

# RESEARCH at RIT

The Rochester Institute of Technology Research Report

Fall/Winter 2016-17

SPOTLIGHT ON

## HEALTH CARE TECHNOLOGY

### Building Expertise

Research, Partnerships Offer New Avenues for Growth

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## RESEARCH at RIT

The Rochester Institute of Technology  
Research Report—Fall/Winter 2016-17

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# Health Care Technology

It has been a tremendous year for research at RIT, as sponsored research grew by almost 18 percent in fiscal year 2016, reaching a record \$73 million in new awards.



Building a thriving research enterprise is a critical part of our strategic plan, Greatness Through Difference, which states that “RIT will be internationally distinguished as a

research university through its focus on and investment in specific inter- and transdisciplinary research areas...”

One focus area selected for this targeted investment, Personalized Health Care Technology, is already helping to drive growth in sponsored research. For example, we now are averaging approximately \$3 million to \$4 million a year in new awards from the National Institutes of Health, which historically had not been a large source of funding for RIT.

We would all like a world in which everyone has accessible, personalized, and affordable health care. However, we know the challenges posed by rising health care costs. At RIT, we are focused on enhancing personalized care and access through intelligent, mobile, and wearable technologies that integrate user-centered design and leverage computation and data, behavioral, and social sciences, with the goal of improving outcomes in a cost-effective manner. We seek to develop these technologies and ensure they are commercialized and available for use.

This vision is at the basis of our partnership with Rochester Regional Health. In 2008, RIT formed a strategic alliance with Rochester General Health System, which has since become the largest health care provider in upstate New York, now known as Rochester Regional Health. This alliance catalyzed many new joint educational, research, and entrepreneurial activities, and is closely linked to establishment of its College of Health Sciences and Technology, RIT’s ninth college.

The college recently opened the RIT Clinical Health Sciences Center in 45,000 square feet on the west side of campus. The new facility has state-of-the-art teaching and research labs for RIT’s physician assistant and ultrasound programs.

It is the mission of the college to prepare the next generation of health care professionals by providing innovative educational and clinical learning experiences, with a strong background in translational research and discovery and the application of evidence-based practices in community health. The college has grown rapidly since its inception and now boasts the Wegmans School of Health and Nutrition, the Center for Bioscience Education and Technology, and the Center for Applied Psychophysiology and Self-Regulation.

RIT’s new health care technology programs complement and enhance strengths in health care research associated with the National Technical Institute for the Deaf, as well as access technology. Efforts with our new and existing partners in the health care arena—including the University of Rochester Medical Center, Al Sigl Community of Agencies, Arc of Monroe, Nazareth College, Association of the Blind and Visually Impaired, Mary Cariola Children’s Center—hold the potential to dramatically expand health care research at RIT. I hope you enjoy reading about this rapidly emerging and exciting area of research at our university.

Best regards,

Ryne Raffaele  
Vice President for Research  
and Associate Provost

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**On the Cover**  
The Clinical Health Sciences building is home to RIT’s ninth college and the epicenter of the RIT-Rochester Regional Health Alliance.



RIT’s faculty, staff, and students have received significant national and international recognition for their research in a host of fields. A summary of awards and honors is provided.

# RIT News

Below are just a few of the stories making headlines, including newsmaking rankings, innovations, and awards.

## RIT Ranked Among Top National Universities by 'U.S. News & World Report'

RIT is being recognized as a top tier national university for the first time in the 34-year history of *U.S. News & World Report* rankings. The change is a result of the university's reclassification in becoming a "doctoral university" this year due to its rapid increase in research and Ph.D. graduates.

The 2017 edition of *U.S. News & World Report Best Colleges* ranked RIT 107th in the "National Universities" category. These top universities—a grouping of 310 schools—"offer a full range of undergraduate majors, plus master's and Ph.D. programs, and emphasize faculty research," according to *U.S. News*. RIT had previously been listed among "Regional Universities." Overall, *U.S. News* cites 1,374 four-year colleges and universities in various categories.

The move to the top tier national category was triggered earlier this year when RIT was listed as a "doctoral university" by the leading classification of U.S. colleges and universities.

The Carnegie Classification of Institutions of Higher Education changed RIT from "Master's—Comprehensive" to "Doctoral University." This change occurs when a university graduates more than 20 Ph.D. degrees per year, a figure that RIT has exceeded in recent years. RIT has seven doctoral programs: astrophysics, color science, computing and information sciences, engineering, microsystems engineering, imaging science, and sustainability. A Ph.D. in mathematical modeling begins in fall 2017.



## RIT Students Win Global Anti-Terrorism Contest

It's Time: ExOut Extremism, a social media campaign created by RIT students, took top prize in a global challenge conducted by the U.S. State Department aimed at finding ways to counter terrorist propaganda online.

The RIT team was the only group from the United States to reach the finals of the P2P: Challenging Extremism competition, and became the first U.S. team to win first place, defeating this year's other finalist teams from Vesalius College in Brussels and Khazar University in Baku, Azerbaijan.

A social media marketing class in Saunders College of Business worked with the Muslim community in Rochester, N.Y., to develop a campaign that included a logo, website, social media, video platforms, and events to raise public awareness.

Judging the competition—held in

Washington, D.C., in June—were officials from the State Department, Facebook, the U.S. Department of Homeland Security, the Combating Terrorism Technical Support Office, and the National Counterterrorism Center.

RIT bested 56 university teams from around the globe including University of California, Berkeley; University of Southern California; Miami University; Oxford; Ohio; New York University; and the University of Mississippi.

In September, the students attended a star-studded gala at The Metropolitan Museum of Art to receive an award for their extraordinary contributions to the global campaign against violent extremism. The RIT "It's Time" team joined world leaders and representatives of international organizations, non-governmental organizations, corporations, and the media. The event was emceed by CNN Lead Political Anchor Wolf Blitzer.

**107<sup>TH</sup>**  
IN THE  
"NATIONAL  
UNIVERSITIES"  
CATEGORY.

## RIT Becomes First University to Launch Video Game on Xbox One

In August, RIT became the first university to publish a video game on the Xbox One gaming platform.

*Hack, Slash & Backstab* was produced in residence at RIT in a studio course offered through RIT's internationally ranked School of Interactive Games and Media, and the RIT Center for Media, Arts, Games, Interaction and Creativity (MAGIC).

*Hack, Slash & Backstab* is a two-

to four-player couch co-op dungeon crawler that uses a game setting to seemingly reduce the stakes. Players work together as warrior, rogue, wizard, and archer to survive a dangerous world, but only one player will be crowned the winner as betrayal and backstab become the tools of choice.



## RIT Named in \$4.2 Million NSF Grant to Fund Entrepreneurial Growth and Innovation

The Upstate New York Alliance for Entrepreneurial Innovation—a partnership of Cornell University, RIT, and University of Rochester—has been awarded \$4.2 million from the National Science Foundation Innovation Corps Program to lead entrepreneurship and commercialization support programs targeted at the scientific community through an NSF I-Corps Node site at Cornell.

The I-Corps program is designed to help teams determine the commercial readiness of their technology concept and identify obstacles that must be overcome to launch their product. The grant will allow the UNY Alliance to capitalize on the partner universities' research to support innovative science, technology, engineering, and mathematics-related pursuits throughout the state.

Led by faculty and entrepreneurs from the three schools, the program will highlight business-model development and customer discovery to apply the state's best research to benefit participants who want to start their own companies and researchers who may go on to work in industry.

"This program is designed to advance the technological ecosystem by providing

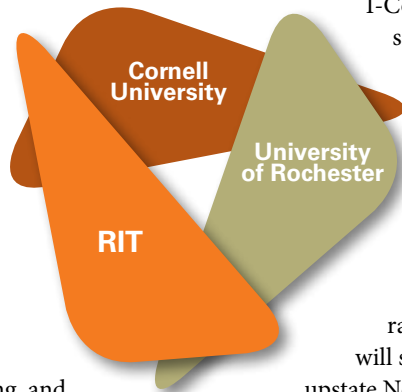
scientists and engineers with the resources they need to turn their discoveries into products, process solutions, and viable businesses that will have a positive impact on society and the regional economy," said Lance Collins, Cornell's Joseph Silbert Dean of Engineering. Cornell Engineering and its partner schools will lead the node program with support from the Cornell Center for Regional Economic Advancement.

Fostering and promoting a diverse and inclusive entrepreneurial community is a key element of the program. "There is great potential to expand

I-Corps programming to significantly increase STEM commercialization generally and, specifically, to under-represented groups," said Ryne Raffaele, RIT vice president for research and associate provost. "This collaboration with our partners will shine a spotlight on upstate New York as a hub for STEM education and entrepreneurial endeavors."

In addition to creating a regional hub for research-driven commercialization, the UNY Alliance will leverage the national network of I-Corps Nodes, further strengthening ties between the scientific and entrepreneurial communities across the United States.

For more information or to learn about the application process, visit [ctt.cornell.edu](http://ctt.cornell.edu).



## RIT Sponsored Research Earns \$73 Million in Funding

RIT's sponsored research portfolio grew by almost 18 percent in fiscal year 2016, reaching a record \$73 million in funding.

RIT received a record 358 new awards during that time period from a variety of state, federal, corporate and foundation sponsors. Included in that funding was a record \$15 million from the National Science Foundation, an increase of \$2 million, and \$3 million from the National Institutes of Health.

"We continue to grow RIT's reputation as a research university, with ever-higher new awards and record funding, especially impressive given that many funding opportunities are in decline," said Ryne Raffaele, RIT's vice president for research and associate provost.

Among the 2016 award highlights:

- \$1.33 million from NSF to Don Figer, professor of imaging science and director of RIT's Center for Detectors, for "New Infrared Detectors for Astrophysics";
- \$820,504 from NSF to Brian Trager, faculty in information and computing studies at National Technical Institute for the Deaf, for "RoadMAPPs to Careers: A New Approach to Mobile Apps Education featuring a Mapp for Deaf and Hard-of-Hearing Students;";
- \$666,960 from NSF for Shanchieh Yang, professor of computer engineering at the Kate Gleason College of Engineering, for "TWC: TTP Option: Small: Automating Attack Strategy Recognition to Enhance Cyber Threat Prediction."

For more information, go to [www.rit.edu/research](http://www.rit.edu/research).

**Don Figer:** \$1.33 million received from NSF for "New Infrared Detectors for Astrophysics"





# History of the RIT-Rochester Regional Health Alliance by Cynthia Gray

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**Cynthia Gray**

Massive health care reform was on the horizon, fueled by a national challenge to deliver better quality and safety for patients while keeping costs down. It was against that backdrop that an alliance was formed between two organizations, a partnership that would focus on employing technology and collaborative clinical research to redefine health care education and delivery.

## **A Meeting to Talk Strategy**

That alliance between RIT and the former Rochester General Hospital System (now known as Rochester Regional Health) was launched at a dinner meeting in

December 2008. RIT President Bill Destler, former RGHS CEO Mark Clement, and the late Michael Morley, a member of both RIT and the hospital system's boards, came together to talk

about how a strategic alliance between the two organizations could leverage their respective strengths and benefit both.

It took another year to work out the details. But by December 2009, an interim

**A New Building:** Construction of a new home for the College of Health Sciences and Technology is among the highlights since the RIT-Rochester Regional Health Alliance was formed.



managing director and a team of consultants were in place and an agreement was signed to establish a joint committee whose working groups would create a strategic plan for the alliance. The committee drafted a five-year plan, which was presented to boards of both organizations for approval by June 2010.

The five-year strategic plan recommended:

- Development of an Institute of Health Sciences and Technology to solidify the union of technology and medicine to innovate in health care education and delivery;
- Development of mutually beneficial shared services that take advantage of mutual strengths and expertise to create increased access to quality health care and education and to create cost efficiencies for both institutions.

