Faculty and kids share Watson connection

Big Data projects bring big benefits

Start-Up Suite gains new tenant

CELEBRATING 30 YEARS
Watson establishes legacy of excellence and innovation
Exceeding expectations since our founding

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pending the past year celebrating 30 years of the Watson School has made us reflect on just how far we’ve come, and all I can say is, WOW!

It is remarkable to think how the Watson School has grown, evolved and expanded since local business leaders initiated conversations with the State University of New York and New York state about creating a comprehensive engineering and computer science school at Binghamton University. The effort would build on the foundations of the University’s School of Advanced Technology and the computer science and technology programs housed elsewhere on campus.

At the time, consultants predicted that when the Watson School reached full size, the program would have nearly 500 full-time-equivalent students. As one of our founders recently said to me, we have more than exceeded those expectations!

Today, with more than 2,700 students in five undergraduate programs and 21 graduate programs, including the Executive Master of Science in Health Systems in Manhattan program, we are surpassing what was expected of us and growing a vibrant academic institution with an active research program and a commitment to undergraduate and graduate education.

During its first decade, the school’s principal research focus was electronics packaging. While we continue to excel in this critical domain, our research expertise has grown in breadth and depth to include fields our founders may not have imagined — cyber security, energy-efficient data centers, health systems, renewable energy, materials engineering and biomedical devices, to name a few.

At present, the Watson School has more than 12,000 alumni who are employed by more than 3,000 organizations around the globe, including *Fortune* magazine’s “World’s Most Admired Companies,” the top IT companies based on revenue and MIT *Technology Review’s* most innovative companies. We continue to have strong ties to this community and remain an important and vital partner to many — from sponsored research with partners such as Innovation to our students working on projects at the Pine Ridge reservation in South Dakota. And yet, we have developed a strong reputation as a high-caliber school, both nationally and internationally. We have pushed past the boundaries originally set for us and continue to exceed expectations with the accomplishments of our students, faculty and staff.

This year, as we have reflected on the past and looked to the future, we are inspired both by those who founded the Watson School and those who shaped it during the past 30 years. The entrepreneurial and innovative spirit that spurred the school’s beginnings and enabled its success still informs our decisions and is very much a part of the Watson School.

We will carry on the great legacy set forth by our founders and continue to become the school that others will emulate, a school committed to excellence in education and cutting-edge research.

Krishnaswami “Hari” Srihari
Dean and Distinguished Professor,
Thomas J. Watson School of Engineering and
Applied Science
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**Watson School Leadership**

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Dean and Distinguished Professor

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Systems Science and Industrial Engineering

**Watson Review**

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binghamton.edu/watson
First group in NYC earns master’s in health systems

The Watson School congratulates the graduates of the new Executive Master of Science in Health Systems in Manhattan program.

Thirty-one students completed the one-year program, which was launched in April 2013 and is taught at the SUNY Global Center in New York City. Students attend classes on Saturdays and have the option of earning a master’s degree in systems science with a health systems concentration or a master’s degree in industrial and systems engineering with a health systems concentration. This year’s cohort was almost evenly split between the two offerings.

A recognition ceremony for graduates was held April 5 at The TimesCenter in Manhattan. James Tallon, one of the founders of the Watson School and president of the United Hospital Fund of New York, was the keynote speaker. Several graduates also chose to participate in the Watson School’s Commencement ceremony on May 17 at the Vestal campus.

According to Mohammad Khasawneh, professor of systems science and industrial engineering and WISE assistant director for health systems, this year’s students are already helping recruit for the next cohort, which begins in August. “Binghamton is indeed well-positioned to continue to deliver high-quality education in this area,” he says.

STUDENTS SUBMIT PROJECTS TO FAA DESIGN COMPETITION

Students of William Ziegler ’76, associate professor of computer science, partnered with the Greater Binghamton Airport and local engineering consulting firm McFarland-Johnson to compete in the 2014 Federal Aviation Administration (FAA) Design Competition, submitting two projects: “Mitigating Laser Attacks in Critical Flight Zones” and “Harvesting Kinetic Energy from Decelerating Aircraft to Improve Airport Energy Efficiency.” Ziegler’s technical engineering writing students have placed first in this competition seven times in the past six years.
MILLER WINS NSF CAREER GRANT

Thanks to a $450,000 grant from the National Science Foundation (NSF), Timothy Normand Miller, assistant professor of computer science, launched an “introspective computing” project that aims to slash the energy used by computing systems ranging from smart phones to data centers. The funding comes from the Faculty Early Career Development Program, which awards the NSF’s most prestigious grants in support of new researchers.

According to Miller, energy efficiency in chips is critical to extending the operation time of battery-powered devices and is a significant factor in the cost of running larger systems, including data centers.

Watson student-athletes honored

Three Watson School mechanical engineering students were among the 37 student-athletes inducted into the National College Athlete Honor Society (Chi Alpha Sigma) in April. They are Elizabeth Greiner, a sophomore; Cal Michael, a junior; and Connor Olsen, a sophomore. All three are track and field athletes.

