



**White Paper – “State Investments in Life Sciences”
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The Biotechnology and Life Science sector¹ has become a vital player in modern economic growth. Countless scientific discoveries and improvements have been commercialized to great business success (and others yet offer significant opportunities) in a variety of areas, notably including medical diagnosis, drug, and device development; biomaterials; biofuels; and biocomposites; as well as other related products and services. As a result, across the United States, states have been making strategic investments to attract, support, and grow the various industries that make up the life science sector.

BIO – the Biotechnology Industry Organization - has recently driven the creation of two significant documents that are central to analysis in this arena: (1) the 2008 State Bioscience Initiatives Report (the “BIO Report”), prepared by the Battelle Technology Partnership Practice, available at http://bio.org/local/battelle2008/State_Bioscience_Initiatives_2008.pdf; and (2) BIO’s presentation of State Legislative Best Practices in Support of Bioscience Industry Development, available at <http://www.bio.org/local/industryDev>. Much of the factual survey information in this briefing paper is derived from these sources.

Because of the complex and multifaceted nature of the life science sector, states can make successful investment at many levels. While a broad legislative approach, meaningfully funded, has generally yielded more systemically significant results, smaller or “one-off” programs or initiatives have also generated positive return. In general, state efforts can be organized into three categories: (1) facilitating and encouraging discovery or development of technology; (2) attracting and retaining talent; and (3) attracting capital. To achieve business success in the life sciences, it is essential to equip research institutions to discover and develop new technologies and methods, facilitate translation of these technologies into new commercial products, and then support entrepreneurs and start-up companies to maximize their chances for success. States achieve these goals by:

- Investing in life science research and development;
- Investing in life science research and development facilities and equipment;
- Supporting faculty development programs;
- Encouraging and facilitating interactions between life science companies and academic researchers;
- Encouraging entrepreneurship and the commercialization of university intellectual property;
- Implementing supportive tax policies; and
- Creating programs that provide access to capital.

¹ Because verbiage differs by user, for purposes of simplicity this briefing paper will use the term “life science” to apply inclusively to the range of human, plant, and animal biosciences.

Life Science R&D

States typically fund research that is nearing commercialization and therefore does not qualify for federal funding, or provide funding for new investigators to help young researchers reach the point at which they can compete for industrial funding. The Bio Report found that thirty states provide funding for life science research and development.

The most common sources of support for state life science R&D are appropriations and allocation of tobacco settlement funds. In a departure from this norm, Kansas created a funding mechanism based on the growth of state income-tax withholdings from employees of life science companies, and the Missouri legislature considered similar mechanisms this year.

Life Science R&D Facilities and Equipment

In order for university life science research programs to flourish, they must have access to an excellent physical infrastructure. This includes state-of-the-art laboratory facilities, equipment, telecommunication capacities, computer systems and software, and the buildings to house all of these elements. Since 2006, many new life science research facilities have been completed and are now fully operational. However, states continue to provide many millions of dollars for life science research facilities. The Bio Report found that twenty-eight states reported making significant investments in life science facilities between 2006 and 2008.

Faculty Development Programs

States are developing academic excellence in the life sciences both by recruiting and equipping established scientists and researchers, and supporting talented junior faculty to grow and retain life science talent within the state. The Bio Report found that eighteen states and Puerto Rico reported having faculty development programs, five of which are limited to the life sciences.

Partnerships Between Researchers and Life Science Companies

Industry approach to life science R&D has become fundamentally different than in other sectors. Rather than maintaining large internal R&D engines, and bearing the expensive and risk that is required to do so, companies are looking to research institutions and early-stage companies for new discoveries. Institutions, on the other hand, are looking to companies and entrepreneurs to enable the transition from discoveries to commercial applications. Because the relationship between basic scientific research and commercial product development is so essential to success in the life science sector, these partnerships between researchers and companies have become crucial to repeat successes. The Bio Report found that twenty-eight states and Puerto Rico reported specific initiatives to encourage industry-university partnerships in 2008, up from nineteen states in 2006.

