

VITAL SIGNS

SUMMER 2017

HOME IS WHERE THE SENSORS ARE

Smart apartment enables research on healthy independent living





DEAN'S MESSAGE

DEAR ALUMNI, PARENTS, AND FRIENDS,

It's hard to believe that I've been at Bouvé only since March. It's been a fascinating and inspiring journey so far, and I thank everyone for making me feel so welcome. Everywhere I look, Bouvé faculty, staff, alumni, and students are doing enterprising work in research, training, and education.

Someone recently asked if I could name a single encounter or conversation that has made a deep impression on me—perhaps something that revealed the true essence of Bouvé. I paused, because I have these encounters every single day and it's difficult to recount just one.

I had that feeling when I toured the lab of Associate Professor Ganesh Thakur, from the Department of Pharmaceutical Sciences, who develops novel medications for patients with conditions like neuropathic pain, who have few good options for relief. I was equally impressed by the work of Associate Professor Eugene Tunik, in the Department of Physical Therapy, Movement and Rehabilitation Sciences, who uses virtual reality, fMRI, and brain stimulation to study brain circuits involved in movement coordination, and to rehabilitate patients after a stroke. And in our Nurse Anesthesia master's degree program, I was deeply moved by our graduates who will be practicing in military hospitals and conflict zones. New ventures that have the potential to change the health care industry are being mentored each day through Bouvé's extraordinary Health Sciences Entrepreneurs (HSE) program. The innovation happening in every discipline across Bouvé excites me for the future of the University.

In the pages that follow, you will read about some of the people, projects, and programs that make Bouvé an exceptional place to study, collaborate, and advance health sciences. You'll learn about a new high-tech apartment-lab that could lead to more seniors aging in place; Associate Professor Edgar Goluch's journey from researcher to entrepreneur, thanks to our HSE program; and alumnus Mark Zilner's transformation of his family's single pharmacy into a multi-million dollar business. And once you read about Assistant Professor Emily Zimmerman's research, you may never look at a baby sucking on a pacifier in quite the same way.

None of this work is possible without the support of our loyal alumni and friends. When you support Bouvé, your contribution has a ripple effect because the work we do here ultimately improves the lives of millions of people—not only in the United States, but around the world.

Best Wishes,

Susan L. Parish, PhD, MSW

Dean, Bouvé College of Health Sciences

Northeastern University
Bouvé College of Health Sciences

VITAL SIGNS

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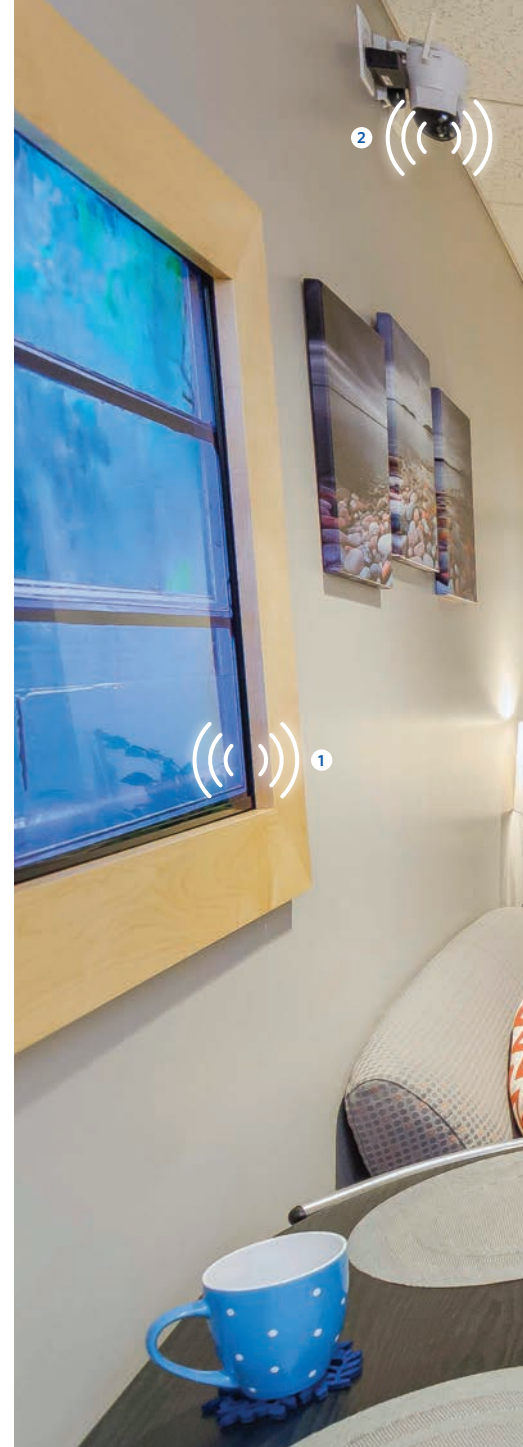
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THERE'S NO PLACE LIKE NUHOME

