BRINGING THE

We're in the late innings. An increasingly competitive economic and sponsored research climate finds successful, research-active faculty being courted by top universities with the same fervor professional teams bring to the recruitment of promising athletes to play on major-league baseball diamonds.

Anxiously checking the bases and finding them loaded, the world is turning to its academic bullpen, where institutions of higher learning are warming up to take on the challenges ahead.

But contracts have been renegotiated. It's no longer possible to remain aloof not in the skybox and not in the dugout. Where they did exist, ivory towers have long since gone the way of Ebbets Field. When it's to the exclusion of other contributions, even coaching the bases from the sidelines borders on being called foul. Though the performance and preparedness of individuals are vital to the team's success, much more than pedagogy is expected and required from players on the higher-education club.

So now, with the competition becoming ever more keen, veteran closers — institutions with long and storied histories of academic and research excellence — and energetic, nimble, rookie colleges and universities, eager to prove their worth, sense the importance and the enormity of what they are being asked to do.

Curves have been thrown, not to mention wild pitches. Crises seem to come out of left field, one after the other. But when facing heavy hitters, the bullpen needs to be focused and strong. And while today's potential all-stars of academe are expected to continue to do what they do so well — educate and explore — they're expected to step up to the plate in many other ways as well.

They are being asked to captain the team. They are being tapped to re-energize the game by generating ideas, technologies and products that advance local, national and global economies. They are being recruited to help even the score and level the playing field by solving pressing social and political problems around the globe. Ultimately, to help save the day, they are being signed by the global community — not just to teach others how to play or appreciate the nuances of the game, but to themselves suit up and play — skillfully.

TOWARD BETTER UNDERSTANDING

While raising its aspirations across the continuum of research, scholarship and creative activity, Binghamton University research is pumping up local and regional economies, advancing state and national interests and teaching students how they can do the same.

When the going gets tough, the tough get going. In the parlance of baseball, that often boils down to the club manager putting in a call to the bullpen for a relief pitcher capable of "bringing the heat." An esoteric reference to a blindingly hot fastball, it didn't take long for Wall Street advertisers, business executives and throngs of non-sports-minded people the world over to adopt the saying as shorthand for "raising your game."

That, according to community partners and its own box scores, is exactly what Binghamton University has been doing in recent years, particularly as concerns its research initiatives. But raising its own game isn't the only effect of Binghamton bringing the heat with ramped-up research, area business people said. Like the burner on a hot air balloon, when the University brings the heat, regional economies and quality of life are elevated as well.

Roberta Rivero, vice president for quality management at United Health Services, where Binghamton University researchers are partnering to improve hospital protocols and practices, credits Binghamton's burgeoning research programs with enhancing the regional economy, fostering "brain draw" to the community, generating local revenue and increasing cultural diversity.

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TOWARD IMPROVED QUALITY OF LIFE

THE UNIVERSITY'S STRATEGIC PLAN, "EXCELLENCE IN A CLIMATE OF CHANGE," UNDERSCORES THE INSTITUTION'S COMMITMENT TO SYNERGISTIC AND INNOVATIVE COUPLINGS OF RESEARCH AND UNDERGRADUATE EDUCATION.



Binghamton University / BINGHAMTON RESEARCH / 2006-07

Cynthia Giroux, technology director of thin films and surfaces research at Corning, and Sandeep Tonapi, project leader of micro- and nanostructure technologies at GE, agree. University research, both said, is key to spurring the economy and keeping bright young professionals in the area.

"Under President DeFleur, the University has flourished, garnered increased funding from state and federal sources and strengthened ties to industry," Giroux said. "With linkage to quality companies through its centers and consortiums, this then allows graduates to be linked to industries in the area."

"We feel that BU research in the areas of small-scale systems integration and packaging, flexible electronics, and electronics packaging is crucial to the region's economic growth and vitality," Tonapi agreed. "BU's participation in these globally competitive areas with very high potential for economic growth complements the industry's growth and provides the critically needed young workforce in science and engineering."