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TWITTER twitter.com/BUWatsonSchool

Ning Zhou
ASSISTANT PROFESSOR, ELECTRICAL AND COMPUTER ENGINEERING
Teaching/research focus: power system dynamic performance, phasor measurement unit application, signal processing/system identification/control system and their application in power systems, smart grid, integration of renewable generation, smart appliances
SAMMAKIA NAMED IEEE FELLOW
Bahgat Sammakia, distinguished professor of mechanical engineering and the University’s vice president for research, was named a fellow of the Institute of Electrical and Electronics Engineers (IEEE). Founding director of Binghamton’s Small Scale Systems Integration and Packaging Center, a New York State Center of Excellence, he was chosen in recognition of his contributions to thermal management applications in electronic systems.

SRIHARI RECEIVES IIE FELLOW AWARD
Krishnaswami Srihari, dean of the Watson School and distinguished professor, systems science and industrial engineering, was selected to receive the Institute of Industrial Engineers (IIE) Fellow Award. This award is the highest classification of membership in IIE and is given to honor outstanding leaders who have made significant, nationally recognized contributions to industrial engineering.

FORMER PRESIDENT CLIFFORD CLARK DIES
Clifford D. Clark, 88, the fourth president of Binghamton University, died January 31, in Detroit.

During his 16 years as president, Clark championed the growth of Binghamton’s graduate programs, oversaw an expansion of the Decker School of Nursing and worked with legislators and local business leaders to found the Thomas J. Watson School of Engineering and Applied Science.

Ye becomes AIMBE Fellow
Kaiming Ye, professor and chair of the Bioengineering Department, was recently elected to the American Institute for Medical and Biological Engineering (AIMBE) College of Fellows, which comprises the top 2 percent of medical and biological engineers in the country. He was inducted into the group at a formal ceremony held during AIMBE’s 2014 Annual Meeting at the National Academy of Sciences Great Hall in Washington, D.C., in March.

Alumnus awarded NSF fellowship
David Bassen ’13, a bioengineering major, was awarded a 2014 National Science Foundation (NSF) graduate research fellowship. He is pursuing graduate work at Cornell.
2013-14

Award recipients

Scott A. Craver, assistant professor and undergraduate program director, electrical and computer engineering, received the Chancellor's Award for Excellence in Faculty Service.

Leslie C. Lander, associate professor and graduate program director, computer science, received the Outstanding Graduate Program Director Award presented by the Graduate School.

Harold W. Lewis III '77, MS '86, PhD '95, associate professor and graduate program director, systems science, received the Chancellor's Award for Excellence in Teaching.

Lijun Yin, associate professor, computer science, received the Chancellor's Award for Excellence in Scholarship and Creative Activities.

Promotions

Congratulations to the following Watson faculty and staff who received recent promotions:

Junghyun Cho, mechanical engineering, promoted to professor

Changhong Ke, mechanical engineering, promoted to associate professor

Mohammad Khasawneh, systems science and industrial engineering, promoted to professor

Suengbae Park, mechanical engineering, promoted to professor

Sharon Santobuono '94, MA '95, Watson advising, promoted to director

Guangwen Zhou, mechanical engineering, promoted to associate professor

Lorna Wells says goodbye

On May 2, friends and colleagues gathered in the Anderson Center Reception Room to celebrate the retirement of Lorna Wells '85, MA '92. Wells, director of advising, spent most of her Binghamton University career in the Watson School. Here is what she had to say about her tenure at Binghamton:

"I was hired as an undergraduate admissions transfer counselor in fall 1985. In that position, I traveled around the state representing all Binghamton programs at community colleges and SUNY information fairs. I also visited various out-of-state locations. Since Watson was newly established in 1983 I felt strongly about emphasizing its information. In those early years, the Watson School was upper-division transfer only and offered four technology majors along with its new bachelor of science degrees in electrical and mechanical engineering.

In spring 1987, Founding Dean Lyle Feisel, Associate Dean Michael McGoff and Associate Dean Richard Culver took a chance and hired me as the coordinator of advising for the Watson School.

The school has changed and grown a lot since that time, acquiring computer science in 1987, retiring the technology majors and adding three more engineering majors along with the Computer Science Department's dual-degree program with Turkey. We have expanded significantly in numbers and opportunities at both the undergraduate and graduate levels, and the advising office has also grown.

Over a decade ago, Associate Director Sharon Santobuono was added, and most recently another advisor, Brad Gordon, was hired. Upon my departure, Sharon will continue as director, leading the office into the next phase with Secretary Sheila Cheevers and Watson peer advisors providing critical support.

I believe the relationships we have established with institutions offering associate of science in engineering science degrees will remain an important part of the school, and I have certainly enjoyed working with those partners over the years. They exemplify the wonderful opportunities available within the SUNY system.

It has been an honor to serve the outstanding faculty and staff of the Watson School for so many years. Most of all, it has been a joy to support and encourage students from so many backgrounds as they pursue their dreams. I never imagined what a gift it would be to connect with so many talented and dedicated people, and I am most grateful for having had this opportunity."

