NEW ORLEANS MEDICAL DISTRICT
ECONOMIC DEVELOPMENT STRATEGY

Issue Paper:

Innovation System Strategy

December 4, 2006

Eva Klein & Associates, Ltd.
Strategies for the Global Knowledge Economy

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(This document is one of a series of four interim work papers prepared for the purpose of supporting stakeholder dialogue in Planning Workshops. It is not a Strategic Plan or formal report.)

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CONTENTS

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(Revised and Expanded from ***Commercialization and Innovation Work Paper***, October 29, 2006)

December 4, 2006

INTRODUCTION

This ***Issue Paper*** is an expanded, revised, and updated version of an initial ***Issue Paper on Commercialization and Innovation*** (October 29, 2006).

It has been reorganized to contain analytical information, peer data, and ***Action Strategies*** relating to all elements of the Medical District plan that are NOT physical development—collectively organized as the ***Innovation System Strategy.***

In this updated version, we have:

- Renamed the paper to reflect that it covers all elements of what could broadly be called the ***Innovation System Strategy*** for the Medical District
- Corrected certain data from the October version
- Added a section on ***Work Force***
- Added a discussion of ***Niches of Expertise*** based on the November 1, 2006 Workshop
- Added ***Action Items*** that are derived from the November 1, 2006 Workshop on Innovation and from other consultant team work

This ***Issue Paper*** is prepared as part of materials to support the Workshop scheduled for December 7, 2006.

EXECUTIVE SUMMARY

AN INNOVATION SYSTEM FOR NEW ORLEANS

To be sure, development of the New Orleans Medical District will entail enormous physical development challenges—to build and rebuild institutional facilities; create attractive places for private sector bioscience activity; and provide common urban and community elements. Yet, however demanding will be the physical development elements, the far more pressing challenges are those that have to do ***not*** with the "bricks and sticks" but, rather, with the people, the science, the expertise, the innovation capacity—in short, all the ***knowledge asset*** activities that fill buildings—all the programmatic elements of the future strategy—here called the ***Innovation System***.

BIOSCIENCES INDUSTRY—GLOBAL AND NEW ORLEANS

Today, perhaps no other industry exhibits the intensity of competition that surrounds all life/biosciences—from competition for basic research funding and findings to competition for high-stakes wealth creation in drugs, devices, and services. New Orleans has a base of competency in research, despite Katrina, but is not as dense with science and scientists as many other areas with which it competes. There is a modest existing bioscience company presence, and it is threatened with post-Katrina stresses.

CAPACITY TO SUPPORT INNOVATION

CENTERS OF EXCELLENCE

The Cancer and Gene Therapy initiatives provide important ***organized*** assets, as well as models for additional institutes that can bring focus, collaboration, and scale-up of funding. In addition, there are pockets of significant expertise—as one example, Tulane's work in Infectious Diseases.

TECHNOLOGY DEVELOPMENT

Like most universities, the local institutions are still inventing their roles and practices in technology development, with Tulane University being more experienced and accomplished than LSU Health Sciences Center in this realm. There remain challenges—from enhancing the culture of entrepreneurship to the technical aspects of managing innovation to acquiring more resources with which to do so.

VENTURE CAPITAL

The State's and the region's performance in venture capital funding lags national averages. On the positive side, there are venture funds operating and there is potential for acquiring more attention to local deals. Like everywhere else, early-stage capital is the greatest gap and need.

WORKFORCE

The region's workforce is diminished and destabilized by Katrina. There is an identified need for laboratory technicians. Overall growth in bio-related degree production is needed. A special problem is recruitment and retention of highly sought-after research scientists and faculty. Entrepreneurial managers are in very short supply.

Peer Data
A section of material about peer programs and practices follows the ***Capacity*** section and precedes ***Action Strategies***. Additional peer information is contained in Exhibits.

ACTION STRATEGIES

Preliminary ***Action Strategies*** are offered for discussion, refinement, and eventual adoption as critical elements of the ***New Orleans Medical District Economic Development Strategy.***

THE BIOSCIENCES INDUSTRY

A HIGH GROWTH AND HIGHLY COMPETITIVE INDUSTRY

Audubon Biomedical Science and Technology Park at Columbia University

Bioscience firms and the cluster of activities and related interests they anchor have become prime targets for state and local economic developers and with good reason. For state and local economic development interests, the biosciences represent an economic triple windfall. It is a rapidly growing and diversifying field; it represents clean industry that everyone can embrace; and it offers high paying jobs. It is also a sector that, as previously noted, attracts a very large share of entrepreneurial and venture capital interest and is the source of multiple spin-offs of related enterprises.

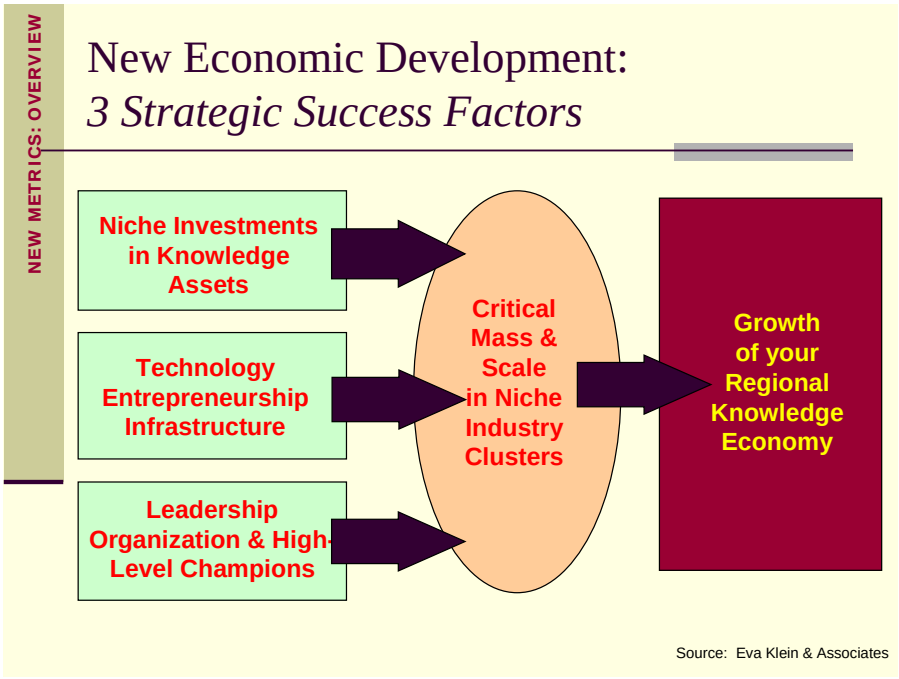
According to a very recently released report by the Biotechnology Industry Organization (***Growing the Nation's Biotech Sector: State Bioscience Initiatives***, 2006), there are nearly 1.2 million people directly employed in this sector in about 40,000 firms nationwide. This sector is made up of primarily small, innovative, entrepreneurial firms involved in producing cutting edge technologies with a wide variety of human, animal and agricultural applications. When spin-offs and support employment for the basic biosciences sector are considered, total employment reaches an estimated 7.0 million. This same study also reaffirmed a very important finding of prior research: bioscience pays very well. Bioscience salaries averaged (in 2005) $65,775 or $26,000 higher than the average salary of all persons employed in the U.S.

SUCCESS FACTORS

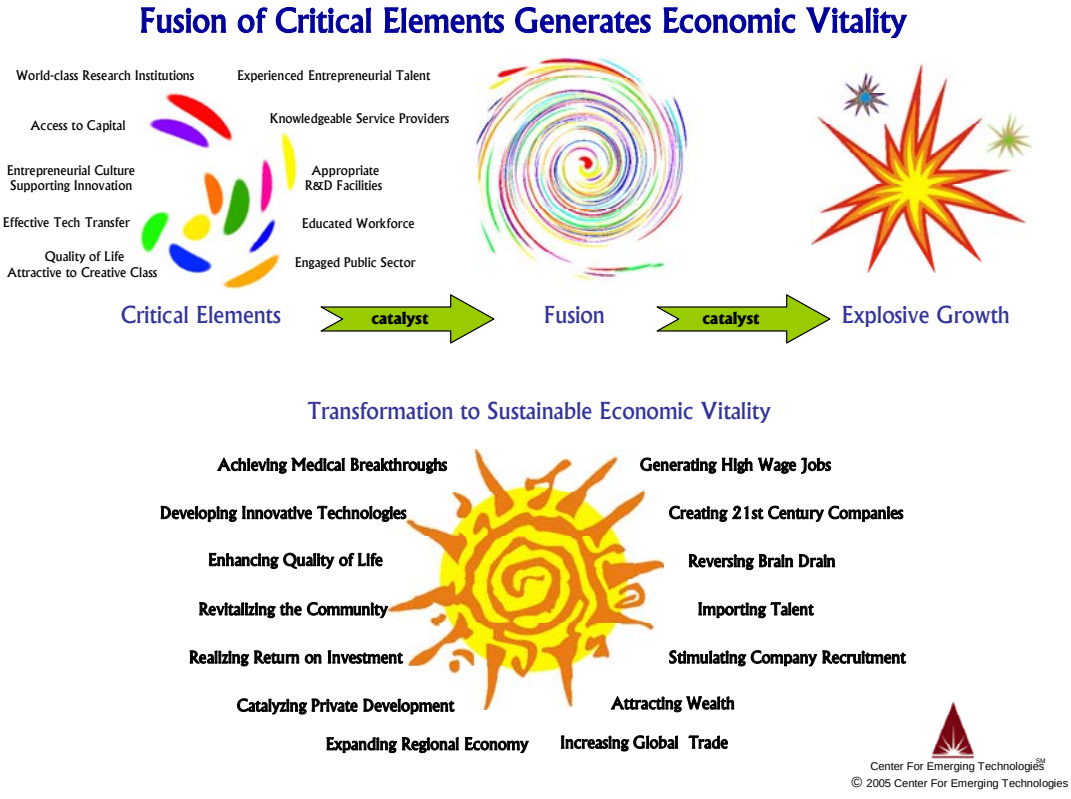
Competition among economic developers to attract and grow the biosciences sector is only going to become fiercer over the next decade. State and local governments will put more resources (financial and otherwise) on the menu of incentives to attract, nurture and most importantly retain bioscience firms. However, communities that are most successful in their efforts to cultivate the bioscience sector will need to build a critical mass consisting of eight key ingredients identified by the Battelle Technology Partnership Practice. These include:

- Engaged universities with active leadership.
- Entrepreneurial cultures with intensive networking across sectors and industries.
- Available capital covering all stages of the business cycle.
- Discretionary federal or other research and development funding.
- A qualified workforce and available labor pool.
- Access to specialized facilities and equipment.
- Supportive business, tax and regulatory policies.
- Patience and a long-term perspective.

Various members of this consultant team also have created "frameworks" to describe the necessary ingredients or success factors. A simplified version from Eva Klein & Associates positions three sets of inputs, as follows:



And, a more detailed set of interactive factors from the Center for Emerging Technologies, St. Louis:



Because we can see, from the experience of others, that successful biotech industry development depends upon "systems" of factors, all operating together, we have elected to call this entire set of non-physical strategy elements the Innovation System for the New Orleans Medical District.

BIOSCIENCES IN NEW ORLEANS

Information on the Post-Katrina condition and structure of the New Orleans area bioscience sector is limited at best. Secondary or published information are not reliable due to the instability of the data sources caused by extensive economic dislocations after the storm. The Bring New Orleans Back Commission (BNOB), however, through the Technology Subcommittee of its Economic Development Committee, did gather some useful information to provide a basic profile of the biosciences sector. The report notes that despite the presence of major medical research institutions such as the Tulane Medical School, LSU Health Sciences Center and the Oschner Foundation Clinic, there are relatively few bio or life sciences companies operating within the region. Many of the companies have been formed by university faculty and researchers who have been able to ***"spin-out research opportunities developed at local medical research institutions."*** The BNOB survey counted seventeen bio or life sciences-related firms operating in the New Orleans metropolitan area. Most of these firms are now located in Jefferson, Orleans, or St. Tammany Parishes.

Most of these firms are very small, generally employing less than five people. The major exception to this is Reliagene Technologies with about 70 employees and PemLab with over 100. The BNOB survey estimated direct total employment in the bio or life sciences sector at 550 to 600 in the entire metropolitan area. Firms currently operating in the region cover a diverse group of technologies including lab test kits, medical devices, environmental remediation, pharmaceuticals and agricultural applications.

If the eight key ingredients noted above will be the standards dictating the viability of developing a bioscience sector in New Orleans, an honest assessment of the current situation reveals significant hurdles that must be overcome and challenges that must be met. It is not necessarily impossible to create the environment in which such a critical mass of support infrastructure could be created. However, it is going to require a significant commitment on the part of all relevant parties to steady, continuous and focused investments, together with patience and long term perspective.

Figure 1 (next page) summarizes local industry information from the BNOB report dated December 2005. Figure 1's information may be somewhat out of date, but it was not within the scope of this analysis to survey existing companies again. Figure 1 represents an approximate view of the current regional industry.

