



## Landscape-changing Technology



In the last 24 years, we've seen the benefits biotechnology can bring to North Carolina. It helped put food on our plates and helped farmers grow more productive crops with less effort. It created jobs at clean, biomanufacturing plants that promise higher wages for those displaced from furniture, textiles and tobacco. It produced medicines that saved lives and improved health around the globe.

Since coming to lead the Biotechnology Center a year ago, I've realized that biotechnology's potential to change North Carolina's landscape is vast. Marine science, nutrition, natural products, agriculture, bio-based fuel, medical devices, and nanobiotechnology

each have a potential market of billions of dollars. All have a base of scientific expertise right here in North Carolina.

Already we have 500-plus companies employing more than 55,000 people. By developing these sectors, we have the potential to create a total of 125,000 jobs in the next decade.

This growth starts with the scientist testing a new idea, the entrepreneur bootstrapping a company and the teacher familiarizing students with science. These are the innovators who fuel the state's biotechnology engine, and we'll introduce you to some of them in this report.

Partners throughout the state—in education, government, academia, and industry—contribute to this success. Programs from the Biotechnology Center help them clear specific hurdles between idea and reality. Through their successes, these programs and partnerships have forged a bioscience community found nowhere else in the world.

For the past year, the Biotechnology Center and our partners have continued our deliberate development of a statewide life sciences community and implementation of a specific vision: high-paying biotechnology jobs accessible to all 100 counties in North Carolina.

In the last quarter century, biotechnology has done much to improve North Carolina's economy and our quality of life. Imagine what we can do in the next 25 years.

*L. Terri Tolson*



## The Biotechnology Center

The North Carolina Biotechnology Center was founded in 1984 to promote long-term societal and economic benefits to North Carolina by supporting biotechnology research, business, education and workforce training statewide.

Some quick figures about the Biotechnology Center and the state's biotechnology industry:

- State funding to the Biotechnology Center in 2007-08 of \$15.6 million, with a total of more than \$200 million from the state since inception.
- 55,000 employees at more than 500 companies.
- Total economic impact of \$45.8 billion annually, as quantified by the Battelle Technology Partnership Practice.



## From the Mind to the Marketplace

When the state began deliberately building a biotechnology industry in 1984, there were just a few biotechnology companies. Now, the industry includes more than 500 companies that employ more than 55,000 people across the state. The industry relies on partnerships and strategic activities that create a biotechnology community like nowhere else in the world.

Coordinating and assisting the community's development is the North Carolina Biotechnology Center, with support from the North Carolina General Assembly. The Biotechnology Center strengthens the path between idea and product by supporting researchers, businesses and educators across the state. During the 2008 fiscal year, the Biotechnology Center worked at all points along that pipeline to create jobs across North Carolina.

The Biotechnology Center, with help from its partners, recently quantified the state's investment in biotechnology development and the results it produced. In just the last 10 years, North Carolina has invested more than \$1.2 billion to grow the industry:

- \$857 million into research and facilities,
- \$135 million toward workforce training,
- \$115 million via the North Carolina Biotechnology Center, and
- \$102 million in direct company incentives.

The Battelle Technology Partnership Practice analyzed the impact of that investment. Each year:

- N.C. biotechnology companies contribute \$28.7 billion to the state's economy;
- Support company activities and employee spending raise that total to \$45.8 billion; and
- The industry produces \$1.4 billion in state and local tax revenues.

Read more at [www.ncbiotech.org/billion](http://www.ncbiotech.org/billion).



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**Rachel Roper, Ph.D., Assistant Professor, East Carolina University**  
**2007 Biotechnology Research Grant – \$72,497**

## 2007-2008 Accomplishments

### Monkeypox Vaccine

Last year Rachel Roper, Ph.D., was among the first group of North Carolina scientists to receive the Biotechnology Center's Biotechnology Research Grant. She is using the \$72,497 award to develop a unique strategy to stop the spread of monkeypox, a relative of smallpox. The virus spread from prairie dogs to humans in a 2006 epidemic.