Lorna Wells with a prospective student on Welcome Day.

Jonathan Cohen
Celebrating 30 years

As University president and a member of the faculty of the Watson School, I’m impressed by its rapid growth in enrollment, research productivity and community outreach. It has rightly earned an international reputation for outstanding education and quality research while its work with local, national and international firms has made it a go-to resource for partners looking to use technology to meet the needs of both industry and individual consumers.” — Binghamton University President Harvey G. Stenger

“It is remarkable to look at how the Watson team has been able to achieve as much as it has over a short period of time.” — Watson School Dean Krishnaswami Srihari

Watson at-a-glance

- 1,921 undergraduate students
- 616 master’s students
- 192 PhD students
- 88 full-time faculty
- 8 fields of study
- 614 degrees conferred
- $41M+ in research proposals
- $11M+ in research expenditures

(Watson Review)
Watson program director Eileen Head with daughter, Hadassah Head, a Watson graduate. Eileen’s son, Michael, also earned his degree at Watson; her husband, Tom, is professor emeritus in the Mathematical Sciences Department.
hen Hadassah Head ’07, MS ’12, was still in high school beginning to contemplate higher-education options, Binghamton University was never off her radar screen. “I always knew I’d be attending a SUNY school,” she says.

The only question was which one. She visited several, stayed overnight at one and soon decided to attend Binghamton, where she majored in mathematics before pursuing a master’s degree in systems science and industrial engineering.

On face value, her decision might seem simple. Binghamton University is, after all, a tradition with Hadassah’s family. Her mother, Eileen Head, MS ’98, is the computer science undergraduate program director at the Watson School. Her father is Tom Head, professor emeritus in the Mathematical Sciences Department. And her brother, Michael, completed his bachelor’s degree in computer science at the University in 1999 and returned, five years ago, to earn his doctorate in computer science.
ufus Lander ’03, MS ’08, had a similar experience. His dad is Leslie Lander, associate professor of computer science. His mother, Maruja, earned a master’s in advanced technology in 1989. Brother Gabriel ’02 studied biochemistry and sister Gwendoline ’05 studied psychology. When it came time for Rufus to decide where he would major in mechanical engineering, it didn’t take long for him to decide on the Watson School.

A revolution every five years

When Leslie Lander came to Binghamton, in 1984, the Watson School was only a year old and he was one of just seven faculty members. “There weren’t many undergraduate computer science programs at the time,” he recalls. “The electrical and mechanical engineering programs were initially junior/senior only, and most of our students would come to Binghamton after a couple of years of community college or a four-year school to complete their last two years here.

“The undergraduate computer science/information science program and the math/computer science program were not in Watson. The first was in the School of General Studies and Professional Education, which no longer exists. The second was part of the math program. The computer science program in the Watson School only took students who already had a bachelor’s degree and came to us to do a two-year master’s in advanced technology degree with a specialization in computer science. All the departments also had a small number of PhD students.”

Gradually, during the late 1980s, those programs were consolidated and the engineering programs became four-year programs.

By the time Eileen Head joined the faculty in 1988, the computer science program was starting to grow dramatically. “In this field there’s a revolution every five years,” she says. “Binghamton has done a terrific job keeping up with that. It has really focused on our computer science program as a leading program, adding many bright faculty members and significantly expanding the scope of course offerings. The result is diverse programming and an equally diverse student population, and many more research opportunities now than when my husband and I came here. Between the rich curriculum and the wealth of experiential learning opportunities, it really is a great school.

“When our children were exploring colleges and universities we felt there were no significant disadvantages to them attending Binghamton,” she adds. “We were confident they would get a great education here.”

Constantly evolving

Like many young people, Hadassah and Rufus looked forward to the college experience — to establishing themselves, moving out of their parents’ homes and living on their own. While they remained in Binghamton, they found autonomy in campus housing, with all the opportunities for social interaction it offered.

As an undergraduate, Hadassah’s brother, Michael, found kindred spirits on a unique residential community floor reserved for a group of students who shared an interest in computers, robotics and engineering (CoRE). “When it was introduced in the late 1990s, it was the first dorm floor on campus to be equipped with Ethernet,” recalls Michael,
now an engineer with Google. “The CoRE floor was not only a close community, but a great enhancement to my education. I’m still in touch with many of the friends I made while I was living there.”

When Michael returned for his doctoral work, he says, “The thing that made me interested in getting a PhD at Binghamton was the new, eager faculty members they’ve hired. These professors are hungry to do research, and consequently there’s been a meaningful investment in labs and infrastructure.”

One doesn’t need to be a doctoral candidate to benefit from those investments in faculty and facilities, however. When Rufus returned to Binghamton for his master’s degree in systems science and industrial engineering, he says, “Things had changed in just a few years. There were more courses, new faculty and greater research opportunities.”

His degree program, says Rufus, “essentially combined a technical degree with an MBA.” The focus was on process management, and the credential helped him land a job in 2008 as a manufacturing supervisor with Lockheed Martin Aeronautics, where he oversees the production of C-130 Hercules turboprop military transport aircraft.