Figure 1
Summary Profile of Bioscience Firms
Located In the New Orleans Metropolitan Area—December 2005

Firm Name	*Location/Address*	*Product/Research Focus*
AUG Biotechnology, Inc.	2135 Lakeshore Drive Mandeville, LA 70470	Fetal gene therapy
Autoimmune Technologies, LLC	144 Elks Place, Suite 1440 New Orleans, LA 70112	Biomedical diagnostic tests for fibromyalgia
BioSouth Research Labs BioSyn, Inc. Therapeutic Peptides, Inc. Vital Assist	5700 Citrus Blvd., Suite B Harahan, LA 70123	Development and synthesis of specialty chemicals for pharmaceutical, cosmetic and industrial applications
Bayou Biolabs	1500 Edwards Ave., Suite Q Harahan, LA 70123	Manufacture and sale of DNA ladders and custom plasmids
Cimex Bio-Tech	72385 Industry Lane Covington, LA 70435	Research, development and commercialization of innovative medical devices
Dana Diabecare USA, LLC	541 Julia Street, 3rd Floor New Orleans, LA 70130	Developer of micro-sized innovative insulin pump for diabetics
Environmental Association of Louisiana	3300 Canal Street, Suite 220B New Orleans, LA 70119	Improving existing sewage treatment plants
EZclone Systems	6240 Carlson Drive New Orleans, LA 70122	Biomedical products allowing more efficient gene cloning experiments
GenVis Biogroup, LLC	8232 Oak Street New Orleans, LA 70118	Re-marketing older drug products and commercializing technologies developed by academic institutions and private entities

Figure 1(continued)
Summary Profile of Bioscience Firms
Located In the New Orleans Metropolitan Area—December 2005

Firm Name	*Location/Address*	*Product/Research Focus*
KAM Therapeutics, Inc.	Dept. of Pharmacology and Experimental Therapeutics LSUHSC	Drugs for neural and cardiovascular diseases and cancer
IntelliFuse	365 Canal Street, Suite 2300 New Orleans, LA 70130	Material for reconstructive orthopedic, neurological and spine surgery
Norian Diagnostic Innovations, Inc.	Research Institute for Children New Orleans, LA	Diagnostic assays for measuring HIV drug resistance
PemLab, LLC	P.O. Box 8950 Covington, LA 70470	Pharmaceutical firm specializing in analgesics, cardiovascular therapy, renal therapy and cough and cold medications
Reliagene Technologies, Inc.	5525 Mounes Blvd. Harahan, LA 70123	DNA lab specializing in human genetic identification
SYNSCIA, Inc.	8220 Neron Place New Orleans, LA 70118	Therapeutics to treat proliferative disorders in ocular, neoplastic and autoimmune indications
St. Charles Pharmaceuticals	P.O. Box 850616 New Orleans, LA 70185	Low toxic analgesics
Universal Sensors, Inc.	5285 Veterans Blvd., Suite D Metairie, LA 70006	Research, development and manufacture of amperomatic biosensor detectors, enzyme electrodes and piezoelectric QCM detectors

Source: Bring Back New Orleans Commission, Economic Development Committee, Technology Subcommittee, Biosciences Workgroup Report, December 20, 2005.

CAPACITY TO SUPPORT INNOVATION

Following is an assessment of the resources, assets, and issues pertaining to New Orleans' capacity to support biosciences innovation, organized into:

- Centers of Excellence
- Technology Development
- Venture Capital
- Workforce.

CENTERS OF EXCELLENCE

THE STATE'S INVESTMENTS

Biospace I, Shreveport

WET LAB INCUBATORS

In Louisiana, the State provided funding for facilities for three biosciences innovation centers / incubators—in Baton Rouge, Shreveport, and New Orleans, for a total of $30 million.

LOUISIANA GENE THERAPY RESEARCH CONSORTIUM

The Louisiana Gene Therapy Research Consortium is a partnership among Louisiana's public and private health sciences centers including: Louisiana State University Health Sciences Centers in New Orleans and Shreveport, and Tulane University Health Sciences Center in New Orleans.

The Consortium began operations in 2000 when the State committed $45 million to its operation. The funds are used to support recruitment of leading researchers in the cell and gene therapy field, establish core technology labs at the sites of member institutions, and develop cell and gene therapy technologies for clinical applications.

The Consortium objectives are:

- Building the research infrastructure
- Establishing a Clinical Manufacturing Facility
- Enhancing educational opportunities

To date the Consortium has received approximately $20 million, with $13 million dedicated for building a Clinical Manufacturing Facility and the other $7 million for attracting researchers and building and equipping core research laboratories. The LGTRC has successfully recruited top researchers and leveraged $60 million in Federal Grants with another $20 million pending. An 850% Return on Investment from the State's initial $7 million funding. Commercialization outcomes include: 22 gene therapy research projects, 19 pre-clinical trials in animals, 4 patent applications, and 1 start-up company.[1]

LOUISIANA CANCER RESEARCH CENTER

The Louisiana Cancer Research Center is a collaborative initiative of Louisiana Health Sciences Center in New Orleans and Tulane University.

The Center's mission is to develop a coordinated cancer research and education program that will optimize discovery and development of innovative cancer therapies; lead to innovative clinical treatment programs offering new opportunities for early detection, treatment, and prevention of cancer in our region; and promote regional economic growth. Ultimately, the Center is intended to advance the State's goal of

[1] Web site, Louisiana Gene Therapy Research Consortium

receiving NIH designation as an NCI-designated cancer center. Specific programs include:

- Molecular Genetics
- Molecular Signaling
- Immunology, Infection, and Inflammation
- Epidemiology, Etiology, and Prevention
- Clinical Research

The Cancer Center is funded from a portion of taxes on cigarettes, in the range of $10 million per year.[2]

RESEARCH COMMERCIALIZATION AND EDUCATIONAL ENHANCEMENT PROGRAM

Very recently, the Louisiana Recovery Authority and the Louisiana Board of Regents unveiled a $28.5 million ***Research Commercialization and Educational Enhancement Program*** (RC/EEP) to stimulate economic development within the portions of the state severely impacted by Hurricanes Rita and Katrina. Funds for this program originate from the Community Development Block Grants (CDBG) appropriated by the federal government.

State officials report how Louisiana suffered $400 million in damage to research facilities and infrastructure after the hurricanes. Furthermore, officials report the aggressive recruitment of key research faculty by out-of-state institutions as another threat to future development and economic recovery. While Louisiana had a strong pre-hurricane research capacity, it lacked a coordinated and focused strategy to drive new company creation, market development, and marketing opportunities, according to an action plan developed by the state.

The highlights of the RC/EEP program include the following components:

- Create an Eminent Scholars Program, similar to that of the Georgia Research Alliance, to promote the retention of faculty and the recruitment of researchers. Funds will be allocated to support salary increases, conference attendance, laboratory necessities, and graduate student support to assist these researchers.
- Provide additional funds to ameliorate research capacity, such as laboratory reconstruction, scientific equipment support, and workforce support.
- Generate an entity to encourage the development of technology in the pre-business phase, especially scientific discoveries with commercial potential.
- Promote the active participation of existing faculty to develop the Science, Technology, Engineering, and Math (STEM) environment of the State by utilizing salary enhancements, summer funding, and release time as incentives.
- Expand student education and training through need-based and merit-based support.
- Enhance research training by providing research opportunities for undergraduate students.[3]

THE BIOINNOVATION CENTER

There is not yet a true technology incubator function nor a fully coordinated technology commercialization strategy in operation within the New Orleans region. In the past three years, efforts to establish both have focused on development of the New Orleans

[2] Web site, Louisiana Cancer Research Center.
[3] SSTI Digest, October 9, 2006.

BioInnovation Center, which would be the first essential economic development project to launch the private enterprise component of the New Orleans Medical District.

The project is designated for a site in the 1400 block of Canal Street, under a ground lease from LSU. The building is expected to house a cGMP facility for the Louisiana Gene Therapy Consortium, as well as the incubator. It is intended to offer space to more mature companies as well. Initially conceived as a 130,000 SF facility for these multiple purposes, the project (building and site) have been the subject of various planning studies.

- State funding was approved for three biosciences wet lab incubators in the State, of which this is one.
- A managing board has been formed for the Center with membership similar to that of NOrMC and the Gene Therapy Research Consortium and Cancer Research Center.
- An Executive Director is in place (Aaron Miscenich).
- Mr. Miscenich has been working with a consultant on physical planning and design
- He also has been developing plans for how the Center would coordinate its operating and management policies with the two university technology commercialization functions operated respectively by their technology transfer officers, Mssrs. Jake Maczuga of Tulane University and Jamie Hardy of LSU Health Sciences Center.
- Turner Construction has just been engaged for pre-construction activities. Mr. Miscenich is working on updating building plans in terms of business plans and budget issues.

Note: Mr. Miscenich provided an update summary, dated October 25, 2006, in which he provides much more detailed information about plans and status.

Thus, a governance structure and management are in place, and funds are available for design and construction of the Center, although the passage of time and the intervention of Katrina and the higher construction costs in the marketplace now may have diminished what may be done with the available funds.

This project has been the subject of collaboration and communication mishaps—and serves to illustrate the fact that commitment to a shared vision and collaborative strategies for the New Orleans Medical District and, specifically, its economic development component, has not yet materialized in New Orleans.

Somehow, the partners—primarily LSU System, LSU Health Sciences (locally), and Tulane University/Health Sciences—have not yet managed to achieve joint decisions that would permit the BIC project to proceed. Indeed, the consultants note that there appears to be a level of anxiety among the various partners about past actions and inactions that is currently impeding action.

It is essential that anxieties be overcome and concerns addressed constructively and promptly. This critical project is not only necessary to launch what, in the best case, will be a long-term development. It also is needed as immediate proof that the institutional parties, indeed, can set and achieve a common goal—to set the stage for further scientific and urban development.

THE INSTITUTIONS

BIOMEDICAL RESEARCH ASSETS AND STRENGTHS

Mr. Miscenich's October 25 summary document lists, in brief, the following areas of particular expertise for LSU Health Sciences Center and Tulane Health Sciences Center:

LSU HSC	Tulane HSC
Infectious Diseases	Infectious Diseases
Neuroscience	Cardiovascular Disease, Hypertension, Renal Disease
Alcohol and Drug Addiction	Lung Biology
Cancer (Tier 2)	Cancer
Ophthalmology	Gene Therapy
Oral Hygiene	
Sources: LSU data provided via Jamie Hardy; Tulane data from Tulane University 2007 Strategic Plan	

Two of these areas, Cancer and Gene Therapy, already are the subject of collaboration, via the Cancer Research Center and the Gene Therapy Consortium. It would be interesting to pursue programmatic opportunities for additional collaborations and Centers of Excellence in some of the other above areas (or still others), where there might be synergies between the faculty and research programs of the institutions.

OTHER REGIONAL INSTITUTIONS

The strategy for innovation and commercialization in New Orleans also will tap resources, program and assets of the other universities and the community college in the area, as well as those of local health care systems / hospitals. Some examples of specific important assets include:

- Xavier University—Science, pharmacy and business programs
- Children's Hospital—The Research Institute for Children
- University of New Orleans—various research centers and programs in technologies that may support biosciences, particularly bio-engineering
- Ochsner Health System—research programs
- Delgado Community College—Several programs that support clinical health care in the region; a resource for development of specific work force support programs that may be needed in biosciences.

TECHNOLOGY DEVELOPMENT

TULANE UNIVERSITY AND TULANE HEALTH SCIENCES

OFFICE OF TECHNOLOGY TRANSFER AND BUSINESS DEVELOPMENT

Tulane's technology transfer function was created in 1985 at Tulane Medical Center. It became a comprehensive University-wide office in 1990. In 2004, it took on a new name—the Office of Technology Transfer and Business Development (OTTBD)—and a broader focus to include commercialization and new local business development, in addition to licensing.

Since its inception, the OTTBD looked to license its technologies and was quite successful, especially with its peptides research. With its name change in 2004, the Office also began to evaluate technologies somewhat differently, seeking a way to generate new local company formation as well as growing its licensing of technologies to existing companies. This new paradigm—creation of start-up companies around Tulane technologies—is a complementary strategy to the overall bioscience strategy for the Medical District, including development of the BioInnovation Center.

POLICY

Tulane splits revenues from the commercialization of a discovery with the faculty discoverer, 50% and 50%, less the expenses of the commercialization process and the operating costs of the OTTBD.

As part of its technology transfer function, Tulane offers "proof-of-concept" funding under certain circumstances to entrepreneurial faculty. Investments of up to $20,000 are available for equipment, materials, etc., that may be required to test a discovery's potential for commercialization. These funds are re-paid by "first dollars returned" if the commercialization is successful. Tulane also gets a 10% share of net income into the future.

Tulane's technology transfer policies are similar in many ways to LSU's regarding faculty ownership of technologies developed outside the university system. Both the LSU System and Tulane recognize that some discoveries may be made by faculty outside their employment with the university, and both entities are willing to waive any rights to such a discovery if university facilities, equipment or students were not used in making the discovery.

COMMERCIALIZATION FOCUS AND ACCOMPLISHMENTS

Tulane's major commercialization activities revolve around medical and bio-medical technologies including:

- Drugs & Therapeutics
- Vaccine Adjuvants
- Medical Devices
- Diagnostics
- Tissue Engineering
- Biomedical Research Tools.

Tulane also has licensed technologies from other university disciplines such as:

- Chemical Compounds
- Advanced Materials
- Industrial Processes
- Novel Mechanical Devices
- Nanotechnology

During the past five years, Tulane research has generated between 40 and 50 discovery disclosures per year and, during that time, Tulane was issued 34 patents. In the latest available OTTBD report on Tulane technology transfer, over the past five years, 24 technologies have been licensed and are generating revenue to the University. Of this; 14 were peptide drugs. More recently an additional seven other technologies have also been licensed, with revenue to be determined. Six of those were peptide drugs.

Overall, Tulane receives between $8 and $10 million per year from its licensing activities. In 2005 Tulane ranked 28th in gross licensing income*among US universities. This ranking is higher, if adjusted for research funding base, making Tulane a productive producer of license income.[4]

[4] Tulane Office of Technology Transfer and Business Development

OBSERVATIONS

Overall, Tulane appears to have a well-functioning commercialization process, though it is not surprising that it is still weighted towards licensing. The University's relatively more recent decision to focus on developing private industry companies from some of its discoveries is a welcome and supportive strategy to help build a bio-science economy in the New Orleans region. And even though Tulane has not, to this point in time, successfully launched a private technology company, it has invested seed money in five entrepreneurial faculty initiatives of which three have progressed to a patent filing.

The provision of small amounts of seed funding to entrepreneurial faculty is encouraging, since such funding seems to be aimed at generating spin-out companies (as opposed to generating more licensing income). As with LSU, there is little internal University infrastructure in place at this time to support new company formation and company progress. This situation points to the need to strengthen or expand internal resources of the current OTTBD, or to clearly establish that this post-formation role, e.g. early stage support through mentoring, seed financing, incubator space and common services, will be provided by the BioInnovation Center, with suitable resources.

LSU HEALTH SCIENCES

OFFICE OF TECHNOLOGY DEVELOPMENT

The Office of Technology Development (OTD) at LSU Health Sciences Center is of more recent vintage. The current Office, with the current Director, became active in 2000. An assistant was added in 2003. In an internal document, the staff indicates that, until recently, ***"commercialization was a rare and unintended consequence of University research activity."*** Clearly, the LSU System (and LSUHSC-New Orleans) are relatively recent entrants into this aspect of university mission.