### **Rapid Growth Follows Launch**

Since that approval, so much has happened. In February 2011, the Institute of Health Sciences and Technology was established, and a search was initiated for a new vice president and dean. That April, RIT announced creation of its ninth college, the College of Health Sciences and Technology, with enrollment for the 2011-12 academic year of more than 550 students. By year's end, Dr. Daniel Ornt had been hired as vice president of the Institute and dean of the College of Health Sciences and Technology.

Under Dr. Ornt's leadership, the college continues to grow.

Programs include master's degrees in health systems administration and medical illustration, BS degrees in biomedical sciences, nutrition management, diagnostic medical sonography (DMS), and physician assistant,



**Dr. Daniel Ornt:** Named vice president and dean of CHST in 2011. He has led significant growth in RIT's ninth college.

which was approved for a new 5-year BS/MS degree. The DMS program has added a certificate in echocardiography and a certificate in exercise physiology has now evolved into a BS in exercise science as part of the new Wegmans School of Health and Nutrition. The college enrollment has now expanded to enrollment of 645 students.



**Campus Clinic:** Rochester Regional Health Family Medicine clinic, which opened on the Henrietta campus in October 2015, offers same-day appointment scheduling for RIT faculty, staff and dependents, and community members.

◀ **Studying in Comfort:** This bright, spacious modern lounge is a popular feature with students and staff in the Clinical Health Sciences building, a 45,000-square-foot addition to the north end of Louise Slaughter Hall.

Shared services between the two organizations also has expanded over the years. Starting in 2013, RIT modeled an employee health benefits plan to offer significant discounts for employees to use the health system's providers. RRH established a Find-a-Physician Service for RIT faculty and staff, including assistance with appointments, and more RIT staff are now getting medical services from RRH.

In fall 2013, Rochester Regional secured a five-year agreement with RIT Athletics to provide sports medicine services for the university's teams, with 24-hour on-call





**Testing, testing:** Fourth-year student Jill Cerame serves as a practice patient as student Shawna Nielsen learns how to conduct an ultrasound scan under the supervision of Clinical Coordinator Jodie Crowley.



**On Staff:** Dr. Eric Wilcox and Practice Manager Ashley Goergen in one of the patient examination rooms in the new Rochester Regional Health Alliance clinic on the RIT Henrietta campus.

coverage, expanding Rochester Regional's reputation in its sports medicine and orthopedic program and giving students ready access to expertise and quality care.

**Other Crowning Achievements:**

The October 2015 opening of a Rochester Regional Family Medicine Practice and Lab, co-located in the RIT Clinical Health Sciences Center with CHST's clinical programs: physician assistant, diagnostic medical sonography, the Wegmans School of Health and Nutrition and Behavioral Health Research. This medical practice offers services to RIT employees and partnership opportunities with these clinical programs, as well as with RIT's Better Me Wellness program for faculty and staff.

Our Health Coach initiative is now

in its third year. RIT students, primarily those interested in professional health care careers, are offered a semester course on community health, taught by Rochester Regional and GRIPA clinicians. A practicum course follows in which students work as part of a care management team to impact the health of chronically ill patients. The program helps train the next generation of health care leaders in the challenges of delivering services in the context of psycho/social and economic barriers. To date, 21 patients have been engaged, resulting in a 90 percent drop in their emergency room use and a 35-percent reduction in inpatient visits.

The Health Care Idea Lab, beginning its fourth year, provides RIT students with real-world experience in solving challenges provided by Rochester Regional Health

team members. Projects such as the mobile centrifuge carrier designed by a student team have already reduced costs for the health system. Other student and faculty projects over the years have provided valuable operational studies that have resulted in changes in thinking and process that impact patient safety, and improve quality and the bottom line for the health system, while furthering RIT's signature experiential learning. The alliance is now headed into the future with a new strategic planning process and a new focus on entrepreneurship.

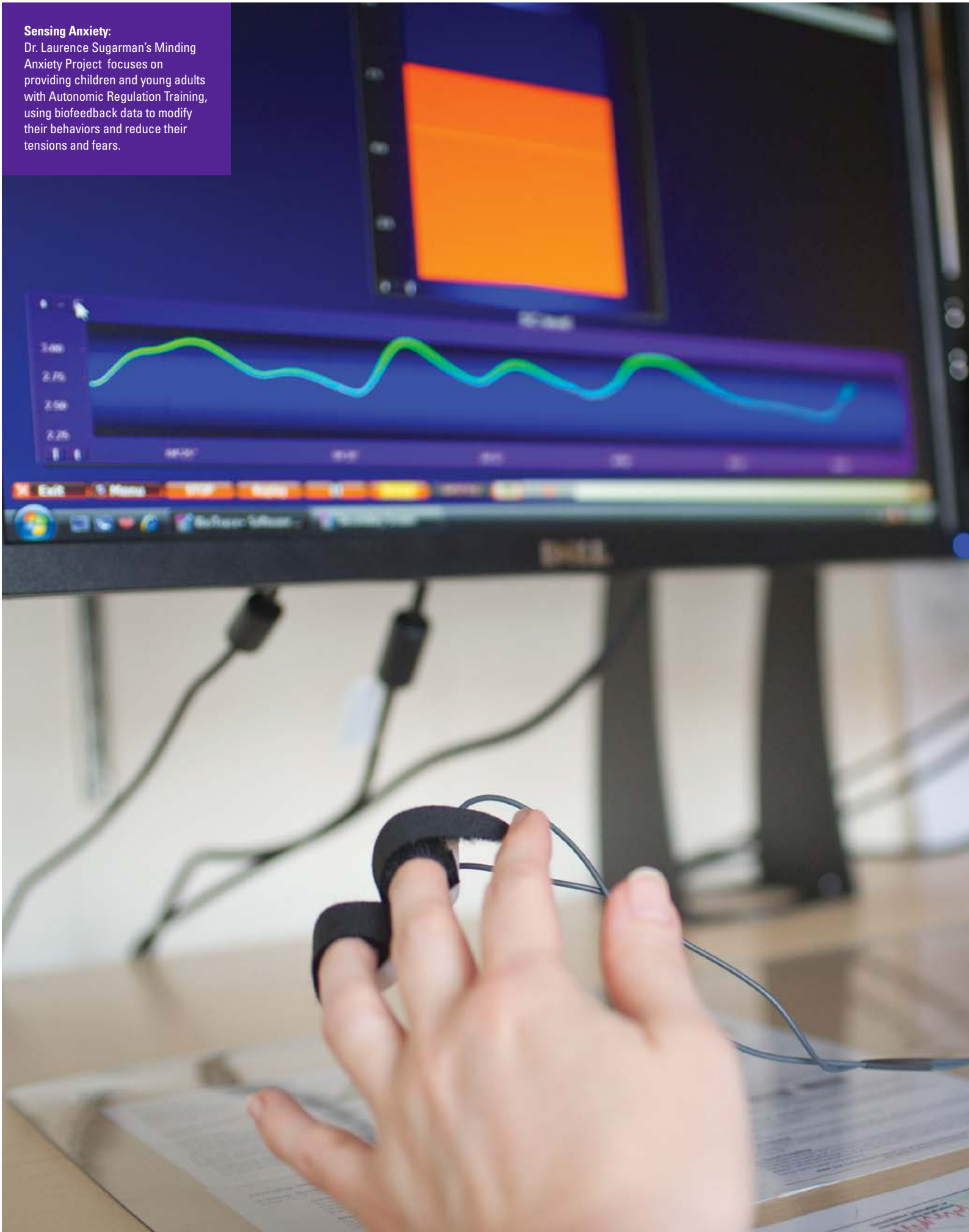
*Cynthia Gray is assistant vice president, RIT-Rochester Regional Health Alliance.*

**On the Web**

RIT-Rochester Regional Health Alliance  
<https://www.rit.edu/affiliate/rrh/>

**Sensing Anxiety:**

Dr. Laurence Sugarman's Minding Anxiety Project focuses on providing children and young adults with Autonomic Regulation Training, using biofeedback data to modify their behaviors and reduce their tensions and fears.



# Research Combines Tech and Health Sciences to Help Children and Adults

by Jane E. Sutter

At the College of Health Sciences and Technology, a pediatrician uses Autonomic Regulation Training (ART) to help RIT students dealing with anxiety and kids with autism. A forensic psychologist employs imaginative ways to help young people learn the dangers of illegal drugs. Other research looks at the most effective treatment for substance abusers with a history of intimate partner violence.



**Laurence Sugarman**

## RIT Students Get Help with Anxiety

Dr. Laurence Sugarman, director of the Center for Applied Psychophysiology and Self-Regulation, operated a primary care pediatric practice in suburban

Rochester for 20 years. He became focused on how to integrate preventive mental health care into primary care because all children struggle with anxiety.

At the same time, he was getting more children referred to him who had neurodiversity, with a large number meeting the criteria for autism spectrum disorder (ASD). He noted that many have difficulty controlling their autonomic—so-called “fight or flight”—responses to stress. Sugarman started using biofeedback for what he calls Autonomic Regulation Training (ART). Since young people with ASD often struggle with social skills that make talk therapy difficult, it makes sense to use computer-based strategies, he said. One advantage of ART is that it provides information in real time to participants, who can then decide how to use the data to modify their behavior.

After joining RIT in 2011, Sugarman developed the Minding Anxiety Project (MAP) when RIT President Bill Destler asked him to use his expertise to help the university’s students. The project involved 104 students who self-identified as having anxiety or ASD. Each student completed psychological surveys and selected goals

in three areas: academics, social interaction, and self-care (such as hygiene and sleep). Each student then learned how ART works and how to use it.

Students were taught how to control their breathing and sweat gland activity, and change their heart rate and skin blood flow while focusing their attention. “It really helped them,” Sugarman said. At the end of the sessions, all of the students increased their self-concept, lowered their anxiety, and successfully moved toward self-selected goals. Sugarman said the odds were less than 1 in 10,000 that the changes were due to chance.

But what is most curious about the results, Sugarman said, is that there was no clear correlation between the physiological measurements and the students’ reported improvements in anxiety, self-image, and behavior. Perhaps the students’ experience that they can learn to control their own physiology and anxiety is more important than actual biofeedback changes, Sugarman said.

“It may not be how you make your breathing smoother and long and regular; it may not be that you know how to lower skin conductance. Just knowing that you can [do these things] could be enough,” Sugarman said. MAP has been handed over to Counseling and Psychological Services for them to offer the program to RIT students, faculty, and staff.

## DyFSS Helps Clinicians Work with Autistic Kids

Sugarman has taken his ART with kids with ASD a step further to improve autonomic biofeedback training so it’s

easier for the child to understand and accomplish. Sugarman points out that, not surprisingly, the neurodiverse are autonomically diverse, meaning they have varied patterns of autonomic control and unpredictable outcomes compared to other children.

