THE 21ST CENTURY LIFE SCIENCE ROADMAP

Creating a world-class life science industry in Texas

"The best way to predict the future is to invent it."

- Nobel laureate physicist Richard Feynman

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TEXAS HEALTHCARE & BIOSCIENCE INSTITUTE

LETTER FROM THE PRESIDENT

Never in the history of mankind has scientific discovery had such an impact on our daily lives and our future wellbeing.

The mapping of the human genome has made it possible for researchers to instantly access mammoth databases containing detailed information on thousands of genes. Scientists are already using that knowledge to unlock the mysteries of the human body and find new ways to fight our most deadly diseases. The application of biotechnology to agriculture is helping farmers produce hardier, more nutritious and more disease-resistant plants. And previously unrelated scientific fields are beginning to merge, spawning entirely new research areas, such as bioinformatics, nanotechnology and biopharming.

Texas universities, life-science institutions and private companies are learning to work together to translate this research into tangible, affordable products, so our citizens can benefit from them as soon as possible. The opportunity has never been greater. But there is still much work to be done.

This report outlines a vision for the development of a vibrant life science industry for Texas through the creation of The 21st Century Life Science Roadmap — a map designed to allow our state to capture new technology and commercialize it for the benefit of present and future generations. Our goal is to create new companies, keep existing companies in Texas, and to establish a strong, vibrant business foundation on which to build the life science industry.

This report represents more than two years of intense research and countless hours of collaboration with many of the key leaders in the Texas life science community. Our thanks go out to the many individuals who participated in this project. Our hope is that these critical steps will lead to the success of the next generation of scientific ideas.

Thomas R. Kowalski
President
Texas Healthcare and Bioscience Institute

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David Nance
Introgen Therapeutics
Austin, Texas

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Austin Community College
Austin, Texas

David R. Margrave
BioNumerik Pharmaceuticals, Inc.
San Antonio, Texas

Dennis McWilliams
Chrysalis BioTechnology, Inc.
Galveston, Texas

Stephen H. Gens
Harrington Regional Medical Center, Inc.
Amarillo, Texas

Ronald G. Tefteller
ILEX Oncology, Inc.
San Antonio, Texas

Holly Jacques
Merck & Co., Inc.
Austin, Texas

Robert W. Jones, J.D.
Novartis Pharmaceuticals Corporation
Austin, Texas

Jaye Thompson, Ph.D.
SYNERGOS, Inc.
The Woodlands, Texas

Robert A. Kennedy, Ph.D.
Texas A&M University
College Station, Texas

York Duncan
Texas Research Park Foundation
San Antonio, Texas

Robert W. Gracy, Ph.D.
University of North Texas Health Science Center at Fort Worth
Fort Worth, Texas

Harry Holmes, Ph.D.
UT M.D. Anderson Cancer Center
Houston, Texas

Amy Shaw Thomas, J.D.
The University of Texas System
Austin, Texas

David R. Strome, Ph.D.
Veridian
San Antonio, Texas

F. Scott Reding
Zonagen, Inc.
The Woodlands, Texas

EXECUTIVE SUMMARY

Texas' life science cluster has reached a pivotal moment in U.S and global competitiveness. Business and economic models are undergoing rapid change, and Texas is facing new trends and changing demographics.

States throughout the U.S. are competing for the business revenues, research investment dollars and thousands of life science jobs expected over the next decade. Twenty-six U.S. regions have significant strategies under way to sustain their life science clusters. Examples of their successes include:

- Seattle Hood Center *($150 million in new funds)*
- Stanford's BIO-X Project *($210 million in new funds)*
- Harvard and MIT *($250 million over two to three years)*
- Indianapolis *($1 billion over ten years)*
- Yale *($1 billion over five to seven years)*

If Texas is going to successfully compete, our life science companies and institutions need to be able to quickly adapt to change, so they can leverage present and future opportunities to sustain research; bring new products to market readily; and leap ahead of competitors.

Texas needs a strategic plan for the life science industry. A plan headed by champion — a connector that can turn the many components of the life science industry into long-term economic and societal benefit.

It is time for Texas to leap-frog the competition and take its place at the forefront of next-generation regions worldwide.

The 21st Century Life Science Roadmap is the strategic plan Texas needs. And creation of the Texas BioInnovation Network – a nonprofit entity – would provide the necessary champion: a dedicated partner for the academic, industrial, entrepreneurial and economic-development interests dependent on the success of the life science market in Texas.

The Texas Life Sciences Cluster

In many ways, today, the Texas life sciences cluster is in an enviable position. We have many highly competitive public and private companies and institutions. We have excellent facilities, and research funding is at an all-time high. Moreover, we have the entrepreneurial mindset necessary to visualize this industry's future direction and position ourselves to take the best advantage of the opportunities ahead.

Today, the healthcare technology industry in Texas includes:

- 500 companies with $6.5 billion annual sales
- More than 50,000 private jobs with an average annual salary of $48,623
- Average company research and development expenditures of $3.1 million a year
- At least 396 new products in development

In the area of basic and applied research, which feeds this growing industry, Texas also possesses a wealth of resources, including:

- 55 medical academic institutions and research parks
- More than $1 billion in academic research expenditures in the life sciences in 1998

These two areas combine to create a formidable economic driver for Texas' economy, with:

- Total expenditures of $20.15 billion
- Gross State Product of $11.57 billion
- State and local government income of $1.04 billion

Roadblocks to Success

Unfortunately, Texas also faces hurdles in the race to compete in the life sciences. Launching a life science enterprise in Texas is difficult. Our state is challenged with minimal capital and managerial talent, insufficient infrastructure, and processes that impede commercialization of technology by private business.

To be globally preeminent, Texas must:

- Spark innovation and discovery by building networks among scientific and research resources and those capable of developing new ideas.
- Attract research and management talent that can drive formation of the next generation of companies.
- Encourage greater commercialization, so society and the state economy can benefit sooner.
- Respond to emerging societal, scientific and economic trends.
- Provide a globally competitive environment and the perspective for collaboration among institutional, scientific, entrepreneurial and public-private institutions.

The Texas Healthcare and Bioscience Institute

As a representative for hundreds of life science concerns across the state, the Texas Healthcare and Bioscience Institute (THBI) is leading the charge to create and promote the 21st Century Life Science Roadmap for Texas.

Created in 1996, THBI is Texas' premier association for the life science industry and the Texas arm of the international Biotechnology Industry Organization (BIO). THBI members include biotechnology, medical device, and pharmaceutical companies, universities and private research institutions, and companies that provide goods and services to core organizations.

THBI promotes the expansion of life science research and manufacturing in Texas by giving these companies an effective voice to pursue issues in their best interest. As such, THBI provides the Texas research and manufacturing community with unparalleled grassroots opportunities to communicate with political leaders, the news media, venture capitalists, investment bankers and the public about the importance of the research and manufacturing community to our state's future success.

THBI demonstrates the major contributions research and manufacturing make to Texas' state and local economies — and the great potential for financial growth and job creation.

Fostering industry development is an important THBI function, and sustaining a favorable business climate is critical for this development to occur. The 21st Century Life Science Roadmap for Texas provides the framework for building an environment that allows the life sciences to flourish.

Only by setting forth clearly defined steps for all segments of our society can we build a vibrant scientific and technological community for the new century before us — a community capable of delivering once unimaginable health, economic and quality-of-life benefits to all of our families.

DESIGNING A 10-YEAR ROADMAP FOR THE TEXAS BIOSCIENCE CLUSTER

Why a Texas Roadmap now?
The life sciences have undergone several changes in recent years. Today, it is a globally competitive market offering billions in revenue. At the same time, advances in technology and communications have changed this sector's business and economic models to ones that allow more outsourcing and rely more heavily on strategic relationships. States that want to compete in this market need to reexamine their resources and their shortcomings and develop near- and long-term strategies for success.

To date, 28 U.S. regions have created strategies to sustain their life science industry clusters and compete for business revenues, research investment dollars, and the thousands of jobs expected over the next decade. Those regions are acting on the knowledge that successful innovation and competition in this new environment relies on funding, public- and private-sector champions and a master plan for achieving specific goals.

While Texas has highly competitive facilities, institutions, research funding, and an entrepreneurial mindset capable of competing internationally, we lack the comprehensive plan — the roadmap — needed to maximize the potential of our life sciences industry.