POLICY

The LSU System policies governing technology transfer, ownership and royalty distribution are contained in the ***By-laws*** of the LSU Board of Supervisors. The Board of Supervisors' intellectual property policies assign 40% of gross distributable royalty receipts of a commercialized technology to the discoverer, less any university legal expense. A 1995 Memoranda from former LSU President Copping says that the *"**transfer of University technology to the private sector is the primary goal of every license negotiation. A secondary goal is to utilize the income from the licenses to further the educational and research goals of the University."***

COMMERCIALIZATION FOCUS AND ACCOMPLISHMENTS

From 2002 to 2004, discovery and patent figures for the LSUHSC have been very moderate. Only four licenses were issued during that time, and disclosures declined from 29 in 2002 to just 22 in 2004.

In addition, LSUHSC filed 39 patent applications during that period, with 17 patents granted. Only one-start up company was formed in that same three year period.

On a very positive note, the LSU System Research and Technology Foundation and the Louisiana Department of Economic Development (as noted earlier) created Louisiana Fund I, an independent $35 million venture capital fund focused on the identification of investment opportunities in early-stage companies emanating from all research-intensive universities, academic medical centers, research institutions and other organizations in the State of Louisiana.

According to the LSUHSC in New Orleans OTD, it has been involved in a few start-up companies created around LSUHSC technologies, including:

- ***Universal PACS***: Creator of software platforms for communicating and managing medical information within one or a number of connected medical institutions. http://www.unipacs.com/en/index.html.
- ***Norion Diagnostic Innovations.*** Norion Diagnostic Innovations, Inc. is a start-up biotechnology company founded by Dr. Seth Pincus and located at the Research Institute for Children (RIC) at Children's' Hospital, New Orleans. The company's research is presently funded by a phase II STTR award from the National Institutes of Health entitled "HIV Infectivity Test for Antiviral Susceptibility."

OBSERVATIONS

Though LSUHSC in New Orleans accounts for the major portion of LSU's federal and sponsored research dollars, it appears that only two companies have come from this process since 2002. At present, LSU's internal resources to support deal flow for creating new companies are still limited. There is some early stage investment capital within the LSU System for "proof of concept" activity, but little entrepreneurial infrastructure or culture appears to exist.

OVERALL ASSESSMENT OF TECHNOLOGY DEVELOPMENT

The two major medical centers, their universities, and UNO handle technology commercialization through their respective tech transfer offices. These efforts have produced some new company formation in the region, but most technologies from the universities have been directed toward licensing. Tulane, in particular, has expressly broadened its focus to include local business development.

Much of Tulane's commercialization activities revolve around the licensing of faculty peptide discoveries which it has moved successfully into private sector development. Other technologies, such as chemical compounds and advanced materials have been licensed as well. However, as is the case with many university technology transfer functions in the US, the number of new companies built locally around university technologies has been few.

LSUMSC's technology transfer office operates under LSU System guidelines for commercialization and has produced few local companies tied to its technologies.

The causes for why the universities tend to license rather than locally commercialize their technologies are many, including:

- University policies putting primary emphasis on protection of intellectual property rights of the institution, rather than on the harder process of new company formation
- Added complexity of supporting the development of a new business and the fact that not all disclosures and inventions are suitable to support a company formation
- Capacity limitations of commercialization functions in both universities.

In the case of Tulane, the focus of efforts has been deliberately broadened to include new business development, but this has not always been the policy focus. In the case of LSU, the OTD function is altogether relatively young.

In all, there is little deal flow for local commercialization from both institutions, leaving the generation of new companies in the New Orleans area primarily to spin out technologies from existing technology firms or university faculty who elect to take the commercialization of their discoveries outside of the university technology licensing

process. Overall, there is opportunity to improve the outcomes and a necessity to do so, for the benefit of the Medical District strategy.

Elsewhere, some universities recognize the benefits of creating new companies around their technologies and provide substantial business development capacity in-house to help these companies develop into successful businesses, e.g., University of Chicago, Virginia Tech. In some cases, this is done via separately incorporated entities, like Virginia Tech Intellectual Properties, Inc. (VTIP).

Other universities sponsor outside commercialization organizations (technology incubators, technology commercialization centers, innovation centers, local seed capital funds, business accelerators, etc) to capture university-developed technologies. These organizations work directly with faculty to assist and develop new business formation. Examples are Northwestern University and Georgia Tech. These entities, usually jointly sponsored by universities, business organizations, or state and local government, provide strong private sector involvement through mentoring and financing. As a generalization, those commercialization activities that include appropriate private sector involvement seem to be more successful.

Lack of deal flow is probably the most difficult problem facing most biotechnology incubators, particularly as their sponsoring universities typically have long histories of focus on licensing.

EKA believes that the post-Bayh-Dole era has led all research universities to focus on licensing. The metrics of success for most technology transfer offices have been established to reflect this focus. Interestingly, there is beginning to be a body of research and policy analysis that is challenging the value of this focus on licensing. This is occurring in context of public sector's increasing clamor to see the results or payback from research investments. The federal government's interest in this also is increasing.

The following observations are based on Carla Fishman's report to the LSU System:[5]

> ***Campus officials also must recognize that licensing to start-up companies is more labor-intensive than out-licensing technology to existing, mature companies. There are special considerations in licensing start-ups, given the significant crossover in roles and relationships. As part of licensing to a start-up company, the technology transfer office must exercise due diligence by reviewing (or developing) a business plan, assessing financial data and evaluating the technical qualifications of those involved. Experienced licensing professionals concede it takes two to three times more staff effort to initiate and conclude a start-up license, given the increased complexity (business plans, equity term sheets, qualified management, and shareholders' agreements). This requires more time and additional skills due to the intricacy of such agreements.***
>
> ***It is our observation that both tech transfer offices in New Orleans understand all this. The local group may look to develop new metrics to measure success in new company formation. These should go beyond revenue generation and include research funds generated through industrial liaisons, employment opportunities for students in newly formed companies, number of jobs created, annual payrolls of newly created companies, products developed from the tech transfer systems and overall improvements in the quality of life.***

[5] Carla H. Fishman, ***Report to the Louisiana State University System on Technology Transfer Initiatives***, 2004.

Both universities may need to consider how they would augment their commercialization capacities. Certainly, Ms. Fishman's report lays out many important recommendations which should be adopted and implemented as expeditiously as possible.

This entire subject may also need to be the subject of dialogue with the executive leadership of the institutions to clarify the extent of commitment.

As the BioInnovation Center is a separate entity, yet subject to oversight by both universities, it could provide technical support and mentoring for both Tulane's and LSUHSC's technology transfer operations and for faculty entrepreneurs on an arms length basis. (Strategies for this are outlined in Mr. Miscenich's October paper.)

In any case, in New Orleans, there must be a real and steady increase in new business creation supported by the two universities, or the BioInnovation Center will have little to do. And, if the growth of at least some new biosciences companies does not occur in New Orleans, the overall Medical District strategy will be left to focus entirely on recruitment of companies from elsewhere. Based on the experience of other bioscience centers, and the overwhelming nature of competition in this industry, a nearly-unique focus on recruiting companies from elsewhere would not bode well for success.

Without an active deal flow of faculty spin-offs from the universities, the Medical District and the New Orleans region will be hard-pressed to develop a lively bioscience economy into the future.

VENTURE CAPITAL

HIGH-RISK BIOSCIENCES INVESTMENTS

Bioscience entrepreneurial start-ups are by definition voracious consumers of large quantities of cash. That is, they are characterized by very high cash burn rates over comparatively long development and pre-launch stages prior to generating any commercial revenue. And, there are an unusually large number of bioscience entities that even after long developmental periods and care and nurturing never achieve commercial launch. Consequently, bioscience firms are usually considered very high investment risks requiring deep patient pockets of seed and venture capital investors.

The pre-launch / pre-commercial revenue life-cycle stages for bioscience start-ups is typically much longer than for most other types of entrepreneurial ventures. The typical non-bioscience start-up, even one developing a new technology, might have a pre-launch period of one to three years. By comparison, a bioscience startup may face a pre-launch period extending for eight to ten years, possibly longer depending upon its specific sub-field within the bioscience realm. Bioscience start-ups usually face lengthy clinical or field trials that may be regulated by one or more federal agencies (i.e. FDA, EPA, USDA). At any point along the path of regulatory approval, the start-up's technology/product entry could face challenges or other requirements that could further extend its commercialization and the launch of a new venture. In the bioscience world, quick entry of products to the marketplace is rare.

During this lengthy pre-launch stage, bioscience start-ups are usually supported, particularly in the very early parts of this stage, by networks of resources providing grant and research funds from federal, state and local sources. They also rely heavily on bootstrapping support resources such as free technical advice and laboratory or incubator space offered by local universities, research centers or local or state economic development organizations.

At the latter phases of the entity's pre-launch stage, the support of seed and formal venture capital becomes necessary to what hopefully will be a successful and profitable business. Thus, communities that are going to successfully compete to create and nurture a viable and sustainable bioscience cluster ***must*** provide access to well funded formal venture capital organizations as well as to active networks of risk-tolerant seed or angel investors. Physical infrastructure and well intentioned public policy and funding are important but not sufficient in themselves. There needs to be a very active presence of private venture capital as evidenced by the experience and track records of successful bioscience clusters that have emerged in other parts of the U.S. over the past 15 to 20 years.

VENTURE CAPITAL IN LOUISIANA AND NEW ORLEANS

When it comes to venture capital, Louisiana in general and New Orleans, by association, have not necessarily lit up the scoreboard. By all historic measures (dollars committed and deals done), the State has attracted what could best be described as a microscopic share of total venture capital investments made in the US over the past decade or so. And, when the focus is placed specifically on the biosciences sector, the evidence of risk capital support for new ventures is no more encouraging.

Since the mid-1990s, venture capital investments (as measured by Price Waterhouse Coopers Moneytree.com data service) in Louisiana have generally accounted for very small (under 0.05%) shares of total venture capital investments nationwide. Investments in Louisiana peaked in 1999 concurrent with the massive flows of venture capital placements nationwide during the dot.com era. In 1999, total venture capital investment in the US was $53.5 billion while, in Louisiana, it was $295 million or about .006% of the total for that year. Since venture capital's slow recovery from the dot.com bust, dollars committed and deals consummated have begun to grow and hold steady at a more sustainable pace. This is particularly true since about the first quarter of 2003. Since then, venture capital investments rose from $19.6 billion in 2,887 deals ($6.8 million per deal) to $22.7 billion in the year 2005 for 3,077 deals ($7.4 million per investment). Through the first two quarters of 2006, there were 1,731 venture capital deals nationwide, representing a total investment of just under $13 billion.

Within the biosciences sector nationwide, both the dollar volume and number of venture capital investments has steadily risen since 2003. Total investment in this sector in 2003 reached $3.65 billion among 317 deals ($11.5 million per investment). This represented 18.6% of all venture capital investment committed that year as measured by PWC Moneytree. By 2005, venture capital investment in biosciences rose to $3.78 billion among 370 deals ($10.2 million per deal) representing 16.7% of total investment for the year. Information for the first two quarters of 2006 illustrates the continued attraction and strength of this sector for venture capital investment. Total investment stood at $2.07 billion among 206 deals ($10 million per deal). This put biosciences at 16% of total investment for the first two quarters of 2006 and ranking it second among all sectors receiving funding during this period.

In Louisiana, the story is much less encouraging. From the first quarter of 2003 to the end of the second quarter of 2006, venture capital investment totaled just $9.0 million in eight deals included in the PWC Moneytree database. Within the biosciences sector, there were only two deals recorded since 1995 for under $2.0 million in total investment.

Figure 2
Louisiana Venture Capital Fund Profiles

Name	Companies Funded		Bioscience Companies Funded	
	National	Louisiana	National	Louisiana
Advantage Capital	51	9	8	0
Stonehenge	88	18	4	0
Louisiana Fund I	1	1	1	1
Louisiana Ventures	0	0	0	0
Louisiana Technology Fund	1	1	0	0

Fund Investment Breakdown

Name	Investment Sectors	Companies	Percentage	Louisiana Companies	Percentage (Total)	Percentage (Sector)
Advantage Capital						
	Communications	7	14%	1	2%	14%
	Energy	3	6%	0	0%	0%
	Healthcare	2	4%	0	0%	0%
	Technology	18	35%	4	8%	31%
	Biotech	8	16%	0	0%	0%
	Other	13	25%	4	8%	31%
		51	***100%***	***9***	***18%***	***N/A***
Stonehenge						
	Technology	28	32%	2	2%	7%
	Business Services	10	11%	1	1%	10%
	Biotech	5	6%	0	0%	0%
	Marine and Energy	12	14%	12	14%	100%
	Manufacturing & Distribution	23	26%	2	2%	9%
	Community Development	3	3%	0	0%	0%
	Other	7	8%	1	1%	14%
		88	***100%***	***18***	***20%***	***N/A***
Louisiana Fund I	Technology	1	100%	1	100%	100%
		1	***100%***	***1***	***100%***	***100%***
Louisiana Ventures	None	0	0	0	0%	0%
		0	***0%***	***0***	***0%***	***0%***
Louisiana Technology Fund	Healthcare	1	1	1	100%	100%
		1	***100%***	***1***	***100%***	***100%***

Source: Individual fund websites.

Figure 2 (above) shows a summary of investment activity for the five operating venture capital funds in Louisiana. The investments shown extend from the inception of the fund to their most current reporting period (typically through the second quarter of 2006). The two most active funds are Advantage Capital and Stonehedge. However, both have made most of their investments to non-Louisiana firms and relatively few are for bioscience enterprises. Since inception, Advantage Capital has made 51 investments, eight of which were to bioscience firms, none in Louisiana. Stonehedge has logged 88 investments since its inception. Eighteen investments were in Louisiana. Of the four bioscience investments made by this fund, none were located in Louisiana.

The other three funds listed are relatively new and have made few investments. Louisiana Fund I, however, has made one investment in a Louisiana-based bioscience enterprise. This fund is a $28 million partnership with the LSU System Research and Technology Foundation and Louisiana Economic Development. Its mission is to

provide capital to companies developing and commercializing promising technologies with an emphasis on those originating from Louisiana universities.

We have heard about another new fund, called Themelios (Ross Barrett, General Partner), but have been unable to verify information about this fund for this draft.