Hadassah is quick to laud the education she received at Binghamton, as well. And she exemplifies the idea of making the most of what is available. Nothing about her approach to her education has been passive.

“Our parents supported my brother and me and paid for our educations, they were big on the idea that we should work for our spending money,” she says. “I had many campus jobs.” And many paid off in dividends far more valuable than “walking around” money.

In 2003, Hadassah landed an office assistant position with EngiNet, Watson’s graduate distance-learning program. Within a couple of semesters she became a videographer and video editor for the program. At the same time, she worked at a senior living community in Binghamton. Later, she spent time as an AmeriCorps volunteer, worked with the Obama campaign and interned in Israel with a human rights organization.

In each of those positions she honed her leadership and communications skills, enhanced her worldview and refined her definition of herself as a professional. By the time she enrolled in her master’s program, she was involved in a variety of community-service activities that seem to fit seamlessly with her systems science education. Her work on evolutionary studies, with Hiroki Sayama, associate professor of bioengineering and of systems science and industrial engineering, led to her current job as Binghamton’s evolutionary studies coordinator and a separate position as special projects coordinator for EVOLUTION: This View of Life, the first online magazine that communicates modern evolutionary science to the general public. In addition, since September 2012, she has been coordinator of the Binghamton Religion and Spirituality Project, a collaboration between SUNY Distinguished Professor David Sloan Wilson and Harvey Whitehouse, a distinguished scholar of religion at the University of Oxford in England. In that role she builds partnerships between the project’s research team and local religious organizations.

The Heads and the Landers are only two examples of families in which a Watson School education is a family affair. There are many other Watson faculty and staff whose children have benefited from a Binghamton education. Their stories reveal a first-class educational institution, constantly evolving to meet the needs of its students.

“In this field there’s a revolution every five years. Binghamton has done a terrific job keeping up with that.”

—Eileen Head
Academy in the Thomas J. Watson School of Engineering and Applied Science are using Big Data to their advantage by mining an information trove that is growing by 2.5 quintillion bytes a day. What’s in this eclectic mix? Your credit card transactions. Images beamed to Earth from the Hubble Space Telescope. Your posts to social networks. Oh, and every Google search, too.

Big Data is gargantuan field — one that can be mined to solve any number of problems, though sometimes it’s put to nefarious uses. For example, federal charges were brought last year against five high-tech thieves who hacked the computer networks of major companies, stealing financial and personal data.

But Big Data projects can also bring big benefits. The potential for better flood predictions offers a case in point.

Historians are fond of saying events are interconnected, with one event leading to another. It turns out that much of our world operates on the same principle: Floods, for instance, result from patterns of interconnected weather changes. These patterns can be discovered by mining Big Data using a specialized algorithm, says Zhongfei “Mark” Zhang, professor of computer science.

He believes the same holds true for tornadoes, disease outbreaks and various other phenomena, even though they may seem dissimilar.

Rather than develop one data-mining algorithm for each event — one for flood prediction, another for tornadoes and a third for disease outbreaks — Zhang and his students created a single algorithm that has wide applications. The University placed the formula in the public domain so it can be put to good use elsewhere.

Flood prediction offers an example of how this data mining works. Zhang and his students mined the giant weather database maintained by the National Oceanic and Atmospheric Administration (NOAA). One aim of their work was to reveal the underlying series of events that led to massive flooding in Binghamton in 2011.

They analyzed not only Binghamton’s past weather patterns but also past patterns for nearby
Taking advantage of Big Data

areas and other parts of the country that had similar weather. And they looked at past weather patterns for the United States as a whole. “We believe that things are always related in one way or another,” Zhang says.

Once they found the past pattern of weather events that led to the Binghamton flood, the team looked for a recurrence of the same sequence of events. Zhang says they correctly predicted flooding in Binghamton in 2011.

“We were not the first to do this kind of prediction,” he notes. But earlier prediction systems were extremely limited in scope. If researchers wanted to predict the weather for Binghamton or Ithaca, for example, they analyzed the weather in Binghamton or Ithaca.

Zhang’s big-picture view required a lot more work. “The bigger the area you take in, the more mathematically complex the project becomes,” he says. But, he believes, it also produces more accurate forecasts.

Zhang, who holds more than a dozen patents related to data mining, believes the algorithm could also uncover the underlying pattern of events behind disease outbreaks if more medical data were made available. Unfortunately, there is no central, public repository of disease data comparable to NOAA’s weather database. Of course, the release of medical records is a much more sensitive matter than the release of yesterday’s weather statistics.

“We would like to discover or even predict disease outbreaks, predict where they might
spread and whether they will become more virulent over time,” he says. “We would also like to predict the time line for the spread of a disease — like, would it get to New York state in a week?”

Another Watson School group is looking into Big Data applications to answer New York travel questions of a different sort.