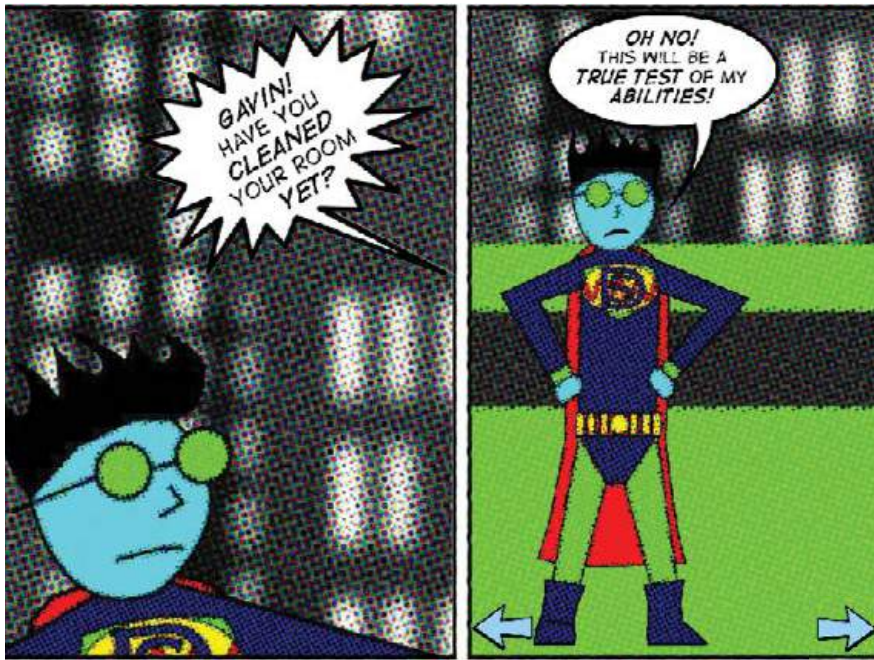
For example, the skin conductance of a child with ASD may not increase when a hand claps unexpectedly, and medication may affect a child’s heart rate variability. So commonly used biofeedback signal-processing software may not be effective.

Sugarman and colleagues developed an algorithm and method called the dynamic feedback set (DyFSS, pronounced diff-iss) to help clinicians quickly and accurately give relevant information to the child. The DyFSS focuses on what the child already is doing best. “Whatever you are doing well, that’s what it feeds back.”

Sugarman gives this example: “If I was playing the violin and you were my teacher, and my intonation and bowing were terrible, and it looked like I was strangling the violin, but the rhythm was really good, you’d say, ‘I really like your rhythm, keep going, keep going with that rhythm,’ with the faith that the positive trends would entrain other abilities.”

Sugarman is especially excited about how DyFSS fits in with RIT’s emphasis on access technologies. He views DyFSS as a technical tool “that increases access for the neurodiverse to autonomic regulation training, increasing access to their own abilities to help themselves.”

With RIT students, Sugarman developed a colorful graphical user interface for the DyFSS. A tutorial and



**Fighting the Stress Monster:** This colorful, interactive game, developed through the work of Dr. Laurence Sugarman, teaches children how to master their “super powers” to fight a “stress monster,” a way to control their anxiety in adverse situations.

quiz, developed with focus groups of kids with ASD, teaches boys and girls with ASD how to develop and master “their super powers” to fight a “stress monster” in various situations to “keep (their) stress control going in the face of adversity.”

The ART protocol was tested with 20 children in a feasibility study; they liked it and their parents reported that ASD behaviors, such as rocking or spinning, improved. The DyFSS is now going

through the federal patent approval process. Sugarman and Drs. Dan Mruzek and Tristram Smith at the University of Rochester Medical Center are collaborating to gather resources and grants to take this project into middle schools in Rochester.

Sugarman also is a consultant on an app called “Repetition Rebellion” being developed by Professor Stephen Jacobs of RIT’s Center for Media, Arts, Games,

Interaction and Creativity, and Robert Rice, a professor at St. John Fisher College. That project is supported by a grant awarded to the RIT Office of Research. The app tracks repetitive behaviors in autism routines and offers coping practices for the user. Ultimately, with these colleagues, Sugarman plans to develop this work further into a “MindGamers” video game in which “players control their stress while successfully navigating their way past overflowing trash cans, asymmetric wall posters, hallway noise, getting called on (in class) and even bullied through a dingy, Tim Burton-esque school,” Sugarman said.

### Virtual Reality Shows How Drugs Affect Body

Four Ph.D.-level students are working as interns performing a year of clinical work in psychiatry in the Rochester community under the oversight of Caroline Easton ’90 (biotechnology/psychology), professor of forensic psychology in the College of Health Science and Technology. The internships are at either Hillside Family of Agencies or Rochester Regional Health.

At Hillside, student Brittany St. Jean uses interactive materials to work with students grades K through 12 to show the effects of illegal drugs on their brain and organs. Students will wear an Oculus Rift, a headset that takes them on a virtual voyage through the human body, showing them the effect of drugs. For example, they see how drugs can stimulate the heart, going from a normal heart beat to a rapid one. “It’s almost like feeling they’re in that environment,” Easton said.

Another tool is called the “virtual roller coaster.” This consists of the child sitting in a gaming chair in front of a large screen. The chair rocks and shakes as the child watches the inside of a brain cell and the negative effects that different drugs have on the brain and behavior. Easton calls it a “creepy, scary ride... We want to show them in an experiential way with these tools that (using drugs) is not fun, it’s dangerous and you can do damage to your organs.”

St. Jean also is looking at whether dual treatment is cost effective. Easton said the cost of integrative care may be as low as \$2,500 as opposed to thousands of dollars



**Using Tech to Produce Science:** RIT professors Caroline Easton '90 and Cory Crane use a variety of interactive technologies in research that is changing how behavioral health clinicians view and treat addiction and domestic violence. Easton oversees the work of four Ph.D-level interns performing a year of clinical work in psychiatry, working with both adults and children at either Hillside Family of Agencies or Rochester Regional Health.

in criminal justice costs and lost work wages due to time spent in jail.

Also focusing on children is student Cassandra Berbary. She is studying whether playing violent video games results in children modeling that behavior. Berbary works with children with behavior management problems who are in group psychotherapy at Rochester Regional Health. “She’s looking at the correlation between violent video games that they play and how they do in treatment,” Easton said.

Children ages 12 and up often play video games that are not age appropriate and have mature content, and the result may be that they have problems in school with impulsivity and inhibition and other behaviors, Easton said. A part of this study is working with parents to educate them on how to monitor and limit their children’s screen time.

Student Lindsay Chatmon is working with adult clients at Rochester Regional Health who have a chronic mental illness, such as psychosis, major depression, or substance dependency. These clients are participating in either a psycho-educational group or cognitive behavioral group therapy. “She’s trying to make the case

that an evidence-based psychotherapy works to target and improve a specific and problematic behavior and whether this healthy change actually works better for these clients in a real-world clinical setting where clients have multiple diagnoses,” Easton said. In fact, “one targeted behavior change can have a snowball effect in the positive direction and it can lead to an overall positive treatment response.”

Two other studies being conducted by the Hillside intern also involve studying adults with substance abuse issues. These are men who also have a history of intimate partner violence. Intern Kaitlin Pughakoff’s work focuses on whether treatment outcomes are better if the men receive therapy for both substance abuse and partner violence, rather than just for one problem. Easton said a previous randomized controlled trial showed better outcomes for the integrated treatment but “we don’t really know how it’s going to work in a real world setting” where clients are treated in larger groups and busy clinicians have a large case load. “Understanding what is effective at decreasing substance use and aggressive behaviors will help us become better at

prescribing client-centered behavioral therapy treatment plans,” Easton said.

Easton said offering the clinical internship program to train and educate interns to provide best practices, and obtain Association of Psychology Postdoctoral and Internship Centers (APPIC) membership and American Psychological Association (APA) accreditation is a step toward developing a Ph.D. program in clinical psychology at RIT. Her hope is that the current interns will choose to stay in Monroe County and become clinical leaders in the field of forensic clinical psychology once their internships are complete.

#### On the Web

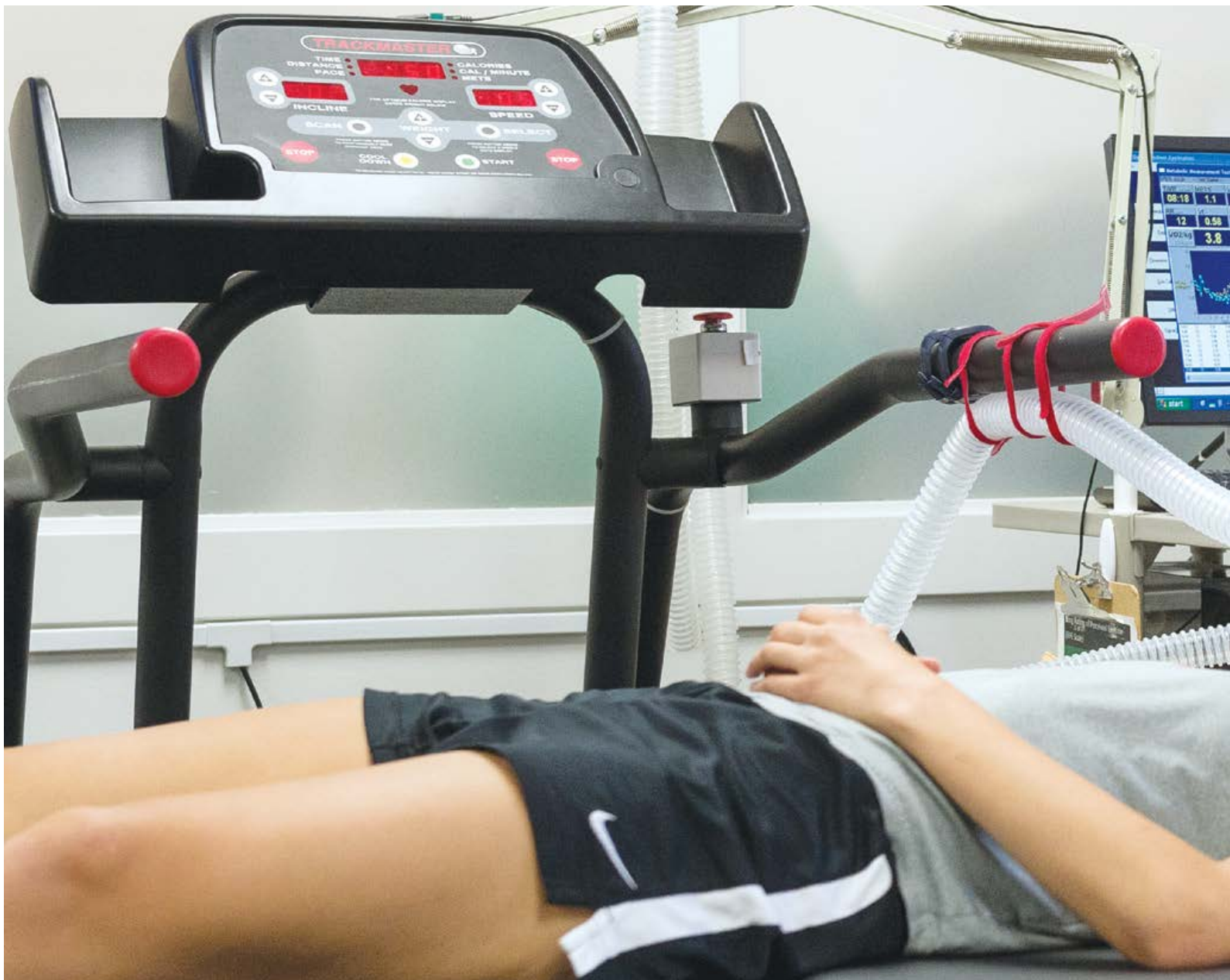
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 and Self-Regulation**

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## Exercise Science

by Suzette Norris

Modern medicine excels at treating disease, but what about helping us avoid it in the first place?

### **New degree focuses on prevention**

That's a loaded question for Bill Brewer, director of RIT's exercise science program, a new, four-year bachelor's degree offered through the College of Health Sciences and Technology.