WORK FORCE DEVELOPMENT

A COMPLEX CHALLENGE

Within the overall aim of nurturing biomedical initiatives as a driver to recovery and development in the Medical District, the question of workforce presents somewhat of a proverbial "chicken and egg" dilemma. Which comes first? Do we go full bore ahead and produce the ideal mix of qualified applicants for positions across the spectrum of needs within the biomedical sector? Or, do we respond to emerging needs of new and existing biomedical enterprises now in New Orleans area, those planning to expand and those that may be attracted to the area as or after they materialize?

As with all complex questions, the answer lies somewhere along a wide spectrum of possibilities. Some workforce needs must be addressed rather quickly if the New Orleans area is going to recover some of its pre-Katrina momentum in nurturing the biotech field as an emerging economic cluster and repair some of the damage inflicted on this sector by the storm. Losing more ground is not a viable option.

Further complicating the workforce issue is the fact that much of what it will take to fix the problems is largely beyond the control of any one person or entity. In fact, resolution of most of the region's workforce issues begins with decisions by individuals (workers and entrepreneurs/business owners) to return to the City. The individual worker's decision is often linked to housing availability and quality of life issues such as schools, neighborhood conditions, security, etc. The entrepreneur/business owner is often faced with the same mix of considerations, but further complicated by factors such as the cost and availability of insurance, access to qualified workers, and having a confidence level that encourages reinvestment in the area.

Although answers to these intertwined questions are generally beyond the scope of this discussion, to not acknowledge them when considering workforce issues for the Medical District in general and for biomedical initiatives in particular would be ignoring reality.

Certainly, established firms pursing relocation opportunities will require existing pods of trained labor to fill the spectrum of needs within this sector. It is not likely, particularly post-Katrina, that New Orleans would be strongly competitive in the business attraction game of the biotech field until the City and region are able to re-establish and nurture a critical mass of businesses and support resources that have staying and drawing power. It would be ill-advised for the Medical District to pursue a strategy by which it competes head-to-head with other more fully developed and better funded biomedical centers across the US.

Fundamental to this discussion is the basic assumption that business development and workforce development initiatives for the biomedical focus will proceed in parallel so as to ensure optimum use and leverage of scarce resources. Also, it is assumed that there will be an attempt to focus on niches—building the initiatives upon existing and emerging competitive strengths of the biomedical cluster in New Orleans.

In the short term, this implies building upon and playing to the City's remaining biomedical competitive advantages; leveraging these assets to grow and diversify; being targeted in making risk capital investments for both support infrastructure and emerging entrepreneurial ventures; and fine-tuning the training and educational resources in the New Orleans area to produce graduates with the skills and qualification firms ***need***, not what academics ***think*** they need.

BIOMEDICAL WORKFORCE AND HUMAN RESOURCE NEEDS—PRE- AND POST-KATRINA

The workforce situation and needs of the biotech sector in New Orleans have been fairly well documented in two relatively recent reports: one published just before Katrina and one produced very shortly after the storm. The pre-storm report (released in January of 2005) was completed by Moran, Stahl, Boyer (MSB) for Greater New Orleans, Inc. (GNO, Inc.). This report represents the most comprehensive assessment of biotech workforce issues ever done in the New Orleans area and addresses the relative strengths and weaknesses of the area prior to Katrina rather well. The second and more recent report was prepared by the Biosciences Workgroup of Economic Development Committee of the Bring New Orleans Back Commission (BNOB). This report was published in December of 2005.

Still more recently (August 2006), the Louisiana Recovery Authority (LRA) in conjunction with the Louisiana Workforce Commission (LWC) produced a report focusing on workforce needs in the State's hurricane disaster areas. This effort forecasted occupational needs in the aggregate for the ten-parish New Orleans region and is primarily concerned with occupations requiring two years or less of technical training in six industry sectors. One of the sectors addressed is health care. Forecasts for the next three years (2007-2009) indicated a demand for 8,803 healthcare jobs in the region, the majority which are registered nurses (2,305) and nursing aides and support personnel (1,107). The report also noted a three-year demand for 118 medical and clinical lab technicians to supplement the already 470 jobs existing in this category in 2006. As employment data becomes more readily available post-Katrina, it will be possible to better assess workforce gaps at the regional and parish levels. However, the balance of this discussion will use the MSB and BNOB reports to address pre-and post-Katrina conditions and as a point of departure for next steps going forward.

Pre-Katrina, the MSB report made a number of important observations regarding the metropolitan area's biotech workforce positioning. Among them were the following with some post-Katrina observations added:

EDUCATIONAL ATTAINMENT

- Educational attainment was relatively low in comparison to competing markets, although this did not necessarily imply an impediment to development of a biotech cluster (since other communities were able to overcome this deficiency). Post-Katrina, the educational attainment profile is probably much the same on a relative basis. Although much of the ***diaspora*** is made up of low and moderate income households with generally less educational attainment, many who have left and still not returned are well educated professionals such as physicians, attorneys, teachers, university professors and the like.
- A recent population survey conducted by the Louisiana Department of Health and Hospitals (DHH) addressed educational attainment. However, due to a lack of response to the educational attainment questions, the post-storm profile for Orleans Parish was inconclusive.

EMPLOYMENT LEVELS AND OCCUPATIONS

- Pre-Katrina there were approximately 3,000 people employed in biotech-related companies or research facilities, ranking the area 67th in the U.S. According to employer interviews, there were 906 people employed in "core" biotech enterprises in the New Orleans region. Post-Katrina, the employment data are insufficient to estimate the number of people currently employed in the broadly defined biotech-related enterprises. However, the BNOB report in December 2005 noted that GNO, Inc. attempted to contact about 12 of the 24 bioscience firms located in the region prior to the storm. Of the five firms with which contact was made, all were operating at pre-Katrina levels. Most were displaced from Orleans Parish locations but had secured temporary space.
- Pre-Katrina, the MSB study reported strong growth potential for more core biotech workers based on employer surveys. Growth in the three to four years prior to the survey was 20% with demand or expansion potential over following five years doubling to 40%. The post-Katrina survey of biotech employers did not request similar information.
- Pre-Katrina, the greatest needs were for laboratory technicians and technologists, research scientists, medical research specialists, data analysts and clinical research coordinators. Post-Katrina, the reported needs have not changed, they are now just more challenging.

WAGES AND SALARIES

- Pre-Katrina, the MSB report noted that average salaries for support jobs (i.e. lab assistant, lab technician and research technician) were 7% to 8% below national averages for comparable positions. For those positions requiring specialized or advanced skills, salaries were competitive with national averages. This also applies to positions where shortages are reported nationally, such as top research scientists. The MSB report observed that the salary differential in support jobs created an operating cost advantage for companies located in the area. Post-Katrina, these relative wage advantages have probably evaporated. Wage and salary costs across the spectrum of employment have all risen significantly post-Katrina and the upward pressure is not likely to subside anytime soon. As such, the operating advantage for most companies has been significantly reduced, if not neutralized.

COLLEGIATE ENROLLMENT AND DEGREE PRODUCTION

All the regional educational institutions are part of biosciences work force preparation.

According to the Moran, Stahl, Boyer report, Xavier's 2002 output of bio-related grads at 378, was the highest of the local institutions (compared for example to Tulane's 369; UNO's 115; and Loyola's 43). Much of Xavier's graduate production is from its Pharmacy program.

- Pre-Katrina, the MSB report noted the presence of multiple colleges and universities with strong biotech-related degree and research programs. In 2002, the area ranked 25th in the US with nearly 1,100 graduated in the biotech-related programs at the bachelors, masters and doctoral levels. The area's major deficiency in this regard was the lack of biotech-related graduates at the associate degree level.
- Post-Katrina, the area's colleges and universities are attempting to recover from the devastating blow the storm inflicted on facilities, faculty and student enrollment. In most instances, universities were forced to cut budgets, eliminate programs, furlough faculty and staff and generally re-trench in hopes of a strong and steady return of students.

RECRUITMENT AND RETENTION OF RESEARCH SCIENTISTS

- Pre-Katrina research activities among New Orleans area institutions were heavily concentrated in areas (niches) with good prospects for generating discoveries with commercial value. These included cancer research, gene therapy, neurosciences, biostatistics, pharmaceuticals, molecular biology and tropical medicine. The MSB report also noted that research productivity in New Orleans generally kept pace with national growth trends, increasing by 60% between 1998 and 2002.

- Post-Katrina disruption of research and clinical facilities has impacted many of the area's scientific community. In some cases, scientists were able to temporarily re-locate to other universities, hospitals or research facilities elsewhere in the Louisiana or the US. The relocation, however, was disruptive and the extent of the damage has not been fully assessed.
- Pre-Katrina the MSB report noted that strong collaborations between area research centers and competitive benefits packages were leveraging successful recruitment efforts for many high-level research scientists. It also noted that the area's relatively low cost of living gave recruiting institutions somewhat of a competitive edge. On the negative side, the report noted the poor quality of public education, particularly secondary schools, as a significant quality of life drawback to recruitment.
- Post-Katrina, the City itself is even less competitive when it comes to quality of life factors. Although the storm forced the long-needed restructuring of the City's public school system, the transition to charter and state-run primary and secondary schools has not been without difficulty. However, the prospect for a better school system long term is much greater now than it was on August 28, 2005. Other quality of life factors are also working contrary to recruitment of top flight researchers and other biotech professionals. Foremost is the ever-present danger of rising violent crime in a City where gaps in police staffing give rise to dependency on National Guard and State Police troops to provide more visibility to law enforcement. And, although signs of recovery are evident throughout once heavily-flooded middle and upper income neighborhoods, extensive damage remains and in some instances is still somewhat overwhelming.
- As for the comparatively low cost of living previously cited as an advantage, much of the marginal advantage has been eroded post-Katrina. Costs for just about everything have risen significantly in post-Katrina New Orleans and some costs, such as homeowners insurance and utilities, are likely to increase even more.

WHAT EMPLOYERS WANT

- The MSD report also noted that while employers were generally satisfied with the quality of the workforce and of local college graduates, they expressed a strong desire for three strategic elements to support their biotech initiatives. These included:
  - More associate degree level biotech graduates
  - More practical internship experiences for college graduates at all levels
  - More investment in updated laboratory equipment for bio-related programs at all levels (so that graduates will be better prepared).
- Post-Katrina progress in these areas has not been fully documented. With regard to improved laboratory equipment, the replacement of flooded facilities using FEMA and insurance proceeds would certainly have been the opportunity to introduce upgrades where possible. However, in many cases, insurance proceeds and FEMA assistance have fallen short of paying for full restoration of facilities. The extent to which upgrades were possible needs to be documented and gaps identified.
- The establishment of an Associate Degree program for laboratory technicians is most practically undertaken by Delgado Community College. This institution was so tasked in the MSD report. Delgado, however, suffered major flooding damage to most of its main campus and is still in the process of stabilizing its operations.

FUNDING POSSIBILITIES

Should funding for any of the initiatives become a problem, the following would represent possible sources of seed and on-going funding:

- Baptist Community Ministries (a private foundation with special interests in healthcare and education).
- Workforce Investment Boards from Orleans or Jefferson Parishes or both.
- The Louisiana Recovery Authority (LRA) workforce development support programs.
- The Greater New Orleans Foundation—a community foundation in which there are funds designated for support of education and health care.
- The Louisiana Board of Regents 8(g) funding for program enhancement and advancement. These funds are competitively awarded using the proceeds of a significant offshore oil settlement dating back to the 1980s. The largest portion of the awards is made to colleges and universities.

PEER INFORMATION AND EXAMPLES

RANGE OF INITIATIVES AND THEIR APPLICABILITY

Peer initiatives that can inform strategies for New Orleans include:

- Incubators focused on biomedical sciences
- Research parks in which biomedical sciences are a major (or unique) focus
- Medical districts that include a component for private industry (not all do)
- State investment and tax strategies
- Special-purpose foundations and centers
- Other local / regional resources, such as venture capital funds.

The EKA team believes that it is virtually impossible to find any single example of a peer initiative or strategy that will provide all elements that would be applicable and relevant to any specific local client situation. For this reason, this material offers selective information on various other strategies and places, to inform the New Orleans strategy.

COMPREHENSIVE STRATEGIES—A FEW EXAMPLES

Following are three quite different examples of comprehensive strategies, representing three of many approaches that have been deployed.

MICHIGAN 21ST CENTURY JOBS FUND

This is an example that is not location-specific, and not even biosciences-specific. However, it illustrates an approach to target a significant level of funding at research and early-stage R&D in priority industries, and in a systematic way.

With $2 billion+ invested in R&D each year and nearly 100 new companies since 2000, Michigan leads the Nation as one of the fastest growing life sciences states. Michigan's life sciences strengths also include:

- 542 companies
- 31,777 employees
- $4.8 Billion in sales
- Growth of Michigan's life sciences industry has exceeded growth of the US average (27% in employment; 32% in number of companies; and 165% in sales).
- Michigan has led the Nation in percentage growth of new companies (1999-2002).
- #2 state for overall R&D expenditures
- #3 university in the Nation for R&D
- 4th largest high tech workforce in the Nation
- 2nd most business-friendly state in the Nation, according to ***Site Selection***
- $178 million in the past four years invested to foster life sciences sector growth.

Now, Michigan is in the process of distributing $100MM that could lead to commercialization in four targeted economic sectors, including Bio-Science. Efforts targeted for the fund include: creative technology transfer programs; incubator development, expansion or redevelopment; seed capital formation; innovative technology business assistance programs; and, redevelopment of wet laboratory space for incubator use. This program, called the ***Michigan 21st Century Job Fund***, contracted with the American Association for the Advancement of Science to choose unbiased peer reviewers who recommended 179 proposals for funding. Of these, 61 were

chosen to split $100MM, the first part of an overall $2BB, 10-year program approved by the Michigan Legislature last year. Source: http://www.michigan.org (Eva, does it help our credibility to mention that one of IDEA's principals was part of that evaluation (me)?

MEMPHIS BIOWORKS

This is an example of a location-based comprehensive strategy that includes a Medical District, a research park, and sponsorship and support by a broad-based public-private academic partnership. It also is an example of a relatively "young" strategy—which has not had decades to mature.