To build new roads, plan bus routes or organize the emergency evacuation of a large city, officials need to know where people go and where they congregate. That is a complicated matter. In New York City, for example, someone may be on the subway at rush hour, on Wall Street for the workday, at a Chinese restaurant for an hour after work and then at Yankee Stadium for a night game. After that comes a brief stop at a local watering hole and then a taxi ride home.

When huge numbers of people are involved, Big Data can help sort out the details. Watson researchers in systems science and industrial engineering used anonymous social network data to analyze movement patterns in the city.

The team — Associate Professor Sarah Lam, Assistant Professor Sang Won Yoon and graduate students Keith Thompson and Ion Ho — worked with just four pieces of data provided by the Xerox Research Center in Webster, N.Y.

Xerox wanted the team to study movement patterns using 15 million tweets and other social network messages. Xerox provided the data — a user ID that did not include the user’s name, the time a text message was sent, the GPS location from which the message was sent and the message's content.

With just those four pieces of information, the Binghamton researchers were able to unravel the travel of 270,000 New Yorkers. For instance, the team could tell what kind of restaurants a user preferred and if this preference changed over time.

The researchers could also track movements of large numbers of people. “Why is this information important? With it, we can have better traffic-management systems and better urban planning for subway stations, buildings, parking lots and more,” Yoon says.

But the big payoff may come if New York is the target of another terrorist attack or other emergency requiring evacuation. “This research provides us with data on how many people might be in a given area at a particular time,” Thompson says.

In a second transportation-related project, Krishnaswami “Hari” Srihari, dean of the Watson School, is working with Lam and Yoon to measure how often truck drivers use cruise control or change lanes. Cruise control saves gas; changing lanes uses more. Sensors implanted in the truck will record the data, which could have a measurable impact on driving habits in the fuel-guzzling trucking industry. Says Yoon, “If they save just a small percentage of the gas they are using, it’s a huge cost savings.”

It all started with a research partnership that, over the course of a decade, laid the foundation for much more: continued growth of a privately held company, its recent launch of a new division and a promise to create high-paying, high-tech jobs in a region in which unemployment remains historically high.

Innovation’s new Advanced Systems Division is the latest business to join the Start-Up Suite at Binghamton University’s Innovative Technologies Complex. In addition, Innovation is among the first few in the suite to apply for the START-UP NY program, a New York initiative that gives qualifying businesses the opportunity to operate completely tax-free for up to 10 years if they launch, relocate or significantly expand in the state through affiliations with universities and colleges such as Binghamton.

Innovation's new division targets pharmacy automation market

Old friend moves new business to campus
Innovation, a private company based in nearby Johnson City, N.Y., designs and manufactures some of the nation’s most advanced pharmacy automation systems — packaging and dispensing systems and other process-optimizing technology — for all levels of pharmacy operations, from smaller pharmacies that fill several hundred prescriptions per week to much larger organizations that fill tens of thousands of prescriptions a day. Customers include independents, chains, hospitals, health systems, government entities and central fill-and-mail order operations.

Tom Boyer, Innovation’s chief operating officer, says the 42-year-old company’s new division will offer professional and integration services for the pharmacy automation market. They’re services that Innovation found itself being asked to provide customers on an as-needed basis, as a way of showing them how to better use and incorporate Innovation’s equipment and systems.

Joe Galati is heading the Advanced Systems Division as its general manager, transitioning from his role as vice president of integrated logistics and support at Innovation.

“We are all looking forward to a very exciting and successful relationship as we enter this next step of our collaboration with the University,” Boyer says.

Partnering with Binghamton

Innovation’s involvement in the START-UP NY program will give its Advanced Systems Division invaluable access to the University’s premier resources: top faculty experts, advanced research and technology, and talented students.

The Start-Up Suite offers companies low-cost office space and business support services, as well as increased opportunities for collaboration with Binghamton and the chance to apply for certain grants and other funding.

Per Stromhaug, who oversees the Start-Up Suite as executive director of Entrepreneurship and Innovation Partnerships at Binghamton, describes the suite as a “pre-incubator to help companies get started.”

“Very often, the business starts with one person,” he says. “They’re often faculty, have their day job and come here (to the suite) at night to work.”

Innovation has already made great use of its relationship with Binghamton, tapping into the University’s engineering and research expertise over the past decade. In a recent quarter, Innovation and the University were working together on eight analytical or modeling projects, according to Boyer.

“The particular advantage of Binghamton is they have this very rich cross-disciplinary knowledge pool available,” he says.

The University’s Watson Institute for Systems Excellence (WISE) has helped Innovation statistically validate simulation models of its systems and analyze performance and reliability, as well as gain tighter control of next-generation procedures for a higher level of quality and dependability, Boyer adds.

This partnership has advanced the research activities of Binghamton faculty and given students meaningful learning opportunities outside the classroom. In fact, Innovation employs 24 Binghamton graduates. The company has about 150 employees total.

“There’s a big advantage to us working in collaboration with the University,” Boyer says. “Their computing capacity is unbelievable. They took one of our modeling projects and got it done in two or three days, and they provided a high degree of analysis in evaluating the results of those production runs.”
The new division

The Advanced Systems Division will start with two or three employees, likely recruited from out of state or from Innovation, Galati says. By the end of the first year, he expects the division will have five or six employees and grow to employ 20 to 25 people within five years.