Benefits of a Roadmap
A Texas Roadmap would:

- Create a shared vision of common goals
- Communicate the industry's intention to compete globally by collaborating regionally
- Provide a specific guide for developing industry "clusters"
- Identify the environmental characteristics and conditions needed for the journey ahead
- Help all parties understand the steps necessary for reaching common goals
- Spur decisions on best approaches and prioritize actions
- Provide a mechanism for measuring performance and success

Such a roadmap would be used to:

- Target resource allocation at the state and regional levels
- Align public policies with desired economic and societal outcomes
- Foster tighter bonds between the industry, government and citizens by building awareness of the needs and potential benefits of the life science industry
- Engage a broader set of stakeholders in the desired outcomes
- Provide direction, identify roadblocks in the path ahead and offer thoughtful solutions
- Spur vital collaborative partnerships to support the entrepreneurial, innovative behavior that sustains the life science industry

Genesis of the Texas Roadmap
Work on the Texas Roadmap began in early 2000 at four regional forums held by the Texas Healthcare and Bioscience Institute. These forums were held throughout the state and were attended by more than 100 representatives of the life science industry, academia, economic development organizations and other interested parties.

Participants were asked to answer three vital questions:

1. *How would you describe Texas' biotech and life science cluster in five to 10 years, if it were globally competitive and hitting on all cylinders?*
2. *What steps must be taken today to reach that vision?*
3. *What roles must the private and public sectors assume independently and collaboratively?*

Their answers formed the foundation of the Texas Roadmap and provided the context for further study by a statewide Roadmap Advisory Working Group and sub-task groups composed of representatives of academia and various industry sectors.

These groups studied domestic and global best practices, analyzed Texas' strengths and weaknesses and examined regional strategies and their implications for a statewide effort. Afterward, the Advisory Group constructed a framework for taking the Roadmap forward and created a set of recommendations for public policy, industry strategy, regional economic development and consumers. (A listing of Advisory Group participants is provided in appendices.)

Texas Strengths and Weaknesses
Identified by the Roadmap Advisory Working Group

Perceived Strengths	Perceived Weaknesses
Existing research and healthcare facilities	Lack of coordinated state strategy to compete
Lower cost of living, positive quality of life	Barriers to efficient tech transfer
Foundations and private wealth generous towards programs and buildings	Regional competition overwhelms opportunities to collaborate
Cohesive industry agenda	Lack of investment dollars for early stage enterprises
Depth of knowledge in key research areas attractive to Nobel prize and other award recognition	Lack of appropriate dollars for clinical and immediate post-clinical opportunities

Critical Connections for Innovation
The Advisory Group agreed that the Texas Roadmap's success would require four elements critical to innovation:

- To compete globally, it must connect disparate assets, institutions and regional competencies.
- To promote and support the life science industry, it must connect public- and private-sector marketing, data and knowledge.
- To attract investment, it must connect entrepreneurs, investors and research and development sources.
- To find near- and long-term solutions, it must connect specific "action hot teams" of industry leaders and interested parties ready to go to work.

THE 21ST CENTURY LIFE SCIENCE ROADMAP

The 21st Century Life Roadmap consists of four vital components and key recommendations:

21st Century BioInnovation Network
A "connective tissue" that links regions, institutions, research and entrepreneurs in the effort to accelerate the statewide goals of more jobs, more prosperous companies, economic growth, and improved health and quality of life.

21st Century Fund and Research Alliance
A statewide investment fund that provides strategic "gap funding" at various stages of discovery and product development and helps early-stage enterprises with access to infrastructure, managerial talent, and clinical trial and testing sources.

21st Century Innovation Strategy
Initiatives attract and support talent and skill development for scientific and managerial human resource needs.

The Global/State Consortia for Biocomputing
A proposed collaborative effort between leaders in computer hardware and software and life science industries to increase the computational power available for research and product development.

Key Recommendations
A series of recommended actions for the industry cluster, officeholders and the Texas Legislature, state and regional economic development, and consumers.

Development of these components is expected to take approximately three years, with completion of all elements by 2005.

The three most highly focused actions — the 21st Century BioInnovation Network, 21st Century Fund, and 21st Century Innovation Strategy — will be driven by committees given the mandate to spur action within 90-120 days. Results will be measured against established performance criteria.

In accordance with its purpose, the Roadmap will use the existing Texas Life Science Foundation (501c3 IRS status) to accept grants, gifts, contributions and equity. The virtual digital network will not supplant any existing institution or initiative. Instead, it will enhance and accelerate the statewide goals of all institutions, agencies and regions.

The State of Texas also will be encouraged to participate through key appointments to the BioInnovation Network's board, co-funded strategies and annual reports to the Legislature.

The 21st Century BioInnovation Network: A Statewide Partnership for Texas
The BioInnovation Network will link research assets, commercialization expertise, entrepreneurs and institutions in various Texas regions. This unique private-public partnership will use the current electronic infrastructure and the private sector's technology backbone to create the virtual linkages across regions and institutions. Estimated competitive level of financial commitment: $3 -10 million. (Comparison with New Jersey, Arizona and Pennsylvania.)

The network will be used to focus attention, resources and policy to attract more high-skill, high-wage jobs and increase the rewards of investment in research and commercialization in the state.

The 21st Century Fund and Research Alliance: Fuel for Innovation

The 21st Century Fund will include targeted funds to accelerate the discovery and commercialization process and support a strategy for maximizing funds.

State Critical Infrastructure Fund: Supports research, manufacturing and testing facility development. Infrastructure required for the life science industry cluster includes contract research, contract manufacturing, and contract testing — a specialized infrastructure typically considered outside of the mainstream life science environment.

TexSeed Capital Fund: Provides early-stage resources for clinical trials, post clinical trials and launch of enterprise efforts. This would include venture and risk dollars to assist enterprises in their early business evolution, in access to both infrastructure and talent, and in developing links with clinical trial and testing sources.

Research Alliance: Leverages, over multiple campuses, the state's share of federal, international and industry resources for basic research funding into the emerging sciences and strengths in Texas (e.g. bioinformatics, nanotechnology, biopharming). Estimated competitive level of financial commitment ranges from $22-50 million (Georgia and Indiana respectively). Suggested matching funds is approximately 50/50 for the State of Texas and industry.

21st Century Innovation Strategy: Bringing Great Minds to the Table

It the life science industry is to succeed, it must be able to attract and retain exceptional talent capable of envisioning new processes, as well as conducting complex research and transforming those processes into commercial and societal benefits. To ensure that Texas can attract and retain those great minds and talents, the following initiatives are proposed:

Skills/Training/Talent Imperative: This initiative will attract, nurture, and support scientific and managerial talent and skills to build our core knowledge base and attract the world's best and brightest to Texas.

Brain Trust Strategy: To secure the next generation of talent for the future, the Brain Trust Strategy will identify and recruit the 21 promising researchers in the United States and globally. Estimated competitive level of financial commitment ranges from $8-12 million (Washington State and St. Louis, Missouri, respectively.)

The Global/State Consortia for Biocomputing

Given that one gene discovery requires a minimum of 2.5 gigabytes of storage capacity, it's clear that successful competition will demand great computing power. This consortia will bring together leading high-technology hardware companies with key software, engineering, genomic, and related physical sciences to create standards and form new products and services — in effect becoming an MCC/Sematech for biocomputing.

Estimated competitive level of financial commitment ranges from $35-150 million (Comparison with Hood Center, the Stanford Center, the Pittsburgh Initiative and Dupont-MIT.)

Key Recommendations

Overarching recommendations for ensuring Texas' global competitiveness in the life sciences include the following:

- Statutory revisions from the 2001 Texas Legislature (S.B. 1190) relating to technology development and transfer should be reviewed to assess how the revisions have been able to provide universities and researchers with greater flexibility to pursue commercial opportunities.
- Regional commercial interests should be assisted in networking to help them leverage capital and entrepreneurial capabilities across the state.
- Events publicizing Texas' wealth of innovation resources (researchers, scientists, principal investigators) should be organized to attract entrepreneurs and managerial talent, as well as research and venture funding.