By removing a specific gene that affects immunity, she's attracting increasing scientific acclaim for her approach. It holds promise not only for improving the safety and effectiveness of poxvirus vaccines, but also for killing other viruses such as coronaviruses, which include the human Severe Acute Respiratory Syndrome (SARS) virus.



### From idea to product

The Biotechnology Center primes the product pipeline by strengthening university research. Grants provide funds to recruit researchers, pay for equipment, and test new research ideas. This year, the Science and Technology Development Program awarded:

- 11 Biotechnology Research Grants totaling \$772,596. BRGs fund projects to gather proof-of-concept data, leading to additional funding.
- Six Collaborative Funding Grants totaling \$495,000. CFGs encourage collaboration between university and company researchers.
- Two Faculty Recruitment Grants totaling \$300,000. FRGs help universities in the early stages of their biotechnology program development bring in top scientists.
- 10 Institutional Development Grants totaling \$1,802,501. IDGs fund equipment used by multiple researchers.
- Six Multi-disciplinary Research Grants totaling \$1,399,224. MRGs bring together researchers from three different fields of study on a single project.
- Two Regional Development Grants totaling \$83,730. These grants are designed to build a foundation for biotechnology industry growth in a specific region.

The Faculty Recruitment Grant program this year celebrated an extraordinary success. One of the first scientists brought to North Carolina with program dollars, 1987 recruit Oliver Smithies, won the 2007 Nobel Prize for Physiology or Medicine. The grant program was re-named in his honor and expanded this year.

Taking technology from a university laboratory to create a company requires specialized skill, and the Biotechnology Center directly supports that effort with a combination of its Technology Enhancement and Acceleration Model (TEAM) loan program and Business Acceleration and Technology Outlicensing Network (BATON). The two together this year helped start two companies, NanoVector Inc. and Galaxy Diagnostics.



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2005 Business Development Loan – \$16,000

2008 Small Business Research Loan – \$150,000

## Arbovax

Getting technology from the university laboratory into a viable company takes a number of steps, and the Biotechnology Center's Business Development Loan helps facilitate this progression.

In 2005, the Biotechnology Center loaned \$16,000 to Arbovax to license North Carolina State University technology that may prevent insect-borne diseases. The company is applying that technology to develop a vaccine for dengue fever, a mosquito-borne illness that is on the rise globally, including in the United States.

The Business and Technology Development Program awarded loans to a total of 16 companies. The loan programs are designed to address specific funding gaps in a company's growth and development. FY 2008 awards include:

- Six Business Development Loans, which support non-scientific, business development efforts, totaling \$150,000.
- Two TEAM Loans, which help a company take technology from university to company, totaling \$96,540. This loan is leveraged with in-kind services.
- Seven Small Business Research Loans, for product-focused research, totaling \$1,046,710.
- One Strategic Growth Loan, designed to help companies bridge the funding gap and leverage larger venture capital investments, of \$250,000.

Merging the ideas behind these two program areas are the Centers of Innovation, which unite research in a specific sector, select the best ideas, and speed products to commercialization. This year, four multi-institution partnerships each received a \$100,000 planning grant to begin their efforts in these areas:

- Nanobiotechnology, administered by the Piedmont Triad Partnership.
- Advanced Medical Technologies, coordinated by the North Carolina Biosciences Organization.
- Marine Biotechnology, coordinated by a planning team led by the University of North Carolina Wilmington.
- Natural Biotechnology and Integrative Medicine, coordinated by the Asheville office of the Small Business and Technology Development Center.

Once their business plans are approved by the Biotechnology Center, these groups will receive another round of funding to begin merging research and resources from across the state to develop these sectors. These virtual centers are designed to give North Carolina prominence in emerging applications of biotechnology.

Though one regional group takes the lead for the project, the COIs will bring together research from many institutions across the state.



## Statewide

North Carolina is abundant in natural and scientific resources from the mountains to the coast. The Biotechnology Center's Centers of Innovation program (previous page) and other groups statewide are putting those assets together—for instance, in marine research—to yield economic and societal benefits for all 100 counties.

So whether it's the growing nanotechnology sector in the Piedmont Triad, breaking new ground in nutrition and cancer research at the North Carolina Research Campus in Kannapolis, or validating the medicinal properties of natural herbs in the mountains, biotechnology is becoming a strong economic driver in the state.