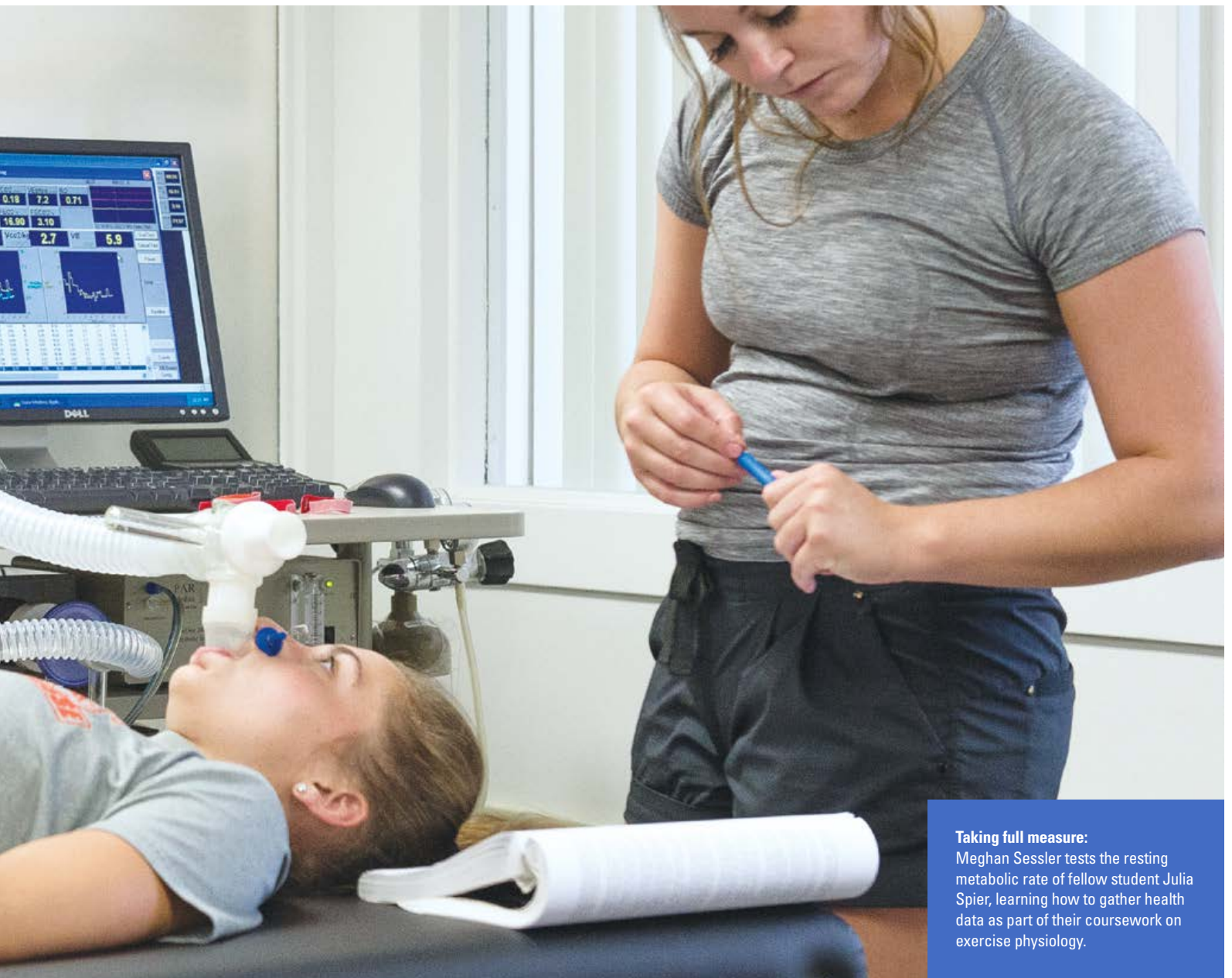
"In many ways we've been using medicine to prop up unhealthy lifestyles,"

Brewer said. "We know that when people are sedentary it leads to an advent of chronic disease, but we don't always see exercise prescribed as the therapeutic tool that can enhance patient health."

The physiological response that occurs during exercise and the effect it has on our health is one of the key themes of

RIT's exercise science program. Brewer believes demand for this expertise will grow as the medical ecosystem moves toward models that require doctors and hospitals to improve patient health over time.

"Today, when signs of coronary artery disease appear, pills are prescribed to change the physiological state that was



**Taking full measure:** Meghan Sessler tests the resting metabolic rate of fellow student Julia Spier, learning how to gather health data as part of their coursework on exercise physiology.

brought about by inactivity,” Brewer said. “The purpose of our program is to create a professional who has the expertise to help people establish exercise patterns to recover from disease or fend it off in the first place.”

The exercise science major provides students with a solid educational base in the biomedical sciences along with a core curriculum in exercise physiology, fitness, and kinesiology (how the body moves). Its clinical track is designed for students who want to help people recover from the unhealthy effects of a sedentary lifestyle. The athletics track is aimed at the science behind improving athletic performance. The four-year degree requires the

completion of 120 credit hours, which includes 65 credits in the liberal arts and sciences, six elective credits and 49 credits specifically in exercise science course work. Brewer, who founded the program, says demand for specialists in both medicine and athletic conditioning is growing.

A science-based approach to athletic conditioning enhances performance and reduces injury, he said. Students learn how to better train and maintain athletes, and have an opportunity to gain hands-on experience through RIT’s athletic program.

As the population ages, clinical exercise medicine also is emerging. Clinical exercise science professionals help patients understand basic indicators of

health such as cholesterol and body-mass index. They study how to motivate patients to change, and learn about the underlying challenges associated with weight loss and smoking. “What does it take to help a 60-year-old patient with high blood pressure, a new knee and a pill habit to get fit?” Brewer said. “Dentists have done a great job teaching us the importance of brushing teeth, and we’re looking for the same kind of impact when it comes to consistent activity over time.”

#### **On the Web**

**Director of Exercise Science Overview**  
[https://youtu.be/nm4dF\\_fvz10](https://youtu.be/nm4dF_fvz10)

**Otto:** This award-winning innovation, designed by 2016 graduate Mariana Pinheiro, uses texture, sound, vibration, and light to stimulate the motor coordination skills of the children who play with it.





# Innovation with Impact— Commitment to Access Technology

by Vienna McGrain

Mariana Pinheiro designs products that will make a difference for children with developmental and physical challenges. Her most recent creation, Otto, is a series of interactive instruments designed to stimulate the senses of children with low-motor coordination skills through the use of textures, sounds, vibrations, and light patterns. And it's just one example of how RIT students and faculty are innovating with impact when it comes to the university's commitment to access technology.

## Award-winning Toy With a Purpose

Pinheiro, a 2016 graduate of RIT's industrial design master's degree program and current adjunct faculty member from Brazil, is among the growing number of students who have a vision for creating products that will improve access for people with disabilities—and those products are being recognized by the community through campus and regional competitions.

In fact, Pinheiro and her design team, Erika Madison (international business, Sodus Point, N.Y.) and Doug Huang (MFA, industrial design, Taiwan), recently won a top innovation award for Otto at the 2016 Greater Rochester Excellence and Achievements in Technology Awards, presented by Digital Rochester Inc.

"Over a number of years, a full-scale access technology design and development program that engages students and faculty in colleges across the university has emerged," said Ryne Raffaele, RIT vice president for research and associate provost. "One of the goals of RIT's strategic plan is to build upon our rich history of developing new technologies to improve access and inclusion for people of all abilities. RIT faculty and student researchers are working with a number of local service providers to support the fine work that they do. It's very gratifying to see how RIT is positively impacting people's lives."

Access technology has become such a focus that RIT holds an annual

conference that showcases research and development in the field and provides a forum for sharing ideas and solutions. And most recently, the most advanced access technology projects were on display for thousands of visitors at Dr. Destler's Access and Inclusion Technology Challenge at Imagine RIT: Innovation and Creativity Festival.



**Dan Phillips**

Leading the signature initiative for RIT is Dan Phillips, Faculty Associate for the Partnership for Effective Access Technology Research and Development. Phillips' goal is to collaborate with cross-disciplinary teams of faculty and students pursuing research and development that targets enhancements in accessibility for individuals with varying abilities.

"RIT's approach of recognizing and integrating design that is functional for engineers, industrial designers, business experts—and, of course, the amazing people who will ultimately be using our products—is the next step of the access technology evolution," Phillips said. "The students, faculty, and staff never cease to amaze me with respect to their ability and willingness to collaborate across disciplines and with our community partners to produce results that benefit society."

## HZ Innovations and Wavio

Greyson Watkins, who is deaf and is a fifth-year computing security major originally from Durham, N.C., created HZ Innovations, which is seeking to enhance life for deaf and hard-of-hearing homeowners with a cutting-edge wireless sound recognition system called Wavio that will soon be marketed across the country. Sound-capturing units plugged into outlets throughout the home are tied into a single central processing unit in the home. When a doorbell rings, smoke



**Sound Invention:** Greyson Watkins, who is deaf, created Wavio, a wireless sound recognition system aimed at enhancing life for people who are deaf or hard-of-hearing. It will soon be marketed across the United States.



**Hardware Engineer:** Nicholas Lamb, a fifth-year electrical engineering student, helped apply robotic concepts he researched to the development of the Wavio product.

◀ **Propelling the Company Forward:** Chrystal Schlenker began as an interpreter for the team and now serves as Hz Innovations chief operating officer.

alarm chimes or water faucet drips, the unit notifies the homeowner via smartphone, smart watch, tablet or laptop, and identifies the sound.

Watkins and his student team, Chrystal Schlenker, of Rochester, N.Y., a fourth-year interpreting and business student in the School of Individualized Study; Zach Baltzer, a fifth-year microelectronic engineering student from Hilton, N.Y.; and Nicholas Lamb, a fifth-year electrical engineering student from Waterloo, N.Y., have won several new-product competitions and are working to expand their pool of investors. This past summer, the team completed production of its first 1,000-unit order.



**Firmware Engineer:** Zach Baltzer, a fifth-year microelectronic engineering student, says he started out just looking for a project, and is thrilled Hz Innovations is becoming a business.



**Something Cool to Wear:** RIT students Bradley Dunn, Crystal Mendoza Paulin, and Kurtis Kracke (left to right) created ThermApparel, a low-cost, lightweight line of garment, such as the vest at left, that will help patients with multiple sclerosis, cerebral palsy, and other conditions control their body temperature in a discreet fashion.



### Keeping Cool in Style

RIT students Bradley Dunn (MFA, industrial design, Baltimore), Kurtis Kracke (MFA, industrial design, Rochester, N.Y.), and Crystal Mendoza Paulin (biomedical engineering, Dallas), worked to create a lower cost, discreet, flexible garment that would assist patients with multiple sclerosis, epilepsy, cerebral palsy, or other conditions, by regulating body temperature in hot weather. The result is ThermApparel, which has won several innovation awards including second place in the RIT Tiger Tank competition, second place in the RIT Effective Access Technology Conference's Product Competition, and the Imagine

RIT: Innovation and Creativity Festival's AI SigI Award.

"It's our mission to create lightweight cooling garments with discretion in mind," said Kracke. "We especially hope our garments will increase comfort and decrease fatigue during exercise and forms of physical therapy so that users can increase and improve their health and quality of life in daily activities. We're looking forward to making our product available to those who need it most."

While many of student and faculty innovators are hoping to bring their tech-forward products to the marketplace—Hz Innovations and ThermApparel have both

joined RIT's Venture Creations business incubator—Phillips believes that often the most gratifying part of the process is the developer's interaction with the people who will ultimately use the technology.

"It changes them. And that's something you can't put in a curriculum," said Phillips.

#### On the Web

**Hz Innovations:**  
[www.innovatehz.com/](http://www.innovatehz.com/)

**ThermApparel**  
[www.thermapparel.net/](http://www.thermapparel.net/)



**Exhaling:**

Professors Risa Robinson and Todd Pagano are investigating the physical effects of pipe smoking, including toxicity and the danger of abuse and addiction.

# National Institutes of Health is a Growing Source of Research Funding for RIT

by Suzette Norris

Is inhaling tobacco through a hookah pipe a benign way of smoking? Many college students think so, and the perceived safety has made the water pipes increasingly popular. But RIT professor Risa Robinson, an expert in the behavior of inhaled particles, believes more research is needed to determine how this sort of inhalation method affects nicotine addiction and inhalation of carcinogens.