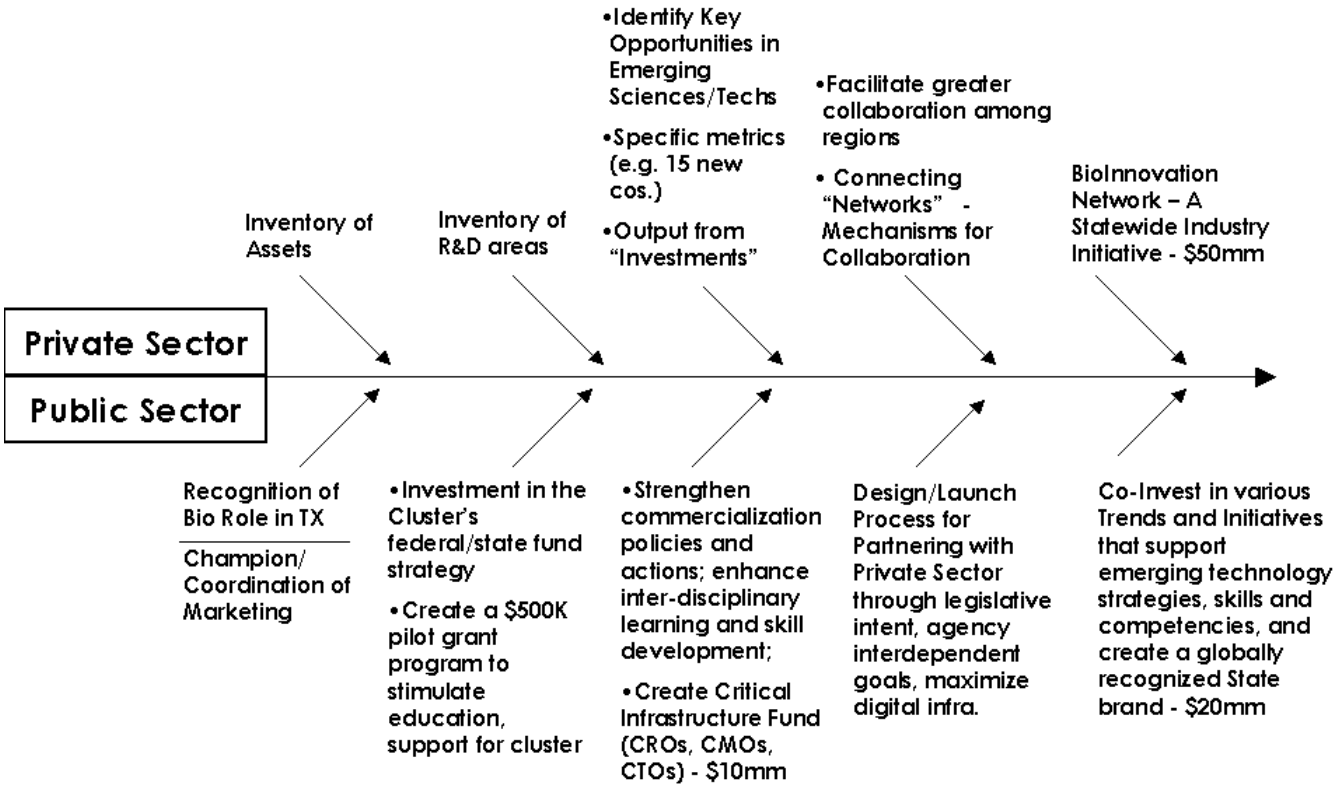
Specific recommendations to the life science industry, officeholders and the Legislature, state and regional economic development interests and consumers are detailed in the final section of this document, "Key Recommendations to Specific Sectors."

The 21st Century Life Sciences Roadmap
Financial Investment Overview

Component	Estimated Investment to Compete
Critical Infrastructure/TexSeed Capital	$ 3 – 10 million
Research Alliance	$22 – 50 million
Skills/Training/Talent Imperative	$ 8 – 12 million
Global Consortia on Biocomputing	$35 – 150 million
BioInnovation Network (total of above project areas)	$68 – 222 million

Figures represent the range of competitive investments made for similar programs per domestic and international case studies.

Moving Toward a Competitive Life Science Environment

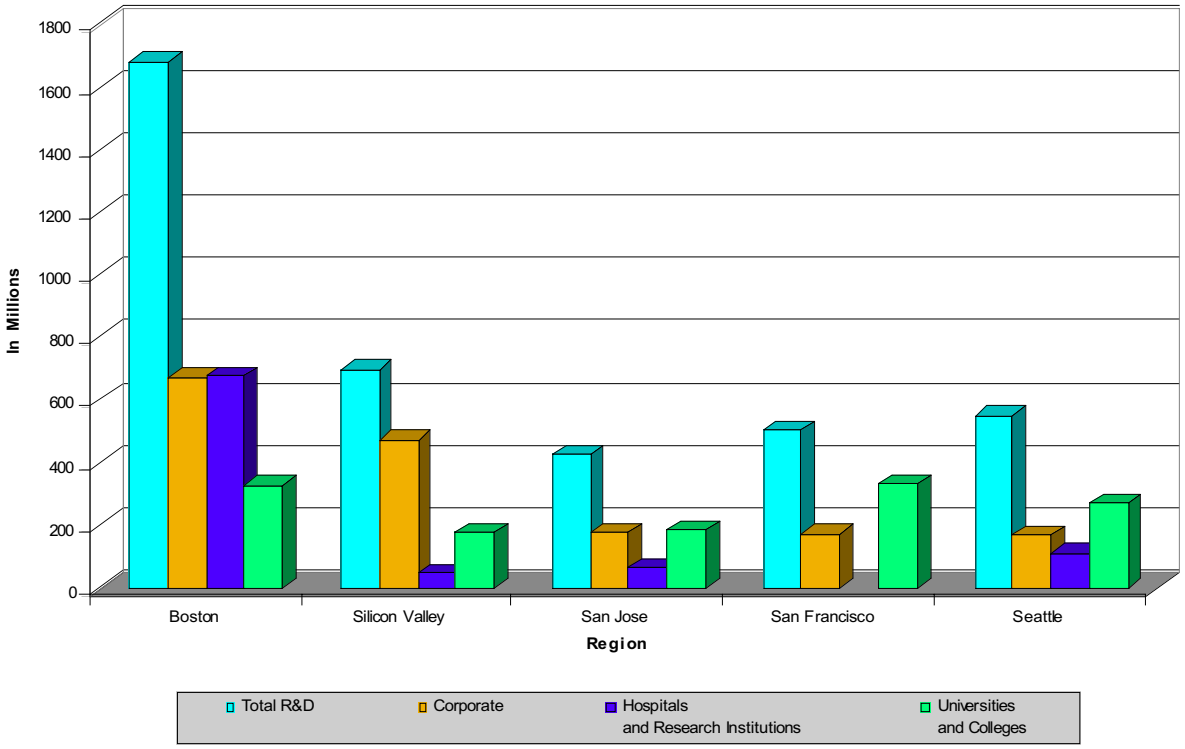


By aligning their priorities and resources, Texas' public and private sectors can complement each other's efforts and accelerate the state's progress toward the creation of a globally competitive life science industry.

THE COMPETITION:
LIFE SCIENCE INVESTMENT IN OTHER REGIONS

Texas is not alone in seeking a long-term strategy for the growth of its life science industry. Other nations and states are bringing public and private resources together to create the circumstances necessary to churn the life science lifecycle.

Top Life Science Research and Development Investments in U.S.



In the United States, state and industry investment in Boston, Massachusetts, is more than double that of its closest competitor. However, the total investment in California almost matches Boston's commitment.

The following case studies highlight selected initiatives under way across our nation and the world.

National Case Studies

University of Wisconsin-Madison Investment: $317 million
BioStar, a public-private partnership, was created to fund campus construction of a Biotechnology Center addition, a new microbial sciences building, a biochemistry building upgrade and an interdisciplinary biology building. Its $317 million cost is being met through a combination of state funding, private gifts and grants to the university.

The Biological Sciences Department at UW-Madison includes about 800 faculty members and 2,000 graduate students spanning more than 60 departments. Over 30 percent of this year's freshman reportedly plan to major in a biology-related department.

The BioStar initiative was unveiled in Governor Tommy Thompson's State of the State address in January 2000. Provost John Wiley is spearheading the building project for UW-Madison.

University of Washington Investment: $100+ million
The university's Institute for Quantitative Systems Biology studies the integration of disciplines and tools and the creation of new tools needed to understand the biology of complex systems.

Established in 1999 and funded by the Bill and Melinda Gates Foundation, the Institute will open a 48,000 square foot warehouse in Seattle. The Institute will partner with other academic institutions and a few large corporations that share an interest in systems biology.

Dr. Leroy Hood, Dr. Reudi Aebersold, and Dr. Robert Franza from the University of Washington are the founders of the Institute.

Stanford University Investment: $150 million
Bio-X is an interdisciplinary program at Stanford University designed to foster collaborative research in basic, applied and clinical sciences. At its center is the Clark Center for Biomedical Engineering and Sciences, which will house 50 faculty members from various disciplines. The program has been made possible by a $150 million gift from Netscape founder Jim Clark.

Bio-X is led by an executive committee, a planning committee and an advisory committee made up of faculty members from Stanford University.

Georgia Investment: $300 million to date in GRA programs
The Georgia Research Alliance (GRA) was founded in 1990 to foster Georgia's economic development by building a partnership of research universities, the business community and state government. GRA investments are focused in several technology areas including biotechnology and life sciences.

The GRA invests through three programs designed to support collaboration between academic and industrial scientists and engineers: the Eminent Scholar Endowment, the Research Infrastructure Development program and the Technology Development Partnership. The Eminent Scholar program has attracted 26 researchers, 12 of whom focus on biotechnology.

