range of programs, focusing in detail on some representative cases.

To conduct this review, we looked at the publicly available information for programs in 15 states. We followed up with phone interviews with people from six states, as well as followup questions via email. We also used information from a phone interview from a seventh state conducted for a previous study for the University, and spoke with representatives of several national organizations who were able to give us a perspective on which states have the leading programs.

We looked exclusively at programs that are funded from state financial resources such as state general revenues, bonds, special tax levies, and Tobacco Settlement funds. Many universities have additional research enhancement funds that are funded from university resources such as ICRs, university-generated endowments, and private gifts—we did not look at those programs.
Considerations

Several factors define these programs—factors that form the basis for comparisons between states and will shape the design of a proposal for Alaska.

Size of the program. The programs vary in the amount of money they make available in any one year, and—by virtue of program longevity—the cumulative funding. The range we found in the 15 states we studied ran from $5-15M a year to programs that report disbursing $390M a year (Ohio). One consideration is what level of investment is required to have a discernable impact in advancing a state’s goals.

Size of the state. Larger states have somewhat different issues than smaller ones. A larger state will have a larger business community, providing more opportunities for commercialization. It also takes more money to have an impact on the larger states and on larger university systems. The $75M allocated to the California Institutes for Science and Innovation in FY01 funded important initiatives, but it fell within the context of $2.2B total FY01 research expenditures in the UC system. By contrast, Arizona State’s expenditures of $22.6M from the Technology and Research Initiative Fund in FY05 constituted 12.3% of its total $183.2M in research spending.

Starting position. Some programs are designed to help a state get into the game, others are designed to put them over the top in places where they have existing strength. To some extent this aligns with size of state, but not entirely.

• The TRIF program in Arizona is part of an effort by the universities to help lead the state away from its traditional economic reliance on the “C’s”: copper, citrus, cattle, cotton, and climate. The TRIF program is intended to help the state start to build strength in high technology fields.

• The Georgia Research Alliance, one of the most well-established programs, had its impetus from experiences in 1980s when the state found itself making the short list for major technology projects but losing out in the final decision. In contrast to Arizona, Georgia was already “in the game,” but when they asked the selection teams about these decisions, one of the factors hurting the state was the perception that Georgia universities were not as well engaged in technology development as the universities in other states. The GRA was a response to that deficiency.

Types of programs and activities funded. This is an area with the most variability.

• Programs may fund individual projects or fund entities like research centers.

• Some fund faculty positions, and within funding for faculty there is a split between programs only available to recruit faculty new to the state (e.g., Georgia) or institution, and programs that will fund faculty already at the institution.

• Most programs include some funds for capital projects.

Institutions funded. The first split is between those programs that fund universities only, and those that offer funding to businesses as well. Within those programs that exclusively fund university programs and activities, some programs focus on the state’s primary research institutions (e.g., Kentucky and Georgia) and others make funds available to all
public universities. In the case where funding is not limited to established research institutions, the goals for funding at less research-intensive institutions may include efforts to build research capacity or promote workforce preparation. Some of the programs are open to private universities—examples include the Georgia Research Alliance (which includes Emory) and Ohio’s Third Frontier Project.

- Of the 15 states we reviewed, the primary programs in 6 are exclusively directed to universities, 2 states have programs directed only to universities along with programs that provide funds to private sector entities, and in 7 the primary program funds private and public sector organizations.

**Discipline focus.** Most programs limit their funds to disciplines of strategic importance to the state. This is consistent with a cluster theory of economic development, where regional success in the global economy derives from a region having a group of related companies with enough critical mass to provide market strength, foster the required human capital, share networks of supporting services, and promote technical expertise. States will typically promote these economic clusters in areas in which the state already has some strength or has other competitive advantages. The fields may be selected based on objective surveys, but there is usually a political element in the selection.

**Permanent or one-time funding.** There are two levels to consider in the permanency of funding.

- First, in a few states the programs are funded from ongoing appropriations or tax streams, but most of the programs are funded from one-time appropriations or the state commits to a total amount of funding to be delivered over a few years.
- The same distinction applies to the programs themselves—many fund projects or programs for specific terms, but others provide ongoing base funding. Ongoing funding can be provided either from an ongoing appropriation or from an endowment approach.

As an example, the Nebraska Research Initiative is funded with a recurring budget line of about $11.4M. It in turn makes multiyear grants for an ever evolving list of programs, so the recipient projects experience the funding as temporary. Arizona’s TRIF has ongoing funding from dedicated sales tax revenue, and some of this funding is used for base funding of research centers. On the other hand, the legislature in California made a commitment to provide $400M of funding for the California Institutes for Science and Innovation over several years, at which time the institutes are expected to stand on their own. The endowments implemented with one-time or phased funding in Kentucky, Wyoming, and Oklahoma will provide a continuous stream of funding for projects.

**Source of funds.** The most common funding mechanisms are general revenue funds and bond issues. There are a few variations. Arizona’s program is funded through a 0.6% increase in state sales tax that was approved by voter referendum. A few states dedicated some tobacco settlement monies to these programs.

**Governance.** Most programs are administered by the higher education system, independent boards, or the state department of economic development. The programs
focused on academic excellence will tend to be housed in the university hierarchy, more so than the commercialization programs. Another important consideration is the involvement of private sector representatives in governance, and the use of external review panels in the proposal approval.

**Public engagement.** Many of the most successful programs had their genesis in strong partnerships between the universities and the business community, and in some cases (such as Georgia), the business community is seen as the primary advocate for the program.

**Success criteria.** Success criteria reflect the different goals of the programs, but there is some convergence in what institutions look at. Most programs, whatever the goal, measure leveraging effects in external funds. Programs with a commercialization focus will emphasize jobs created and patents issued, but even programs more focused on university enhancement may track those as indicators of university performance. One challenge with finding success criteria for these programs is that it is hard to do a true cost-benefit analysis of the programs, since the highest level policy objectives, like the development of a strong high technology economy, involve many factors. Practical problems with attributing effects to programs leads to a more near-sighted emphasis on changes most closely related to the program.

