

## Technology Resources of UNC Charlotte

**WHEN CHARLOTTE BUSINESSES SUCCEED,** UNC Charlotte succeeds. From the chancellor, trustees, faculty and students, UNC Charlotte bolsters the intellectual and economic health of the Charlotte region through:

**Knowledge:** UNC Charlotte graduates supply regional industry with technical expertise from IT to engineering.

**Employee development:** Corporate employees tap executive and continuing education opportunities to enhance performance.

**Partnerships:** The University of North Carolina at Charlotte works shoulder-to-shoulder with industry for important research.

In many ways, UNC Charlotte and the many services it offers to Charlotte-area businesses are like a newfound resource. While many businesses rely on the university's research and best practice expertise, considerably more is available. Consider these facts:

- ▶ The University's Charlotte Research Institute Visualization Center was named by the Department

### CHARLOTTE IS A PREMIER LOCATION FOR TECHNOLOGY-BASED COMPANIES.

of Homeland Security in 2004 as the Southeast Regional Visual and Analytics Center.

- ▶ The Charlotte Research Institute convenes numerous events annually so industry and researchers can easily exchange ideas and build relationships in disciplines such as cyber security, visualization, bio-tech and optical energy and photonics.
- ▶ The University comprises seven professional colleges and currently offers 18 doctoral programs, 62 master's degree programs and 89 programs leading to bachelor's degrees. Current enrollment exceeds 23,000 students.

UNC Charlotte and its Charlotte Research Institute regularly help people in Charlotte, across the country and around the globe with research, development, technology and more.

The Charlotte Research Institute, or CRI, is a portal for business-university technology partnerships. CRI professionals have international reputations for their research and best practices in Precision Metrology, eBusiness Technology and Optoelectronics.

The university's Life Sciences programs, meanwhile, will join these ranks through work in such areas as bioinformatics, biomedical engineering systems, cancer research and translational research.



### eBusiness Technology Institute

The university's e-Business Technology Institute (eBTI):

- ▶ Develops and implements new technologies to support or improve business processes
- ▶ Educates information technology specialists
- ▶ Provides students with "hands on" experience

eBTI has deep roots with major financial organizations and helps to improve information privacy and security solutions for Web-based banking and intelligent data analyses. In fact, UNC Charlotte has one of the largest visualization and visual analytics programs in the country. Tools used in fraud detection, such as artificial intelligence, data mining, visualization and complex adaptive systems, help to determine customer preferences, relate cause-and-effect scenarios with changing customer attitudes and deliver personalized services to each member of a large customer base.

UNC Charlotte is educating the next generation of cyber defenders to serve industry and government. The founder of the Center for Information Security and Assurance, a cryptographer, has created new techniques to defend networks against zero day attacks, viruses, worms, Trojan horses and other digital dangers with a system called "signcrypton." Depending on the crypto-systems used, signcrypton can be up to 90 percent more efficient than previous systems.



IN 2007 THE **MOTORSPORTS AND AUTOMOTIVE RESEARCH CENTER** RECEIVED THE NORTH CAROLINA **MOTORSPORTS ASSOCIATION** AWARD FOR **UNIVERSITY EDUCATION.**

As examples of ebusiness work, eBTI faculty and researchers have applied visual analytics to anti-money laundering investigations in wire transfers and developed advanced identity management systems. The VisCenter and partners are developing a visual grid-computing network to analyze data for pollution and air quality models. And eBTI database decoys attract viruses to study their behavior and then create cures.

Companies contact eBTI for research and applications in: Data-mining and modeling data; cyber security solutions; increased diversity in the IT and computing workforce; visualization applications in finance, risk management, demographic studies; bioinformatics and homeland security.

**Center for Optoelectronics and Optical Communications**

This UNC Charlotte center designs and develops new optoelectronic components, devices and sub-assemblies, with applications in telecommunications, sensors and imaging. The center has nanoimprint capabilities, varied materials growth and etching capabilities, e-beam and optical lithography, as well as state-of-the-art characterization and measurement.

Examples of Opto research include:

- New imaging algorithms and imaging hardware that can improve high resolution compact camera technology for the defense and biomedical arenas.
- New sensor technology images single molecules to detect chemical and biological hazards.
- New light source technologies that can enhance energy efficient solid state lighting, solar blind communications and spore identification.
- Photonic crystal structures that can guide light and allow integration of different functional components leading to an optical chip.
- Very short pulse lasers can be used to write nanoscale patterns onto a variety of surfaces.