The state has set aside a $1.5 million endowment for custom-tailored laboratories and promises an additional $1-3 million. Moreover, the state is spending $20 million for an applied genetics research complex at the University of Georgia.

Arizona Investment $50,000

The Arizona Bioindustry Cluster is the result of the Governor's Strategic Partnership for Economic Development, which commissioned studies of clusters in Arizona in the early 1990s. The cluster, which focuses on the industry's overall competitiveness in the national and international marketplace, was initiated with a $50,000 investment by the state.

The cluster works on a variety of issues through its subcommittees on Workforce, Legislation & Regulations, Technology Transfer, Financing, Education, Trade Missions, Membership and Marketing. Its website at www.azbiocluster.org provides employers and potential employees with a forum to find each other. The subcommittee works with the Governor's School-to-Work Initiative to develop future employees from within the state.

Robert Case of the Harrington Arthritis Research Center and Steven Langford of CardioWest Technologies co-chair the cluster's board of directors.

Alaska Investment: $7.32 million to date

The Alaska Science and Technology Foundation (ASTF) was established in 1998 to promote and enhance the development of commercialization of technology; the economic development and technological innovation of Alaska; and sustained growth and development of Alaskan scientific and engineering capabilities.

ASTF projects range from creation of a venture capital/entrepreneur-matching program to finding cost-effective ways to use Internet technology for health education.

Last year, ASTF approved $1.07 million worth of funding that will be matched with $1.25 million for eight different projects. ASTF also has invested $5 million in providing all classrooms in the state with Internet access. They estimate that 98 percent of classrooms have received such funds.

Columbia University

The Columbia University's Innovation Enterprise's (CIE) New Enterprise Development group evaluates and develops start-up companies based on Columbia intellectual property. The group advises faculty and researchers on new opportunities and helps them with business plans, company formation, and locating sources of capital. The group maintains relationships with funding sources and acts as a starting point for venture capital firms and other companies interested in Columbia technologies.

In Fiscal 2000, CIE brought in nearly $141.6 million in license and research revenue, in addition to $20 million in corporate research revenues. Last year, Columbia was first among U.S. research universities in revenue generated from patents and research. CIE manages income from more than 250 active U.S. patents and signs as many as 100 technology licenses annually.

Indiana Investment: $25 million/year

The Indiana 21st Century Research & Technology Fund was created by the state in 1999 to support Indiana's high-tech sector and promote job growth and a healthy economy. Investments focus on biomedical research and biotechnology, information technology and other high-technology industry clusters.

The fund encourages cooperation among universities and the private sector, awarding grants in Science and Technology, High Technology Business Development and a "Center of Excellence" category. Activities are judged for funding by their ability to develop or transfer technology into commercial products, broaden interactions among academic and commercial sectors and spur continued discovery, innovation and commercialization.

International Case Studies

Scotland Investment: £38 million (plus private funds)
The Scottish Enterprise Network Biotechnology Group includes businesses, research bodies and other organizations in support of innovation, commercialization and globalization in life sciences in Scotland. The Network's original commitment of £38 million is augmented by research funding by a host of private companies. The group has developed an online cluster "extranet" to act as a networking tool for those involved in its initiatives.

The group's strategic plan includes the following goals to be attained in the next five years:

- Double the number of biotech companies.
- Double employment in the cluster.
- Improve the performance of Scottish biotech companies.

Avril Gold serves as the head of Biotechnology for Scottish Enterprise.

New Zealand Investment: $600 million annually
New Zealand Biotechnology Association (NZBA) is part of the New Zealand Foresight Project. An ongoing program of the New Zealand government, the Foresight Project links government investment in research, science and technology.

As part of its industry vision for 2010, the NZBA proposed that the government introduce a variety of regulations, ranging from control of exportation of natural resources to maintaining excellence in science education.

Selwyn Yorke is the Chairman of the NZBA Foresight Subcommittee.

Sweden Investment: 12 billion SEK (2000)
Established in 1994, Swedish Foundation for Strategic Research supports research in natural science, engineering and medicine in Sweden. Originally financed by a government grant of 6 billion SEK, the capital grew quickly to 12 billion SEK in 2000. The foundation is currently financing 70 research programs and 100 projects. It is expected to continue in operation through the 2020s, but total disbursements for research will be reduced starting in 2005.

The foundation is run by a government-appointed executive board and three advisory committees.

THE TEXAS LIFE SCIENCE INDUSTRY TODAY

Overview

The Texas life science industry is already an important and growing part of the new Texas economy:

- The Texas healthcare technology cluster surpasses state averages in job growth and wages.
- The cluster stimulates creation of at least two additional jobs in Texas for each job it adds directly.
- The number of healthcare technology patents and new intellectual properties are steadily increasing, paving the way for new products, companies, and jobs.
- Texas is a leader in research and treatment of cancer, heart disease, diabetes and age-related conditions.
- Texas is rapidly gaining momentum in nanotechnology, genomics and agritech.
- Altogether, the industry employs nearly 49,000 people statewide. The largest segment is laboratory/research services (52 percent of employment), followed by medical devices (36 percent) and pharmaceuticals (12 percent).
- Medical devices is the fastest-growing segment, enjoying average annual job growth of 4.7 percent since 1990.
- The average establishment size in pharmaceuticals is 87 people, compared with 75 for medical devices and 19 for laboratory/research services.
- The industry provides a wide range of occupational opportunities, with 42 percent of jobs related to production and 24 percent related to science and engineering.

While the industry is most active in Dallas/Fort Worth, Houston, Austin, Amarillo and San Antonio, it is beginning to extend into more and more jurisdictions. If this statewide cluster is to continue to grow, it must be nurtured by public and economic policies that support its advancement.

General Economic Conditions

The continued success of the life science sector in Texas today is more important than ever before. While our state is weathering the current economic slowdown better than the nation as a whole, slower growth is apparent, most notably in apparel, transportation equipment, semiconductors, PCs, and telecom equipment. According to the Texas Comptrollers Office (Fall 2001), in Texas:

- Employment growth dropped from 3.3 percent in June 2000 to 2.3 percent in June 2001. (Nationwide, employment growth has nearly come to a standstill, dropping from 2.5 percent in June 2000 to 0.3 percent in June 2001.)
- Non-farm employment rose 2.3 percent from June 2000 to June 2001.
- Industrial production rose 0.7 percent from May 2000 to May 2001.
- Our unemployment rate rose 4.5 percent in June 2001, after dropping to a 27-year low of 3.8 percent in January 2001.
- Unemployment initial claims rose 32 percent from May 2000 to May 2001.

- The Consumer Confidence Index for the west, south and central states has remained mostly stable throughout the first half of 2001 at 24 points above the baseline. That figure is down from 47 points above baseline in September 2000.
- Sales tax receipts rose 5.1 percent from June 2000 to June 2001. Sales tax revenues for the month of September 2001 dropped $40 million from September 2000.

Texas' Regional Strengths
Texas boasts a wealth of resources, research and industry specialization, talent, and infrastructure capabilities, from major medical centers to outstanding research and development organizations. Some of our regional strengths include:

- Austin: software engineering, Internet content
- Dallas-Fort Worth: Dallas Plan legacy, UT Southwestern Medical Center, Telecom Corridor, a strong venture capital base
- Houston & Gulf Coast: Texas Medical Center, Woodlands experience, international representatives, Shriner Burn Unit, NASA
- San Antonio: Defense related healthcare, Texas Research Park, a gateway to Latin and South America
- Panhandle: Rural health care test bed of multiple agency/institutions
- Northeast Texas: Tri-state linkages, UT Tyler Initiative
- El Paso & Upper Border: Challenging agritech opportunities, good existing cross-border dialogue and potential for economic growth.
- South Texas & Lower Border: new health science center, key demographic test bed, maquiladores facilities

Some of Texas' Most Progressive Bioscience Initiatives

Austin Technology Incubator
Entrepreneur, professor of business and innovation advisor George Kozmetsky launched the ATI as an innovative approach to university commercialization in the late 1980s. It became one of the most critical catalytic events for Austin's young technology market. Some 100 company graduates later, with numerous IPOs and mergers, ATI has become a standard-bearer for national incubator models.

STARTech Early Ventures
Richardson's Telecom Corridor is the largest concentrated source of communications switching and product development in the world. In a square-mile plot of North Texas are assembled some of the world's most visionary talents, companies and manufacturing facilities in the telecommunications industry. Taking its cue from the success of Texas Instruments, the Corridor has launched its own high-tech business accelerator to facilitate and accelerate new enterprises, including biotech and life science industries, in the North Texas area.

Houston Technology Center
Frustrated by the knowledge that Houston's technology assets — the Texas Medical Center, NASA, universities and corporate powerhouses — were not realizing the fullest benefit of

their research, a number of entrepreneurs and institutional leaders formed the Houston Technology Center. The Center is a federal-city-private sector initiative that serves as a regional hub for focusing attention on the needs of the technology entrepreneur.