**Risa Robinson**

## Researching the Impact of Pipe Smoking

With a recently awarded grant from the National Institutes of Health, Robinson and Chemistry Professor Todd Pagano of NTID are part

of a team researching pipe use and the resulting health impacts, including toxicity and danger of abuse and addiction.

In Robinson's view, this sort of research just scratches the surface of what role engineering can play in health care. "In some ways, engineering has to reach out and say to health scientists 'look what we can do for you' in this space," she said. The \$391,000 grant, entitled "Topography, Constituents, and Toxicity of Waterpipe Tobacco Smoke Under Realistic Conditions," is a collaboration with the University of Rochester.

Sponsored research funding, particularly from the NIH, is growing across RIT. Since 2007, the total amount of NIH awards annually has hovered around \$1M, but during the last two years, it has increased significantly, with RIT receiving

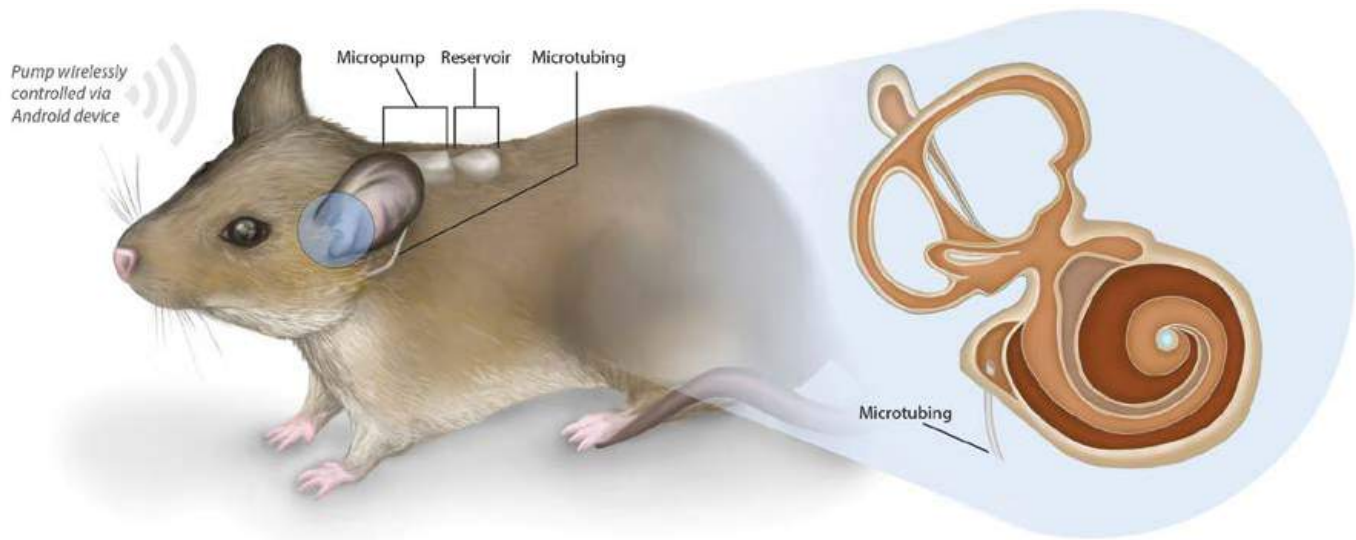
a total of \$3.4 million in 2015 and another \$3.2 million in 2016.

This is significant because the "explosion in medical technology" has opened the door for RIT to play a larger role pursuing research related to health and well-being, said RIT Vice President for Research and Associate Provost Ryne Raffaele. RIT's strengths in digital imaging, data analytics, computer modeling, and many other areas today can support NIH's pursuit of knowledge that prevents, detects, diagnoses and treats disease and disability.

"The NIH funds more research at universities than all the other federal departments and agencies combined, so this is a significant opportunity," he said.



**Growing opportunity:** Ryne Raffaele says a boom in health care technology opens the door for RIT researchers seeking funding for projects.



**Tiny implant:** Researcher David Borkholder has an NIH grant to develop devices that will deliver therapies to treat hearing loss through an advanced intra-cochlear or inner-ear system. The first phase involves creating a “research” version of the micropump, a device small enough to fit in the inner ear of a mouse. The miniature pump, about the size of a sesame seed, requires integration of microsystems engineering and mathematical modeling, and will be used to test various delivery systems in the laboratory setting.

“I’m proud that RIT is doing its part to step up to one of the biggest challenges our country faces today.”

The National Technical Institute for the Deaf (NTID), which sponsors and encourages research designed to enhance the lives of deaf and hard-of-hearing people, historically has received support from NIH, and played a key role in recent growth. The establishment of RIT’s biomedical engineering BS program and the university’s alliance with Rochester Regional Health have “expanded our view of health care related issues as well as our ability to pursue new research opportunities,” Raffaele said.

Here are some examples of NIH-funded research underway at RIT:



**David Borkholder**

### **Tiny Devices Set to Improve Treatment Options**

RIT recently received initial funding of \$1,184,771, part of a \$2.7 million, five-year project for “Enabling Microsystem Technologies for Advanced Drug Delivery” research to further develop an

advanced, intra-cochlear drug delivery system.

The idea behind this research is to alleviate hearing loss by safely delivering drugs, gene therapies, and other treatment options directly into a delicate area of the inner ear called the cochlea. Researchers eventually want to develop a micropump that’s implanted in the ear, so that treatment can be managed in a very safe, controlled, and measurable fashion.

But before that can happen, a “research” version is needed—one that is designed for a mouse cochlea, which typically measures 4 mm, the length of a large sesame seed. This miniature device will make it possible to test various delivery methods in a laboratory setting. Creating a micropump for a mouse’s ear requires integration of a variety of disciplines such as microsystems engineering and mathematical modeling. David Borkholder, RIT’s Bausch & Lomb Professor of Microsystems Engineering, is the principal investigator of the project, which is a collaboration with the University of South Florida.

The research project, he said, began with a cold call. After arriving at RIT in 2004, Borkholder explained, he became interested in combining microsystems

and auditory research. “I called Dr. (D. Robert) Frisina, the first director of NTID, saying I was interested in this sort of convergence,” Borkholder said. Frisina suggested a meeting, and invited his son who was doing auditory research at the University of Rochester.

Within two years, the NIH’s National Institute on Deafness and Other Communication Disorders awarded Borkholder and the younger Frisina more than \$900,000 to fund the research for an implantable micropump. The project led to key integration technologies required for a micro-electrical-mechanical system, or MEMS-based device. It also established inner-ear drug delivery paradigms and quantification methods, and provided information about acceptable dose and timing profiles for intra-cochlear drug delivery in mice.

The current effort focuses on two key challenges. The first is to create a micropump design that scales for use in a human ear. This involves integrating multifunctional printing and electronic packaging—two additional disciplines found at RIT. The second challenge is to measure and track how a drug might leave the pump and diffuse through the membranes of the cochlea. “The volumes



**Understanding Cochlear Implants:** Researcher Mark Marschark has a grant to conduct a comprehensive study of “Language, Learning and Cognition Among Deaf Students With and Without Cochlear Implants.”



**Blowing Smoke:** RIT/NTID faculty have been awarded a grant for research to develop better ways of analyzing the effects of electronic cigarettes on smokers. Their work includes developing testing devices that measure puff length, emissions, and other factors to determine vapor exposure to the smoker.

we’re talking about are really small—about one billionth of a liter,” Borkholder said. “The goal is to optimize the concentration delivered from our pump.”

A smart, programmable micropump for animal model testing, eventually could lead to better treatment options for children and adults with permanent hearing loss, balance problems, and deafness. Collaborators on the project include Denis Cormier, Brinkman Professor in Industrial and Systems Engineering, and Frisina, who now serves as the director of the Neuro Engineering Research Group at the University of South Florida.



**Marc Marschark**

**Enhancing Education and Opportunities for Deaf Students**

RIT recently received continued funding of \$552,000 as part of a \$2.2 million, five-year project to study

“Language, Learning and Cognition Among Deaf Students With and Without Cochlear Implants.” The project will produce the most

comprehensive studies to date in this field.

The intent of the research is to better focus services for individuals with hearing loss, making them more efficient and effective, while enhancing educational and employment opportunities as well as physical and emotional health. The research will involve three groups of young adults who will participate in eight studies. Participants will include deaf students with and without cochlear implants as well as hearing students. RIT’s Marc Marschark, principal investigator, leads NTID research concerning the relationship of language, learning and development among deaf children and adults.

**Exploring E-Cig Emissions**

In addition to funding waterpipe tobacco smoke research, the NIH has awarded a more than \$413,000 to RIT/NTID faculty and student researchers to develop better ways of analyzing the effects of electronic cigarettes.

During the past several years, mechanical engineering researchers in RIT’s Kate Gleason College of Engineering led by Robinson (who heads up the mechanical engineering

department) have developed several unique testing devices used to assess the behavior associated with e-cig use. The handheld devices have internal sensors to track the number of cigarettes an individual uses, puff length, emissions and flow rate to determine the total exposure a smoker or vaper would have.

NTID researchers led by Pagano have been analyzing the potential toxicants produced by e-cig flavorings, looking to determine what compounds are present before and after vaping, and which compounds might be harmful.

Working together, the researchers are ranking e-cig flavorings by chemicals and hazard with the aim of informing government agencies of the long-term adverse effects of existing and newer flavorings. Their work is part of a larger project led by principal investigator Irfan Rahman of the University of Rochester Medical Center, whose aim is to examine the DNA damage and inflammatory responses of cells exposed to e-cigs.

**On the Web**

Risa Robinson’s work  
[www.rit.edu/news/story.php?id=51201](http://www.rit.edu/news/story.php?id=51201)

Healthy Eating by Design:  
Barbara Lohse, director of the Wegmans School of  
Health and Nutrition, believes research provides the  
evidence needed to design, promote and deliver  
effective education on nutrition.

when you can, or walking  
stretching every hour

# Preventing TYPE 2 DIABETES

You can start today.





# RIT Nutritionists Design Curricula that Lead to Healthier Lifestyles

by Jane E. Sutter

“Just try two bites.” “Doesn’t it taste good?” “Clean your plate.” What parent hasn’t tried to coax a child to try different foods or eat all his dinner? But those tactics actually build up resentment in the child, and RIT researchers are working with kids, parents, and teachers on better ways to approach eating and ultimately adopt a healthy lifestyle.

## Feeling Good about Eating

As the director of the Wegmans School of Health and Nutrition, Barbara Lohse is passionate about designing and conducting research that leads to promoting and delivering evidence-based nutrition education. “A few years ago, some research came out that said nutrition education doesn’t work,” Lohse said. “In our group, we knew that is totally not true.”

The problem is that teachers may not use the curriculum properly or at all; they may be too busy or they don’t have the proper resources. So Lohse and her team strive to provide materials that are proven to work and can easily be used by education professionals.

That means designing a curriculum, training teachers to use it with kids and parents, and then evaluating the results to see if the desired outcomes are achieved.

Lohse has established a Nutrition Education Engineering and Designs (NEEDs) Center at RIT, similar to one she founded and directed while on faculty at Pennsylvania State University.

A clinical nutritionist, registered dietitian and professor, Lohse became the first director of the Wegmans School in July 2015. A year later, she received the Society for Nutrition Education and Behavior Research Award for outstanding achievement in the field of nutrition education.

Lohse’s research efforts focus on three tracks that are interrelated: educating parents and children so they have a healthier lifestyle; eating competence; and feeding dynamics.



**NEEDs for Tots** is a print and web-based curriculum designed to educate children, parents and preschool providers on the principles of the Division of Responsibility in Feeding and USDA Core Nutrition Messages. Rather than focus on specific foods, portion-sizes, or nutrients, NEEDs for Tots focuses on shared family mealtime, the importance of food-neutral mealtime conversation, the way to accept and refuse foods, and the need to trust each person to manage his/her own eating.