Companies contact the Center for Optoelectronics and Optical Communications for: Active and passive photonic devices, integrated optics and packaging, fabrication of engineered optical materials, optical metrology, optical imaging, optical communication networks and photovoltaic devices.

**Center for Precision Metrology**

UNC Charlotte, known as one of the best institutions in the world for precision engineering, is home to the Center for

**UNC Charlotte R&D Performance Ranking**

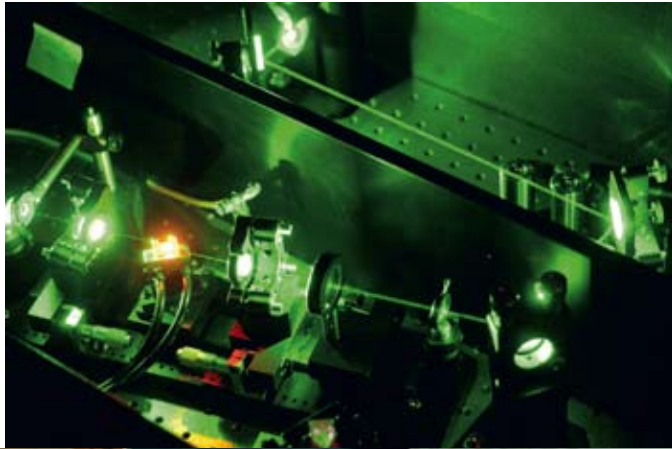
Category	National Ranking*
Patents Insured	1
Patents Applied	2
New Start Ups	3

\*Per \$10 million research expenditures  
Source — The Association of University Technology Managers, (AUTM) 2007

Precision Metrology (CPM). CPM trains professionals and performs exacting measurements to build instruments used by researchers and industry. New applications include producing a new generation of smaller, faster and less expensive computers, fuel efficient cars, reliable aircraft and new medical instruments.

Examples of CPM research include:

- ▶ High axial resolution grazing incidence interferometry uses grazing incidence illumination combined with lateral shearing interferometry to characterize the straightness of machined surfaces.
- ▶ A Multi-scale Alignment and Positioning System is designed for nano imprinting a new generation of circuits.
- ▶ A Sub Atomic Measuring Machine is being improved for picometer resolution.



Businesses turn to the Center for Precision Metrology for: Dimensional, coordinate machine tool, and computational metrology, nanotechnology instrumentation design, manufacturing process modeling, machine dynamics and high-speed machining, computer-aided tolerancing and electro-optics.

## Energy Production and Infrastructure Center (EPIC)

Beginning in 2008, the state legislature funded \$58.5 million to build an innovative energy production and infrastructure center (EPIC). The center will train engineers to build and run power plants — particularly nuclear reactors. EPIC will also research improved technologies for power distribution, control and power systems infrastructure as well as alternative energy technologies.

## Life Sciences

UNC Charlotte leverages research strengths in biology, engineering and IT to create solutions for biomedical needs. In the

**MULTISCALE ALIGNMENT AND POSITIONING SYSTEMS HAVE BEEN DESIGNED AND FABRICATED BY THE PRECISION METROLOGY RESEARCHERS AT CRI.**



past five years the university has invested \$100 million in Life Sciences for several areas of study, including:

**The Bioinformatics Research Center.** Bioinformatics is a multi-disciplinary program with the physical and life sciences, computer science, and mathematics and statistics. Its specific focus is in functional genomics, statistical genetics and proteomics. Bioinformatic applications are helpful in drug discovery, genetic modification of crops, biochemical production and personalized medicine.

Research examples include:

- DNA microarrays can comprise all the genes of a given genome on a single microscopic slide and have promise as a better way to interpret important medical data. A CRI researcher is working to improve microarray design to enable better data interpretation.
- Another CRI researcher is using computational techniques to search genetic material in common plants to find a cost effective one step process for creating biofuels.

**The Center for Biomedical Engineering Systems (CBES)** harnesses interdisciplinary research expertise, local healthcare institutions and other universities' research for biological support systems; biomedical modeling, imaging, and processing; biomechanics and mobility research; and biomedical instrumentation.