San Antonio Initiative
The San Antonio Initiative is designed to bring public and private sectors together to work toward common goals in development of its biotech and life science industry. Currently, it is conducting an analysis and review of its biotech and life science infrastructure to determine how it can encourage greater entrepreneurship from its highly regarded Health Science Center, Research Park, and from its military bases. One opportunity emerging is Department of Defense-driven bio-terrorism research.

Southwest Bio-Link Center
Bio-Link is a National Science Foundation-funded project that links seven regional centers across the country to promote biotech education (particularly technician education) and respond to the needs and curricula designed by industry. Austin Community College serves as the Southwest Region Center and is currently working toward a major industry-education skill assessment and a strategy for statewide skill development.

Center for Nanoscience and Technology
Rice University's nanoscience commitment is built around the Nobel work of Richard Smalley and the "bucky ball" discoveries that allow manufacturing at the atom-to-atom level. The Center is working on an interface between the nanosciences and bioengineering, as well as with molecular electronics and membrane technologies. Competitors run the range from Japan-China-Germany, to Stanford-Harvard-Northwestern University as well as IBM. The opportunities for Texas — the energy industry, NASA and the life sciences are endless!

The Panhandle Initiative
The Harrington Regional Medical Center has merged with 26 facilities and agencies — Texas Tech, Texas A&M, West Texas A&M, U.S. Veterans Hospital and many others — to a unique regional life science capability in agritech, biotech, environmental biology and pharmacology. The Panhandle Initiative is a prime example of clinical and agricultural research collaboration.

Questions and Answers about the Challenges Facing Texas' Life Science Cluster

Does Texas have the infrastructure it needs to compete nationally and internationally?
Texas offers top-notch research facilities, but not enough wet-lab space and other flexible spaces to meet the needs of the growing life science community. Digital services are coming online but nothing that focuses on the life science cluster future demands. Although university systems are making significant commitments, competitiveness will require more focus on the emerging business model, especially as contract research, contract manufacturing and contract testing become unique advantages.

While individual institutions are successful in garnering significant federal funds and private support, what is Texas' strategy to attract even greater investment in research?
Texas universities are highly competitive in seeking NIH, federal and corporate research funds, but other competing regions have specific collaborative strategies. The Georgia Research Alliance model, Pittsburgh Tissue Initiative, and Michigan Life Sciences Corridor are a few examples of research strategies that are helping drive legislative, corporate, and collaborative agendas.

Does Texas have an effective framework for management of intellectual property that could benefit the Texas economy and society in general?
Texas is a net exporter of intellectual property. Multiple university systems and policies, plus inadequate resource allocation, however, create barriers to commercialization. Texas needs programs that place a greater value on innovation, such as those at Columbia University and Stanford University, and the Indiana Fund that encourage greater innovation among the university and industry.

Venture capital dollars invested in Texas are on the rise. Are all forms of financial, legal, accounting and support services appropriately knowledgeable and willing to invest in the life science cluster?
Because of high capital requirements and length of time required to reach profitability, the life science industry is not well understood as an investment opportunity. Texas needs a strategy for 'brokering' investments in the industry and promoting better understanding of opportunities and the changing economic models among financial and investor markets.

The advance of new economic and business models requires an integrated skills, certification and competency approach – what is Texas' plan?
Professional training programs require better understanding of the industry. As yet, Texas has an unmet demand for multidisciplinary and interdisciplinary course loads and a mechanism to connect high schools and technician training to career paths. With the imminent demise of the Smart Jobs program, Texas is poised to take a fresh look at workforce development.

Overcoming immediate labor needs requires significant program changes. The Southwest Bio-Link program, a National Advanced Technological Education program supported with a grant from the National Science Foundation, provides educational programs to prepare skilled technicians for careers in bioscience. Programs such as this could provide a vital solution for workforce demands.

The Texas "laissez-faire" environment must be adjusted if it is to accept and support new public-private partnerships and forms of greater collaboration – is Texas prepared?
The lack of statewide coordination and cohesiveness has become a cost of doing business in Texas. The time and effort required to access resources, research, management talent and public policy support make our state a less attractive business destination than many other regions. For example, the facilitation of collaboration is one of the vital elements of the Scotland and New Zealand roadmaps. San Diego's CONNECT program also is recognized for its ability to facilitate partnering behavior.

Texas needs to determine when and where it could help public and private sectors collaborate most effectively and begin the process.

Is Texas prepared to create and sustain collaborative partnerships to focus attention, resources and policy on being globally competitive?
While attitudes about the life science industry in Texas are becoming more favorable, there is still little awareness of the industry outside of the entities directly involved.

Texas needs a communications strategy to increase understanding of this industry and its importance among all Texas audiences, and to make them stakeholders in its future. These stakeholder relationships will assist in keeping Texas focused in the journey forward.

TRENDS IN THE BIOTECH & LIFE SCIENCE CLUSTER

Critical influences on biotech and life science cluster and our state's future

The new century presents great challenges and demands unique solutions for the life sciences.

Today, this industry is undergoing a significant transformation as it is forced to replace outmoded business, research and economic models with new forward-looking models based on the availability of new technology and new ways of thinking and working in the 21st century.

The Texas Roadmap, therefore, doesn't simply draw on past experiences, it examines forces affecting our state in an effort to forecast the impact of the industry's continued transformation and ensure a sustainable competitive stance.

Trends Affecting Texas and the Opportunities They Present
Texas is undergoing massive changes in virtually every arena, from demographics and infrastructure to the dynamics of our economy. This is presenting new opportunities for Texas to rethink its approach to economic development and identify new research opportunities for the benefit of all citizens.

Demographics. Texas' is becoming both top- and bottom-heavy, as our young and elderly populations increase in number. It is also moving from a "population of the majority" to populations of Hispanic, Anglo, Asian and African-American. This has placed new demands on healthcare services and shifted its emphasis to prenatal, neonatal, aged, and end-of-life issues.

Infrastructure. Demands on the state's infrastructure are shifting toward digital marketplaces, mechanisms to accelerate the innovation life cycle, 24/7 airports, public/private partnerships, and a distributed, networked economy that supports outsourcing. This has accentuated the state's need to focus on rural access, broadband dissemination and other digital initiatives.

Texas has the opportunity to form statewide public-private partnerships centered on research, commercialization and entrepreneurial business-to-business transactions.

Business and Economic models. The traditional business model of a fully integrated and self-sustaining company is changing to a new model that includes more outsourcing. As a result, new supplier relationships are emerging and turn-key capabilities are becoming less significant. In the life sciences, pressure to expedite discovery and testing and produce earlier returns on investment are challenging the existing regulatory process, and the industry is actively seeking new approaches to meeting demands more quickly.

New and existing Texas companies must begin to outsource research, clinical trial and manufacturing capabilities. For this, a statewide strategy for connecting the dominant regional players with new players will be critical.

New Economy Dynamics. The New Economy is increasingly defined by speed, knowledge, flexibility and networking. And technologies are converging (e.g. bioinformatics, nanotechnologies), calling for greater interdisciplinary skills among colleges, research organizations, and industry.

A statewide audit should be conducted to determine whether Texas companies have all that is necessary to compete in the New Economy and what must be done to fill in the gaps.

Global Competitiveness. After a decade of success, primarily due to acquisition and merger strategies, Europe's major players in biotech and life science face tough challenges, including a backlash against genomic technologies and agricultural biotechnology, more stringent environmental reviews and the absorption of the corporate "buying binge" of the 1990s. Meanwhile, more and more regions in other countries, such as Singapore, New Zealand and Scotland, are accelerating their cluster support and activities.

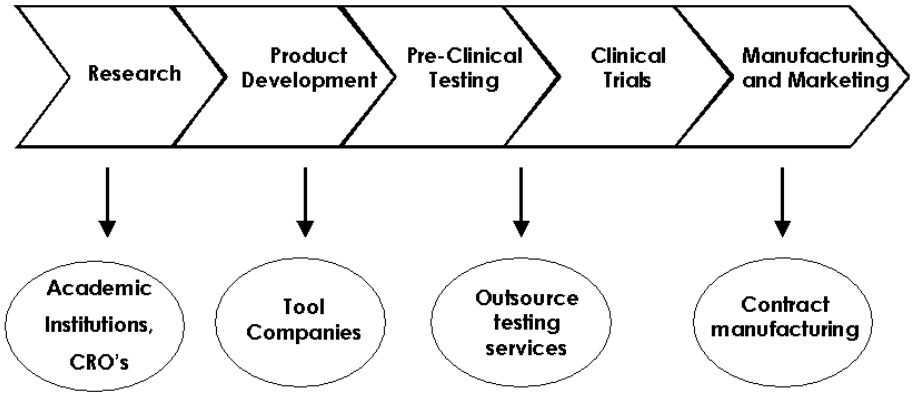
> "I think the industry we're creating is a feeder industry, maybe the first of its kind, with the exception of independent film making. What we're searching for, both pharmaceuticals and biotech alike, is a new model for the 21st century of what a company should look like."
>
> *Stanley T. Cooke*
> *Chairman/CEO*
> *Isis Pharmaceuticals*

Outside of New York and Washington D.C., Texas is home to more foreign representatives than any other state. Texas now has the opportunity to form strategic alliances with foreign interests, attracting investment and marketing our exports.