Some of the most frequently used success measures:
- Leverage: Federal and other external dollars generated
- Jobs created
- New companies formed
- Patents
- Evidence of collaboration

Some other success measures we found were
- Contacts with industry (similar to “moves management” in the fundraising world)
- Program benchmarks (e.g., director of center hired)
- Number of biotech firms
- Number of companies doing sponsored research
- Economic Impact calculations
**Detailed information**

The key elements of each program are summarized on the following tables, one tables for states where we contacted people directly, another for the states where we looked only at web information. The information from the web is offered with the caveat that it has not been verified for currency.

The column “Econ dev or enhancement” characterizes each program by its predominant goal—strengthening the universities (“enhancement”) or commercializing research and building bridges between the universities and local companies (“economic development”). In reality and in the details, every program here contains a mix of these motives.

Following the table are detailed descriptions of the programs in each of the states we contacted directly. We have also included a section that lists selected details from the states where we looked only at publicly available information.
### Primary Program Characteristics

#### States Contacted Directly

<table>
<thead>
<tr>
<th>State</th>
<th>Name of program</th>
<th>Year started</th>
<th>Funds</th>
<th>Econ dev or enhancement</th>
<th>Types of activities</th>
<th>Types of entities</th>
<th>Key details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>Technology and Research Initiative Fund (TRIF)</td>
<td>2001</td>
<td>$67M FY06 + carry forward</td>
<td>Enhancement</td>
<td>Operations and capital for major research centers and programs</td>
<td>Universities</td>
<td>0.6% sales tax</td>
</tr>
<tr>
<td>Georgia</td>
<td>Georgia Research Alliance</td>
<td>1990</td>
<td>$400M total since 1990</td>
<td>Enhancement</td>
<td>Faculty recruitment, labs and equipment, national centers, tech transfer programs</td>
<td>6 universities</td>
<td>Independent 501(c)3</td>
</tr>
<tr>
<td>Kentucky</td>
<td>Endowment Match Program</td>
<td>1997</td>
<td>$350M from Leg.</td>
<td>Enhancement</td>
<td>Matching funds for chairs, fellowships, infrastructure</td>
<td>UL and UK</td>
<td>Also several smaller programs</td>
</tr>
<tr>
<td>Kentucky</td>
<td>Regional Stewardship Funding Program</td>
<td></td>
<td>$50M</td>
<td>Economic Development</td>
<td>Support to projects and programs for universities to cooperate with entities on local needs, and programs of distinction</td>
<td>Comp universities</td>
<td></td>
</tr>
<tr>
<td>Maine</td>
<td>Economic Improvement Fund (MEIF)</td>
<td>1997</td>
<td>$12M in FY05</td>
<td>Economic Development</td>
<td>Faculty support, infrastructure, equipment, matching</td>
<td>Universities</td>
<td></td>
</tr>
<tr>
<td>Maine</td>
<td>Maine Technology Institute</td>
<td>1999</td>
<td>$5.5M most recent yr</td>
<td>Economic Development</td>
<td>Seed grants and development awards</td>
<td>Universities, companies, NP research labs</td>
<td></td>
</tr>
<tr>
<td>Nebraska</td>
<td>Nebraska Research Initiative</td>
<td>1989</td>
<td>$11.4M total</td>
<td>Enhancement</td>
<td>Core facilities and project grants</td>
<td>Universities</td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>Name of program</td>
<td>Year started</td>
<td>Funds</td>
<td>Econ dev or enhancement</td>
<td>Types of activities</td>
<td>Types of entities</td>
<td>Key details</td>
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</tr>
<tr>
<td>Ohio</td>
<td>Third Frontier Commission</td>
<td>2002</td>
<td>$390M FY07</td>
<td>Economic Development</td>
<td>Major innovation centers, seed funds, project grants</td>
<td>Private and university</td>
<td></td>
</tr>
<tr>
<td>Wyoming</td>
<td>Excellence in Higher Education Endowment</td>
<td>2005</td>
<td>$505M capital</td>
<td>Enhancement</td>
<td>Scholarships and chairs/professorships</td>
<td>University</td>
<td>$105M for faculty</td>
</tr>
<tr>
<td>Wyoming</td>
<td>School of Energy Resources</td>
<td>2006</td>
<td>$12.1M for 2 years</td>
<td>Enhancement</td>
<td>Start up costs of new school</td>
<td>University</td>
<td></td>
</tr>
</tbody>
</table>