Since its inception in 1946 as Triple Cities College, the University has changed significantly. From its roots as a four-year liberal arts college with a reputation for superb undergraduate education, it has evolved into an excellent doctoral research university, with a broad range of liberal arts and professional programs, all carefully designed to preserve and build upon its traditional undergraduate excellence.

The University's strategic plan, "Excellence in a Climate of Change," underscores the institution's commitment to synergistic and innovative couplings of research and undergraduate education.

The plan, which "arises from the vision of a truly distinguished and unique institution of higher education, one that combines an international reputation for research, scholarship and creative endeavor with the best undergraduate programs available at any public university," calls for and commits resources to achieve a doubling of sponsored research activity over the next five years. Quantifiable evidence affords strong support for the claim that the research environment at Binghamton is already vital and growing. In the past decade, sponsored research activity more than doubled. This past year alone, the University posted a 24 percent increase in sponsored research awards.

Meanwhile, the University has also seen significant growth in technology transfer activity. With its posting of a 53 percent increase in licensing income this past fiscal year, the University staked its claim as second in this category in the entire 64 campus State University of New York (SUNY) system.

Notably, Binghamton was also the only SUNY institution to post an increase in licensing income on the year, with the other leading universities seeing declines of from five to 80 percent. University research has also spawned nine new start-up companies, and last year led to a 45 percent increase in invention disclosures and to the filing of 20 patent applications, up from just eight the year prior.

The main significance of these numbers, said Eugene Krentsel, director of technology transfer and innovation partnerships, is not necessarily in the absolute numbers, but in the trends they represent. In a period of generally flat federal research funding, and when other SUNY schools are seeing a dramatic waning in the creation of new knowledge and its transfer to the marketplace, Binghamton is clearly bucking the trend. During the past several years, New York state has recognized and lent significant

support to the University's successful blending of research and undergraduate excellence. The University received \$15 million in state funds to renovate its Innovative Technologies Complex, \$21 million to design and build a University Downtown Center and \$66 million for the design and construction of a new science and engineering research building. The University has also received federal earmarks totaling about \$11 million to support ongoing research projects and won a national competition leading to its selection by the United States Display Consortium as a Center for Advanced Microelectronics Manufacturing. That move was accompanied by the award of more than \$13 million in firstgeneration roll-to-roll (R2R) electronics manufacturing equipment, establishing Binghamton as home to the world's first prototype manufacturing and testbed line.

Electronics is a major strength at Binghamton, and one the University has leveraged across the disciplines, culminating most recently with the designation of its Small Scale Systems Integration and Packaging program as a New York state Center of Excellence.

But research at the 887-acre campus spans the disciplines and more and more often draws upon the expertise of faculty from across the disciplines to form unique research teams addressing urgent world problems.

Because of the interdisciplinary nature of some of today's most pressing questions - questions involving human genomics, materials science, cell biology, bioengineering and biomedicine these cross-disciplinary connections regularly develop into permanent working relationships.

Binghamton faculty have formalized these relationships through the Center of Excellence, a host of organized research centers and three institutes for advanced studies.

These organizations, which offer equipment and expertise that may be accessed by faculty across the disciplines and by members of the community who need specialized services, are one of the University's most important links to larger local, regional and global communities.

Ultimately, however, the University's research success depends on the contributions and commitment of individual faculty. And there, the game is being raised as well.

Toward better understanding

Assistant Professor Leo Wilton, for instance, was chosen for a prestigious fellowship with the Center for AIDS Prevention Studies at the University of California at San Francisco. Over the course of three summers, he will lay the foundation for a multimillion-dollar research grant proposal. His central goal is to address the disproportionate HIV/AIDS infection rate among people of color.

Wilton, who holds appointments in the Department of Human Development as well as with Africana Studies in Harpur College of Arts and Sciences, will study body image and how it interfaces with HIV risk behaviors among black gav men. Issues he will consider include race stress, gay stress and internalized homophobia.