The Emergence of a New Business Model

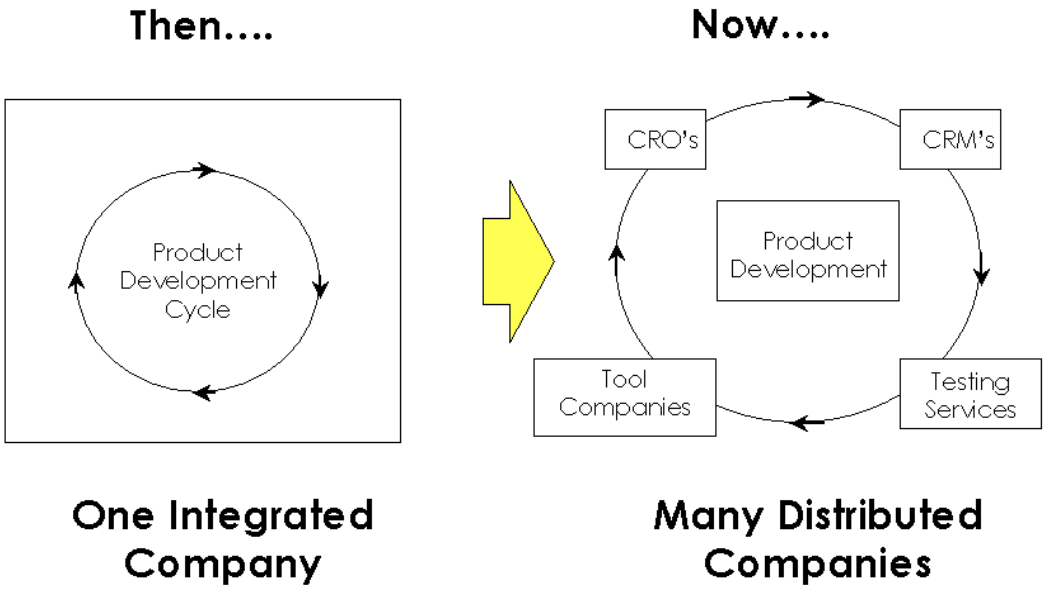
As with many other industries, the business model for the life sciences has changed significantly over the past decade. Once dominated by self-contained companies that handled the conception-to-market process from research to testing to manufacturing, today the life sciences are more specialized and more work is outsourced. Research may be performed at universities, clinical trials contracted by testing services, and manufacturing handled by companies specializing in specific product areas, such as pyrolytic carbon prostheses.

New Business Models Emerge



This new model allows companies to adapt more readily to advancements in scientific knowledge and research tools, as well as the unpredictable economic environment.

As a result, many independent yet interdependent companies have emerged, creating a web that stretches across the state, touching more communities and more economies.



Changing Commercialization Strategies
Traditionally, commercialization focuses on building a successful enterprise around a license or patent and linking tech transfer, entrepreneurs, infrastructure, funding and markets.

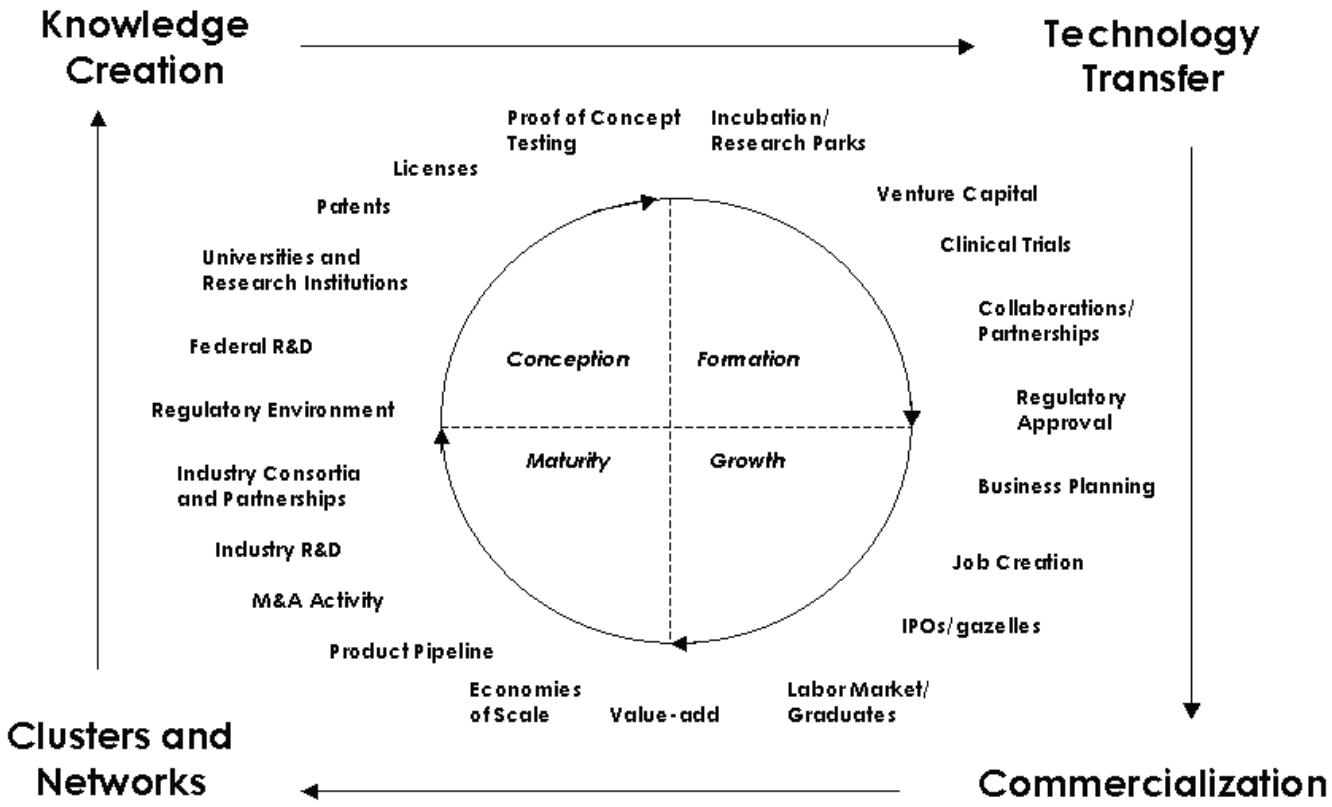
New forms of commercialization are emerging, however, that add value to existing technologies, update older technologies (past licenses and patents) to meet the demands of new markets and/or apply current technologies to traditional applications but in different industries (i.e. convergence). These strategies may require interdisciplinary involvement on the university campus; construction of a flexible infrastructure; crosscutting managerial talent and competencies; and creative public-private partnerships between industry, academia, manufacturers and entrepreneurs.

A Texas Commercialization Strategy could combine traditional and newer strategies and use them to move ideas to market more quickly to the benefit of all.

Churning the Innovation Lifecycle
An examination of the life science industry's innovation lifecycle is paramount to understanding why a detailed roadmap for the Texas cluster is vital. The following diagram identifies some of the critical steps involved in taking a product from conception to maturity and emphasizes the cycle's repetitive nature.

"Churn" — the repeated completion of the lifecycle — is the end goal. For the more turns of the cycle, the more successful this industry will become and the more talent, technologies and investment our region will attract.

The Life Science Innovation Lifecycle



It's important to note that the life science innovation lifecycle is marked by more challenges and more unique industry relationships than those of most other industry clusters, because of numerous clinical trials, regulatory hurdles and patent applications. Consequently, the life cycle can be assisted — or hampered — at a many points.