**Web only research**

<table>
<thead>
<tr>
<th>State</th>
<th>Name of program</th>
<th>Year started</th>
<th>Funds</th>
<th>Econ dev or enhancement</th>
<th>Types of activities</th>
<th>Types of entities</th>
<th>Key details</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>California Institutes for Science and Innovation</td>
<td>2001</td>
<td>$300M over 4 years</td>
<td>Enhancement</td>
<td>Four interdisciplinary/intercampus centers</td>
<td>UC system campuses</td>
<td></td>
</tr>
<tr>
<td>Michigan</td>
<td>Technology Tri-Corridor</td>
<td>2002</td>
<td>Economic Development</td>
<td>Grants for commercialization and development, entrepreneurship training</td>
<td>Private and university</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montana</td>
<td>Board of Research and Commercialization Technology</td>
<td>1999</td>
<td>$26M since inception</td>
<td>Economic Development</td>
<td>Project grants</td>
<td>Private and university</td>
<td></td>
</tr>
<tr>
<td>New Jersey</td>
<td>NJ Commission on Science and Technology</td>
<td>1985</td>
<td>$16M awarded FY05</td>
<td>Economic development</td>
<td>Proof of concept research, bridge grants, seed funds, stem cell research, tech fellowships</td>
<td>Private and university</td>
<td>Multiple initiatives</td>
</tr>
<tr>
<td>State</td>
<td>Name of program</td>
<td>Year started</td>
<td>Funds</td>
<td>Econ dev or enhancement</td>
<td>Types of activities</td>
<td>Types of entities</td>
<td>Key details</td>
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<tr>
<td>New York</td>
<td>NYSTAR</td>
<td>1999</td>
<td>$120M in 2000</td>
<td>Mix</td>
<td>Applied research, tech transfer, faculty retention, matching grants</td>
<td>Private and university</td>
<td></td>
</tr>
<tr>
<td>North Dakota</td>
<td>Agricultural Research Fund</td>
<td></td>
<td>Up to $50K/yr</td>
<td>Economic development</td>
<td>Matching funds, start up, equipment, public and private facilities, investment capital, IT systems</td>
<td>Private and university</td>
<td></td>
</tr>
<tr>
<td>Oklahoma</td>
<td>Economic Development Generating Excellence</td>
<td>2003</td>
<td>$1B endowment</td>
<td>Mix</td>
<td>Matching funds, start up, equipment, public and private facilities, investment capital, IT systems</td>
<td>Private and university</td>
<td></td>
</tr>
<tr>
<td>Texas</td>
<td>Emerging Technology Fund</td>
<td>2005</td>
<td>$200M</td>
<td>Mix</td>
<td>New Centers of Innovation and Commercialization, matching grants, attract top research teams</td>
<td>Private and university</td>
<td>From General Revenue and Rainy Day surplus</td>
</tr>
<tr>
<td>Texas</td>
<td>UT Competitiveness Initiative</td>
<td>2006</td>
<td>$2.56B</td>
<td>Enhancement</td>
<td>Major capital projects</td>
<td>UT system universities</td>
<td></td>
</tr>
</tbody>
</table>
Detailed Program Descriptions

Arizona
Technology and Research Initiative Fund (TRIF)
Contact: Steve Goodnick, Associate Vice President for Research, Arizona State University

Funded from a 0.6% increase in the state sales tax put into effect by Arizona voters through Proposition 301, which passed in November 2000. Funds are split between K-12 (which gets the largest part), higher education (about 10% of total), and community colleges. The higher education portion of Prop 301 funds are administered by the Arizona Board of Regents and go to the University of Arizona, Arizona State University, and Northern Arizona University.

Each of the institutions uses the TRIF funds a bit differently reflecting their mission and strategies. Arizona State has chosen to fund a small number of high visibility projects, in particular the Biodesign Institute. The deployment of TRIF funds is part of President Michael Crow’s institutional strategy to reposition ASU as a major research center. The University of Arizona has spread its funds primarily between four research areas—information technology, optical sciences, water sustainability, and biosciences—as well as investments in e-learning, core facilities and IT capacity, and technology transfer. Northern Arizona dedicates over half of its funds to e-learning and workforce development.

While the TRIF funds are not directed to commercialization projects per se, the program does have clear economic development goals. The TRIF program was intended to build intellectual capacity in high technology fields that could help the state move its economy from a reliance on traditional sectors like mining, agriculture, and tourism. The program also plays into the argument that strengthening the universities and their research programs will lead to returns in the form of intellectual property, industry attraction, and spin off companies. The program can also push the universities overall (not just in programs supported by TRIF) to strengthen their ties to industry and pursue “use-inspired” research.

Funds are used for capital and operating expenses. TRIF funds pay a significant number of faculty salaries (64 new tenure-track and research faculty at ASU). ASU has hired prominent out of state scholars to head the centers, but they also support faculty already there, investing in those who are successful.

The Arizona Board of Regents assembles a lengthy annual report that includes sections on each major project, including a table of metrics. Some metrics are obvious, like external research funding, new grants, corporate grants received, number of graduate students enrolled. People in the state have found it harder to answer questions about how much of this success to attribute to the TRIF program—for example, when a PI who has received support through TRIF has success in securing further grants, would she have
been successful anyway without the TRIF support? The Regents are interested in a more rigorous, systematic measurement system, and groups in the state are working on it.

One place ASU has seen an impact is in NIH funding. 10 years ago the University had very little, but now NIH is nearly their largest funder. ASU has no medical school, so research in this area was scattered throughout the University. The Biodesign Institute has provided a focus for their efforts and helped “get them on the map.”

An interesting development in this program is that the sales tax has brought in more money than projected, which has created a problem of “over-realization.” There was some talk of the Regents keeping those funds, but the universities have come up with spending plans in their recent budgets.

Advice:
• Focus is extremely important. You don’t want to disappoint people and need to be able to show tangible results. The danger is diffusion. The Biodesign Institute provides something everyone can see.
• Make sure the effort and its results are publicized. ASU upgraded its media relations function early in Crow’s tenure. You need to show the benefits the state and the public are receiving.
• Educate yourself before you invest. Develop a compelling understanding why University investment can lead to tangible benefits.

Georgia
Georgia Research Alliance
Contact: Susan Shows, Vice President GRA

Georgia has one of the most well-established programs for state promotion of technology-based economic development. The Georgia Research Alliance was founded in 1990 largely at the initiative of business leaders in the state. Georgia had gotten to the short list in the site selection process for several major technology projects in the 1980s, but came up short. When they asked site selection teams, one of the weaknesses was in the role of higher education. They got comments such as it seemed like the first time the universities had been involved in these projects, and that the university presidents didn’t seem to know each other.

The GRA is an independent 501(c)3 which receives state funds ($400M received since its founding—the first funds were received in 1993). It funds initiatives at six universities in the state: University of Georgia, Georgia Tech, Georgia State, Clark Atlanta, Emory, and the Medical College of Georgia.