Memphis Bioworks Foundation was founded in 2001 with the goal of establishing the Memphis region as an internationally recognized center for the development and commercialization of biomedical technology. It is a broad alliance of corporate CEOs, university presidents, and foundation leaders. The Foundation is executing a 10-year, $500 million initiative to build a local biosciences industry.

Elements of the strategy

- Build a research park in an urban site
- Develop entrepreneurship with research grants, technical assistance and venture capital
- Develop infrastructure through UT-Baptist Research Park, Memphis Life Science incubator
- Eliminate downtown blight
- Develop education and workforce through partnerships with Tennessee Tech, Southwest Tennessee Community College and state universities
- Creation of the Memphis Academy of Science and Engineering (7th through 12th grades)
- Develop academic pilot programs with Memphis City Schools.

The web site lists partner organizations as follows:

- The Assisi Foundation of Memphis, Inc.
- Baptist Memorial Health Care
- Campbell Clinic
- Companies: FedEx, GTx, Inc., Toof Commercial Printing, Luminetx, Medtronic Sofamor Danek, Smith & NephewVentures
- Memphis Regional Chamber

Rendering of the Future UT-Baptist Research Park

- Plough Foundation
- St. Jude Children's Research Hospital
- Southwest Tennessee Community College
- University of Memphis
- University of Tennessee

NORTH CAROLINA BIOTECHNOLOGY CENTER

Many are familiar with Research Triangle Park and the impact it has had on creation of the high-tech "Triangle region" of North Carolina. Not everyone is as familiar with other related strategies that have been part of North Carolina's long-term success.

In fact, North Carolina is an interesting model for New Orleans, if one considers that the State has come from a standing start in 1950, when North Carolina was 47th of 48 states in per capita income and its major industries were Textiles, Furniture, and Tobacco, to become one of the US's and global top biotech/life sciences centers today.

In prior research, Eva Klein & Associates has concluded that the Biotech/Biosciences accomplishments in North Carolina result from a combination of not necessarily pre-organized strategies—deployed over decades. These include:

- Research Triangle Park (1950s)
- Centennial Campus of NC State University (1980s)
- Piedmont Triad Research Park (1980s)
- NC Biotechnology Center (NCBC) (1980s).

Today, there is an additional project—Carolina North—a planned 1,000-acre development of University of North Carolina-Chapel Hill, with major bioscience focus.

The NCBC remains a superb example of steady state-sponsored investments that, over a period of time, have made a huge impact toward cultivation of a biosciences industry in North Carolina. NCBC was established 1981 by an Act of the NC General Assembly and was funded for many years with state appropriations. It is now an independent non-profit organization.

Its mission is to provide long-term economic benefit to North Carolina through support of biotechnology research, development and commercialization statewide. NCBC does not itself perform lab research. NCBC's core programs are:

- Science and Technology Development
- Business and Technology Development
- Education and Training

Based on data compiled by EKA (primarily from the NCBC web site), accomplishments as of 2004 included:

- Provided $10.6 million in financial assistance to 70 early-stage biotechnology companies
  - Those companies raised more than $500 MM from other sources
- Worked to recruit, retain and expand biotechnology companies
  - Those companies generate 1,000s of high-paying jobs
- Invested $50 MM+ to recruit 46 outstanding faculty, purchase multi-user research equipment, and sponsor more than 450 research projects at universities.
  - For every $1 invested in research projects by the Biotechnology Center, the universities have gained about $14 in federal grants

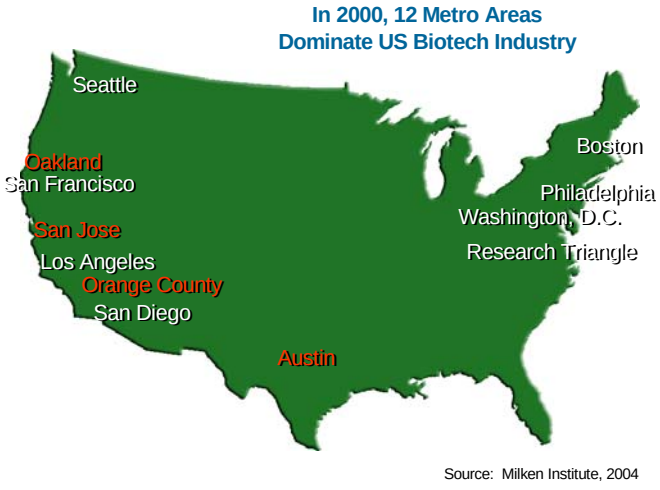
- Prepared more than 1,100 NC teachers to teach about biotechnology
  - These teachers, in turn, have given lessons and labs to 100,000s of students
- Granted $8 MM to improve biotechnology programs at the state's six historically minority institutions
  - Tripled enrollment in biosciences at these universities

NCBC now has regional locations and personnel in Winston-Salem and in Western North Carolina and is working to expand the industry from the Research Triangle area to other parts of the State. It is a participant, along with universities and other organizations in the North Carolina Bio-manufacturing & Pharmaceutical Training Consortium and the North Carolina Genomics & Bioinformatics Consortium.[6]

BIOSCIENCE ECONOMY DATA—BATTELLE/SSTI

In 2006, the international bio-science organization, BIO, along with the Battelle Institute, SSTI and Public Affairs Consulting updated their groundbreaking 2004 study of the bio-science economy in the United States, along with an analysis of individual state funding programs for the bio-sciences.

What follows is a short discussion of state funding in bio-science, including university biomedical research; grants for incubator and seed capital development; capital grants to create physical centers of excellence in bio-science; grants to improve university technology transfer; and funds to create new chairs in bio-science and for additional bioscience research faculty.



Source: Milken Institute, 2004

Much of the action in state bioscience funding occurred on the East and West Coasts, where there was already a large concentration of healthcare and bioscience activity—as the map, based on Milken Institute 2004 data, shows. (In fact an earlier Brookings Institute study in 2000 did not include Austin. In the 2004 Milken data, Austin is still the only "non-coastal" major biosciences center in the US.)

Probably the best known and largest investment made in bio-science was the State of California's voter approval for a $300 billion bond fund to create the California Institute of Regenerative Medicine. The State of Washington, meanwhile, created a $350 million Life Sciences Discovery Fund that will allocate $35MM annually from tobacco settlement dollars to support bioscience research with economic development potential.

An East Coast state, Massachusetts, shows the many ways in which state, university and private money are attempting to leverage new bioscience activity.

- The Massachusetts Technology Transfer Center, funded at University of Massachusetts for $1.9 million in the Economic Stimulus bill, makes Technology Assessment awards up to $5,000 and Technology Investigation awards up to $25,000 to all research institutions, both public and private.
- Internal to UMass, the Office for Commercial Ventures and Intellectual Property has a $100,000 fund from which it makes pre-commercialization development grants up to $20,000.

[6] Information about NCBC from www.ncbiotech.org and Eva Klein & Associates, Ltd., ***North Carolina's Emerging Biotechnology Corridor***, presentation at BioParks, 2004

- At MIT, the Deshpande Center has targeted $15 million of its $20 million endowment to support development of promising research into commercial enterprises. The center makes Ignition Awards up to $50,000 to research teams and somewhat larger Innovation Awards to help determine whether to start a company or execute a license with an existing firm.
- And, at Boston University, the Office for Technology Development, now embedded in a larger Institute for Technology Entrepreneurship, maintains resources for similar technology development awards and to initially capitalize start-up entities.

Some states have focused upon a singular bioscience niche. For example, New Jersey is making major investments in stem cell research. The New Jersey Commission on Science and Technology recently issued $5 million in grants to 17 stem cell research institutions across the state. In addition, the State has committed $11.5 million for a Stem Cell Institute. Also proposed are a $150 million capital spending program for stem cell research facilities along with a $230 million in grants for stem cell research.

Not to be outdone, a neighboring state, Connecticut, has committed to invest $100 million during a 10-year period to fund embryonic and adult stem cell research. Connecticut also is investing money in medical workforce development by building career pathways to health science, from high school to community college to 4-year and graduate and postdoctoral education and experience. Similar programs are taking shape through innovative not-for-profit entities such as the Maryland Biotechnology Institute and Berkley Biotech Education, Inc.

Smaller states, similar in population to Louisiana, like Arizona, are investing major funding in bio-science development. The Arizona Legislature in 2003 authorized $440 million for construction of university research facilities, primarily in the biosciences. Alabama, for example, has committed $50 million—being matched by $80 million in private money—to construct a facility to house the Hudson-Alpha Institute for Biotechnology in Huntsville. The State is also indicating it will invest another $50 million to support bioscience research at the University of Alabama at Birmingham.

Montana, North Dakota and South Dakota all have made recent commitments to fund any number of bioscience support entities from bio-incubators and centers of excellence to seed and venture capital funds.

Iowa has developed a Bio-based Products and Bioenergy Vision. Kansas is targeting human and animal health, food safety, biologically inspired materials and bio-products. In Peoria, Illinois, a consortium of Caterpillar Corporation, the University of Illinois College of Medicine, Bradley University and the Peoria region's medical and hospital communities, along with the US Department of Agriculture's National Center for Utilization Research, have broken ground for an Innovation Center and have raised in excess of $10 million in local seed capital funds.

In Oklahoma City, a major health science medical district has arisen around the University of Oklahoma Health Science Center, the Oklahoma Medical Research Foundation, the Children's Hospital, University Hospital, and Veterans Administration Hospital. In addition, a biomedical research park also lies within the district, providing 550,000 SF of lab and office space to 34 bioscience companies, some spinning out of the 300-acre medical complex. The Park is sponsored by the Presbyterian Health Foundation and is completing its sixth building with four more in master planning.

Another major trend is "mixed use" campus expansions by major universities in Raleigh, Seattle, Portland, New York City, Denver, Chicago and San Francisco, as universities and state governments see the logic of creating ***"knowledge communities"*** rather than research parks or pure university campuses.

Other states have seen the need to add medical anchors to their existing bioscience base. The most recent example is the State of Florida's investment (with Palm Beach County) of $550 million to get the San Diego-based Scripps Institute to establish a research center in the State.

These are just a partial list of state, regional and university investments in the biosciences. Competition among states, regions and universities to be the "biggest and the best" place for bioscience companies and investment will provide a serious challenge for the New Orleans Medical District and the State of Louisiana as a whole. Without serious collaboration among and between the State's medical and university infrastructure, and without some greater and very focused investments, New Orleans may have little chance to compete against the rest of the nation, if not the world—even to become a "second-tier" biosciences center.

Sources for the above include: ***Growing The Nation's Biotech Sector: State Bioscience Initiatives 2006***, Battelle Technology Partnership Practice and SSTI, April 2006 and other sources.

PEER CASE STUDIES—LESSONS LEARNED FOR BIO INCUBATORS

For this project, the consultant team conducted interviews to gather fresh data on six of the top biomedical incubators in the US, most of which are associated with a research park. All of these programs have faced varying degrees of the same difficulties and have used innovative approaches, based on local resources, to overcome those problems. All feel that they are still grappling with these issues on an ongoing basis.

In general, successes were attributed to a strong leader who had the ability to leverage locally-available resources to create enough critical mass to be successful.

By and large, most of these "successful" commercialization strategies were launched in the 1980s; struggled in early stages; and still have not overcome all their challenges—demonstrating the overwhelmingly important point that this is an endeavor in which success takes time, patience and steady effort.

SUCCESS FACTORS

- Public-private-university collaborative effort to develop the infrastructure that can support biomedical companies
- Effective leadership in creating and running the biomedical incubator program, who understand the life science industry and what it takes to grow these companies.
- Sources of funding to build wet lab facilities for incubator, accelerator and graduate companies and in several cases, to purchase specialized shared equipment
- Close proximity and collaborative relationship with a medical research university. Support from the university administration for commercialization of technology and entrepreneurial faculty open to collaborative research and commercialization of their technology
- Sources of capital for companies at various stages: commercialization, seed, early stage, and later stage

- Funding to underwrite staffing services
- Major federal, state, local and/or university support.

PROBLEMS

Major issues that had to be overcome and still slow down the process:

- Deal flow, particularly the lack of companies that are created by university tech transfer offices and difficulties in working through the university requirements. Lack of entrepreneurial culture among faculty
- Lack of adequate funding for companies, particularly at the commercialization and seed stage, but generally a shortage of local capital and a struggle to attract outside business capital sources
- Shortage of management talent, both the lack of serial entrepreneurs with biomedical industry experience who could run a company and the lack of experienced individuals to mentor or manage companies
- Retention (or attrition) due to financing issues, resulting in companies starting elsewhere, leaving town, or being bought out
- Lack of understanding that this is a "grow your own" industry and the commitment of public resources towards recruitment rather than creating the necessary infrastructure to support biomedical company start-ups and development

Exhibit 3 provides thumbnail summaries of the peer incubator and biomedical commercialization strategies.

GOING FORWARD—ACTION STRATEGIES

Following are preliminary action strategies, proposed as elements of the plan to strengthen the ***Innovation System*** (all program elements) for New Orleans Medical District:

- Research Funding: Strategic Niches of Expertise
- Technology Development and Culture of Entrepreneurship
- Business Incubation and Development
- Business Capital Formation
- Work Force

These require discussion, adoption (as is or modified), and preparation of implementation plans, including assignment of specific responsibilities. (Roles and responsibilities will be addressed in Governance and Management in a forthcoming work paper and workshop.)

RESEARCH FUNDING: STRATEGIC NICHES OF EXPERTISE

RATIONALE

In 2005, Louisiana institutions had about $185 million in research funding. Approximately 71% of this was in New Orleans. Overall funding has fallen some, to about $165 million. The base remains, despite damage and loss of some researchers, on which to rebuild. From a purely institutional point of view (without regard to economic development outcomes), coming back to pre-Katrina research levels and then climbing from there in research volume and quality will require focus of capital and faculty investments in niches.

From an economic development point of view, the New Orleans Medical District cannot hope to acquire private biosciences economic activity by hanging out a shingle that says in a general way: ***"Open for Bioscience Business."*** With all due respect to the research accomplishments and expertise in place, it is plain fact that global competition is ferocious and that New Orleans does not have the scale of assets to compete broadside against regions around the globe with much greater concentrations of bioscience scientists, research programs, and companies. Thus, selection of certain niches of existing strength as priorities AND then deliberate focused investments to organize and build on those strengths also is a ***sina qua non*** of the Medical District private activity strategy.