In fact, the Battelle Technology Partnership Practice found biotechnology supports a total of 180,000 jobs in the state. As sectors begin to grow, the potential exists for many more jobs.



## North Carolina's Strengths are Statewide

One set of Biotechnology Center programs is designed to grow biotechnology companies in North Carolina from North Carolina research. The Biotechnology Center also works with partners statewide to bring new biotechnology companies to North Carolina and to expand the ones already here. This year, the Biotechnology Center re-organized its operations to place emphasis on company recruitment and on bringing the benefits of biotechnology statewide.

The resulting unit, Statewide Operations and Economic Development, includes the regional offices and Bioscience Industrial Development. These staff members work with economic development groups to provide the specialized knowledge necessary to support biotechnology company growth.

This year, the Bioscience Industrial Development Group:

- Worked with more than 40 companies interested in expanding in or relocating to North Carolina.
- As of June, had 10 active projects with the potential to create up to 2,500 jobs.
- Worked in Europe and Asia to develop opportunities for partnership and collaboration.

Statewide offices organized a number of biotechnology and educational events for their constituents, in addition to serving as liaisons for Biotechnology Center programs. The statewide offices and their advisory committees, groups of 20 to 25 regional leaders, guide development of local biotechnology resources and jobs. Selected regional office accomplishments include:

- Facilitated the consortia for the Centers of Innovation, which touch all areas of the state.
- Opened the WetLab Launch Pad in the Piedmont Triad.
- Organized two Regional Exchange Groups for East Carolina University scientists.
- Worked with Charlotte-area groups to support company recruitment and the North Carolina Research Campus in Kannapolis.
- Supported development of the Bent Creek Institute in Asheville.
- With educational partners in the Southeast, established post-secondary training programs and educated secondary teachers about biotechnology careers.



## Education

States often concentrate workforce development efforts in post-secondary institutions, and North Carolina has been highly successful in this arena (facing page).

For 21 years, the Biotechnology Center has provided middle and high school teachers with the knowledge and tools they need to bring biotechnology to grade-school classrooms. Successes include:

- Training more than 1,450 teachers.
- Filling more than 1,800 teacher requests for free laboratory supplies in the last 10 years.
- Loaning hundreds of educational videos.
- **Hundreds of thousands of students taught.**