The GRA has four primary programs
• Eminent Scholars. This program provides endowments to recruit scholars new to the state (it is not a promotion platform). GRA puts up half, the university puts up the other half. The program now has 54 permanent endowments.
• Funding for R&D labs and equipment
• Support for five National Centers for Innovation and Research
• Technology transfer programs

The centerpiece is the Eminent Scholars program. Over the years they have been focusing on these fields:
• Bioscience
• Nanoscience and advanced materials
• Computing and communications
• Energy

GRA staff work with the universities on recruitment, letting them know what areas the GRA wants to recruit in and using the other Eminent Scholars as a sounding board. They feel they are getting smarter about recruiting the best faculty, and now insist that the recruitment must involve the institution’s President and Provost, rather than the President just giving the chairs to the departments to fill. The GRA staff also participate in the recruitment, visiting the candidates.

GRA runs an academy for the Eminent Scholars, which gives them a chance to network and creates a sense of identity among them.

While this was seen as a 20 year strategy, the program has been in place long enough to see results. One metric is the number of biotech firms in the state: previously Georgia wasn’t even rated, but now they are 7th. Federal grants have tripled. (They recognize that the GRA is not the only input to these results, and that other states have seen dramatic growth in Federal research dollars.) They have also calculated the economic impact using the same multipliers as the Center for Disease Control—and have concluded that the GRA is like having a second CDC.

They strongly recommend that any state starting this sort of program:
• Assemble a good advisory group that includes higher education, state government, and business representatives. This is the group that should put the program framework together.
• Identify core competencies for the state.

Kentucky
Endowment Match Program
Contacts: James Applegate, Vice President for Academic Affairs, Kentucky Council on Postsecondary Education (CPE)
Sandy Woodley, Vice President for Finance
Bill Payne, Senior Associate, Finance

The state’s Post-Secondary Improvement Act of 1997 included among its goals moving the University of Kentucky into the top 20 public research universities and positioning University of Louisville as a “preeminent national research university.” The driver was economic development—they determined that strong research universities are a key to
the state’s development, and that one step in achieving this goal for the universities is to attract top notch faculty.

The Endowment Match Program, also known as “Bucks for Brains,” put up $350M in state resources which the universities have to match 1:1 from external sources and then the payout will be available for chairs, professorships, research staff, fellowships, and infrastructure. The program has two components, the Research Challenge Trust Fund ($300M from state for UK and UL) and the Regional University Excellence Trust Fund ($50M for the other universities in the state). The stated goals are

- Short-term
  - Grow university endowments
  - Increase the number of endowed chairs and professorships
  - Increase externally sponsored research
- Long-term
  - Stimulate business development
  - Job creation
  - Facilitate Kentucky’s transition to a knowledge-based economy

The funds for UK and UL need to go 70% into targeted areas:

- Health and Human Development
- Biosciences
- Materials Science and Advanced Manufacturing
- Information Technologies and Communications
- Environmental and Energy Technologies

These were identified by the state’s Office of the New Economy.

Each institution submits an annual report on how it spent EMF dollars and the results. The CPE identified a series of outcome areas 3 years ago: annual giving, market value of the pool, number of chairs, race and gender of the holders, patents, extramural funds, etc. The CPE has a policy group working on a more detailed analysis of the impact of Bucks for Brains.

The CPE has started a new program, the Regional Stewardship Program, which puts state money behind projects and programs in which the comprehensive universities cooperate with local entities to address regional needs like water quality or the racial divide.

Kentucky also has other programs run by the Kentucky Science and Technology Corporation that deal more with commercialization. The KSTC is a private nonprofit corporation that among other things administers the state’s EPSCoR program. Its programs include a series of rural R&D funds for vouchers and pre-seed capital.

Advice to other states:

- Think about what the state’s needs are from a research or engagement perspective. To move forward, where does the state need intellectual capital?
- Think thoroughly about the metrics to document success of the program.
• Need clear guidelines on how institutions should spend money – some of the early money in Kentucky was not well spent.

Maine

Maine Technology Institute and Maine Economic Initiative Fund
Contact: Janet Yancey-Wrona, Director Maine Technology Institute and State Science Advisor

The Maine Technology Institute started in 1999. It is a private non-profit with a board appointed by the governor. The State Department of Economic Development has a seat. Funded by the state, it offers seed grants (up to $10K) and development awards (up to $500K) to universities, companies, and private research labs for projects that are rated by external peer reviewers according to economic impact (40% weight) and scientific and technical merit (60%). They are looking for projects that will lead to job creation or are important to industry.

The MTI’s funds are targeted to seven areas:
• Aquaculture and Marine Sciences
• Environmental Technologies
• Biotechnology
• Information Technologies
• Composites and Advanced Materials Technologies
• Advanced Technologies for Forestry and Agriculture
• Precision Manufacturing

This list started with 4 areas, but was expanded in the legislative process. Yancey-Wrona would rather not limit programs to specific areas, but identify the characteristics they want from a successful proposal (such as market potential) and fund the best proposals.

The Maine Economic Initiative Fund goes directly to the University system. About 80% goes to the Orono campus, the primary research campus, and 20% to University of Southern Maine which is trying to develop research capacity. There are relatively few restrictions on the University, which allocates them to proposals that go through an internal review process.

Yancey-Wrona believes the MTI has stronger support than the University program because all parts of the state were involved in establishing the vision and providing governance for the program.

Nebraska

Nebraska Research Initiative
Contact: Donal Burns, Associate Executive Vice President and Provost

This program was funded some time ago, in 1989 or the early 1990s. The governor at the time wanted to attract companies to Nebraska and a key was the resources in the universities. She planned to set up a budget of $20M, building up $4M a year over 5
years, but only got to $12M. There have since been budget recisions, so the annual budget is now around $11.4M. These are made available to any of the four campuses in the university system for core facilities and a competitive internal grant process that provides up to 4 years of funding.