**Elizabeth Ruder**

Building on her research at Penn State, Lohse and RIT Assistant Professor Elizabeth Ruder recently launched a curriculum called “NEEDs for Tots” at the Volunteers of America (VoA) in Rochester.

They conducted a training session in September for teachers at the Head Start program at the VoA. Funding for this project is provided by a \$5,000 grant that Ruder was awarded for a proposal she wrote as a participant in RIT’s annual Grant Writer’s Boot Camp.

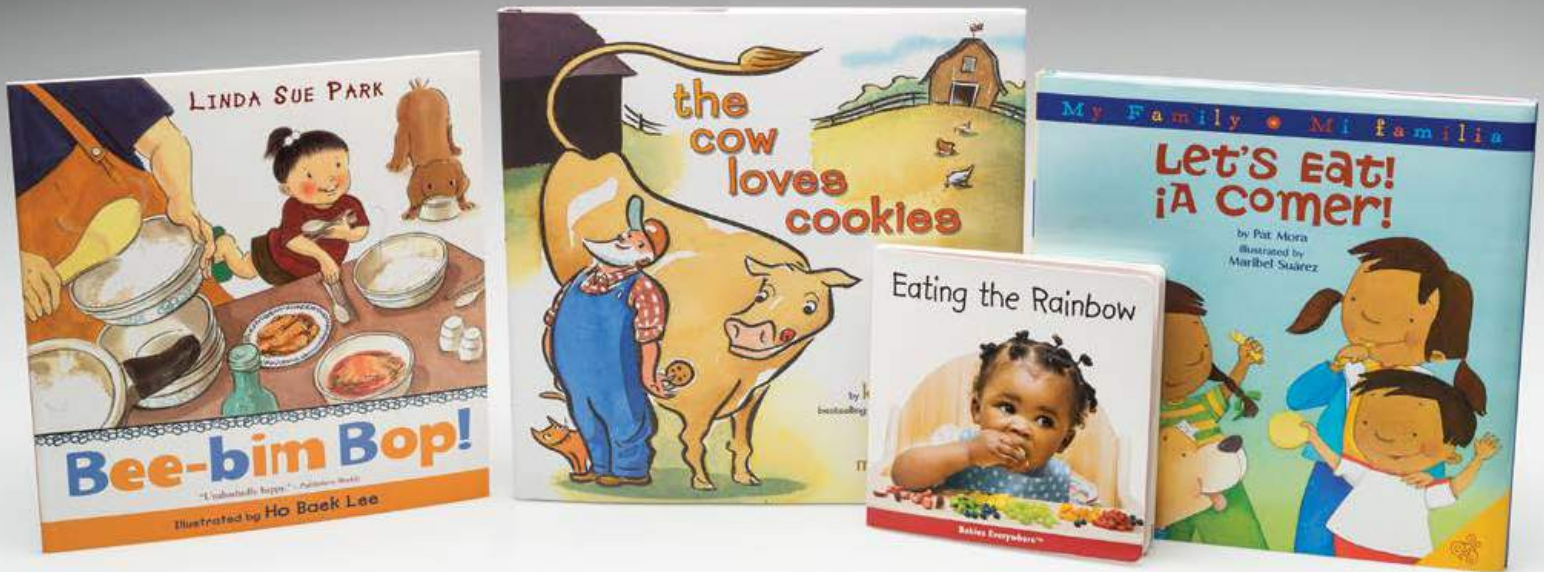
The focus of the VoA program is to educate preschoolers and their parents on ideas of how to have a healthier life, with nutrition as the entry point. Teachers use colorful illustrated children’s books, such as one titled *The Cow Loves Cookies*. “It has to do with the idea of celebrating our love of food, and feeling good about eating and good about eating foods we

like,” Lohse said.

Physical activity also is a component. “The book is all about how the different animals show they like to eat,” Lohse said. Illustrations show birds flapping their wings and pecking, for example.

Each preschool teacher at the VoA received a kit that includes all the handouts, books, shelf-stable foods, and even bowls for the food, so the teachers have everything they need. One tasting activity is centered around a book in English and Spanish called *Let’s Eat! ¡A Comer!* that teaches about mealtime. A meal time is defined as a family sitting at a table, facing each other, and eating the same foods. The parent isn’t talking on a cell phone and the child isn’t watching TV.

As a complement to the book, children get to taste whole wheat tortillas, spreadable cheese, pinto beans, and green chilies. “So kids have the opportunity to taste this food, and they also have the opportunity to practice learning how to decline a food, if it’s not something they care to try, and learn how to do that politely,” Ruder said.



**Children's Books:** Four books used in the NEEDs for Tots program promote family mealtime, cooking and being together, and colorful foods to taste or not taste. The books are part of a kit used to educate children and their parents about healthy food choices.

There are also activities for parents to do at home with their children. Both teachers and parents are surveyed at the start of the program and at the end. The surveys are meant to measure changes in behavior and get feedback from teachers and parents to the curriculum.

“We’ve tested this (program) in 30 different preschools in Pennsylvania and in two different waves, so we’ve been able to modify and change things,” prior to bringing it to the VoA, Lohse said.

**Feeding Dynamics**

The study at the VoA also will examine how teachers and parents approach feeding children based on a concept called “the division of responsibility in feeding,” developed by Ellyn Satter, an internationally recognized expert on eating and feeding.

The idea is that the parent’s job is

to provide healthy foods in satisfying amounts in an environment that’s conducive to eating, with adults and children eating together, no TV in the room, and so on, Lohse said. The child’s job is to decide if s/he wants to eat and how much s/he wants to eat. “The parent doesn’t determine if the child puts food into their mouth. The parent doesn’t determine how many bites they take or how many helpings; that’s the child’s responsibility.”

Lohse gives the example that adults would be repulsed by the idea of eating worms or dirt, but that’s how a child might view a certain food, like chicken. But children naturally want to please their parents, Lohse pointed out, so if the child sees the parent eating chicken and enjoying it, “over time, they will start to eat it, and that’s clinically been proven. We’re working on proving it research-wise.”

This ties back to all that coaxing parents use to get their children to eat. The division of responsibility in feeding goes counter to those social norms. Rather than trying to persuade their kids to try a bite, parents should always have some food on the table that they know their child likes, such as applesauce or bread, so the child does eat something, Lohse said.

While at Penn State, Lohse and her research team videotaped 20 families eating a meal and then surveyed the parents about their eating dynamics; they also surveyed 100 more parents who weren’t videotaped. The study measures quality of life; childhood nutrition status; the parent’s eating competence, role modeling and approach to eating; and food insecurity, and compares those to feeding dynamics.

While the data analysis isn’t complete



**Cooking Lessons:** Preliminary data show that the children cooking programs are really having an impact. There is an improvement in (food) preference and an improvement especially in kids who had no cooking experience beforehand (especially boys).

yet, Lohse said it does show that if parents follow proper feeding dynamics, their children are healthier and have a higher quality of life.

### Teaching Children to Cook

There's a payoff when children get active in the kitchen, Lohse has found. She has been working with Dr. Leslie Cunningham-Sabo, an associate professor at Colorado State University, and Ruder on a program with fourth-graders in Colorado. The study is in its fifth and final year, so the group has data from four years of working with fourth grade students and their parents.

The yearlong program measures whether teaching children to cook influences their fruit and vegetable preferences, their feelings of self-efficacy for preparing food, and so on, Lohse explained. "Our preliminary data show that we are really having an impact. ... We're seeing an improvement in (food) preference and an improvement especially in kids who had no cooking experience beforehand (especially boys). We feel cooking experience is important because a lot of families don't cook. A lot of kids don't know how to cook. They have no idea you can actually make something, not just buy it" already made.

She believes these lessons fill the gap created by schools abandoning home economics classes, and they help to reduce childhood obesity. "If you overlay the childhood obesity problem on the removal of home economics, it's almost a perfect overlay." The lessons also have an online component for parents, called "About eating," which is available from the NEEDs Center website.

This research ties into the idea of eating competence (an intra-individual approach to eating), a construct also developed by Satter. "We have done a lot of research where we have seen that if you have an eating competence approach, you actually have better sleep hygiene, fewer cardiovascular risk factors, healthier BMI (body mass index). You're more physically active; you have higher dietary quality," Lohse said.

In a nutshell, eating competence means "you give yourself permission to eat what you want but you discipline yourself so you are eating routinely and regularly in amounts that are satisfying and healthy for you." Lohse wants to implement the Colorado program in Rochester. As a first step, Lohse just completed surveying fourth-graders and their parents in city schools about physical activity.

### Online Learning

Lohse's research and development of materials tie in well with RIT's emphasis on digital resources. Lohse recognizes that smart phones, tablets, and social media are vital tools to reach a target audience. For example, "ne/Frames" (nutrition education frames), available online from the NEEDs Center website, can be shown on any screen in PowerPoint, jpeg, video stills and video animated format. The frames cover topics such as diabetes, sodium, fiber, herbs, child activity and more—with many available in Spanish. Prior to launch, each frame was shared with the intended audience and revised based on their feedback before being posted on the website.

Much of Lohse's research during her career has focused on low-income populations. "I grew up in Minnesota and found there were a lot of poor families around. I just always was struck by 'how do they eat?' I was interested in nutrition and learned that poor families have a lot more problems with nutrition." Back then, the focus was on malnutrition; today it's on obesity, Lohse explained. While at Penn State, Lohse oversaw the SNAP-Ed program for the state, which provided nutrition education for people eligible for SNAP (formerly known as food stamps).

Lohse wants the federal government to make materials that promote positive feeding dynamics available to federally funded programs, such as child care centers, schools, and WIC (Women, Infant and Children) supplemental nutrition programs.

Lohse has connected with researchers from around the world who are doing eating competence research. "We're trying to create a critical mass of researchers who feel the same way and we stop all this craziness about here's this diet, here's that diet, eat carbs, don't eat carbs, eat nuts, no, don't eat nuts."

The ultimate goal for Lohse? "To help people to be better friends with food."

### On the Web

NEEDs Center  
[www.needscenter.org](http://www.needscenter.org)



**Help at the Doctor's Office:** RIT/NTID's new master's degree provides advanced training for interpreters interested in specializing in American Sign Language interpretation in health care situations who will work with physicians, patients, and family members who are deaf or hard of hearing.

## RIT/NTID Establishes Master's Degree Program in Health Care Interpretation by Susan Murad

The first-of-its-kind degree in health care interpretation has been developed by RIT's National Technical Institute for the Deaf. It also marks the first collaborative venture between NTID and the College of Health Sciences and Technology to create and implement a program that will take advantage of the equipment and expertise in both colleges.

### **Filling a Great Need**

To help meet the growing demand for specialized sign language health care interpreters as more deaf and hard-of-hearing professionals enter medical/

health care fields, increase the number of specialized sign language interpreters working in patient health care settings, and to prepare interpreters to work in administrative roles to ensure language

access to patients in hospital settings, RIT's National Technical Institute for the Deaf and College of Health Sciences and Technology have teamed up to develop a first-of-its-kind master's degree in health



**Gathering:** Although much of their course work is done online, students in the RIT/NTID master's in health care interpretation do meet once a week in a classroom on the Henrietta campus. The program, a first-of-its-kind degree, is offered as a collaboration between two RIT colleges: the National Technical Institute for the Deaf and the College of Health Sciences and Technology.

care interpretation. The degree provides training for currently certified interpreters with specific interest in working in health care environments.

“We are excited about this new venture with NTID in a graduate-level degree for health care interpreters,” said Richard Doolittle, vice dean for RIT’s College of Health Sciences and Technology. “Our collaboration will help ensure these highly skilled interpreters receive the kind of medical technical training they will need to succeed in health care settings.”