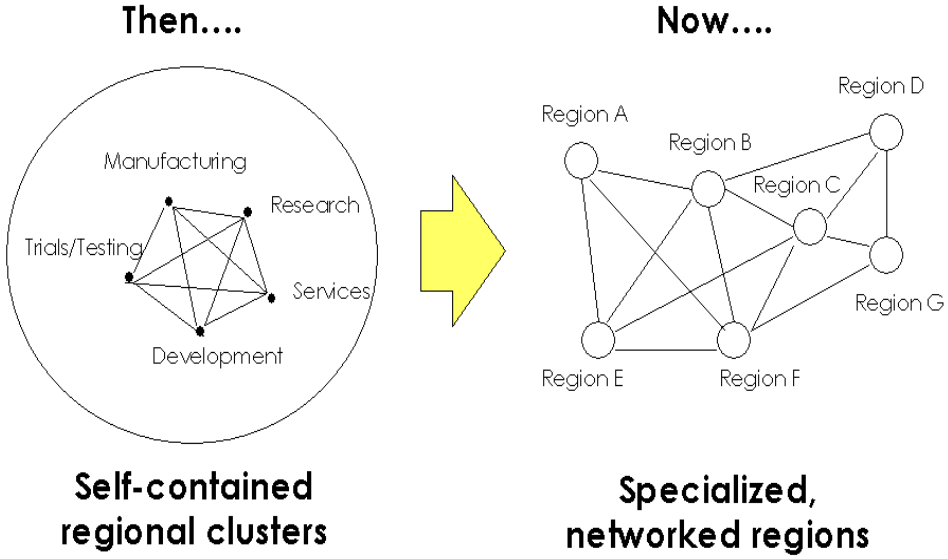
Where is the cycle most likely to break in Texas?

- Between conception and formation, when critical dollars and facilities become important to sustain the move to growth stage.
- In the approval stage, when management talent and investment dollars begin to meet cash flows demands.

- In the product stage, when growth requires certain talents and capacities for manufacturing, marketing, and distribution.

Because of this, a strategic plan to successfully churn the cycle must reflect a significant understanding of where and how the cycle can be best affected. And it must focus on connecting people, institutions, infrastructure and resources in a manner that complements the new business model.

A New Regional Model



Leveraging Networked Regions: A Critical Component to Future Success
No single region in Texas has all the intellectual or infrastructural assets needed to churn the lifecycle and provide long-term benefits. By combining their strengths, however, our state can create a powerful force capable of serious competition on a global scale.

The new business model, which encourages greater specialization and outsourcing, supports this approach.

It is time to move away from self-contained regional clusters and develop specialized networked regions that make each area's strengths — their technologies and talents — available to institutions and companies throughout the state.

This new regional model will make it possible to:

- share specialized knowledge,
- leverage infrastructure,
- converge technologies, and
- seamlessly connect research operations.

"The world cannot afford inefficiencies anymore, so people cannot build organizations that duplicate things available out in the field solely for ego's sake. The company of the future will have fewer employees and more relationships."

Edward Penhoet
President/CEO
Chiron Corporation

FUTURE SCENARIOS:
TRANSFORMATION OF THE TEXAS CLUSTER

What does the future hold for the Texas life science industry? We have a choice.

Scenario 1: *Status quo*. We do nothing while competitiveness slips, other regions with fewer advantages begin to pass us up and the flight of talent and resources from our state accelerates.

Scenario 2: *Incremental*. We make investments in portions of our state and neglect others, creating an imbalance among institutions and regional initiatives and fostering internal competition for resources. Transaction costs become prohibitively high, stifling research, development and commercialization.

Scenario 3: *Leap-frog*. We create an organized roadmap that puts our vast resources to innovative use, bypassing the competition and making Texas a world-class competitor in life science industry.

The Innovative "Leap-frog"
When Texas chooses to leap ahead to become a leader in the life science industry, the landscape changes for the good of all.

Regions, institutions, economic development interests focus on the global competitive environment and resolve to work collaboratively on talents and skills, research and the entrepreneurial environment for innovation. Making sure that both public and private interests recognize the life science industry's potential contributions becomes a top priority.

We assure our state has the appropriate critical infrastructure to recruit both talent and knowledge, making Texas a global magnet for progressive business. The lifecycle is churned across all of our regions, institutions and research-entrepreneurial linkages. And a network emerges that sustains the work necessary to respond to global markets, trends and needs of patients and society.

RECOMMENDATIONS FOR SPECIFIC SECTORS

Ensuring successful implementation of the 21st Century Life Science Roadmap

The following recommendations are set forth by the Advisory Group for the successful development of Texas' life science industry.

Overarching Recommendations:

- Statutory revisions from the 2001 Texas Legislature (S.B. 1190) relating to technology development and transfer should be reviewed and consideration given to how the revisions have been able to provide universities and researchers with more flexibility to pursue greater commercialization opportunities.
- Regional commercialization interests should be assisted in networking to leverage capital and entrepreneurial capabilities across the state.
- Awareness should be heightened of Texas' wealth of innovation resources (researchers, scientists, principal investigators) through events that attract entrepreneurs, managerial talent as well as research and venture funding.

To the Life Science Industry

- Join forces with THBI and the Texas Life Science Foundation to create the BioInnovation Network, which will serve as a framework for the collaborative network model, and to serve its future needs and demands regarding infrastructure, capital, skills and commercialization of research.
- Fund, support and participate in those initiatives that are focused on critical results linked to specific performance metrics.
- Engage the Texas Legislature, state agencies, universities and the public in a dialogue on the future of the industry cluster and build a private-public partnership responsive to the window of opportunity that exists for the next 18-24 months.

To Statewide Officeholders and the Legislature

- Receive an extensive briefing on the future of the life science industry cluster in Texas and the U.S.
- Develop and support recommendations for a rational and innovative strategy for private-public collaborations that will allow Texas to compete globally in the life science industry.
- Work with the industry, the research and scientific community, and entrepreneurs to identify the significant barriers that, once removed, will make Texas a magnet for the expansion of the life science industry cluster.
- Establish a Blue Ribbon Commission to report on steps necessary to support and sustain the industry cluster and to make recommendations to the governor, lt. governor and speaker of the House.

- Commit matching funds to establish the 21st Century Fund, and allocate such funds for the research, infrastructure and skills necessary to compete globally.
- Implement and support the Product Development and Small Business Incubator Funds, as enacted by the 2001 Legislature, to provide critical financial support for startup companies.

To State and Regional Economic Development Interests

- Work together to distribute information that increases awareness of the industry cluster's importance to Texas. Network regions through existing resources and organizations, such as the Texas Economic Development Council, the American Electronics Association, and similar stakeholder groups.
- Identify existing infrastructure and support development of new infrastructure needed by contract research, contract manufacturing and contract testing facilities.
- Allocate resources to create appropriate infrastructure and build alliances between international markets and "biotech zones" for research and development using the Roadmap's performance criteria.

To Consumers

- Engage with industry leaders and policy-makers in conversations about the future of the cluster and how it benefits consumers through healthcare, agricultural, environmental, and other applications.
- Learn about the educational and entrepreneurial opportunities that will follow.
- Foster a statewide vision that maximizes resources and the state's potential for the benefit of all citizens.
- Work with industry leaders and institutions to ensure an appropriate and balanced approach to ethical standards for clinical testing, data and privacy standards.

Appendix A

ROADMAP ADVISORY TASK FORCE

Public Policy Solutions Subcommittee

Harry Holmes, Ph.D. (Chairman)
UT M.D. Anderson Cancer Center

Holly Jacques
Merck & Co., Inc.

Robert W. Jones
Novartis Pharmaceuticals Corporation

David Nance
Introgen Therapeutics

F. Scott Reding
Zonagen, Inc.

Amy Shaw Thomas
The University of Texas System

Jaye Thompson, Ph.D.
SYNERGOS, Inc.

Commercialization and Innovation Subcommittee

David R. Margrave (Chairman)
BioNumerik Pharmaceuticals, Inc.

Robert W. Gracy, Ph.D.
University of North Texas Health Science Center at Fort Worth

Robert A. Kennedy, Ph.D.
Texas A&M University

Dennis McWilliams
Chrysalis BioTechnology, Inc.

Jaye Thompson, Ph.D.
SYNERGOS, Inc.

Long-range Strategy Team Subcommittee

David R. Strome, Ph.D. (Chairman)
Veridian

York Duncan
Texas Research Park Foundation

Linnea Fletcher, Ph.D.
Austin Community College

Stephen H. Gens
Harrington Regional Medical Center, Inc.

Ronald G. Tefteller
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Appendix B

THE FUTURE RESEARCH AGENDA

Federal Life Science Priorities

Biotechnology Research Subcommittee; Committee on Fundamental Science of the National Science and Technology Council
The Biotechnology Research Subcommittee (BRS) is working on federal investment in the "second wave" of biotechnology research, in four areas:

- Agricultural biotechnology
- Environmental biotechnology
- Manufacturing/bioprocessing (including energy research and nanotechnology)
- Marine biotechnology and aquaculture

The overarching priorities identified by the BRS are:

- Expand research to discover, characterize, modify and control the genetics and biochemical products and processes of a broad range of terrestrial and marine organisms for applications in biotechnology.
- Apply the tools of modern biotechnology to problems in agriculture, the environment and manufacturing to facilitate the development of new and improved products, processes and test methods.
- Strengthen and enhance facilities, repositories, databases, reference standards and human resources to ensure the future vitality of the U.S. biotechnology enterprise.