Proposals have to have an economic development focus and relate to the following areas:
- Biosecurity
- Bioscience, Biotechnology, Molecular Biology, and Molecular Genetics
- Construction and Infrastructure Studies
- Environmental Quality, Sustainability, and Security
- Food Productivity, Food Processing Safety and Toxicology
- Information Technology and Security
- Manufacturing and Materials
- Water Resources of Nebraska

These also have to be new projects—they will not consider continuation funding of existing projects. The system prefers interdisciplinary and intercampus projects.

Funded projects go through an annual review looking at things like leverage of funding—although over 4 years, it can be hard to see the results of a project. The core facilities also are reviewed periodically.

Annual selection process for proposals
1. System office issues an RFP
2. Proposals come in from campuses
3. Proposals go through external review by panels of 5 reviewers
4. A panel of representative outside the University assesses the top group
5. Those are forwarded to a Presidential review board made up exclusively of people outside the university, many from industry.
6. All of the information is put together, and the system’s Provost makes awards

Projects usually receive $200K-$400K a year, and proposals should request a minimum of $50K.

Some observations from Burns:
- Difficult to do research with an immediate economic impact—the greatest impact is on total funding. Along with EPSCoR, these projects help give the institution a leg up in competing for funds.
- Some research areas are hard to connect to economic development.
- In a smaller state, it is difficult to have the diversity of programs that allow you to hit it lucky and develop a program with great economic success
- What you need—in addition to luck—is to push the institution in the right direction and keep at it.
Ohio Third Frontier Project

Contacts: Norm Chagnon, Staff Director, Third Frontier Commission
Fleda Anderson, Stephen Myers, and Michael Benzakein, Ohio State University

In 2003 the Third Frontier Commission was created by the legislature. It will spend $1.6B over 10 years to:

- Build world-class research capacity
- Increase early stage capital formation
- Improve the climate for innovation
- Make the state more attractive for investment
- Create jobs

Not explicitly intended to provide resources for universities, although a lot of the money has gone to universities. They want to build major research platforms, like nationally designated research centers. They expect collaboration among institutions.

Their primary funding areas are:

- Research and Commercialization Collaborations. These include Wright Centers of Innovation, which are collaborations between Ohio companies, universities, and non-profit research organizations. One of their purposes is to bring basic research and technology development into closer contact. Many but not all are housed on university campuses (private and public). There are also grants for research commercialization projects. $240M budgeted in FY07.
- Entrepreneurial Support. $50M in FY07 for pre-seed funds and entrepreneurial projects.
- Product Development Assistance. $24M for a commercialization grant program and a fuel cell program.
- Company Attraction. $16M.

They also held $50M in unallocated funds in their FY07 budget which totals $400M. Funding has come from a combination of general revenue, a share of Tobacco Settlement funds, the Higher Education Capital Improvement Fund, and a $500M bond issue (this required a constitutional amendment to allow bond proceeds to be used for operating funds). Most of the funding goes to operating costs, not capital.

Funds are directed to five core competence areas identified in an extensive study by Battelle:

- Advanced materials
- Biosciences (including Ag-Bio)
- Instruments, Controls, and Electronics
- Information Technology
- Power and Propulsion

All Third Frontier projects are competitively awarded and all have external review. The largest projects are reviewed by the national academies.
The Third Frontier Commission is starting to review the target areas based on where the successful proposals are coming in. They may start to focus investments based on these self-identified “winners.”

The Commission had an outside group develop a commercialization framework to help guide where Third Frontier investments can have the most impact.

Currently they are assisting over 200 early-stage companies.

Organizations are required to report quarterly. The Commission has forms to collect financial information and dashboards, along with anecdotal descriptions. Still working on measures of success. It is easiest to measure the effects nearest to the project, but broader goals become more nebulous.

They believe it is still too early to judge success. These are multi-year projects. They are seeing benefits in goals like increased inter-institutional work and pushing universities out of their comfort zone. They also believe things like collaborative projects help tee up the universities to be more in line with Federal funding bodies.

Ohio has the advantage of having many universities, but it also makes it hard to develop critical mass. There are few nationally ranked programs in the state.

Earlier efforts to build bridges between universities and industry had been on a smaller scale. The $1.6B of the Third Frontier is big enough to “turn heads,” and Mr. Chagnon sees benefits in that national visibility.

The perspective of some researchers and administrators at OSU is that the University started with a strong position in industry-funded research, but the Third Frontier has helped them maintain that position. OSU encourages faculty from areas more focused on basic research to join with teams that are more involved in applied research. Faculty members cite the Third Frontier funds as smoothing the transition from academic research and proof of concept stages to funding by industry. One center director described it as “the ‘connective tissue’ between the typical time horizons of academic research and industry.” The Center directors describe the intellectual resources as having been in existence, but the Third Frontier funds brought them together under the Wright Center for Innovation structure.

Lessons learned

- Decide what are the best ways to take the resources you have and exploit them. Where can you have the most impact?
- Spend time on where your state can have competitive advantage.
- Avoid a “build it and they will come” approach. Proposals need to provide evidence why there is a potential competitive advantage in the area.
- The university researchers most successful in the program already had an inclination towards commercialization and partnerships with the private sector.
Wyoming Excellence in Higher Education Endowment
Contact: Bill Gern, Vice President for Research and Economic Development, University of Wyoming (interview conducted December 2005)

With the large increase in state revenues related to energy extraction, the legislature decided in 2005 to invest in its higher education system as a way of leveraging the state’s current good fortune to make it more attractive in the long run for business and residents. The endowment, of $505M, has two portions. $400M will provide scholarships for Wyoming high school graduates to attend the University of Wyoming or any state community college. The second part, $105M, will fund chairs and professorships, 2/3 at the University, 1/3 at the community colleges. The funds are not restricted to any particular fields of study, although the University does have some challenge areas that it will emphasize with at least 2/3 of its funds:

- Energy and natural resources
- Wildlife
- Science
- Earth science
- Health sciences
- Agriculture
- Education
- Engineering

The State also has a separate list of “UW Areas of Distinction” that include broad science areas and history, cultural studies, and the arts.