According to projections from the U.S. Bureau of Labor Statistics, between 2012 and 2022, there will be 46-percent employment growth for interpreters and translators, much faster than the average for all occupations. The field is on track to add more than 29,000 positions during

that time period. Graduates of the program may find work as staff interpreters, freelance interpreters, or on a per-diem basis in health care, health care education and health care research settings nationwide.

“The program will provide in-depth specialized education in the field of health care interpretation that is not currently available to interpreters,” said Kim Kurz, chairperson of NTID’s American Sign Language and Interpreting Education Department, which will house the new degree program. “The program will appeal to certified interpreters aspiring to direct their careers into health care environments, as well as to interpreters who currently are working in the health care field.”

The program begins with a one-week, on-campus residency professional

seminar, with the remainder of the program delivered online.

“The advanced skill sets required to interpret in health care, health care education, and health care research environments constitute an emerging specialization in the interpreting profession,” said Gerry Buckley, president of NTID and vice president and dean for RIT. “There are currently no programs in the United States that offer a master’s degree in health care interpretation, and we are proud to be the first to provide this type of educational experience to meet the growing demand.”

**On the Web**

**MCHCI Program Overview**  
[www.ntid.rit.edu/aslie/mshci/overview](http://www.ntid.rit.edu/aslie/mshci/overview)

# Innovating and Transforming Health Care Delivery

by Kelly Sorensen

RIT and Rochester Regional Health are working together to capitalize on technology and innovation in three key areas: education, research, and clinical medicine. We asked several members of the alliance's leadership team to share their perspective on the alliance's synergy and key initiatives.



**Dr. Eric Bieber**

**We asked Dr. Eric Bieber, president & CEO of Rochester Regional Health: What is it about the alliance with RIT that is unique?**

**Bieber:** When I was evaluating whether to come to Rochester

Regional two years ago, the alliance with RIT framed my level of interest for the CEO position. I knew about RIT and recognized that the institution was different than many other higher education organizations. For me personally, when driving health care innovation and transformation, it's important to have the right people and the right partnerships. If you think about things in a standard fashion, you are unlikely to transform. So I knew there was something special there as RRH is an organization that has been doing transformational population health care delivery for many years.

**What is the potential of the alliance?**

**Bieber:** I thought we were doing good work before. It's now looking at how we can make it really great. We have high-quality people from both organizations working together. There is much more to be garnered from the relationship. It's the promissory note of how we fundamentally redesign health care and make it more patient consumer centric, make it easier, make it better. We have an ability to go out and do things that very few others can do.

**There is a greater focus now on entrepreneurship. Why is this necessary?**

**Bieber:** If you want to transform something, you can't keep doing what you are doing. And you can't do it in an additive manner. That means we need to fundamentally think differently. Innovation and entrepreneurship often-times are different concepts, but they live in close residence. It's unleashing the untapped potential that exists on the people that work here and the people that work at RIT to think about existing problems and try to solve them. And then implementing the stringent processes that we use to vet, prioritize, alpha and beta test ideas, and commercialize those that are viable. At the end of the day, we are trying to change the world. We want to help others regionally, nationally, and beyond.



**Dr. Daniel Ornt**

**We asked Dr. Daniel Ornt, vice president and dean, RIT's Institute of Health Sciences and Technology: How does working with RRH benefit our students and faculty?**

**Ornt:** As a result of this unique agreement we have strengthened the clinical training of our existing programs, and are able to explore new programs that may be of mutual interest to both organizations. And we are also able to explore new faculty recruitment that could be advantaged by the relationship with the alliance

so that people can have a clinical component to their career. We don't have a medical school, but we have clinical programs that need professional training in a clinical setting that can only be achieved in a health system. It was wonderful when RRH began to grow and acquired Unity Health Systems because it added facilities that could be utilized by our students.

**Clinical medicine is also another important component. How is that achieved?**

**Ornt:** For us, clinical medicine takes a little bit different direction than for a school of medicine, but it has many of the potential similarities. We would love to look for opportunities to hire faculty who do clinical work as well as teach our students. They are better teachers because they are active clinicians. And that model exists readily in schools of medicine where doctors of medicine or doctors of osteopathic medicine take care of patients and are simultaneously teachers of students. We are just beginning to try to make these kinds of relationships work.



**Dr. Bridgette Wiefeling**

**We asked Dr. Bridgette Wiefeling, chief quality and innovation officer, RRH: What are the challenges in health care that the RIT/RRH Alliance could address?**

**Wiefeling:** We need to continually use technology to leverage our skills and to address broader population needs as well

how to reach out and care for individuals. And there is a shortage across the country of primary care physicians and certain specialty doctors. The ability to literally do more with less is really important. Technology affords us that ability. RIT provides fresh ideas around how to apply technology created for a problem in another area and see if it could work to solve a problem in the health care industry. The other thing is that the industry needs young bright minds. The more we are able to interface with RIT students, the more likely they are to understand health care and be excited about wanting to work in the field. RIT is a great place to create the seedbed for workforce. It's wonderful to work with your physician assistant and nutrition management programs and figure out how to maximize the educational opportunities for the students.

**Can you talk about the alliance's Health Coach initiative, an example of how students are engaging with patients?**

**Wiefeling:** The Health Coach initiative is certainly one that we are really proud of. We believed there was an opportunity for RIT students to see the world through the patients' eyes. It's very important to create a workforce that has the ability to engage with patients differently, understand their barriers to care, and the socioeconomic barriers that get in the way of patient living their healthiest lives. The students do one semester of course work. They then get to do home visits with patients, assess the overall environment that the patients are living in, and help them to think about how they can advocate for themselves and better communicate with their providers.

**Talk about the design and establishment of the new family medicine practice at RIT that you were instrumental in developing.**

**Wiefeling:** Yes, I believe it's very important for large employers to provide primary care to their employees and I know RIT employees spend a lot of time on campus. When people are so dedicated to their work they tend to put their own needs aside. So making it as simple as possible

for RIT employees to get good primary care is a win. It's a win for the employees as patients and it's a win for RIT, because the more you can let prevention and primary care be the kernel around which you build health care, the more likely you are to reduce overall costs and improve your employees' quality of life.



**John Foley**

**We asked John Foley, executive vice president and business development at Rochester Regional: Why is entrepreneurship included as a key prong?**

**Foley:** Rochester Regional requested a separate focus and effort around entrepreneurship in order to help us establish and foster a culture of innovation within the system. The alliance allows us to leverage the expertise and experience of RIT in creating and commercializing new products and businesses. Our employees now have a new process through which they can help us innovate—and possibly grow these ideas into products and businesses for other health systems throughout the United States. We are leveraging our health care clinical expertise with the technical and business expertise across RIT—including Kate Gleason College of Engineering, College of Imaging Arts and Sciences, Golisano College of Computing and Information Sciences, Health Sciences and Technology, Golisano Institute for Sustainability, and the many RIT resources for innovation, such as the Simone Center for Student Innovation and Entrepreneurship, Saunders College of Business, and Venture Creations.

**Talk about the three-phase approach that the alliance is using: discovery, development, and commercialization.**

**Foley:** Think of it as a funnel-type process to help us gather ideas, get creative about how to solve problems, test our assumptions—and even get the feedback needed from our first large health care “client”—Rochester Regional Health.

In the discovery phase, RRH health care experts work with RIT technology experts to leverage each other's strengths and create new products, services, and business concepts. We put our clinical experts together with RIT's faculty to solve “health care related” problems. These solutions are vetted through a structured process that includes a formal market review (via Saunders College of Business) to determine if they move on to the next stage—development.

In the development phase, products, services, or businesses are looking to prove themselves. The Alliance workgroups/teams are given a budget to help them create a prototype of their new products. The teams do customer research, market strategies, and cost analysis in order to create their software development plans or even new business plans. These plans are presented to the Joint Committee for the Alliance.

Once a team has completed the development phase and is approved for funding, it moves into the commercialization phase, which can take several different paths. It can be developed for internal use at RRH, positioned to be sold as a standalone product to other health systems, or a full-scale business launch with startup angel or venture funding.

RIT and RRH are investigating the creation of a joint “Health care Innovation Venture Fund” to help launch these new businesses. This kind of commitment only comes through a strong partnership with deeply rooted trust in each other and our abilities to succeed in this type of business venture.

**RRH/RIT Alliance Highlights**

- 188 PA clinical appointments
- 14 RRH employees with academic appointments
- RRH has hired more than 40 RIT co-ops from various programs
- Thermal imaging project for early stage breast cancer screening—received NSF funding
- RRH Family Medicine at RIT has seen over 500 new patients since it opened

# Faculty, Staff, and Student Achievements

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RIT values the research contributions of its faculty, staff, and students. Below are some members of the RIT community who have received recent international, national and university recognition.



Researchers at RIT and physicians at Rochester Regional Health are advancing thermal imaging techniques as a potentially safer and less invasive diagnostic tool for

the detection of early-stage breast cancer. A National Science Foundation grant of \$99,620 is supporting the two-year project and the multidisciplinary team that represents the strategic collaboration of the RIT & Rochester Regional Health Alliance.

**Satish Kandlikar**, the Gleason Professor of Mechanical Engineering in RIT's Kate Gleason College of Engineering, is leading the NSF-funded study to establish modern thermal, or infrared, imaging as a viable alternative to other technologies, such as ultrasound and MRI, used in addition to conventional mammograms.

"Modern infrared imaging has the potential to significantly increase the accuracy of screening for breast cancer and could have broad implications for preventive medicine," Kandlikar said.

Kandlikar said existing thermal imaging techniques are not very accurate, are cumbersome, and uncomfortable to the patient, requiring cooling of the breast tissue by 3 to 5 degrees Celsius with a blast of air or metal plates, and are not widely used.

New thermal imaging techniques can detect when cancer alters the metabolic behavior of tissues and radiates specific thermal signatures,

or localized "hot spots."

Kandlikar's method combines thermal imaging with an artificial intelligence system that predicts the location and size of tumors on a thermal map. The algorithms will simulate scenarios based on numerical models of thermal-signature patterns derived from mammography and MRI conducted at Rochester General Hospital.



**David Borkholder**, RIT's Bausch & Lomb Professor of Microsystems Engineering, was named "Distinguished Inventor of the Year" by the Rochester

Intellectual Property Law Association.

Borkholder was honored for his work on the Blast Gauge® System, a blast dosimetry system that captures and interprets data associated with concussions. The data helps caregivers administer faster and more accurate treatment, and allows for better research for advancing the study of traumatic brain injuries. Military troops and police officers around the world use the technology.

The technology has been translated to the playing field with the Linx Impact Assessment System to address sports-related concussions. Both systems are produced by Blackbox Biometrics Inc., a company founded by Borkholder that is based in RIT's Venture Creations business incubator.



**Sara Schley**, co-director of the National Technical Institute for the Deaf's Research Center for Teaching and Learning has been awarded a \$443,200 grant from the National

Science Foundation to provide additional training for faculty in science, technology, engineering and math disciplines who teach classes in which deaf, hard-of-hearing and hearing students are present.

The three-year grant will help develop an "accessibility toolkit" for faculty who are searching for viable ways to adapt their teaching methodologies to accommodate the learning needs of deaf and hard-of-hearing students.

Schley, principal investigator on the grant, said the project will combine faculty engagement in instructional change, universal design for teaching and learning, and student-centered pedagogy that all ultimately enhance inclusiveness within the classroom.

Co-principal investigators on the grant are associate professors Jessica Cuculick from NTID and Stephanie Cawthon from The University of Texas at Austin.

"Faculty members who teach deaf and hard-of-hearing students may assume that notetaking services and interpreting services, for example, are tools that sufficiently provide an adequate learning environment," Schley said. "While these services certainly assist the students with their learning, we've found that there are many other ways that instructors can adapt their teaching styles to enhance the learning



environment for our students. This project is meant to provide relevant information to our faculty in a supportive way.”