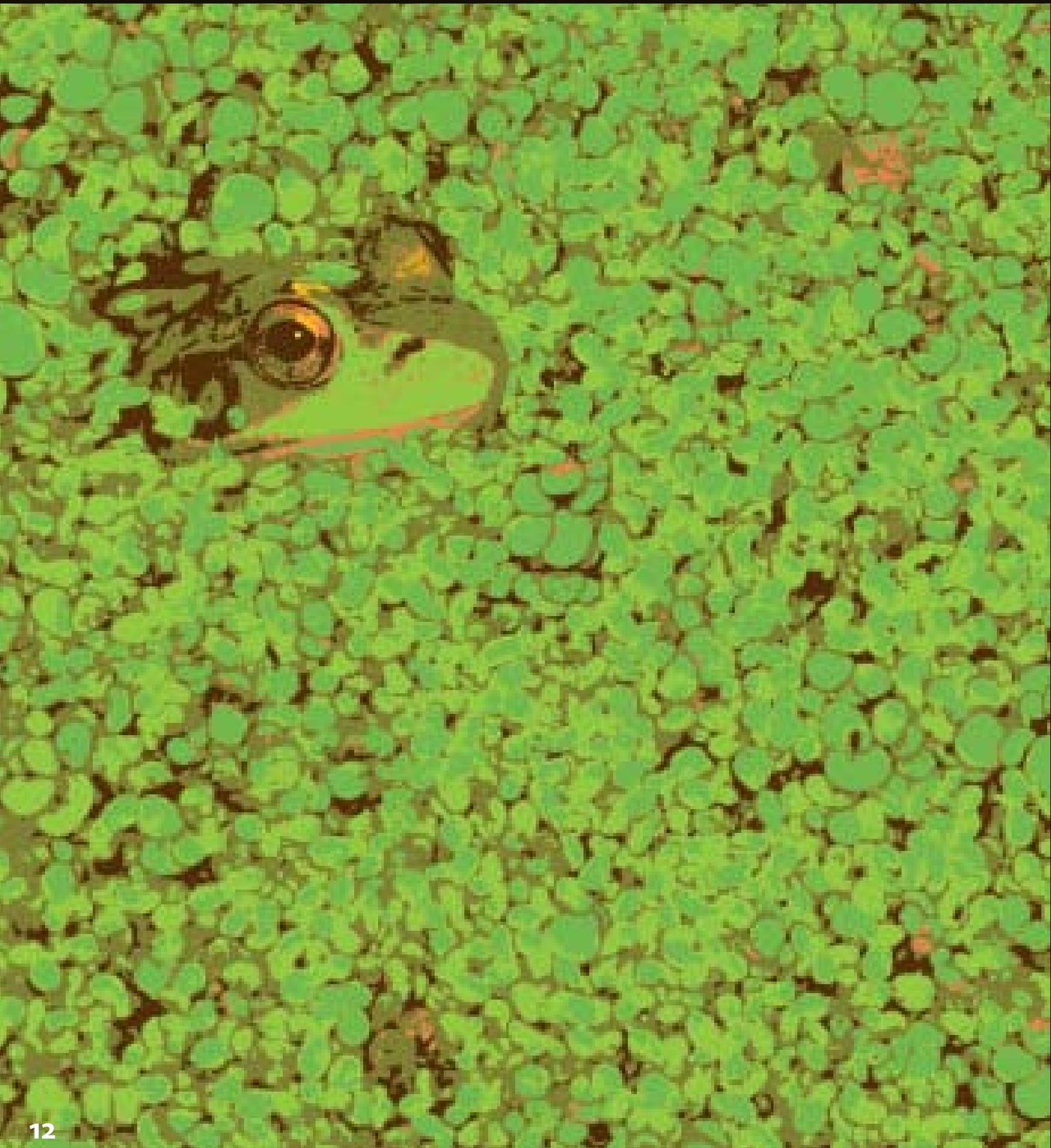
## Job Training and Workforce Development

North Carolina's workforce training programs are emulated around the world. The Biotechnology Center staff, particularly the Education and Training Program, works with partners in the North Carolina Community College System and the University of North Carolina to design those programs and assist with implementation. The staff also surveys industry needs to ensure the courses stay up-to-date.

The education unit awards grants to public schools, community colleges and universities to support the training of tomorrow's scientists. This year's awards include:

- 13 Education Enhancement Grants, which support curriculum development, totaling \$540,481.
- Five Biotechnology Education Mini-Grant awards totaling \$25,380. Mini-grants take biotechnology to K-12 classrooms by reimbursing teachers for instructional expenses and supplies.
- Three grants totaling \$15,000 to two community colleges to support the teaching of BioWork, a course that trains workers in the basic specialized skills needed in a bio-manufacturing plant.

Education and Training's annual summer workshops for teachers completed their 21st year. The total number of teachers trained is now more than 1,450. The Biotechnology Center's programs for teachers also provide up to \$200 in classroom supplies for laboratory experiments, supplies that were used by 242 teachers last school year. It is estimated that hundreds of thousands of North Carolina students have benefited from this program.



**1986 Faculty Recruitment Grant – \$185,000**

**2000 Small Business Research Loan – \$100,000**

## Biolex

Success in biotechnology is a long-term endeavor, and North Carolina and the Biotechnology Center support each step along the pipeline.

Take the recruitment of Anne-Marie Stomp, Ph.D., to North Carolina State University, partially funded by a Biotechnology Center grant. When she began studying duckweed instead of trees, she hit upon a faster way to produce proteins.

That technology was licensed to create Biolex, which received a \$100,000 loan from the Biotechnology Center early in its development. The company has gone on to bring in more than \$173 million in venture capital investments, and it employs 100 people in Pittsboro.

## A Community Like Nowhere Else in the World

Biotechnology is gaining attention as states and countries look for ways to rebuild struggling economies. In North Carolina, the state has already committed 25 years to building a successful and close-knit community. At the heart of the community is an exchange of ideas between and among scientists and business developers.