This year (2006), the Legislature funded a School of Energy Resources at the University. The School will hire some faculty but will primarily support existing degree programs in other units rather than launch new degree programs. It will conduct energy-related research and outreach services, and will have $1M a year in matching funds to enhance prospects for external funding.
Selected Details on Programs in Other States

The following are selected details on the programs in states where we conducted web research only. These fill in some of the points on the summary table and capture details that seemed particularly noteworthy in these programs.

California

California Institutes for Science and Innovation

Institutes and participating institutions
- California Institute for Quantitative Biomedical Research (UC San Francisco, UC Berkeley, and UC Santa Cruz)
- California NanoSystems Institute (UCLA and UC Santa Barbara)
- California Institute for Telecommunications and Information Technology (UC San Diego and UC Irvine)
- Center for Information Technology Research in the Interest of Society (UC Berkeley, UC Davis, UC Merced, and UC Santa Cruz)

Michigan

Technology Tri-Corridor

Within the four target areas (Life Sciences, Future Fuels, Advanced Automotive Technologies, Homeland Security), the Technology Tri-Corridor programs are designed to promote:
- Technology clustering regions within the State for the growth and expansion of target industries.
- Business attraction, expansion and retention, attracting companies engaged in these industries to the State as well as encouraging expansion and retention of companies within those industries located in Michigan.
- Marketing efforts include marketing the brands, sites for development and programs or services created to support the target industries.
- Commercialization of research. The State of Michigan hopes to grow companies by empowering technology transfer activities that are occurring in the private, public and educational sectors.
- Development of new technologies. The State is providing grants and incentives to support research and development.

Montana

Board of Research and Commercialization Technology

Criteria for approving proposals:
- Has potential to diversify or add value to a traditional basic industry of the state's economy,
- Shows promise for enhancing technology-based sectors or commercial development of discoveries,
- Employs or takes advantage of existing research and commercialization strengths,
- Has a realistic and achievable project design,
- Employs an innovative technology,
- Is located in the state,
- Has a qualified research team,
- Has scientific merit based on peer review, and
- Includes research opportunities for students.

**New Jersey**

**NJ Commission on Science and Technology**

NJCST programs and initiatives:

- **New Jersey Technology Fellowships.** Salary for recent NJ doctoral graduates to work in small NJ tech firms.
- **Technology Incubator Network.** Support to 12 technology business incubators
- **Entrepreneurial Partnering Fund.** Support to NJ technology companies in partnership with a NJ research university, for proof-of-concept research and development
- **Commercialization of University Intellectual Property.** Funding to universities to make services available to companies and for proof-of-concept work.
- **Small Business Innovation Research Bridge Grant Program**
- **Incubator Seed Fund Grant Program.** Funding for companies located in an NJCST technology incubators.
- **Stem Cell Research Grant Program.** Open to university, not-for-profit, and for-profit laboratories to fund proposals that demonstrate a means for translation to patient treatment and that create capacity fin New Jersey for a stem cell research community.
- **SBIR/STTR Training and Assistance**
- **Stem Cell Symposium.** NJCST hosts an annual Stem Cell Scientific Symposium
- **Incubator Feasibility.** Feasibility studies for groups interested in creating a new incubator.
- **New Jersey Manufacturing Extension Program.** Seminar/training sessions and development of a preliminary assessment of the needs of start-up high-tech businesses.

**New York**

**NYSTAR**

Core programs

- **Center for Advanced Technology Program.** Supports university-industry collaboration in research, education and technology transfer.
• **Faculty Development Program.** Provides assistance to colleges and universities in attracting and retaining research faculty.

• **Technology Transfer Incentive Program.** Helps business make the rapid transfer of new ideas and new technology from the research lab to the marketplace.

• **Matching Grants Leverage Program.** $5 million for matching grants to leverage resources from Federal or private sources for efforts associated with high technology economic development.

• **James D. Watson Investigator Program.** Grants to outstanding early career scientists.

• **College Applied Research & Technology Center Program.** Encourages greater collaboration between private industry and colleges toward development and application of new technologies.

• **Science and Technology Law Center.** Advises Centers for Advanced Technology, Strategically Targeted Academic Research Centers, Advanced Research Centers, Centers of Excellence, and other academic institutions and NYSTAR on technology-related legal issues.

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**North Dakota**

**Agricultural Research Fund**

Administered by the State Board of Agricultural Research and Education, funds are split as follows:

- 70% to research affecting agricultural commodities, apportioned based on each commodity’s percentage of total agricultural sales in the state.
- 18% to research affecting North Dakota animal agriculture
- 12% to research affecting new and emerging crops in North Dakota

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**Oklahoma**

**Economic Development Generating Excellence**

The program has the following stated goals:

- Transform Oklahoma into the Research Capital of the Plains®
- Dramatically Update Oklahoma’s Public Education System
- Reverse Our State’s Health Trends – Now
- Immediately Reform and Improve Our Business Climate

They expect the $1B endowment to pay out $35-49M a year that will allow the state to:

- Commit significant matching funds to compete successfully for federally funded “centers of excellence” that produce jobs and create new businesses.
- Purchase equipment that provides researchers with the necessary competitive advantage to secure high-profile research projects that lead to commercially viable products.
• Build public and private sector facilities that provide researchers with the optimal environment in which to develop technological breakthroughs and to attract additional funding and other outstanding researchers.
• Create “centers of innovation” in the state, for example, agriculture product processing or energy extraction or sensor technology, to benefit Oklahoma industries.
• Invest capital to move innovations and inventions from the prototype stage to the level of maturity that will attract venture capitalists.
• Implement and manage sophisticated information services networks to give small and rural businesses access to the latest research results, technologies and market opportunities.
• Invest in start-up money to attract outstanding researchers to Oklahoma's public colleges and universities and to public and private laboratories.
• Signal to the business world that Oklahoma understands the importance of research, innovation and technology transfer and is committed to transforming Oklahoma into a national leader.