The jobs will be professional, high-tech or engineering-oriented, with some positions having starting salaries of $65,000 to $75,000 annually, he adds.

“We want to offer services to the pharmacy industry in a very unique way that’s not there today,” Galati explains. “We want to work on projects ranging from patient adherence to their therapies, all the way up to productivity in the pharmacy itself. With help from our good friends at the University, WISE and the Watson School, we can make a big, sweeping impact in the sector.”

Boyer says the new division will offer à la carte services that clients can choose from based on their needs — without being required to buy any of the parent company’s products. These services could include simulations to show clients how they can enhance effectiveness and productivity, as well as other offerings that demonstrate the best use of staffing and ways to improve workflow, inventory management, and facility layout and design.

“A customer with a small chain of pharmacies may be interested in consolidating the operations of 120 to 130 of its stores into a central facility, Boyer explains.

“So they have questions — not pharmacy questions, but logistics questions, distribution questions,” he says. “How much of that work can be directed to a central facility? At what time? So they come to us and we say, ‘That’s all we ever do. We’re familiar with it.’”

START-UP NY

Participating businesses must create net new jobs by being a new start-up in New York, relocating to New York from out of state, or by having employees in New York with plans to expand and create jobs in the state (not move existing jobs from elsewhere in the state).

“This is an extraordinary opportunity for industry to partner with higher education in order to spur economic growth in New York state,” Binghamton President Harvey Stenger says. “We want to collaborate with companies whose products and technologies align with our University’s research and academic missions.”

The University is targeting technology businesses with expertise in the areas of health sciences, smart energy, and microelectronics integration and packaging.

Businesses must locate on property affiliated with the sponsoring college or university. Certain types of businesses, such as retail and hospitality, are excluded from the program.
Guy German used to just sigh to himself when he saw shoppers in the cosmetics aisle, imagining that they were on their way to cleaner, more youthful skin. “Is it real or is it snake oil?” he would wonder.

As a bioengineer with expertise in fluid and solid dynamics, he decided to find out whether there was more going on than hype. “I’m interested in the underlying physics of it,” he says.

Most cleansers — from shampoo to floor cleaner — are based on surfactants. They’re a handy way to remove dirt and oil.

Why is that? The surfactant creates a nice, foamy lather. It also works as an emulsifier. “Essentially, oil and water do not want to mix,” German explains. “When surfactants are added during washing, they will sit at oil-water interfaces. This reduces the surface tension at the interface of the two liquids and allows the oil drops to be suspended in the water.”

But as your skin gets clean, it may also feel tight. That’s because along with the dirt, you’re washing away lipids and natural moisturizing factors that healthy skin needs.

Washing changes the chemical composition of the dead skin cells that form the outermost layer of skin, the stratum corneum. This shell is what protects the soft, tender living tissue — the rest of you — from dehydration and infection.

“You’ve got to thank the stratum corneum for allowing you to live on land,” German says. “It works to slow down the water escaping from your body, which means we can live on land and not in the ocean.”

In a study funded by Unilever, German developed a technique called high throughput correlation tracking to measure how much the stratum corneum dries out and stiffens after being treated with surfactants. This technique will allow researchers to test hundreds of surfactants and build a better soap.

To keep your skin healthy, read the label on your soap or skin cleanser, German advises.

Surfactants have a variety of names. Cocamidopropyl betaine, cocamide DEA, ammonium lauryl sulfate, lauramide DEA, sodium cocoglycinate, sodium lauryl ether sulfate and alkyl polyglucoside are common. Some dry your skin a little, some a lot.

Compare the surfactants on skin cleansers with harsher cleaners, say, floor cleaner or dish detergent. Find a match? That may help you decide what to put on your face. —Todd R. McAdam
Improving artificial joints

Researcher engineers greater performance of upper-limb prostheses

Joint replacement surgery offers people with painful and degenerated joints the opportunity to have them replaced with more functional orthopedic prostheses. However, many of these artificial joints can wear out prematurely, requiring additional surgeries with a lower rate of success.

Ryan Willing, assistant professor of mechanical engineering, aims to improve artificial joints by applying a systematic engineering approach to the field of orthopedic biomechanics. Willing uses a combination of cadaveric studies, mechanical experiments and computer modeling techniques to simulate the conditions artificial joints operate in, in order to predict when they will fracture or wear out. Better understanding the failures of these joints also allows him to optimize their designs for improved performance.

Willing is focusing on improving the design of upper-limb (elbow) devices and eventually hopes to put together a lab that can improve the performance of any joint replacement using computational modeling and experimentation combined with design optimization. —Chris Ertel ’14

As one of just 15 recipients of a 2014 Summer Scholars and Artists award, Watson bioengineering student Rebecca Irwin is spending her summer in the lab investigating how bacterial biofilms grow and how to inhibit their formation. Her faculty mentor on the project is Paul Chiarot, assistant professor of mechanical engineering.