While some of this prioritization may be intra-institutional, the most mileage is to be gained by multi-disciplinary and multi-institution collaborations, probably organized as institutes or centers and thus positioned to compete for large-scale grants. The Louisiana Recovery Authority and the Louisiana Board of Regents currently are seeking a consultant to assist those two agencies in developing a s***tatewide initiative on research and commercialization*** which will involve selecting niches for research investments and preparing for funding. The RFP language specifically mentions ***"synergies among institutions."*** Some initial funding via CDBG funds will be available for New Orleans institutions. Therefore, university proponents of the Medical District Strategy would be well-advised to prepare themselves for this by taking up the process described above for deciding on niches for investment.

ACTION STRATEGIES

1. ***Via NOrMC or other means, and including key faculty leadership in the deliberations, make prioritization decisions about which existing strengths should be subject to scale-up (or reorganization and scale-up) into a few more institutes or centers (like Cancer and Gene Therapy). Ideally, these would be selected in part for their potential applications in products, drugs, devices, or services.***
2. ***Develop these decisions into the Medical District's multi-institution Strategic Biosciences Program Plan, including an overview of the targeted research programs and initial estimates of new resource requirements, including additional research faculty, technicians, research space, instrumentation, etc.***
3. ***Use the Strategic Biosciences Program Plan for New Orleans Medical District as a point of departure for soliciting federal, state, and foundation funds for major research growth.***
4. ***In addition, of course, each institution will continue to manage its own internal strategic plan, which will include research growth targets other than those defined for the Medical District's Strategic Biosciences Program Plan (above).***

TECHNOLOGY DEVELOPMENT AND CULTURE OF ENTREPRENEURSHIP

RATIONALE

Any discussion of intellectual property, technology transfer, licensing, technology and business development, or commercialization runs the gamut from high-level mission considerations of whether and how universities and their faculty engage in these activities all the way to tactical considerations of how to do it (evaluate technologies, frame agreements, report, etc.) It is a subject that inherently ranges from big picture philosophical and cultural beliefs to very detailed administrative considerations.

Since the 1980s approximately, universities have struggled with the mission question, the cultural divide, and the technical management problems. We are only now ***beginning*** to "mature" in this realm. Most of the New Orleans institutions involved in the Medical District are not among national leaders in this realm, although Tulane University does have substantial experience and a strong track record. It really must become a major commitment on the part of the New Orleans institutions to work harder to modify institutional cultures, policies, and internal infrastructure to cultivate and reward entrepreneurial faculty and their efforts to help stimulate innovation. To that end, perhaps a language change will help, along with senior administration messages about priority.

The primary goals must be on ***LOCAL/REGIONAL IMPACT—*** not necessarily optimizing license revenue. Metrics of success must be organized around this principle.

Then, beyond culture and attitudes, some changes in technology development operations are needed, and greater levels of investment to acquire more specialized expertise are required.

In the November 1, 2006 Workshop on Commercialization and Innovation, there was considerable discussion of how to create a culture of entrepreneurship and how to interest more faculty scientists in becoming entrepreneurs. We have thought about this.

The reality is that it is a rare combination to find someone who is a top flight researcher producing cutting edge technologies and at the same time is an entrepreneur with all of the requisite skill set and experience to successful launch and manage a high performance enterprise. In most areas this person is a 1 in 10,000 presence! He or she is very rare!

Creating an entrepreneurial culture within the university and medical school environment does not mean making entrepreneurs out of scientists/technologists. Doing so is generally a disaster and contributes mightily to the extremely high failure rates of small businesses. (See ***The E-Myth*** by Michael Gerber).

Focusing on such a strategy for the Medical District and its Bioscience initiatives fits well into one definition of insanity: doing the same thing over and over and expecting different results. There is a more sane and realistic alternative to create such a culture of entrepreneurship that focuses on value-added innovation at all levels. There are 5 elements that must be included:

This conversation has to be about ***TRANSLATIONAL RESEARCH, INNOVATION, ENTREPRENEURSHIP, and SERVING SOCIETY AND COMMUNITY—***not about commercialization.

THE MISSION AND MISSION LANGUAGE

The mission language of the institutions must be clear: knowledge is the university's most visible, prevalent and valuable asset. As a service to society at large, it is the duty of the university to apply knowledge assets to make a difference, to improve people's lives in the community's served by the university. In a global economy, there are no jurisdictional boundaries that matter. Understanding that the private sector takes knowledge to the marketplace to make a profit, the university must be fully engaged in facilitating the transfer of this knowledge and innovation and wherever possible reaping financial rewards provided by the marketplace. Institutions must recognize that making a profit is ***not*** inconsistent with its fundamental mission of discovery and creating knowledge. Knowledge ***has*** value. However, it ***adds*** value to society only to the extent it is ***released*** from the institutional silos and laboratory test tubes in which it was discovered or created.

LEADERSHIP MESSAGE

The leadership message regarding the institution's mission focus in knowledge and innovation must be clearly, forcefully and repeatedly communicated to ***all*** levels of the academic food chain. It is the job of the university chancellors and presidents to communicate the institution's role not just in discovering and creating knowledge, but more importantly that it is transferred to help society at large do things better, more safely and more effectively and where possible more profitably. There must be a consistent message from top leadership that is communicated throughout the institutional leadership including deans and department chairs. Even more importantly, it is the top leadership's responsibility to secure buy-in at all levels and to monitor adoption of policies, procedures and initiatives that reflect and work toward accomplishing the mission of knowledge application through effective engagement.

REWARDS AND INCENTIVES

The Reward and Incentive System of the institution must reflect the clearly stated mission of knowledge application through Innovation and Engagement. This includes promotion, tenure and pay adjustments. The institution must recognize that the one shoe fits all medieval system of teaching, research and service does not fit all of those who make up the university's human resource assets. Effective engagement through entrepreneurship and innovation must be placed on an equal plane with traditional merit measures. If they are not, then much of the discussion of encouraging scientific entrepreneurship is just that: talk. This fundamental re-adjustment in the rewards system must be approached from ***both*** the top down (System and University) and bottom up (departmental) levels. Without fundamental guidance from the top, nothing will happen at the departmental level where promotion and tenure policies are crafted and executed. Without buy-in at the departmental level, faculty (particularly non-tenured individuals) will not trust the system and therefore be less inclined and

motivated to take unnecessary risks in their career path. Successful approaches to addressing the re-working of rewards systems to appropriately incentivize engagement must be researched, evaluated and applied where possible.

SUPPORT INFRASTRUCTURE

The support infrastructure to facilitate a culture of entrepreneurship must be readily available and accessible to scientists whose discoveries and innovations have (or may have) market value. If the knowledge has market value it will attract capital – both equity and debt. The key is identifying the discoveries and knowledge that have significant market value and formulating a path (business model) that moves it from the lab to the street as quickly, efficiently and profitably as possible. Although licensing is the possible path of least resistance, it is not necessarily the approach that adds value to the institution and community which helped support discovery and creation of new applied knowledge. To add value these knowledge assets must crate jobs locally through creation of high performance businesses. This infrastructure can function through a variety of existing networks of service providers and working groups within the scientific and business communities. However, these networks need to be fully integrated and fortified where necessary to provide the hands on assistance, mentoring and coaching needed to facilitate the process of transferring scientific innovation to the marketplace. Strategies for engaging networks of technology manager/entrepreneurs, institutional alumni and essential professional expertise (i.e. legal, accounting, finance) must be formulated and implemented. The extent to which existing business support resources at local universities and organizations such as GNO, Inc. and Idea Village can be tapped should also be addressed. Where jurisdictional or institutional barriers exist, they must be removed or mitigated to the extent possible.

VISIBLE SIGNS OF SUCCESS

There must be visible signs of celebration for those engaged in scientific discovery that results in commercial success. Traditional celebrations usually involve departmental recognition of peer-reviewed articles accepted by A+++ journals or extensive citations of one's seminal work by other top-flight researchers. These are all good and should continue. However, the culture of scientific entrepreneurship must be recognized differently and more extensively if the right message is going to be sent consistently from all levels of leadership. Perhaps an annual award for scientific entrepreneurship should be established that includes not only a token of recognition but a monetary reward. There could be different types of awards (i.e. different stages of business development) and commensurately different levels of monetary award. These issues could be addressed by a work group of NORMC that ensures the award is inter-institutional. However, whatever form it takes, the award and recognition and publicity that goes along with it are clear: This is important!

ACTION STRATEGIES

5. ***Help change the culture and attitudes of faculty toward participating in the Innovation System by avoiding the terms "commercialization" and "technology transfer." Instead, frame the conversation in terms of:***

   - Translational research
   - Health care advances
   - Innovation
   - Entrepreneurship
   - Service to society.

As we are seeing elsewhere, the essential origin of this message must come from OUTSIDE the universities—from their most influential constituents in government and industry and community. Then, it must be carried by institution leaders.

6. ***Commit to sending clear and consistent top-down messages, via incentives, rewards, budgets, and other ways, that advancing innovation in bioscience applications IS directly relevant to the performance of institutions and their faculty. Be clear about this message in ways that count.***

7. ***Refine policies and success metrics to place priority on local/regional impact, not on maximized license revenues. Not all inventions are capable of becoming start-ups or having local impact. But, this focus might mean changing the process by which disclosures and potential innovations are evaluated and the decision process or options considered for IP disposition.***

8. ***Enhancement of outcomes also will require more staff and expertise, which may offer an opportunity for the local institutions to share resources. Overall, greater levels of well-placed investments are required in the internal capabilities. LSU Health Sciences Center, in particular, should work to adopt and implement the Fishman report, as it pertains to LSU Health Sciences Center.***

BUSINESS INCUBATION AND DEVELOPMENT

RATIONALE

The BioInnovation Center facility is a critical piece of the Medical District's ***Innovation System Strategy***. The District needs a programmatic and a physical "heart." While there are reasons for past delays and while the Executive Director has been avidly pursuing both planning and interim activities, it is essential that the program and facility elements be put in place now.

The ***Development Strategy Work Paper*** has parallel recommendations about the building projects.

ACTION STRATEGIES

9. ***Proceed immediately with design and development of a facility that can be accomplished within the available capital dollars, ensuring that the design is such that it can be readily expanded when additional funds are available.***

10. ***Continue and expand efforts (already underway) in outreach to companies and entrepreneurs, in entrepreneurship training, and in overall cultivation of a sense of community and connections among bioscientists in the area.***

BUSINESS CAPITAL FORMATION

RATIONALE

November 1 Innovation Workshop participants were somewhat divided on the question of venture capital availability. Some express the feeling that venture capital is in short supply and others feel that money can be found for the right "deal." In general, entrepreneur participants agreed that the most acute business capital problem is at the early or seed stage.

This solution for seed capital funding may be addressed via the State's new program and the entity to be created. The Medical District should be prepared to make a cogent case for allocation of seed funding, based on its Economic Development Strategy.

ACTION STRATEGIES

11. ***Via NOrMC, propose to the State creation of a seed capital fund in the range of $10 million that would make biosciences (seed) investments in the range of six figures for proof-of-concept stage work, perhaps in two stages, and that would be dedicated to pre-company projects and companies associated with the New Orleans Medical District.***

12. ***Take actions to make national and global VC firms more aware of New Orleans.***

WORK FORCE DEVELOPMENT

RATIONALE

The action agenda with respect to workforce seems to fall into a few categories:

- Quality of life factors (for high level recruitment)
- Information
- Technical training
- Internships
- K-12 STEM programs

QUALITY OF LIFE FACTORS

It is well beyond the capability of the Medical District to affect overall quality of life in New Orleans, other than by advancing successful redevelopment of the District itself.

INFORMATION

Post-Katrina New Orleans (and all affected parishes and institutions) have been studied in numerous ways. Yet, there are some information gaps. At the risk of advocating more "studies," when we really wish to advocate more "actions," it does seem that a consistent means to maintain current information on work force dynamics with respect to bio-related disciplines would be very useful to the Medical District strategy. This might include annual tracking of the kinds of metrics that were studied in the pre-Katrina and post-Katrina work force analyses described above, including:

- Baseline academic programs relating to biosciences—and highly related disciplines (at all institutions)
- Graduate (degree) production at all levels in bio-related disciplines
- Current and anticipated staffing (workforce) needs of bioscience companies and health care institutions in the region

TECHNICAL TRAINING

No matter what other highly specialized workforce needs emerge, it is clear that there is an existing need for laboratory technician training. This was tasked to Delgado Community College, which has had post-Katrina difficulties. Yesterday would not be too soon to develop and implement this program. (Eva, Delgado needs more money to up front the costs of bio-science technician training (chicken and egg). We cannot just dump this problem on them without pushing for more resources for them.)

INTERNSHIPS

Internships are a useful way to motivate students to pursue technical and scientific careers, as well as to enhance their education. In many cases, the challenge for internship programs is not availability but communication and effective matching between the potential intern and internship opportunity.

K-12 STEM ENHANCEMENT PROGRAMS

It is well beyond the scope of this analysis to assess the existing programs in the currently reorganized New Orleans schools. However, we can guess that there it would not be superfluous to suggest some special initiatives to help encourage young children to understand and pursue science.

ACTION STRATEGIES

13. ***Via NOrMC, establish the function of collecting and maintaining biosciences and health care workforce information (degree programs, degree production, employment levels, and company workforce needs).***

14. ***Via NOrMC, immediately initiate meetings with Delgado officials, including Dr. Kathleen Mix, to express detailed curriculum needs, assist in program design, establish funding needs, and offer support with other elements of the strategy for launching a two-year lab tech degree program. Via the BioInnovation Center, bio companies also should provide input on skills needs. NOrMC should commit to support and assist Delgado in this endeavor as a shared agenda and collectively advocate for program funding.***

15. ***Via NOrMC, engage institutions in creating a one-stop or centralized clearinghouse for all internship or co-op education opportunities relating to health care and biosciences in the region. While complicated, this would not be impossible. It might be "housed" administratively at the BioInnovation Center.***

16. ***Via NOrMC, investigate a few models for K-12 STEM programs, such as the five programs operating in Caddo Parish, that are supported, in part, by fundraising efforts of the Biomedical Research Foundation. Develop, acquire funding for, and implement such programs.***

EXHIBITS

EXHIBIT 1—SOURCE AND REFERENCE MATERIALS

NEW ORLEANS MEDICAL DISTRICT ENTITIES AND DATA

Facility Description and Operational Strategy, New Orleans BioInnovation Center, Inc., Aaron Miscenich, October 19, 2006

Biosciences Work Group Report, Bring New Orleans Back Committee, December 20, 2005

2007 Strategic Plan (draft), Tulane University School of Medicine, August 7, 2006

Fishman, Carla H., Report to the Louisiana State University System on Technology Transfer Initiatives, 2004

Various information about technology transfer (policy, data, etc.), Office of Technology Transfer and Business Development, Tulane University,

LSUHSC—New Orleans Profile, Office of Technology Development, James A. Hardy, October 23, 2006

Various information about technology transfer (policy, data, etc.), LSU Health Sciences Center

Web Sites, Louisiana Gene Therapy Research Consortium, Louisiana Cancer Research Center, the universities, etc.