**Texas**

**Emerging Technology Fund**

Addresses the gap between the time of the formation of an idea and the formation of a viable business around that idea.

Priority will go to projects that

• Involve scientific or technology fields that have a reasonable probability of enhancing the state's national or global economic competitiveness
• May result in a medical or scientific breakthrough
• Are collaborative
• Are interdisciplinary
• Are matched with other funds
• Have a demonstrable economic benefit to the state
• Have attracted or may attract federal and other funding for research superiority
• Are likely to create a nationally or internationally recognized locus of research superiority.
• Address federal or other major sponsors priorities in emerging scientific or technology fields

Among other requirements are:

• The preponderance of jobs created must pay more than $18 an hour
• Researchers brought in must have a track record of success in commercialization of research.
Recommendations

1. Establish a strong partnership with business and community leaders up front

Many of the most successful programs have their origins in strong partnerships of universities with business and community leaders, where those leaders were seen as primary, or nearly primary, in driving and championing the program. The University of Alaska needs to assemble this team of partners to help develop goals for the program, define its structure, and build the case for funding. Identifying champions in the Legislature is also critical.

The Alaska State Committee on Research, or one of its subcommittees, may be able to serve this role. Whatever group is brought together must be able to act as a vigorous and effective advocate as well as a body to provide advice and oversight.

2. Focus on University enhancement

When weighing the degree of emphasis on commercialization or on university enhancement, Alaska should lean towards the latter, focusing on reinforcing and advancing the University’s intellectual capital. Given the size and age of the state, the business sector may not yet have enough critical mass to commercialize a large number of scientific and technical innovations. Alaska’s situation is analogous in many ways to Wyoming, which adopted a program with a strong emphasis on strengthening the University of Wyoming. Wyoming’s investment does serve long-term economic development goals in that a stronger university provides a stronger foundation for business and job growth both by building expertise in fields relevant to future economic development and by improving the quality of life in the state. The same should hold true in Alaska.

The need to realize long-term economic impact does argue for directing investments in University research to areas where future Alaska businesses would have the best competitive potential, but to be careful in establishing performance standards (discussed below) that balance ambition and realism. Also, in Alaska it may be reasonable to see economic impact as encompassing University programs that enhance the capability of State agencies to deliver service.

3. Concentrate some of the program funds

The program should concentrate some funds in a few areas to achieve critical mass. Representatives from several states cited the value of visibility and the difficulty of making a discernible impact, and concentrating funds increases the chances of a higher impact payoff. This does not preclude making a portion of the funds available for a broad range of programs, as long as there is a core of funding available to go into major efforts.
Whether the goals are intellectual achievement, economic development, or a balanced mix, concentrating a significant portion of funds is analogous to a mixed risk portfolio which includes low risk and high risk investments. The large investments reflect large risks with a large potential payoff in the research portfolio.

This concentration of funding can occur with or without making a strict upfront prescription for disciplines funded. While many states did start with a list of target fields, others either allow projects to come from any area or have refined their program focus as proposals came forward, projects were completed, and patterns emerged.

4. Engage MAU and Statewide leadership in deployment of resources.

Deploying resources within a State-funded research program will need to involve leadership at the Statewide and MAU level. Decisions need to reflect an institutional perspective on the potential impact of projects in their intellectual contributions and/or economic and social returns to the State. Several of the most well-established programs found that their investments worked best if upper level system and campus leadership took an active role in determining what and who gets funded.

5. Establish appropriate performance goals and accountability systems

The strongest investment programs have clear definitions of what is expected from the program and how to measure it. Accountability systems for research investment have many recurring elements (e.g., additional research dollars generated, patents issued, jobs created) but any system needs to be developed and evolve over time. As noted above, goals such as job creation or business partnerships need to take a realistic view of local conditions—large states start with a significant corporate and entrepreneurial base, and some small states benefit from proximity to larger markets. Also, linking cause and effect is not a trivial exercise. Even an apparently simple measure like additional research funding generated is subject to the question of whether that researcher or program would have secured the same funding without the state’s investment.
Targeted Disciplines

Several states have chosen to focus their investments in specific fields that represent areas where the state has or wants to develop competitive advantages.

Maine
- Aquaculture and Marine Sciences
- Environmental Technologies
- Biotechnology
- Information Technologies
- Composites and Advanced Materials Technologies
- Advanced Technologies for Forestry and Agriculture
- Precision Manufacturing

Michigan
- Life Sciences
- Future fuels
- Advanced automotive technologies
- Homeland security

Nebraska
- Biosecurity
- Bioscience, Biotechnology, Molecular Biology, and Molecular Genetics
- Construction and Infrastructure Studies
- Environmental Quality, Sustainability, and Security
- Food Productivity, Food Processing Safety and Toxicology
- Information Technology and Security
- Manufacturing and Materials
- Water Resources of Nebraska

Georgia
- Bioscience
- Nanoscience and advanced materials
- Computing and communications
- Energy
Ohio
- Advanced materials
- Biosciences (including Ag-Bio)
- Instruments, Controls, and Electronics
- Information Technology
- Power and Propulsion