Support Services for Entrepreneurship and Commercialization

Early-stage companies, limited by strict budgetary constraints, face a desperate balancing act. Support services that have proven essential include:

- Business mentoring by successful serial life science entrepreneurs;
- Guidance to refine investment presentation to angel and other investors;
- Consultation regarding economic feasibility, and accessible markets and distribution channels;
- Access to specialized equipment, laboratories, and technical consulting;
- Assistance addressing regulatory and other life science-specific issues;
- Assistance in recruiting key personnel, including business managers; and
- Access to potential capital sources.

The Bio Report found that eleven states reported entrepreneurial support programs specifically targeted to the life sciences.

Supportive Tax Policies

Tax policies are another tool that can be successfully used to encourage investment in early-stage companies, as well as in the investment funds that support early and late stage companies. Tax policies can also ease cash flow demands on life science companies themselves. The Bio Report found that thirty-six states offer R&D tax credits, thirty-one states exempt sales tax for equipment used in R&D; four states offer sales tax exemptions specifically targeted to life science firms; and thirty-nine states allow firms to carry forward net operating losses.

Access to Capital

Access to capital is a central and recurring need for life science companies. The challenge is especially great for companies in biomedicine, which face a long and expensive development process through clinical trials and regulatory approval before advertisement and sales can even begin. Increasingly, state governments are trying to address capital needs by providing funding for precommercialization/proof-of-concept activities, including creating seed funds, supplying capital for facilities financing, and implementing policies that encourage private investment in early-stage and later-stage venture capital.

SUMMARY BY STATE

In alphabetical order, the following are representative summaries of notable state efforts.

ARIZONA

- 1984. The Arizona Biomedical Research Commission was created to provide monies for research on the causes and prevention of diseases and the development of new drugs. The Commission connects researchers and clinical research assets for specifically identified goals, and its matching funds often help to attract additional federal and private funding.
- 2001. Arizona legislature passed Proposition 301, providing \$1 billion over 20 years for scientific research at state universities.
- 2002. Creation of the Biodesign Institute at ASU. Initially solely supported by a voter-approved fund, competitively awarded research grants now comprise its single largest source of funding, along with industry research contracts.
- 2004. \$440 Million appropriated to build university research facilities.
- 2004. Department of Commerce awarded \$1 million in Arizona Job Training Credits to various companies to support the training of 786 individuals.
- 2005. Legislation adopted crediting bioscience enterprises with a 12% tax credit on investments in the first two years and 11% for the third year.
- 2005. Legislation adopted creating an Angel Tax Credit Program granting 35% tax credits for investors in early stage biotech companies.
- 2006. Legislation adopted creating the Arizona 21st Century Fund, funded by appropriations of \$35 Million. The stated purpose is to build, strengthen, and support medical and scientific research and infrastructure with an emphasis on bioscience. The fund is administered by the Commerce and Economic Development Commission (part of the Arizona Department of Commerce), through a memorandum of understanding with the Science Foundation of Arizona, a private nonprofit corporation.
- 2007. \$25 Million appropriated for Phoenix Biomedical Campus, and \$100 Million for the Science Foundation of Arizona.
- 2008. R&D tax credit increased to 22% of R&D expenses, up to \$2.5 Million.

ARKANSAS

In 2008, Arkansas Science & Technology Authority (the “ASTA”) released \$250,000 in initial funds toward development of an Arkansas Research Alliance, intended to establish programs to build the state’s R&D base by recruiting eminent scholars and undertaking other initiatives. The Authority also increased the maximum grant under its Technology Development Program to \$100,000 and increased to 100% the maximum credit available under the Research & Development Tax Credit Program for qualified research expenditures at universities.

In 2007, ASTA received a \$9 million Experimental Program to Stimulate Competitive Research grant from the National Science Foundation, matched by \$4.5 million from the state,

for university-based research with potential for commercial applications in plant-based bioproduction and wireless nano-bio sensors.

Arkansas continued annual allocations of about \$10 million from its tobacco settlement funds to the Arkansas Biosciences Institute, a nonprofit coordinating consortium that reported that its five partner institutions had leveraged \$32.7 million in extramural awards in 2006–2007.