Irwin’s project includes developing two microfluidic devices. The first is a biofilm reactor that has two identical, parallel channels that allow for on-the-chip comparison of two different biofilms in each channel: one natural “wild type” and one mutant. The second device will produce artificial outer membrane vesicles identical to the ones found in nature, which will help researchers understand how these vesicles are formed and the nature of their functions in bacterial physiology and behavior.

Zhongzhou Huang is the other Watson School student who received a Summer Scholars award this year. A mechanical engineering student, he is investigating the mechanical properties of carbon and boron nitride nanotubes-based polymer nanocomposites under the guidance of Changhong Ke, associate professor of mechanical engineering. —Natalie Blando-George
INTO THE LAB

Research lab meets movie studio
Inside the Seymour Kunis Media Core

RESEARCHERS
Scott Craver, associate professor of electrical and computer engineering; Lijun Yin, associate professor of computer science

PURPOSE
The lab provides facilities for multimedia research, including security, forensics, biometrics, steganography and steganalysis, immersive displays, and virtual and augmented reality.

LOCATION
Second floor, Engineering and Science Building

SPECIAL FEATURES
• An overhead grid for hanging lights and cables
• A rear-projection video wall designed to test human-computer interaction
• An open floor plan with highly reconfigurable spaces for experiments
• A green screen
• Room for multiple student groups to set up experiments for testing
• Electrical outlets in the floor, walls and ceiling

RESULTS
Scott Craver, a recipient of the prestigious Presidential Early Career Award for Scientists and Engineers, conducts research related to information security, especially digital watermarks and ways to break them. He and doctoral student Idris Atakli, MEng ’07, are developing the Brief-lifetime Ink (BLINK) system. The device, designed to sit on the cable between a computer and a monitor, can temporarily decode an encrypted document, achieving the goal of self-destructing e-mail that can’t be copied or shared.

Lijun Yin and doctoral student Shaun Canavan are working on a simulation project designed to measure drivers’ gaze and determine whether they’re sleepy. Another project, combining speech, video and 3D graphics, could enable people with physical disabilities to create art or compose e-mail messages more easily. “Eventually, computers will be able to read people’s intentions,” says Yin, who plans to combine eye tracking with physiological data to measure stress levels and other factors. —Rachel Coker

GO INSIDE the Seymour Kunis Media Core and get a 360-degree view at go.binghamton.edu/kunis360.
Dawn Sutherlin ’00 and Robyn Burg Decker ’00, MS ’04, have been classmates, peer advisors, engineers, managers, world travelers and friends since they met in the Watson School.

Today, Sutherlin is a product engineer working on Corning’s specialty optical fiber products. She travels the world as the technical liaison between Corning’s customers and the specialty optical fiber manufacturing team.

Decker, based in Edinburgh, Scotland, works for BAE Systems and is on the executive leadership team for the UK Aircraft Carrier Program. She ensures the program operates within the governance structure and keeps external stakeholders informed.

But at Binghamton, they were members of a small group of women engineering students, taking nearly all the same classes and participating in Tau Beta Pi, the Engineering Honor Society. And they just “clicked.”

“We spent a lot of time together in and out of classes,” Sutherlin says. “And no matter where you are, when you meet someone that you click with — you just become friends.”

After graduation, Decker went to work for BAE Systems. She started as a circuit design engineer, then moved into project management and international business development.

“Each job builds on the knowledge and skills that I learned in the previous positions,” says Decker, who has been in program management for about 10 years.

“We are currently building two aircraft carriers for the Royal Navy, employing approximately 10,000 people on the program. My role is based in Edinburgh, but I am frequently traveling around the United Kingdom,” she says.

Sutherlin has been with Corning for most of her career, starting as a controls engineer and then a process engineer. When Corning sold the division in which she works to a company called Avanex, she moved to Bangkok, Thailand, for a few months to help with the transition of manufacturing to an overseas facility. She later returned to Corning and has been an applications engineer for the past six years.

Both agree that having earlier experiences with manufacturing has helped them in their current positions, as they need to understand manufacturing processes in order to set requirements for things that their companies make or build. Even if those things are as different as warships and optical fiber.

Sutherlin says she and Decker are extremely busy, but all it takes is a quick, one-line e-mail to stay in touch.

“Good friends can do that — pick right back up where you left off when you get together again,” she says. “We have been blessed in that I have a job that takes me around the world. And anytime that I get to places in Europe that are near Robyn, we try to find a way to connect.” —Diana Bean ’81
Over the course of a week, the volunteers built bunk beds and outhouses, skirted trailers and installed wheelchair ramps. They also studied the writings of Native American leaders and attended presentations and performances by Lakota leaders and artists.

“This wasn’t a vacation,” Shull says. “We did a lot of manual labor, but it was enjoyable because we all worked together.”

On the last day, Catalano and his students delivered outhouses and bunk beds they had made. “That day above all others touched our hearts in ways that we perhaps will never recover from,” he says.