Life Science Opportunities

Cluster Research Opportunities

Scientific Area	Research Areas	Background & Growth
Gene Therapy	Through-put screening, cancer therapies	1996: 50,000 cell replacements worldwide; 110,000 by 2005 2000-2002: project growth to $1 billion
Biosensors	Electrochemical measurements, protein engineering, bio-chip devices	40 companies with 50 different devices today 1997: $610 million with 90% toward clinical diagnostics By 2005, nearly 48.8 billion
Instrumentation	Analytical instruments, filters and membranes, synthesizers	2002: just under $1 billion

Cluster Research Opportunities continued

Scientific Area	Research Areas	Background & Growth
Laboratory products	Chromotography, electrophoresis, cell culture incubators, centrifuges	1996: $1.75 billion 2001: $2.17 billion, filters 37% growth bioseparations 31% over five years
In vitro diagnostics	Nucleic tests, laboratory testing, emerging point-of-care testing digitally connected to management solutions	1998 worldwide $18.9 billion; 2003 worldwide $ 23 billion
Cancer	Tumor suppression, liposomal emphasis on breast and prostate	1996 US $3 billion; 2001 US $17b
Automation/ Robotics	In-lab support, toxicity testing, hospital management	1996 N.A.: $45m; 2000: $93m 1996 worldwide: $93m; 2000 worldwide: $193m

Gene and Cellular Therapy

- Today, close to 100 companies are in the process of commercializing cell capture and delivery systems as well as gene-based therapeutics.
- The Human Genome Project and other gene programs launched in the past ten years are leading the way for future cellular and genetic therapeutics.
- Sequencing the complete human genome is expected to be one of the most significant milestones in the biotechnology industry, but the reaction of healthcare providers has shown that such information may be of limited use without bridging the gap between gene and protein with pharmacogenomics.
- In 1998, approximately 50,000 cell replacement procedures were performed. By 2005, that number is expected to grow to 110,000.
- It is predicted that the market for gene therapy products will soon reach $1 billion. The emphasis will continue to be on cancer therapy as the first products to reach market.

Research — Intellectual Property Tension

- Some have expressed concern that the intellectual property system locks up new knowledge and information, while the goal of science is to gain new information and disseminate knowledge at little or no cost.
- One way that intellectual property and science are being brought together is the increase in privately-funded R&D in conjunction with the university and non-profit community commercializing the results of federally funded research. More $30 billion of economic activity, 250,000 new jobs and 2,200 new companies can be attributed to such commercialization nationwide.
- Another trend bringing the research and intellectual property communities together is the increasing importance of the economic value of information and knowledge.

Biopharming

- About 20 companies are working on producing pharmaceuticals in plants. Drugs already in the clinical trial phase include vaccines for hepatitis B and an antibody to prevent tooth decay.
- Biocrops are expected to produce large quantities of drugs at a low cost compared to genetically modified cells, which can cost thousands of dollars per gram to produce.

Immunodiagnostic Markets

Assay	Assay Subsegment	Total Sales Share	1994 Revenue	CAGR	Projected 2000 Revenue	Manufacturer Market Share
Endocrine		21.3%	$537m	4.7%	$707m	Abbott: 28.3% Ciba Corning, J&J, Carter Wallace, Dade International, Parke Davis and Whitehall Robins all range from 5.2-8.2%.
	Pregnancy tests	41.9%				
	Thyroid	28.4%				
	Anemia			6.7%		
Cancer		9.3%	$236m	11.1%	$444m	Abbott: 50.4%; Lilly's Hybritech Subsidiary: 18.6%; Ciba Corning and Roche also play roles.
	PSA	61.7%		93%		
	No others on market			22.8%		
Infectious Diseases		21.5%	$542m	8.0%	$242m	Abbott: 37.5%. Five competitors led by J&J and Sanfoni range from 5.2-6.6%
	Sexually transmitted	28.6%		7.8%	$242m	
	H. pylori tests	6.6%		12.2%		
	Streptococcol	21.4%	$116m	7.6%		
Blood Processing		10.8%	$272m	1.6%	$299m	Abbott 54.5%; J&J: 25.7%; Sanfoni and Organon Teknika also play roles.
Serum Proteins		11.1%	$284m	9.9%	$502m	Beckman: 32%; Dade15.5% Abbott: 12%
	Classic serum			2-7%		
	Cardiac tests			14%		
Immune Disorders		3.8%	$96m	9.2%	$163m	Kabi Pharmacia: 27.1%; Sanofi: 22.9%
	Allergy			10.4%		
	Autoimmune			8.0%		

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Appendix D

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Houston, TX 77002-2786

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Senior Manager, Government Affairs
Aventis Pharmaceuticals
1406 Murdock Road
Marietta, GA 30062

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State Government Affairs Manager
Bayer Corporation
4205 Lonesome Valley Court
Austin, TX 78731

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Bristol-Myers Squibb Company
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Austin, TX 78701

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Vice President, Government Affairs
Genentech, Inc.
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Washington, DC 20006

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9785 South Maroon Circle Drive, Suite 300
Englewood, CO 80155-6544

Robert W. Jones, J.D.
Regional Manager of Government Affairs
Novartis Pharmaceuticals Corporation
1505 Preston Avenue
Austin, TX 78703

Kenneth A. Ardoin
Director, State Government Relations
Pfizer Inc.
7 Village Circle, Suite 500
Westlake, TX 76262

Curtis W. Krause
Manager of State Government Affairs
Pharmacia Corporation
921 Curtis Drive
Arlington, TX 76012

Richard E. Ewing, Ph.D.
Vice President for Research
Texas A&M University
Office of Research and Graduate Studies
1112 TAMUS
College Station, TX 77843-1112

David McWilliams
President and CEO
Texas Biotechnology Corporation
7000 Fannin, Suite 1920
Houston, TX 77030

Robert W. Gracy, Ph.D.
Associate Vice President
Research and Biotechnology
The University of North Texas Health Science Center
at Fort Worth
3500 Camp Bowie Boulevard
Fort Worth, TX 76107

Michael H. Richmond
President and Chief Executive Officer
The Woodlands Operating Company, L.P.
2201 Timberloch Place
The Woodlands, TX 77380

Greg Hoke
State Government Relations Manager
Wyeth-Ayerst Laboratories
P.O. Box 6166
Kingwood, TX 77325-6166

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KEY DEFINITIONS & TERMINOLOGY

biopharming: The process of developing therapeutic products made through the genetic manipulation of living things or their cells.

bioinformatics: The science of developing computer databases and algorithms for the purpose of speeding up and enhancing biological research.

biotechnology: Often used as an overarching description of the conversion of basic sciences to technological consequences, biotechnology can convey several meanings; the term 'life science' may better describe the use of biology to produce products or services produced for applications such as medical, agricultural, animal health, and food and materials processing.

churn: To produce in an abundance and automatic manner. Industries, entrepreneurs and regions may complete the lifecycle once – but those that move through the lifecycle repeatedly churn talent, skills, knowledge, resources, funding and technologies.

cluster: Geographic concentrations of competing, complementary, and interdependent firms and industries that create wealth in regions through export and share access to specialized workforce, suppliers, and business and technology networks.

connective tissue: A biological phrase used to describe a network as a means of connecting vital elements of regional assets, institutions, and people around a common vision.

infrastructure: Buildings – from laboratory, research space to operations and manufacturing – often define infrastructure. Yet in a period where physical space is not always necessary for innovation, infrastructure must includes the digital world of the Internet, electronic commerce, and online repositories of knowledge. Furthermore, infrastructure can be purely public sector, purely private sector, or in some cases a partnership between the two sectors as a requirement for success.

lifecycle: The framework that details how ideas move from conception to maturity, from basic research to applied research to a commercial product or service.

nanotechnology: The direct control of atoms and molecules in biological or engineering research.

network: Formal and informal social processes that strengthen economic, business and technology interests and bonds leading to greater economic outputs, acceleration of results, and leveraged usage of cluster workforce, suppliers, and acumen.

roadmap: A method used by an industry and/or region to chart its own course for the future. The roadmap examines existing institutions, knowledge, assets, emerging trends, demographics, and market conditions, then recommends a desirable strategy for success. The intention is to provide a common point of departure, a common goal, and several paths that lead in the same direction.

Texas Healthcare & Bioscience Institute
815 Brazos Street, Suite 310
Austin, Texas 78701
512.708.8424
512.708.1607 fax
www.thbi.com