CALIFORNIA

The California Institute of Regenerative Medicine (“CIRM”) is funded by a \$3 Billion bond issue authorized in 2004, and subsequently by a \$150 Million loan provided by the state during litigation over the bond issuance. CIRM invested \$174 Million in stem cell R&D and \$321 Million in supportive facilities in 2007 and 2008. In May 2008, CIRM announced it would allocate another \$271 Million to help build 12 stem cell research facilities.

In 2006, California created the University of California (UC) System’s California Institute for Bioengineering, Biotechnology, and Quantitative Biosciences, one of three new institutes for science and innovation, funded with \$100M and matched by \$200M in private funds, holding 100 scientists in three new buildings.

GEORGIA

The Georgia Research Alliance (the “GRA”) is a privately organized 501(c)(3) that allows business, research universities and state government to collaborate to build a technology-driven economy fueled by innovative university research. The operations are funded through private and industry donations, while its investments are part of the budget of the Office of the Governor, and approved by the legislature. The GRA manages 3 main programs:

- *The Eminent Scholars Program* – the GRA contributes \$750,000 to an endowment fund for each eminent scientist or researcher that is targeted for recruitment, with a matching grant by the partner university.
- *Centers of Research Excellence* – the GRA invests in facilities located at its partner universities, or at collaborative facilities involving multiple partner universities. These investments are often in the form of matching funds to attract outside private or federal grants. Not only do these investments ensure strong research facilities, but also they are often used in conjunction with the Eminent Scholars Program to ensure that the incoming scientist will have the most up-to-date facilities necessary.
- *Commercialization* – the GRA has created VentureLab, which evaluates the best inventions that come out of the partner universities and provides grants for the formation of start-up companies to commercialize the technologies. VentureLab also assists with management guidance and incubator placement for the new companies. Independently of VentureLab, the GRA will invest in promising private sector R&D projects structured as university and private sector collaborations.

The GRA also provided \$500,000 in FY 2007 and \$400,000 in FY 2008 for biofuels seed grants.

In 2008, the GRA launched its new Next-Generation Vaccines and Therapeutics Initiative with \$10 million in initial funding from the state. This funding is focused primarily on recruitment of academic scientists, development of research infrastructure, and acceleration of commercial translation programs. Approximately \$1.1 million of the initial allocation supports collaborative R&D projects among researchers at Georgia's academic institutions.

Life Science Facilities Fund - the legislature has appropriated \$5 Million in the last two years to this Fund for loans to companies building life science related facilities. This fund was created through budget appropriation, is administered by the Georgia Department of Community Affairs (the "GDCA"), and governed by regulations published by the GDCA.

Georgia Bioscience Joint Development Authority – four counties created a panel of economic development and government officials who are working to attract biotech-based businesses to the corridor to create a cluster of research and development much like the "Research Triangle" between Raleigh-Durham and Chapel Hill, N.C. These development authorities are created pursuant to a Georgia statutory section which grants them rights to create tax incentives, issue bonds, enter into development contracts, and perform other actions to incentivize and entice development in a particular region or county. Tax credits include Job Tax Credits, Headquarters Tax Credit, and Retraining Tax Credits, each tied to the number of jobs created.

ILLINOIS

The University of Illinois' signature multidisciplinary bioscience R&D facility, the Institute for Genomic Biology, is now open at the Urbana-Champaign ("UIUC") campus. The Institute will also house the University's umbrella Center for Advanced BioEnergy Research and UIUC's component of the Energy Biosciences Institute, funded by BP in collaboration with UC-Berkeley and Lawrence Berkeley National Laboratory.

Through the National Governors Association Policy Academy program, Illinois is developing a demonstration program on using the National Education Technology Standards in a curriculum to promote innovation-centered learning.

The House of the Illinois General Assembly has also added a Bio-Technology Committee.