“I remember, most poignantly, at one house a little girl who reached out to touch her new bed. She seemed frozen in time at first, but then smiled a most beautiful smile followed by a torrent of tears,” Catalano adds.

Shull, too, was deeply affected by Pine Ridge. “I can’t stop thinking about ‘Mitakuye Oyasin.’ The idea that you learn from everyone you’re living with and that

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“After this trip I’m not thinking about what I can make that’s cool, but what in this world needs improvement and how can I apply what I know to change things?”

—Gabriella Shull

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Shull, too, was deeply affected by Pine Ridge. “I can’t stop thinking about ‘Mitakuye Oyasin.’ The idea that you learn from everyone you’re living with and that
you’re all connected; it really resonated with me,” she says.

The service-learning trip also served as a fact-finding visit to identify capstone projects for senior engineering majors to pursue in 2015. All engineering students are required to successfully complete a senior-year design project.

Although she won’t be taking senior design for another year, Shull is already contemplating her capstone project.

“As an engineer you focus on things that are in front of you and sometimes it seems almost disconnected from the real world,” she notes. “But then you go to the reservation and you see how you can apply your studies to make things better.”

The non-engineering majors participated in the trip as part of a Community of Peace initiative implemented in the University’s Apartment Communities, where Catalano is faculty master. This effort challenges students to become agents of peace in the residential community, on campus and beyond.

Funding for the trip was provided through a 2013-14 Iberdrola USA Foundation Grant and Binghamton University’s Office of the Provost and Division of Student Affairs.
Designing the future of surgical gloves

Seniors create puncture-resistant device for use in abdominal surgery

by Natalie Blando-George

Last summer, bioengineering students Katie Schwiker, Lisa Benison and Matt Reiss agreed to team up for their required, two-semester senior design course. They decided to add a fourth team member and looked outside their own engineering discipline.

“Other engineers have a different mindset in how they think and how they go about projects,” Schwiker explains.

Reiss suggested senior mechanical engineering student Calvin Davis, who quickly agreed. “I knew Lisa, Matt and Katie were very good students and took their work seriously,” Davis says.

For their project, the team chose a problem presented by a New Jersey surgeon: “Design a device to protect the hands of assisting surgeons from needle stick injuries during abdominal surgery while also maintaining manual dexterity and increasing retracting ability.”

Davis had further reasons for selecting this problem. “Since I am going to medical school, being able to work with an osteopathic physician was a valuable opportunity,” he says.

During the first semester of the sequenced course, students complete assignments each week that lead them through the design process.

“During the fall semester we spent a lot of time researching existing solutions to solve individual problems, but not necessarily our specific problem; looking at different materials; purchasing samples; and doing some testing,” Schwiker explains. “We also came up with multiple design iterations for our device [a glove], so we had several to choose from.”

“By the end of spring semester we knew what our device should look like, roughly what it would be made of and approximately how it would be made,” Benison adds.

Making the glove presented the students with a significant challenge.

“We had a design aspect of the device that is key to its retraction, and when we discussed our ideas with our seamstress, her expert feedback was that it was probably not going to work,” Reiss says. “We had a long period when we wondered if we might have to redesign the glove entirely.”

The team altered some of its construction plans and that, combined with the hard work and perseverance of the team’s seamstress, resolved the problem.

Most of the spring semester was spent devising and performing dozens of tests that focused on the four criteria essential to meeting the client’s needs: dexterity, puncture resistance, retraction and sterilization. All the tests met or exceeded their performance expectations, and by the end of the semester, a prototype was presented to the client.
To actually be used in a surgical environment, the glove must be constructed with surgical-grade materials and tested under U.S. Food and Drug Administration guidelines. However, the students are happy with their results, especially because they say there's nothing like their device on the market.

“There’s stuff out there that can prevent needle-stick injuries, and there’s stuff out there to help with retraction, but ours is a happy marriage of the two,” Reiss says.

The group’s faculty advisors, Amber Doiron and Guy German, both assistant professors of bioengineering, were also pleased with the team’s work.

“These four have been an impressive group in terms of the results they achieved in the given timescale,” Doiron says.

“They were all very engaged with the project, and they worked extremely effectively together,” German adds.

Providing students with a comprehensive engineering experience is the idea behind the course.

“Senior capstone design students get the chance to examine a problem from all sides and come up with a solution,” Doiron says.

“Even if their solution isn’t perfect, they take away a much more global understanding of engineering.”

German concurs. “With this experience our students get the opportunity to take something from start to finish and that is fantastic,” he says. “I think this is what engineering is about.”

All four students graduated in May. Schwiker joined the U.S. Patent and Trademark Office as a biomedical engineering patent examiner. In the fall, Reiss will pursue graduate work at the University of Pennsylvania, and Davis begins medical school at Nova Southeastern University College of Osteopathic Medicine. Benison is also pursuing graduate studies.

From left, Matt Reiss, Katie Schwiker, Lisa Benison and Calvin Davis perform dozens of tests in the Biomedical Nanotechnology and Molecular Imaging/Biological Soft Matter Mechanics laboratories as part of their senior design capstone project.
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