Activities supported by the Biotechnology Center this year include:

- Seven Intellectual Exchange Groups, designed to let academic and industrial scientists share ideas.
- Four Regional Exchange Groups, which work like Intellectual Exchange Groups in specific regions.
- A variety of business networking opportunities via the Biotech Forum, the Life Science Business Development Professionals, Biotech 08, and the Life Science Entrepreneur Network
- The partnering initiative, which allows large pharmaceutical, agricultural, or animal health companies to search for North Carolina companies that match their product development needs.
- Funding for 50 meetings: 37 event sponsorships totaling \$82,858 and 13 grants for scientific meetings totaling \$97,799.

Some of those meetings took place at the Hamner Conference Center, part of the Biotechnology Center's Research Triangle Park headquarters. The conference center welcomed more than 26,000 guests at more than 1,600 meetings.

Information is key for this community, and the Biotechnology Center's Library and Information Services provides research on all facets of commercial biotechnology to staff and external customers. The number of external research requests increased nearly 50 percent to 230 this year.

The library research staff increased efforts to track the state's bioscience industry through the BioSciNC company directory, which is used for print publications and the Web site.

Corporate Communications continued to move toward electronic marketing. Several publications were combined to create a new *BT Catalyst*, a weekly, electronic digest of news, events and features for the state's biotechnology industry. The group responded to 122 media calls,

## Nowhere Else in the World

In North Carolina, biotechnology is truly a statewide endeavor. With cutting-edge research, low business costs and a high quality of life, North Carolina's competitive advantage is clear to those looking to locate a new facility.

This year, the Biotechnology Center began marketing the state's biotechnology assets as those found "Nowhere Else in the World." The state backs its claim with:

- A high caliber of people working in the industry, including a world-class biomanufacturing worker training program,
- A state rich in natural resources set to tap into the benefits of biotechnology,
- A thriving industry with global impact,
- An unprecedented industry/education partnership,
- A vibrant, supportive community, and
- A government-sponsored center, in operation for 24 years, to facilitate the deliberate growth of the industry.





in addition to hosting a media event in March titled “The State of Science.” The event featured Nobel prizewinner Oliver Smithies and other leaders who discussed North Carolina’s unique ability to foster scientific collaboration.

Last year’s work on *North Carolina’s Strategic Plan for Biofuels Development* led to the incorporation of the Biofuels Center of North Carolina. The new non-profit hired its first staff members, opened its office in Oxford on North Carolina’s Biofuels Campus, and made its first funding awards. The Biotechnology Center catalyzed the state’s policy commitment to biofuels development statewide.

## Looking to the Future

As the Biotechnology Center celebrates its 25<sup>th</sup> anniversary next year, many new programs will be under way. The funding opportunities for start-up companies have been streamlined and increased, and companies can now receive more than \$1 million over time from the Biotechnology Center. A fellowship program to place academic Ph.D.s with companies in-state will welcome its first class. The international BIO conference will be held in Atlanta, and North Carolina is planning a major presence.

Sector development is also key in the coming year, via the Centers of Innovation and a new initiative in agricultural biotechnology. A group of 100 North Carolinians will work together as the *Advisory Committee: Growing North Carolina’s AgBiotech Landscape* to make recommendations about using biotechnology to enhance the state’s \$70 billion agriculture sector.

To support these new initiatives and increasing demands from the nation’s third-largest biotechnology industry, the Biotechnology Center has begun planning for an addition to its Research Triangle Park headquarters. Staff is actively pursuing public and private support for a four-story annex to house the programs that enable faster industry growth.

In the next year, the state’s bioscience community will face challenges from many corners. The Biotechnology Center will continue to forge the partnerships and programs that catalyze growth in ways that can only now be imagined.

For the latest information, please visit our Web site, [www.ncbiotech.org](http://www.ncbiotech.org).

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## **Agricultural Biotechnnology**

In the next year, more than 100 leaders from across the state will work with the Center in a steering committee to chart the state's course for agricultural biotechnology. The group will produce a report in the spring of 2009 (page 15).



## **North Carolina Biotechnology Center**

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