KANSAS

The Kansas Bioscience Authority ("KBA"), created by the Kansas Economic Growth Act of 2004 and funded by incremental personal income-tax collections in designated life science industry sectors, estimated to aggregate over \$500 Million over 15 years, operates the following incentive programs:

- Kansas Bioscience Eminent Scholars – offering grants to recruit distinguished bioscience researchers to conduct their research and commercialization activities at Kansas research institutions;
- Kansas Bioscience Rising Stars – offering grants to retain and advance Kansas’ best and brightest bioscience scholars and attract world class bioscience scholars;
- Kansas Bioscience R&D Voucher – offering funding to Kansas bioscience companies, in partnership with a Kansas research university, company, or institution, for proof-of-concept research and development activities and ancillary activities necessary to commercialize bioscience technologies;
- Kansas Bioscience Matching Fund – offering funds to Kansas universities, research institutions, and bioscience companies to match research dollars from federal, private, and other sources of funding;
- Kansas Bioscience Expansion & Attraction – offering qualifying companies direct financial assistance in the form of low-interest loans, grants, and bonds;
- Collaborative Cancer Research Initiative - offering vouchers to attract academic, federal agency, and nonprofit researchers inside and outside of Kansas to collaborate with Kansas scientists to perform research in Kansas facilities;
- Kansas Bioscience Centers of Innovation – offering funding intended to leverage federal and private funds; and
- Heartland BioVentures – offering assistance to early stage bioscience firms to fundamentally address business, technology, management and other strategic issues, improving their access to venture capital.

The KBA has additionally allocated over \$1 million to planning grants for a series of university-industry Centers of Innovation, and \$2.5 million to a Collaborative Biosecurity Research Initiative at Kansas State University, which contributed to successfully attracting the federal National Bio and Agro-Defense Facility, which was awarded to Kansas in 2009. Overall, the KBA reached the level of \$35 million in annual R&D funding during FY 2008.

MARYLAND

Maryland has created several bodies legislatively empowered to manage specific programs and incentives. In 2007, the Maryland Life Sciences Advisory Board (“LSAB”) was created by special legislation. The 15-member Board includes senior officials from life science companies, the state’s institutions of higher education, and federal laboratories with life science missions. LSAB is charged with promoting life science research, development, commercialization, and manufacturing in Maryland and making recommendations to address critical needs in the life sciences, including access to venture capital and capital construction funding. In the summer of 2008, LSAB submitted to the Governor a strategic plan to further Maryland’s position in the life sciences. As a result, the Governor has proposed plans have been proposed, but not yet adopted, to substantially increase appropriations to \$1.3 billion for various biotech programs over the next ten years, including the following:

- *Biotechnology Investment Tax Credit Program* – modeled on the Kansas Angel Investor Tax Act, this program currently grants investment tax credits to investors in

early stage biotech companies. TEDCO may currently award up to \$6 million per year, but it is proposed to double this amount by 2010, and again, by 2013.

- *Maryland Biotechnology Center* - this is proposed as a “one stop shop” to showcase and support biotechnology innovation and entrepreneurship in Maryland, and consolidate various state, academic and private sector ventures. Industry experts at the Center will build or expand the state’s relationship with federal labs, universities, and private sector companies.
- *Technology Incubator Network* - Maryland intends to invest \$60 million over the next ten years to leverage \$120 million in private and federal investment funds and grow Maryland’s incubator network by 50%.
- *Stem Cell Research Fund* – as proposed, Maryland would contribute at least \$20 million annually to the Maryland Stem Cell Research Fund.
- *Increasing Maryland’s Technology Transfer Programs* – proposed to increase funding to the universities for technology transfer programs.

The Maryland Technology Development Corporation (“TEDCO”) is a statutorily created body politic of the state. Funding is approved and appropriated on annual basis. TEDCO’s role is to be Maryland’s leading source of funding for seed capital and entrepreneurial business assistance for the development, transfer and commercialization of technology.