Interview Notes, EKA interviews with principals in New Orleans

Brady, Raymond J., Louisiana Workforce Training Efforts to Rebuild Hurricane Disaster Areas: Forecast of Critical Occupations Requiring Two Years or Less Training in Six Industry Sectors for the Recovery Period 2006-2009, Louisiana Occupational Forecasting Conference, August 2006.

Moran, Stahl, Boyer, Biotech Workforce Evaluation, January 17, 2005.

NATIONAL AND PEER DATA

Interview Notes, EKA telcon interviews with various peer biosciences centers

North Carolina's Emerging Biotech Corridor, Eva Klein & Associates, Ltd, BioParks, 2004

Memphis BioWorks, pdf file, various materials of the Memphis BioWorks Foundation

Web Sites, venture capital industry/firms

Growing The Nation's Biotech Sector: State Bioscience Initiatives 2006, Battelle Technology Partnership Practice and SSTI, April 2006

EXHIBIT 2—FROM 2006 BATTELLE/SSTI STUDY

SELECTED STATES AND UNIVERSITIES

CALIFORNIA

California leads the way in State bio-science funding with voters approving $3 billion in bond funding to create the California Institute of Regenerative Medicine as a means to assure California universities as the largest players in bio-science research and new company formation.

WASHINGTON

The State of Washington has created a $350MM Life Sciences Discovery Fund that will allocate $35MM annually from tobacco settlement dollars to support bioscience research with economic development potential.

PENNSYLVANIA

In Pennsylvania, the Governor has proposed creating a $500MM fund that would support bioscience faculty recruitment and facilities construction.

MISSOURI

The Governor of Missouri is proposing to create a $450MM Lewis and Clark Discovery Initiative that would fund university capital improvement projects, technology commercialization, scholarships and endowed professorships.

OHIO

Ohio has recently expanded its Third Frontier project to $1.6 Billion and awarded $300Million, most of which went to bioscience-related initiatives.

ARIZONA

Arizona's legislature recently passed legislation authorized $440 Million for construction of university research facilities, primarily in the biosciences.

MINNESOTA

Between 2000 and 2005, the Minnesota Legislature approved a total of $240 million in bond funding for bioscience-related science laboratories throughout the state. Proposals for an additional $160 million have been introduced in the 2006 legislative session, and a bill is expected to be introduced in the 2006 Legislature that would authorize the state to create a $330 million bond fund for a newly created Minnesota Biomedical Sciences Research Facilities Authority.

IOWA

Iowa, New Jersey, New York, and Pennsylvania are among the states that have provided funding to universities to further build their technology transfer and commercialization activities. The Grow Iowa Values Fund is providing $5 million to its three state universities under the control of the Board of Regents to expand infrastructure in the areas of technology commercialization, entrepreneurship, and business development.

MASSACHUSETTS

Massachusetts has multiple public and private sources to support pre-commercialization research. They include the following:

- The Massachusetts Technology Transfer Center, funded at UMass for $1.9 million in the Economic Stimulus bill, makes Technology Assessment awards up to $5,000 and Technology Investigation Awards up to $25,000 to all research institutions, both public and private.

- Internal to UMass, the office for Commercial Ventures and Intellectual Property has a $100,000 fund from which it makes pre-commercialization development grants up to $20,000.
- At MIT, the Deshpande Center has targeted $15 million of its $20 million endowment to support development of promising research into commercial enterprises. The center makes Ignition
- Awards up to $50,000 to research teams and somewhat larger Innovation Awards to help determine whether to start a company or execute a license with an existing firm.
- At Boston University, the Office for Technology Development, now embedded in a larger Institute for Technology Entrepreneurship, maintains resources for similar technology-development awards and to initially capitalize start-up entities.

THE UNIVERSITY OF CALIFORNIA AT SAN FRANCISCO

The University of California at San Francisco has created and stationed at the Mission Bay campus a Bio-entrepreneurship Center, which offers mentoring and training for faculty members whose discoveries might form the basis of a spin-off, as well as funding for translational drug development. The Center is supported by the QB3 Institute.

VANDERBILT UNIVERSITY

Vanderbilt University in Nashville partnered with Cumberland Pharmaceuticals and Tennessee Technology Development Corp. to create Cumberland Emerging Technologies (CET), a commercialization company intended to access federal SBIR funding and other sources to commercialize intellectual property licensed from Vanderbilt. Management is provided by staff from the pharmaceutical company. CET also has an agreement with the University of Mississippi School of Pharmacy to develop and commercialize new pharmaceutical products.

Source: ***Growing The Nation's Biotech Sector: State Bioscience Initiatives 2006***, Battelle Technology Partnership Practice and SSTI, April 2006

FUNDING FOR EARLY STAGE INVESTMENTS

State	State Commercialization Funds	Level of Investment	Size
Arizona	ASU Catalyst Fund	$25,000 to $50,000	$415,000
Arkansas	ASTA Tech Dev. Program	Up to $50,000	$1.6 million
California	CalTech Grub Stake	Up to $50,000	
Colorado	Proof-of-Concept Fund at University of Colorado	Up to $20,000	
Georgia	Emtech Bio Competitive Grant Fund	$75,000 to $100,000	
Hawaii	Hawaii Technology Development Venture	Up to $400,000	$3 million
Indiana	Technology Innovation	Up to $100,000	
Iowa	ISU proof-of-concept fund /UI commercialization Projects	$25,000 to $200,000	$1.4 million
Kentucky	Kentucky Commercialization Fund	Up to $225,000	
Maryland	University Technology Development Fund	Up to $50,000	$450,000
Massachusetts	Technology Assessment Awards		
Michigan	Michigan State Universities		$15 million
Michigan	Michigan State IP Ventures	Up to $150,000	
Missouri	Washington University Bear Cub Fund	$20,000 to $50,000	
Missouri	St. Louis University	$15,000 to $20,000	
New Jersey	Entrepreneurship Partnering Grants	Up to $500,000	
New York	New York University Applied Research Support Fund	Up to $750,000 over 2 years	
Pennsylvania	Pennsylvania BioAdvance	Up to $200,000	$900,000
Pennsylvania	Tech Commercialization Alliance in Pittsburgh		$900,000
Pennsylvania	Technology Development Fund—LSG of Central PA	Up to $250,000	
Rhode Island	Slater Technology Fund	Up to $100,000	
Texas	BCM Technologies		$20 million
Utah	Centers of Excellence Program	Up to $25,000	$500,000
Washington	Univ. of Washington Technology Gap Innovation Fund		$500,000
Wisconsin	Robert Draper Technology Innovation Fund	Up to $35,000	

Source: ***Growing The Nation's Biotech Sector: State Bioscience Initiatives 2006***, Battelle Technology Partnership Practice and SSTI, April 2006

TAX CREDITS FOR BIOSCIENCE COMPANIES BY STATE

State	Tax Credit
Arizona	Credit for investments in bioscience enterprises
Arkansas	Credit for investing in Arkansas Institutional Fund
Hawaii	Credit for investing in high-technology businesses
Indiana	Credit for investment in a qualified Indiana business
Iowa	Credit for investing in a qualified business or community-based seed fund
Kansas	Credit for investing in a qualified business
Louisiana	Credit for investing in a Louisiana Entrepreneurial Business
Maine	Credit for investing in eligible businesses
Maryland	Credit for investing in biotechnology companies
Missouri	Credit for investing in local seed funds
New York	Credit for investing in qualified emerging technology companies
North Carolina	Credit for investing in qualified business
North Dakota	Credit for investing in a certified business
Ohio	Credit for investing in technology-based companies
Oklahoma	Credit for investing in qualified businesses
Vermont	Angel Investor tax carryover—allow capital gain to be deferred when gain used to invest in an eligible business
Virginia	Credit for investing in technology companies
West Virginia	Credits for investing in a qualified R&D company
Wisconsin	Credits for angel investors and angel investor networks investing in qualified new business ventures

Source: ***Growing The Nation's Biotech Sector: State Bioscience Initiatives 2006***, Battelle Technology Partnership Practice and SSTI, April 2006

EXHIBIT 3—PEER CASE STUDY INFORMATION—BIOTECH CENTERS

Advanced Technology Development Center Atlanta, Georgia		
	History and Base Facts	***Comments***
Year program (or facility) opened for business	1980: General tech incubator without wet lab facilities 2003: Separate wet lab incubator	
Ownership and governance structure (and relationships with university/universities)	No-for-profit, state-funded. ATDC is a line item on the state budget, not funded through an institution. Management and personnel employed by the ATDC are employees of Georgia Tech and have faculty benefits.	Although the main ATDC location is on the Georgia Tech campus, ATDC has a state-wide mandate to the extent possible. Additional ATDC locations are in Warner Robins, GA and Savannah, GA.
Facility size—in NSF:	ATDC main location: Office & dry-lab space = 140,000 SF ATDC Biosciences Center= 22,000 SF	Since 1980, ATDC has occupied 3 locations on the Georgia Tech campus. The current office and dry lab location was occupied in August 2004. The office and dry lab space is located in a 487,000 SF multi-story building.
Wet lab rentable NSF	18,040 SF	The wet lab incubator is located within a 287,000 SF academic building on the Georgia tech campus.
Dry lab/office rentable NSF	97,000 SF	Excludes staff office and reception space
Common areas NSF	12,000 SF	Includes several conference rooms, library, general reception area
Common facilities provided: Scientific or Amenities	A wide variety of scientific equipment is provided at no cost to tenants– water systems in all labs, chemical hood, biological safety cabinets in 75% of labs. Quite a bit of general lab equipment – pH meters, centrifuges, HPLC, spectrophotometers, microscopes, balances, electrophoresis equipment, refrigerator/freezer combinations, -80 freezers, ice maker, full lab cabinetry, all office furniture.	***Scientific:*** Access to lab equipment is cited by companies as beneficial as lab space Many companies take advantage of core labs on as needed basis – mass spec, clean room, vivarium, electron microscopy ***Amenities:*** Amenities include access to Georgia Tech core lab facilities, most with a reduced indirect rate, use of Georgia Tech library, student recreation center at faculty rate. Shared copy machine and fax are also available at minimal cost to tenants.
Types of companies or technologies targeted	No specific target other than technology based.	We do not admit companies based solely on services.
Number of companies served since inception	ATDC: In excess of 150 companies ATDC Biosciences Center: 10 companies since 2003	Record keeping in early years of ATDC was spotty at best. Tracking metrics since 1995 have been much better; early years (1980-1995) are estimated.
Number of companies considered "successful graduates" since inception	ATDC: Applying fairly strict graduation criteria (profitable company, acquired for profit, successful IPO), the number of graduates is about 110. ATDC wet lab specific graduates: 3 since 2003.	Metrics for success were not well defined until mid to late 1990s. Companies that wind down, go out of business or are acquired for less than funds invested are not considered successes
# or % retention of successful graduates in the region	Of the sustainable graduates that retain their identity, at least 90% remain in the Atlanta area. Of the 3 Bioscience Center graduates since 2003, 100% remain in the Atlanta area.	This is difficult to estimate with any certainty. Many "successful" graduates are acquisition by out of region companies.

Success and Failure Factors: Lessons to Learn	
What have been your ***greatest strengths*** or resources or those factors most contributing to the program's commercialization success?	Overall, the most significant ATDC programs are those that help create a sense of community and foster networking opportunities. Numerous surveys have cited the ATDC community of entrepreneurs as the greatest benefit. There is significant sharing of experience and knowledge in these community building events. For the bioscience focus companies, we have found significant benefit in providing access to lab equipment and specialized facilities at Georgia Tech. Companies would often have little or no access or access at significant cost to these facilities. This is evidenced by the fact that essentially 100% of the bioscience-focused companies in the incubator have an association with Georgia Tech (licensed technology, sponsored research or use of core lab facilities) whereas less than 50% of the non-bioscience companies have an association with Georgia Tech.
What have been your ***greatest weaknesses*** or factors inhibiting your program's success in commercialization and industry growth? (And what have you done or what are you doing about these?)	Our greatest weakness was, until 2003, not having any wet lab facilities. We have had no problem keeping our wet lab facility full. A current limitation is the absence of adequate lab space in the community for ATDC graduates that need such space for expansion. To overcome this limitation, Georgia Tech is building a research park adjacent to campus to provide space for graduates and other companies needing lab space. Another weakness that is being overcome is the lack of ATDC staff members with sufficient domain experience to provide advice and support to entrepreneurs.