Forty-six percent of black gay men are HIV-positive, Wilton said. "In terms of the nation, we're in a crisis," he added.

In the School of Management, Francis Yammarino and other researchers have been given \$160,000 to complete work driven by the changing nature of the U.S. Navy's mission, equipment and technology. Yammarino and his team

are helping to develop a database that will match Naval personnel and their skills with the numerous tasks the Navy may undertake and the kinds of people needed to fulfill them.

When the project is completed, a Naval officer will be able to go to a computer, answer a series of questions about the tasks he or she has been assigned and receive a list of skilled people appropriate for the mission.

"The thing that makes all of it work is leadership," said Yammarino, who noted this project may eventually be part of a much larger reorganization of the entire Department of Defense.

A distinguished professor of management and director of the Center for Leadership Studies, Yammarino has partners at SkillsNet in Texas as well as at the University of Oklahoma and the University of Central Florida.

Toward improved quality of life

Another new study led by researchers at Binghamton University's Decker School of Nursing is looking at ways to improve heart-healthy behaviors among rural women. The work is funded by a threeyear, \$150,000 grant from the National Institute of Nursing Research.

Rural women may not be at higher risk for cardiovascular disease than the rest of the population, but they do face particular challenges. For instance, they were among the last groups in the country to start smoking - and they're among the last to quit.

"I've seen a lot of the issues firsthand," said Associate Professor Pamela Stewart Fahs, a native of Kentucky and director of Binghamton University's O'Connor Office of Rural Health Studies. "I've also seen what socio-cultural aspects of rural living both protect and cause problems for those citizens."

The study will involve a total of 176 women ages 45-65 at moderate to high risk for cardiovascular disease. Half will be from Delaware County in New York and the other half will be from a rural Virginia county.

Researchers will use two techniques in an effort to encourage study participants to be physically active, eat at least five servings of fruit and vegetables daily and not smoke. The first technique, called community intervention, will be available to all of the women in the study. The second technique, a series of nursing interventions, will be part of the program for half of the study participants.

Toward a safer world

Researchers at Binghamton University are also exploring a first-ever opportunity to determine if chronic wasting disease (CWD) in deer can be spread to humans who ingest "infected" meat. Ralph M. Garruto, professor of biomedical anthropology, is heading up a study to monitor the health implications for a group of people who are known to have consumed venison infected with CWD. Recently discovered in both wild and captive deer herds in New York, CWD is similar to mad cow disease in that it concentrates in the spinal cord and brain, and is caused by a virtually indestructible mutated protein called a prion.

"We don't know if CWD can be transmitted to humans," Garruto said. "So this group, some of whom we know for sure ate infected meat, offers us a unique opportunity. I'm hoping the study will allow us to determine if this disease can affect humans in the same way mad cow disease has been shown to cause neurological disease in those who consume infected beef."

The study focuses on a group of people who attended a sportsmen's feast in

COVER STORY

TOWARD A SAFER WORLD



THE UNIVERSITY **RECEIVED \$15 MILLION IN STATE FUNDS TO RENOVATE ITS INNOVATIVE TECHNOLOGIES** COMPLEX, \$21 **MILLION TO DESIGN AND BUILD A UNIVERSITY** DOWNTOWN **CENTER AND** \$66 MILLION FOR THE DESIGN AND **CONSTRUCTION OF A NEW SCIENCE AND ENGINEERING** RESEARCH **BUILDING.** COVER STORY

TOWARD AN INVENTIVE FUTURE

"THE IDEA IS, IF YOU'RE GOING **TO GO INTO BUSINESS, CHANGE** THE WORLD. DON'T JUST DO SOMETHING **MUNDANE. EVEN THOUGH A START-UP IS ALWAYS GOING TO START** SMALL, YOU SHOULD HAVE AND HOLD ONTO THE VISION THAT IT COULD BE SOMETHING BIG." — Kenneth McLeod



Binghamton University / BINGHAMTON RESEARCH / 2006-07 95 Verona, N.Y., in 2005. At least some of the attendees, who had a choice of entrees, consumed venison from a deer infected with CWD. Upon hearing of the dinner, Garruto approached the Oneida County Health Department to determine if it would assist in a scientific examination of the people who ate the meat. The study will monitor the health of the participants over six years.