**André O. Hudson**, associate professor in RIT’s Thomas H. Gosnell School of Life Sciences, has been awarded a \$436,989 Academic Research Enhancement Award from

the National Institute of General Medical Sciences.

The grant will be used to fund research at RIT into the efficacy of using the DapL enzyme as a target in the creation of new narrow-spectrum antibiotics to help combat the growing threat posed by antibiotic-resistant bacteria.

“I’m thrilled that we’re receiving this grant to continue our research to help combat the threat of antibiotic-resistant bacteria,” said Ryne Raffaele, RIT vice president for research and associate provost. “Our study of the DapL enzyme could lead to breakthroughs in targeting pathogenic bacteria. This award will also support RIT as we work to build the workforce our community needs to help solve these critical issues related to antibiotic resistance.”

Raffaele thanked U.S. Rep. Louise Slaughter for her efforts to raise awareness of the critical rise in antibiotic-resistant bacteria, her leadership in helping procure federal funding for research to combat the problem, and her advocacy in bringing that funding to RIT and the Rochester region.

“The dangers posed by an antibiotic-resistant superbug aren’t some far off threat, as we saw earlier this year with the discovery of our nation’s first case of bacteria that could not be killed by any known drug. This is a global problem, and I’m proud that RIT is receiving this award so scientists in our community can lead the way in finding a global solution,” said Slaughter, the only microbiologist in Congress and the author of the Preservation of Antibiotics for

Medical Treatment Act.

Hudson said he is excited about the prospect of this research, which he said is essential to the future of the world’s health.

“No new class of antibiotics has been developed in 30 years,” said Hudson, the principal investigator on the grant. “Had we had the notion of having antibiotics in the pipeline, we could have had them ready to use when resistance first became a problem.”

He said he’s particularly excited about this grant because it will be used to help train undergraduate and graduate students at RIT and engage them in ongoing research.



**Callie Babbitt**, an associate professor at RIT’s Golisano Institute for Sustainability (GIS), has received a nearly \$1 million award from the National Science Founda-

tion (NSF) to research sustainable solutions for minimizing and managing the growing and complex challenges of food waste generated across the food supply chain.

The four-year project, titled “Managing Energy, Water, and Information Flows for Sustainability across the Advanced Food Ecosystem,” will launch an interdisciplinary research collaboration with faculty from five RIT colleges. The research team will study how innovative technologies, waste management systems, and policies can reduce the volume and environmental impacts of food waste—while at the same time creating economic growth and maximizing efficient use of energy and water resources.

The stakes are huge. Faced with a growing world population and a shrinking pool of natural resources, the world today faces an unprecedented challenge to provide a resilient food supply—made even more complex by vast inefficiencies and resulting food waste generated across the food supply chain.

“About 40 percent of food produced in the United States is never eaten,” Babbitt said. “There are huge losses that become apparent when we look at the entire supply chain: from excess crops left in the field; wastes from food processing; imperfect or ‘ugly’ foods discarded by grocery stores and restaurants; not to mention food that is purchased but then spoils, goes past its expiration date, or isn’t ultimately wanted by consumers.”

Babbitt noted that technologies exist to convert food waste to biofuels or value-added products, but are not yet optimized to handle large volumes of complex food waste streams.

This NSF grant will enable RIT researchers to make technological advances in food waste-to-energy conversion systems that are more efficient, cost-effective, environmentally friendly, and scalable for a wide range of food waste streams.

This project is one of only 17 research awards made as part of NSF’s new program on Innovations at the Nexus of Food, Energy and Water Systems, or INFEWS. This initiative was created to catalyze interdisciplinary research that will transform scientific understanding about interconnections between food production and energy and water resources and lead to solutions for the grand challenges facing the world in the new millennium.

“Food waste is such an immense and complex challenge that effective solutions will only come from merging the best ideas and insights from many different disciplines,” Babbitt said. “We plan to use ideas and innovations from engineering, policy, ecology, decision science, geospatial optimization, and education.”

The project also will create new educational programs, with efforts aimed at engaging underrepresented groups—including deaf and hard-of-hearing students at RIT and the National Technical Institute for the Deaf (NTID) as well as high school students in the Rochester City School District. Babbitt is currently teaching a pilot course on sustainable food systems for RIT graduate students and plans to integrate future research findings into this educational model.



**Jing Zhang**, faculty member in the Kate Gleason College of Engineering, received a \$305,000 grant from the National Science Foundation to acquire

a new etching system for photonic, electronic, and bio-device fabrication. The system strengthens RIT's fabrication capability in its Semiconductor & Microsystems Fabrication Laboratory to support new and existing multi-disciplinary research in science and engineering, to enable educational curriculum development, and to be used for workforce development and training activities led by the engineering college.

The ICP-RIE system—an inductively coupled plasma reactive ion etching system—is equipment used to create specific structural patterns, or to expose different conductive layers, on the integrated circuits found in electronic devices, said Zhang.

"If we want to fabricate a wafer into a device, we needed to have this type of etcher," said Zhang, the Kate Gleason Endowed Assistant Professor in the electrical and microelectronic engineering department. "There is no equipment like this close by so there was a huge need, and it will help with collaborations we have with other university and corporate researchers."

Traditional semiconductor research has focused on silicon-based materials. Zhang is working on compound semiconductors, and gallium nitride is an emerging material being applied. Gallium nitride-based semiconductors are being integrated into optoelectronics, such as LEDs, to power electronics for smart grid applications and power management for electric vehicles, solar applications to harvest solar energy and transfer it into electrical energy. New research in ultraviolet wavelength sensors is an emerging area, she explained.

"The instrument is essential to enable research and education on III-Nitride-

based light emitting diodes and lasers, and other semiconductor devices. We are studying every aspect of this material, from understanding the physics to the realization of novel devices. This equipment will help with that process," said Zhang, who has been at RIT since 2014 and is part of a growing and accomplished group of semiconductor materials and photonics device researchers at the university. She has expertise in the area of ultraviolet and visible light-emitting diodes, also referred to as LEDs, and in developing semiconductors for optoelectronic and electronic devices.



**Bill Jones**, manager of business development at RIT's Venture Creations business incubator, won the Magical Mentor award presented by Upstate Venture Connect.

Jones was honored in September during the 2016 Upstate Unleashed Conference.

Jones, who is an expert in business startups and clean energy, was recognized for "having a transformative impact on the trajectory of one or more startup companies."

At Venture Creations, Jones mentors a number of companies with the primary goal of developing successful businesses that can benefit from RIT's strengths in technology and innovation while having their design go into production.



RIT is collaborating with the American Physical Society to transform physics graduate education with the goal of building a scientific workforce that reflects

the nation's shifting demographics and ensures U.S. technological leadership.

RIT associate professor **Casey Miller** is contributing to the American Physical Society-led effort to create a national network for access and inclusion in physics graduate education.

The two-year project is funded by the new National Science Foundation program INCLUDES, (Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science) to increase diversity in the scientific workforce.

According to the U.S. Department of Education's National Center for Education Statistics, the percentage of physics doctoral degrees awarded to women and minorities from 2012 through 2014 is the lowest among the scientific fields. Women earned 19 percent of conferred doctoral degrees and ethnic and racial minorities earned 7 percent.

Underrepresented groups include women, Hispanics, African Americans, Native Americans, persons with disabilities, people from rural areas, and people of low socioeconomic status.

An RIT strategic goal is to become one of the largest producers of female and underrepresented graduates with science, technology, engineering and mathematics, or STEM, degrees among private colleges in the United States.

"The economic livelihood of the country depends on having a diverse set of skills and people who are able to do science," said Miller, director of RIT's materials science and engineering graduate program.

"Research shows that diversity enhances innovation. People with different perspectives find different creative solutions to problems."

The discipline-wide effort seeks to improve recruitment, admissions, and retention outcomes by making strategies discovered through bridge programs applicable to small and large universities. A national network of disciplinary colleagues, experts, and representatives from professional associations will work to build knowledge and inclusive practices.



RIT's industrial design program won the prestigious Editors' Award (Best School) at International Contemporary Furniture Fair (ICFF) 2016, held in May in conjunction with Design Week in New York City.

RIT was honored for its Metaproject 06 booth with Poppin—a leading manufacturer of workplace furniture and supplies. The award recognizes the best and most innovative designs at ICFF 2016.

ICFF convenes the industry's top editors annually and invites them to scout the show and choose the best of the year's design crop. Five editors canvassed more than 700 booths on two floors of New York City's Jacob K. Javits Convention Center to determine this year's winners.

RIT was awarded the top prize among 14 institutions in the annual ICFF Schools exhibitions. More than 20 fourth-year industrial design students participated in Metaproject 06, an annual interdisciplinary and collaborative design project between RIT and an industry partner.

The course offers RIT students a taste of real-world experience, connections with design professionals, and the possibility of having their design go into production.



A team of students won a top award for its innovative creations at the 2016 Greater Rochester Excellence and Achievements in Technology Awards,



A game developed by three RIT students has been named one of the most well-designed apps of 2016, according to Apple.

The game app, called Dividr, took home an Apple Design Award at the tech giant's Worldwide Developer Conference (WWDC) in June.

Apple gives out 12 Apple Design Awards each year—10 to professionally developed apps and two to student apps. The annual awards are meant to recognize independently developed apps that raise the bar in design, technology, and innovation.

Dividr was created by **Josh Deich-**

**mann** (left), a third-year computer engineering major from Belmont, N.Y.; **Erik Lydick** (center), a third-year mechanical engineering major from Blue Bell, Pa.; and **Patrick Pistor** (right), a third-year web and mobile computing major from Otego, N.Y.

Their app was selected out of 350 entries for the student award.

The students created Dividr as part of the 2016 RIT iOS App Challenge, an Apple-sponsored hackathon hosted at RIT. The goal of the retro 2D arcade game is to move the main player in and out to avoid obstacles on the map and collect coins along the way.

presented by Digital Rochester Inc. The ceremony was held in September.

Otto, founded by **Erika Madison** (international business, Sodus Point, N.Y.); **Mariana Pinheiro** (MFA, industrial design, Brazil); and **Doug Huang** (MFA, industrial design, Taiwan), won the Student Achievement Award, presented to a currently enrolled student or team of students at a Greater Rochester higher education institution who has shown leadership and skill in applying or advancing innovative technology for the betterment of themselves, their educational institution, and/or the greater Rochester community.

Smart Toy is a series of interactive instruments designed to stimulate the senses of children with low-motor coordination skills through the use of textures, sounds, vibrations, and light patterns.



RIT Distinguished Professor **Vicki Hanson** was elected president of the Association of Computing Machinery, the world's largest educational and scientific computing society.

She leads ACM with its first all-female executive committee.

Hanson is a human-computer interaction expert and has been an ACM member and active volunteer for more than two decades. She has contributed to association conferences and served on the ACM executive committee.

As president, her key priorities include reaching out to practitioners, young professionals, and the global computing community, as well as underserved communities.

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Rochester Institute of Technology is internationally recognized for academic leadership in computing, engineering, imaging technology, sustainability, and fine and applied arts, in addition to unparalleled support services for deaf and hard-of-hearing students.

For two decades, *U.S. News & World Report* has ranked RIT among the nation’s leading comprehensive universities. RIT is featured in *The Princeton Review’s* 2016 edition of *The Best 380 Colleges* as well as its 2015 *Guide to 353 Green Colleges*. *The Fiske Guide to Colleges 2014* describes RIT as “strong in anything related to computing, art and design, and engineering.”

### Contact Information

To learn more about research opportunities on campus, contact us directly or through the RIT research website at [www.rit.edu/research](http://www.rit.edu/research).

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