The Maryland Stem Cell Research Fund (“MSCRF”) is a statutorily created fund governed by a statutorily created Stem Cell Research Commission. The MSCRF was initially funded by the legislature, and now is included in the Governor’s annual budget bill, presented annually to the legislature. The MSCRF promotes state-funded stem cell research and cures through grants and loans to public and private entities in the State. Administration of the fund is performed by TEDCO. Over \$60 million dollars was appropriated and distributed during the first two years of the program.

MASSACHUSETTS

Signed into law in June of 2008, the Life Sciences Initiative represents a 10-year, \$1 Billion umbrella program expanding the programs and funding for the Massachusetts Life Sciences Fund (the “MLSF”) and Massachusetts Life Science Center (the “MLSC”), which, created in 2006 within the Executive Office of Housing and Economic Development, oversees and administers the MLSF. The Initiative includes \$500 million in funding for various life science capital projects at universities, medical centers, and laboratories across the state, including design, construction, expansion, and renovation of facilities and infrastructure for R&D facilities and improvements in biomanufacturing and wet lab incubation; \$250 million in granting authority, and \$250 million in tax credits. Additional programs include:

- *Life Science Accelerator Program* - through which the MLSC will provide loans to certified life sciences companies operating in Massachusetts;
- *Matching Grant Program* – this program is operated through three strategies:
 - Cooperative Research Solicitation Grant (\$250,000 per year for up to three years, in a 1:1 match with its industry partner);

- New Faculty Startup Solicitation Grant (\$250,000 per year for up to three years, in a 1:1 match with the academic institution);
- New Investigator Solicitation Grant (\$100,000 per year for up to three years for cutting edge life science research projects at Massachusetts colleges, universities, and affiliated research institutions)
- *Dr. Craig C. Mello Small Business Equity Investment Fund* - providing up to \$250,000 in seed capital per qualifying entity.
- *Dr. Judah Folkman Higher Education Grant Fund* - providing grants of between \$5,000 and \$15,000 to graduate students studying life science.

The Initiative also appropriates \$25 million per year for 10 years for various tax incentives, highlights of which include:

- 10% Life Science Investment Tax Credit;
- 100% FDA User Fees Credit;
- Extension of Net Operating Loss Carry-forward from 5 to 15 years;
- Establishment of a Life Science Research Credit;
- Sales Tax Exemption for certain tangible personal property purchased for use in a life science facility;

MISSOURI

Missouri's Lewis and Clark Discovery Initiative ("LCDI"), signed into law in May 2007, will provide \$335 million in funding for facility and infrastructure improvements at Missouri's colleges and universities between 2007 and 2012. These funds will be used to construct new research labs, teaching facilities, business incubators, and a plant science research center. Funds provided by the initiative will be augmented by more than \$150 million in federal and local matching money, resulting in a total investment of approximately \$470 million.

In addition to the funds targeted toward research and education, \$15 million was earmarked for the Missouri Technology Corporation ("MTC") for various programs designed to improve commercialization of Missouri technologies. Life science related initiatives funded include the following:

- *MTC Entrepreneur Pipeline Program/Plant and Ag Biotech Seed Capital Co-Investment Fund*. LCDI allocated \$3 million for seed capital co-investment and the establishment of an entrepreneurial pipeline.
- *Medical Device Innovation Program*, a \$350,000 program designed to enhance collaboration between physicians, engineers, and business people to create new entrepreneurial opportunities.
- *Opportunity Fund for Bioenergy Research Center*, which received \$3.25 million that can be used to enhance Missouri's competitive position in seeking major federal research facilities.

- *Animal Health and Nutrition Center and Animal Health Workforce Development Initiative.* These efforts are being undertaken in partnership with Missouri universities and leading companies in the St. Joseph area, which has a large cluster of animal health–related companies.