Because of another research project, child pornographers will soon have a harder time escaping prosecution. Thanks to a stunning new technology that can reliably link digital images to the camera with which they were taken, in much the same way that telltale scratches are used by forensic examiners to link bullets to the gun that fired them, the rug will be pulled from under a common ploy used by child pornographers to raise "reasonable doubt" about their guilt.

"The defense in these kind of cases would often be that the images were not taken by this person's camera or that the images are not of real children," said Jessica Fridrich, associate professor of electrical and computer engineering. "Sometimes child pornographers will even cut and paste an image of an adult's head on the image of a child to try to avoid prosecution.

"But if it can be shown that the original images were taken by the person's cell phone or camera, it becomes a much stronger case than if you just have a bunch of digital images that we all know are notoriously easy to manipulate."

Fridrich and two members of her Binghamton University research team, Jan Lukas and Miroslav Goljan, are co-inventors of the new technique, which can also be used to detect forged images.

The three have applied for two patents related to their technique, which provides the most robust strategy for digital-image forgery detection to date, even as it improves significantly on the accuracy of other approaches.

Toward an inventive future

Passing on to students not only the education but also the scholarly and entrepreneurial mindset that gives rise to this level of imagination, ingenuity and invention are a very real goal of Binghamton University's research enterprise, even at the undergraduate level.

Kenneth McLeod, director of the University's nascent bioengineering department, for instance, focuses on teaching his students how to bring "magic" into their senior research project. The year-long project challenges teams of four to six students to identify an existing technology that can be tweaked or redirected so as to serve as the basis for a start-up business addressing a niche need in the marketplace. The "magic" he refers to is drawn from a principle promoted by Guy Kawasaki, a Silicon Valley venture capitalist and one of the original Apple Computer employees responsible for the successful marketing in 1984 of the first Macintosh. The term speaks to the catalyzing energy of finding and tuning into the world-altering potential of your product while fashioning your business or making a pitch to potential investors, McLeod explained.

"The idea is, if you're going to go into business, change the world. Don't just do something mundane. Even though a start-up is always going to start small, you should have and hold onto the vision that it could be something big.

"What I really try to emphasize is that students shouldn't focus on hightechnology," McLeod added. "It takes roughly one human generation for a new technology to be incorporated into products that are commonly used. So

if you've got 25 to 35 years, go ahead and start a company based on new technology. But most people don't."

Once students settle on their product and marketing strategy, they must complete and present a business plan to a team of judges who are positioned as potential investors.

The approach is considered bioengineering, McCleod said, because it challenges students to do exactly what nature does to create new, more successful life forms: "Use what's already out there."

Students in last year's first graduating class said the research project changed their worldview and gave them a new sense of possibility in their lives, more so than any of their traditional studies.

"In a practical way, we've been taught a language to be able to talk to all the different disciplines," said Michael Brown, who graduated last May with a double major in bioengineering and philosophy. "We've done research, we can read the research, we can interpret it, we can digest it, we can present it."

Giya Abraham, who landed a teaching job even before graduation last May, agreed. She can't imagine not pursuing her newfound interests in entrepreneurship and business after being introduced to the "magic" during her senior project.

"With our experience, felt like we could go anywhere," she said. "That has definitely changed my outlook on my future. It's really been great. The door just opens in your mind."

It's a door that Brown and Abraham said they and 25 of their classmates will waste no time walking through, helping to ensure that Binghamton research will keep on bringing the heat into the next decade and beyond.