Center for Emerging Technologies St. Louis, Missouri		
	History and Base Facts	**Comments**
Year program (or facility) opened for business	1998	
Ownership and governance structure (and relationships with university/universities)	Not-for-profit 501(c)(3), with 30 member board that includes Washington University, Saint Louis University, and UM-St. Louis	Employees are employed by UM-St. Louis
Facility size—in NSF:	Building I is 42,000 SF Building II is 47,000 SF	Both buildings were rehabs of old commercial facilities. Building II is "historic commercial"
Wet lab rentable NSF	Full wet labs = 8,500 SF DNA sequencing/analysis = 3,800 SF	DNA lab has sinks but not hoods
Dry lab/office rentable NSF	Dry labs = 5,600 SF; Assembly = 5,300 SF; Office = 37,000 SF	Building II cannot structurally support labs, so CET is in planning process for a new lab building
Common areas NSF		Range of shared conference rooms, training and board rooms, plus office equipment and storage
Common facilities provided: Scientific or Amenities		***Scientific:*** Autoclave, dishwasher, di-water, ice, darkroom ***Amenities:*** Lobby , 2 break rooms, patio and conference rooms (above)
Types of companies or technologies targeted	Biomedical (Biotech, instruments, devices) and advanced technologies	
Number of companies served since inception	25	
Number of companies considered "successful graduates" since inception	7	
# or % retention of successful graduates in the region	3 operating in area; 2 bought out; two moved to other states	Financing was the factor in the buy-outs and relocations

Success and Failure Factors: Lessons to Learn	
What have been your greatest strengths or resources or those factors most contributing to the program's commercialization success?	• Washington University School of Medicine is one of the top in the country • Able to learn best practices from others and maintain an ongoing national network • Availability of federal tax credits and grants and state tax credits and funding • Adopted by UM-St. Louis • Coalition effort to create a range of sources of venture and investor capital • Community interest and support • Great staff that works well as a team • Staying current with advances in commercialization practice and the science
What have been your ***greatest weaknesses*** or factors inhibiting your program's success in commercialization and industry growth? (And what have you done or what are you doing about these?)	• Weak state support and difficulty in dealing with them • Anti-life science religious ideologues in state legislature • Divided local governance and extremely limited city and state budgets • Limited private financial support • Originally no VC and now not enough at any stage, especially early and later • Lack of companies created by WU and conservative approach to tech transfer • Lack of experienced life science entrepreneurs We have worked with others to create sources of VC; have done creative financing to develop the buildings; hired a lobbyist to stabilize and increase state funding; conduct extensive training courses for tech entrepreneurs and service providers; help with SBIR grants and connections to university researchers, federal labs and drug companies.

Chicago Technology Park and Research Center Chicago, Illinois		
	History and Base Facts	***Comments***
Year program (or facility) opened for business	1985	
Ownership and governance structure (and relationships with university/universities)	University owns the incubator on university land. Lease agreement with Chicago Tech Park Corp to manage staff and maintain the building. University Research Park LLC established by University to be interface between Board of Trustees and each of 3 parks –primarily advisory to Board of Trustees (real estate, tech expertise)	University has 2 buildings and 2 seats of 6 or 7 on Board (Vice Chancellor/Vice Chancellor-Research) but doesn't do anything. Two buildings are on University land. Rush building is on Tech Park; also others. Medical District owns two buildings and land and leases land to other entities (Land given by state).
Facility size—in NSF:	33,000 rentable	56,000 GSF
Wet lab rentable NSF		38 wet labs in 3 configurations; 600-800 SF lab and 2 small offices; 80% labs
Dry lab/office rentable NSF		
Common areas NSF		
Common facilities provided: Scientific or Amenities		***Scientific:*** Labs; autoclave, etc. ***Amenities:***
Types of companies or technologies targeted	Biotech and devices	Only lab companies are in the incubator
Number of companies served since inception		20-30 at a given time (100% full since 1998)
Number of companies considered "successful graduates" since inception		Rehabbed a building for 2 grads and 6 office suites plus built a 16,000 SF building for 2 companies; purchased a 70,000 SF building with labs for grads that needs to be rehabbed.
# or % retention of successful graduates in the region		

Success and Failure Factors: Lessons to Learn	
What have been your greatest strengths or resources or those factors most contributing to the program's commercialization success?	• Building: affordable, quality lab space near other services and facilities; offer university core facilities, equip, animals (since university-owned building with joint grants or licensing tech, companies get assess to these at on-campus rates - all centralized services). Direct reimbursement for costs plus small mark-up (same as faculty pays on a research grant). Since they have down time, they don't mind; Memo from Vice Chancellor for Research several years ago established policy • Library: Allowed to have certain classification of affiliate users – limited. Only one person in company annually is designated – give them a university appointment as "affiliate"- get a university ID and access to network, including access to on-line journals but not inter-library loans. (This is called a 0% appointment) • University of Illinois is #2 in the US in company creation (AUTM). There are 4 or 5 a year in Chicago. They do not license to faculty but only to a management group with $ and a plan. Illinois Ventures handles company development (wholly-owned subsidiary of the University, an LLC. There is state $ from General Revenues, since tobacco $ is gone. It is not limited to university-sourced companies. • $2 M pre-seed funding annually • $28 M VC fund—Illinois Emerging Tech Fund. Raised from limited partners. Illinois Ventures manages and gets a carry on the VC fund to support assistance services. • 30 companies funded since 2002 – leveraged $80 M in co-investment. • I Techs got state funding – pre-seed (couple hundred thousand annually from state) • Illinois Ventures offices in Chicago and Urbana includes $ plus team of professionals with early-stage experience and a network of business professionals brought in, and they find early-stage management • OTMs bring technology to them. The teams on both campuses use students to evaluate disclosures for Technology Manager and faculty member and get patent searches done by a DC firm. They do an Analyst Report for hot ones – very thorough (some done inside and some outside). Then, passed on to Illinois Ventures for their due diligence
What have been your ***greatest weaknesses*** or factors inhibiting your program's success in commercialization and industry growth? (And what have you done or what are you doing about these?)	• Park is no one's first priority. Operating company of Illinois Medical District and no one paid attention until they got a $40M bond issue to buy and rehab the 70,000sf building and land to develop. It is not a full separate identity; needs its own governance structure and people with it as their priority. This is why it has been so slow to develop.

Sid Martin Biotechnology Development Institute Alachua, Florida		
	History and Base Facts	***Comments***
Year program (or facility) opened for business	1995	Affiliated with the University of Florida and its foundation
Ownership and governance structure (and relationships with university/universities)	U of Florida Foundation. Incubator is a state building; maintained by University.–	Assistant Director is on-site Manager of program employed by University
Facility size—in NSF:	40,000sf	
Wet lab rentable NSF	18,000 usable sf (offices, labs and common rooms)	Rentable lab space = 16,000sf 14,000 licensable labs
Dry lab/office rentable NSF		2,000 office
Common areas NSF		General lab space (w/equipment)
Common facilities provided: Scientific or Amenities		Scientific: $1MM in shared equipment Amenities:
Types of companies or technologies targeted		
Number of companies served since inception	35 – 12 current – all biotech	
Number of companies considered "successful graduates" since inception	9 failed and 12 graduates	
# or % retention of successful graduates in the region	All but 3 in general area	

Success and Failure Factors: Lessons to Learn	
What have been your greatest strengths or resources or those factors most contributing to the program's commercialization success?	• UFL is a single campus and includes everything • $500M in research; half is in life sciences • Attached small animal facility and attached green house and internal fermentation facility (not GMP) for animals • University just opened a Phase 1 & 2 size bio-production facility next to Institute • $1MM of shared equipment, including fermentation • Properly designed incubator program • UFL among top in licensing revenue and spin-outs (Milken study). Top in US for a single public university. Enlightened tech transfer process and aggressively creating companies • Lots of value from animal facility etc., so have been able to accommodate the range of life science companies • Can use Institute and University's core facilities at faculty rates! General Counsel's office approved this because facility is under the University Foundation; also can use the library • Tech Connect Grant from EDA for licensing office – matching faculty with outside entrepreneurs (not necessarily local) to write business plan around their technology, with the idea of attract the entrepreneur to move there and start a company ($5,000 each) • Also court VCs in the Southeast • Office also e-mails out latest patenting technology to an interested list. Called Tech Alert –has been a big boost to licenses
What have been your ***greatest weaknesses*** or factors inhibiting your program's success in commercialization and industry growth? (And what have you done or what are you doing about these?)	• Very little capital is available, and none locally. Companies raised $50M in equity investment last fiscal year, which was far higher than the last 10 years combined. • It takes a very long time to reap success • Companies are small and initially using grant funds • Small community • Biotech companies are expensive to incubate and have a long adolescence • Limited pool of experienced management • Companies only from university, but half hour from campus and looking to do something closer, but attract comp because of access to labs and spec equip • Biotech pain therapeutic company from New Orleans that had been VC-funded, had been in LSU, but not moved back

Louisville Medical Center Development Corporation Louisville, Kentucky		
	History and Base Facts	***Comments***
Year program (or facility) opened for business	2002	
Ownership and governance structure (and relationships with university/universities)	LMCD owns and manage the building. MetaCyte is a wholly-owned subsidiary. Funded by University of Louisville, University Hospital; Jewish Hospital; Norton Healthcare; state, city, and Jefferson Community College. Operating budget = $730,000	Building that functions as an incubator building Med Center 3 and an incubator program. MetaCyte Business Lab, LLC. For entrepreneurial services – operate like a VC – equity for time. Tech transfer offices are in this building with them LMCD manages the building and has other companies in addition to MetaCyte clients; 8 or 9 people $1.2 M budget (formerly with Senmed) – do not have a fund, find funding, strategic planning, SBIRs and VC funding. $5M commercialization fund from University, hospitals, and state; fund translational research primarily but not limited to university faculty; usually take 25% equity; state has seed fund and tobacco money for agriculture-related technologies. President formerly with Lilly – orchestrates corporate alliances
Facility size—in NSF:	47,000 SF	One floor with labs =17,000 SF Another building with labs = 10,000 SF One-third of it is conference room space; 3-5,000 SF computer lab
Wet lab rentable NSF		
Dry lab/office rentable NSF		
Common areas NSF		
Common facilities provided: Scientific or Amenities		***Scientific:*** ***Amenities:***
Types of companies or technologies targeted	Biomedical, mainly devices	
Number of companies served since inception	20	
Number of companies considered "successful graduates" since inception	2 grads from MetaCyte; one sold.	Program does not push them out
# or % retention of successful graduates in the region	All grads have stayed.	

Success and Failure Factors: Lessons to Learn	
What have been your greatest strengths or resources or those factors most contributing to the program's commercialization success?	• Gheens Foundation in Louisville: only makes contributions in Louisville and LA; Life Sciences in Louisville ($2.5 M to a faculty member which state matched); Foundation likes to be change agent; might like a joint venture between the two; Dr. Lehman Gray on Board; They do not like bricks and mortar, like programmatic stuff • Incubator/park is independent entity but close to university and operates within university. Flexibility but access to faculty. • Having a few cracker jack people with industry experience in life sciences; will be import when get into business attraction also –have big pharma experience • Critical to have funding for companies at seed level and angels; redundancy of funds and focused on life sciences – smart money who connect to outside VCs • Aggressive in % of intellectual property allotted to faculty • State "Bucks for Brains Program" for attracting star faculty and Eminent Scholars Program has provided $300M over 6 years. University must match one to one. Only for University of Kentucky and University of Louisville • Aggressive federal & state funding support. Sen. Mitch McConnell (wife Elaine Chou is Secretary of Labor)—earmarks for research buildings
What have been your ***greatest weaknesses*** or factors inhibiting your program's success in commercialization and industry growth? (And what have you done or what are you doing about these?)	• Scarcity of seasoned life science management talent • Lack of access to life science-dedicated venture capital • Internal culture at university is geared towards research and publishing

Virginia Biosciences Development Center (Virginia Biotechnology Research Park) Richmond, Virginia		
	History and Base Facts	***Comments***
Year program (or facility) opened for business	End of 1995 The incubator was the first building in Park. Now have 9 (7 commercial and 2 state lab buildings). There are 400-500 people employed, mostly scientists). Over 1 M SF.	Building 2nd multi-tenant graduate building; have funding. VCU real estate foundation owns 2 buildings. State funding for the incubator and 2 public labs (tax-free bonds issued by Authority). Private company used municipal bonds; transplant association funded with part bonds and part capital campaign. New building is public-private partnership with a developer. Will be a 70,000 SF building with a 300-car deck parking. Authority will put equity $ and land into it, they will manage it and they did the design. Pre-leasing 50% for building and parking lot (also used by Community College). Incubator grads, larger companies in Park needing additional space, outside park to locate near Phillip Morris Research and Technology Center (450,000 SF, 500-700 employees, including cutting edge scientists) for new product development
Ownership and governance structure (and relationships with university/universities)	The state created VA Biotechnology Partnership Authority. The Board is appointed by Governor and mission is to promote life sciences for entire state. Created VA Biotechnology Research Park in Richmond (state, city and VA Commonwealth University). Each has seat on the Authority Board.	Initially, the Park Director ran the incubator. After 4 years, hired Robert Skunda and entered into a strategic planning process and created VA Biosciences Development Center to develop a best in class incubator and current director was hired. The Park has its own Board (501©(3). Boards tend to meet together. State passed a high education bond referendum for building the incubator.
Facility size—in NSF:	27,000 GSF	10 wet labs – entire second floor
Wet lab rentable NSF		
Dry lab/office rentable NSF		
Common areas NSF		
Common facilities provided: Scientific or Amenities		***Scientific:*** ***Amenities:***
Types of companies or technologies targeted	Biomedical 99% = life sciences, all are “tech”	
Number of companies served since inception	62 companies	18 came from University (1 or 2 a year) $50M in research should generate one company. Engineering is much more active, (doubling in size); also medicinal chemistry. Toxicology is a strength
Number of companies considered “successful graduates” since inception	31 graduates, 9 failed	3 are public, 2 are still there and a third one has research still there.

# or % retention of successful graduates in the region	Most are still there (80%)	
Success and Failure Factors: Lessons to Learn		
What have been your greatest strengths or resources or those factors most contributing to the program's commercialization success?	• Must inventory your assets, determine what it will take, and what you need to do to get there • There will be a cluster of second tier cities in targeted areas • $220MM in sponsored research (70-80% in life sciences), but only $100MM when started; $300MM corporate research center, that will house opportunities that they do not pursue • Strong partnership between City, state and university. VCU Pres has been major driver since the beginning • Outstanding management (e.g., Bob Skunda architect, urban planner, Secretary of Commerce for Governor Allen, private business background) • Good geography and good assets • Location is right downtown—an urban brownfields site (total site for Park is 34 acres; 2/3 built)	
What have been your ***greatest weaknesses*** or factors inhibiting your program's success in commercialization and industry growth? (And what have you done or what are you doing about these?)	• Biggest problem: Access to capital; still difficult to get deals funded; beginning to get attention from East Coast funds • State budget limitations: Could have moved faster and have lost prospects by not having wet lab space; looking for a one-time revolving loan fund managed by Authority for lab fit-out, but could not get approved • Not linear growth. Growth comes in spurts. It has been a struggle to get to critical mass, but now feel they are there with Phillip Morris building (a 300,000sf research building)	