In 2009, two pieces of legislation were introduced in Missouri, which would provide for significant state life science incentives: the Missouri Science and Innovation Reinvestment Act (“MOSIRA”), which was introduced in the Missouri Senate as Senate Bill 572 and in the House as HB 1029; and Missouri Jobs for Technology and Science Legislation (“MO-JTS”), introduced in the Missouri Senate as an Amendment to Senate Bill 377. Neither was adopted, but both are expected to be reintroduced next legislative session. A brief summary of each legislation follows:

Missouri Science and Innovation Reinvestment Act

The purpose of MOSIRA is to foster economic growth and the creation, attraction, and retention of quality jobs by providing a predictable, stable source of funding for building science and innovation companies in Missouri. The key components are:

- Creation of a Science and Innovation Reinvestment Authority, governed by a public board of directors, and advised by expert advisory committees;
- Funding for the Authority created by capturing new growth in state income taxes generated by new employees working in Missouri within designated science and innovation fields, above a designated base year level;
- The Authority is given broad authority to create, fund, and operate a wide variety of programs to stimulate the life science sector in Missouri, including:
 - Grants, or bond financing, to addressing the infrastructure needs of science and innovation companies, including incubators, lab space, research parks and district development;
 - Creating and funding programs at universities and other facilities to train a qualified, professional workforce;
 - Creating and funding programs to attracting and retain scientists to universities and other research institutions;
 - Assisting in commercialization of research discoveries by facilitating partnerships with new Missouri-based companies;
 - Assisting entrepreneurs by offering focused services to assist early-stage companies;
 - Providing seed capital at the early and middle stage, either to leverage federal and institutional money, or to assist scientists, entrepreneurs, and executives in getting to the point where such money can be captured; and
 - Offering specific benefits to recruit science and innovation companies to Missouri.

Missouri Jobs for Technology and Science (MO-JTS) Legislation

The purpose of MO-JTS is to build a sustainable foundation of high-quality science and technology jobs in MO-JTS districts and regions that will allow Missouri to effectively compete in the 21st Century global economy and transition its diverse economy to its strengthen its core assets and resources.

Mo-JTS provides a mechanism for the creation of geographically defined areas, each referred to as a business, education, science, and technology district (a “BEST district”), and provides an incentive mechanism to attract private and public investment, foster interactivity between business, education, science and technology, and ultimately increase the number of high paying and high skill jobs within such clusters.

Each BEST district requires designation by one or more municipalities, and the review of and recommendation by the Missouri Department of Economic Development that the district would result in a “net benefit to the state.” Each Best district would be focused on a specific “targeted industry cluster” (as defined by the DED).

Each BEST district must include the significant physical presence of at least one Missouri-based higher education institution (including universities, colleges, and community colleges) or a recognized research institution that provides educational resources in the district, such as classrooms, curriculum, dedicated faculty, graduate students, and public/private industry partnerships supportive of the targeted industry cluster.

Funding is provided by the capture 50% of the net new incremental general revenue portion of the sales taxes produced within the BEST district above a base year, plus up to 100% of the incremental state income taxes produced in the district above the base year, in each case for up to 25 years. The incremental revenues captured may not exceed 50% of the BEST district project costs.

The sponsoring municipality or county or affiliated entities (such as economic development corporations), or two or more such organizations acting together, must provide at least 10% of the BEST district project costs, in the form of funding, real property, infrastructure improvements, or other in-kind contributions over 10 years following establishment of the district.

Resulting revenues may be used to acquire property, install infrastructure, build public buildings, and otherwise promote and support the development of the infrastructure to attract employers to bring high quality jobs to the district in conjunction with the research university or institution.

WEST VIRGINIA

In 2006, Marshall University opened the \$48 million Robert C. Byrd Biotechnology Science Center, a collaborative research facility for the School of Medicine and the College of Science. The State of West Virginia provided \$10 million toward the cost of construction.

In 2008, legislation created the West Virginia Research Trust Fund supported by \$50 Million in state funds to match private donations to stimulate research at West Virginia University (“WVU”) and Marshall University (“MU”). The funds will be used to support expansions to faculty research and infrastructure. Four areas are targeted for funding, of which one is biological, biotechnical, and biomedical science. In 2007, \$10 million was invested through the Eminent Scholars Recruitment and Enhancement Program.

The Blanchette Rockefeller Neurosciences Institute and the Biomedical Science Research Lab Facility at WVU also opened in 2008, with the latter providing facilities for expanded research programs within WVU’s Health Sciences Center.