Kentucky (70% of EMF)
- Health and Human Development
- Biosciences
- Materials Science and Advanced Manufacturing
- Information Technologies and Communications
- Environmental and Energy Technologies

Contacts
- Steve Goodnick, Associate Vice President for Research, Arizona State University
- Susan Shows, Vice President, Georgia Research Alliance
- James Applegate, Vice President for Academic Affairs, Kentucky Council on Postsecondary Education
- Sandy Woodley, Vice President for Finance, Kentucky Council on Postsecondary Education
- Bill Payne, Senior Associate in Finance, Kentucky Council on Postsecondary Education
- Janet Yancey-Wrona, Director, Maine Technology Institute and State Science Advisor
- Donal Burns, Associate Executive Vice President and Provost, University of Nebraska
- Norm Chagnon, Staff Director, Third Frontier Commission
- Fleda Anderson, Assistant to the Vice President for Research, Ohio State University
- Stephen Myers, Director, Ohio BioProducts Innovation Center, Ohio State University
- Michael Benzakein, Director, Ohio Center for Propulsion and Power, Ohio State University
- Bill Gern, Vice President for Research and Economic Development, University of Wyoming (interview conducted December 2005)
- Dan Berglund, President and CEO, State Science and Technology Institute
- Kei Koizumi, Director, R&D Budget and Policy Program, AAAS
- Howard Gobstein, Vice President of Science and Research, NASULGC
Web References

Arizona
Technology and Research Initiative Fund (TRIF)
http://www.abor.asu.edu/1_the_regents/TRIF/FINAL%20FY%202006%20TRIF%20Rep ort.pdf
The 2005-2006 annual report by the Arizona Board of Regents has an executive summary that includes historical information and measurement data. It also provides detailed program descriptions and financial information.

http://www.asu.edu/copp/morrison/CATREPORT.pdf
An overview of TRIF program effectiveness at Arizona State University, including a description of how it is being measured.

California
Institutes for Science and Innovation
http://www.ucop.edu/california-institutes/
The homepage for the initiative provides links to the four intercampus institutes and detailed information about their structure, programs, and services.

http://www.universityofcalifornia.edu/regents/regmeet/july06/304attach1.pdf#search=%22california%20institutes%20for%20science%20and%20innovation%20at%20UC%22
A seven-page document with a short overview of the history, purpose, and focus areas of the initiative.

Georgia
Georgia Research Alliance
http://www.gra.org/homepage.asp
The homepage for the organization provides information about its history, programs, partners, and results.

Kentucky
Endowment Match Program
http://cpe.ky.gov/research/endowment/
This web page provides links to information on the program’s guidelines and procedures, annual reports, and diversity.

Maine
Maine Technology Institute and Maine Economic Initiative Fund
http://www.mainetechnology.org/
The homepage for the Maine Technology Institute provides links to information about its grant and award programs, history, and resources.

http://www.maine.edu/pdf/meif05annualreport.pdf
The 2005 annual report of the MEIF provides information on its history and structure and financial data and descriptions of the programs that it funded state-wide.
Michigan
Technology Tri-Corridor
http://www.michigan.org/medc/ttc/
   A webpage from Michigan’s economic development and travel website that provides information on the programs of the Technology Tri-Corridor initiative.
http://www.rochesterhills.org/business_climate/smartzone/technology_tri-corridor.asp
   A webpage for the city of Rochester Hills that provides the history and background information on the Technology Tri-Corridor.

Montana
Board of Research and Commercialization Technology
http://businessresources.mt.gov/BRD_RCT.asp
   A webpage with information on the initiative’s history, programs, and achievements. The FAQ page is particularly useful.

Nebraska
Nebraska Research Initiative
http://www.unmc.edu/dept/spa/index.cfm?L1_ID=5&CONREF=135
   Provides basic information on NRI Grants and the application process.
http://www.unmc.edu/dept/spa/index.cfm?L1_ID=5&CONREF=128
   Provides the RFP for the FY 2006-2007 Grants.

New Jersey
New Jersey Commission on Science and Technology
http://www.state.nj.us/scitech/
   The official site for the Commission provides detailed information on its initiatives and programs with links.

New York
New York State Office of Science, Technology and Academic Research (NYSTAR)
http://www.nystar.state.ny.us/default.htm
   A large website with detailed information on many aspects of the initiative.

North Dakota
Agriculture Research Fund
http://www.ag.ndsu.nodak.edu/sbare/fund/arf.htm
   State Board of Agricultural Research and Education web page that provides links to the ARF’s policies and procedures, application process, budget, and other limited information.

Ohio
Third Frontier Project
http://www.thirdfrontier.com/
   The homepage for the initiative provides detailed information on their numerous programs including financial data.
Oklahoma
Economic Development Generating Excellence (EDGE)
http://www.okhighered.org/edge/
   Oklahoma State Regents for Higher Education web page with links to more
   information about the program. The Action Plan is particularly helpful.

Texas
Emerging Technology Fund
   This white paper provides concise information on the program. For more
   information on it go to: http://www.texascapital.org/.

UT Competitiveness Initiative
http://www.utsystem.edu/news/2006/BOR-CompetitivenessInit-08-10-06.htm
   A news release on the initiative.

Wyoming
Excellence in Higher Education Endowment
http://uwadmnweb.uwyo.edu/AcadAffairs/PolicyStatements/Report-100105.doc
   A fifteen-page committee report about the endowment that describes what it is
   and how it will be implemented.

School of Energy Resources
http://uwacadweb.uwyo.edu/SER/
   The homepage for the School provides information on the plans for the program
   and links to faculty members and reports.
Selected documents

“Agricultural Press Briefing” (Ohio)
“Trust Fund Reports Presentation” (Kentucky)
“Leveraging Research Dollars” (Kentucky)
“Texas Emerging Technology Fund Executive Overview”