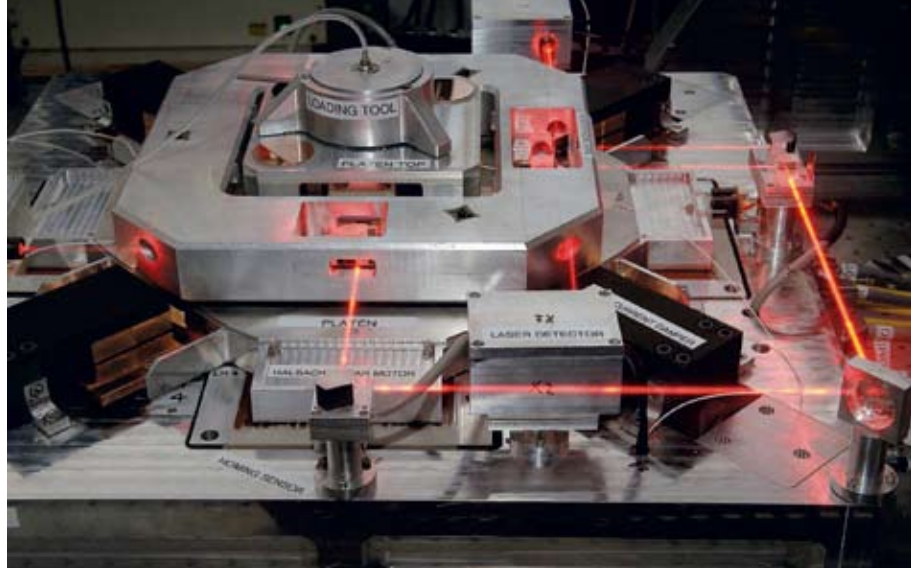
In the world of liver transplants, where there are more liver transplant patients than livers, for instance, CRI's liver research group is working on solutions. They are developing bio-artificial liver devices as temporary support systems for patients awaiting donors. CRI biomobility researchers work with orthopedic surgeons to develop surgical tools that will enable failsafe hip replacements. Another medical device permits the patient to defer hip replacement surgery by stimulating cartilage regrowth.

A new initiative in Translational Research at CRI works with various cancer biology researchers in technologies for new metastatic cancer therapeutics, including:

**Cancer Genomics and Tumor Formation:** A cancer biologist is studying the complex biology of tumor formation by examining the molecular role of the Myc protein in cell growth and cancer initiation to learn how to prevent tumor metastasis.

**Brain Cancer:** Brain Tumor Fund for the Carolinas partners with CRI to fund a brain cancer research project focused on gene expression in metastatic cancer tumors that migrate to the brain to determine which genes are active in the process of metastasis.

**Liver Cancer:** A CRI physiologist and a computer scientist are studying how natural killer T cells find and kill metastatic tumor cells in the liver to be able to devise treatments to enhance this trait.



## Motorsports and Automotive Research Center

Charlotte is the hub of auto racing and UNC Charlotte is considered one of the best motorsports engineering programs in the nation. More than 60 grads are employed by NASCAR teams to advance the science of speed.

Motorsports expertise translates to varied industrial applications. Automakers test components on campus. Cities engage UNC Charlotte personnel for fleet fuel studies. Teams employ graduate students for engine research.

Companies contact the Motorsports Center for applications as diverse as: Algorithms for fuel injector geometry characterization, characterization of surface textures in automotive components, crash and safety simulation, development and simulation of new suspension geometries, drivetrain and CVT research, dynamics of valve train linkages, selective assembly strategies, production of thin-walled castings with low dimensional variation to lighten passenger cars, three-dimensional fluid flow analysis of carburetor/intake flows, vibration analyses and water tunnel experiments.

## A Ready Resource

Like a newfound resource, UNC Charlotte is a deep repository of research, best practices and technology ready to help business and industry grow. Though its expertise and reputation is known throughout the world, UNC Charlotte prides itself on offering customized and personal attention and working shoulder to shoulder with companies.

**CRI: The Charlotte Research Institute at UNC Charlotte**

704.687.8284

[www.CharlotteResearchInstitute.com](http://www.CharlotteResearchInstitute.com)