Northeastern's smart apartment-style lab enables home-based research right on campus



Imagine you are 80 years old and living independently. Your health is generally good, but you're showing signs of physical and cognitive decline. Your apartment "knows" this and is designed to help you age in place successfully:

Your cane detects when you're wobbling. An interactive screen leads you through strengthening exercises. A dispenser reminds you when it's time to take your medication. Lights inside the toilet help you find your way. At dinner, your long-distance daughter keeps

you company through a tablet computer mounted on wheels. And while you sleep, hidden sensors monitor your breathing, heart rate, and sleep quality, and if you're not up doing your usual activities in the morning, someone is notified.



1. Faux window for controlled environment
2. Control room view camera
3. Sensor devices: lamp, Amazon Echo, blood pressure cuff, universal remote for all devices
4. Motion sensor for detecting resident's location within the home and gait analysis
5. Smart phones and tablets
6. Wristband to capture physiological data like heart rate, accelerometry, and electrodermal activity
7. Smart cane for measuring gait and balance
8. Interactive video exercise system

This “smart” apartment may sound futuristic, but it exists now as a transdisciplinary laboratory on Northeastern’s campus, thanks to a research team at the Bouvé College of Health Sciences and the College of Computer and Information Science (CCIS). The investigators are using the lab—a

space converted into a contemporary one-bedroom apartment in Richards Hall—to develop, showcase, and train students in technology designed to support older and healing patients, as well as their caregivers, and to avoid unnecessary hospitalizations.



NUHome simulates a homey independent living environment, but one outfitted with sensors, voice-recognition devices, and other unobtrusive monitors. Using sophisticated data science, the technology picks up subtle variations in a person's daily patterns and provides tailored, just-in-time feedback to promote healthful behaviors. Your high-tech cane, for example, might say, "Take me for a walk!" if it notices you have been too sedentary. Or a sensor on your refrigerator might ping your nurse if you have not opened it in a while.



HOLLY JIMISON, PhD

"Family members are a committed, interested and yet untapped resource and should be a part of the health care team."

"With this model, we can detect an individual's specific health issues, such as changes in eating, sleeping, cognitive function, stress level, and socialization, earlier and more reliably—and help caregivers intervene at the right time," says project co-leader Holly Jimison, PhD, professor of practice at Bouvé's School of Nursing and

CCIS. Adds Misha Pavel, PhD, also a professor of practice at Bouvé and CCIS and project co-leader, "We now have the opportunity to do evidence-based coaching—that is, coaching based on digital data collected continuously in an individual's home. This approach combines human coaching with machine coaching."

The pair believes NUHome represents the type of new model needed to help transform a U.S. health care system "in crisis" with a graying population, swelling health care costs, and a high burden of chronic disease related to poor health behaviors. The country's population aged 65 and over is expected to nearly double by 2050, according to the U.S. Census Bureau. Most older adults have multiple chronic conditions, and nearly three-quarters of total health care spending is associated with chronic illnesses, reports the U.S. Centers for Disease Control and Prevention.

"We need new models of care that emphasize prevention, self-management, and social connections to improve patients' quality of life," says Jimison. "This approach offers a scalable way to provide better continuity of care than happens with sporadic visits to the hospital or clinic," says Pavel. "Many chronic conditions can be managed well at home with the proper support and continuity."

WORK IN PROGRESS

NUHome builds on earlier work by Jimison and Pavel at Oregon Health & Science University, where the couple (they are married) served on the faculty for



MISHA PAVEL, PhD

"Many chronic conditions can be managed well at home with the proper support and continuity!"

many years, and more recently in Washington, D.C., where they had government appointments focused on technology, data, and health. They joined NU in 2013 and established the Consortium for Technology for Proactive Care, which fosters innovation to promote long-term health behavior change and continuity of care outside a hospital setting. The innovative smart home lab is an outgrowth of the Consortium, as is NUCare, a project that enables nurse scientists to conduct cutting-edge research on self-management interventions (and was featured in the Spring 2015 *Vital Signs*).

The NUHome team is now fine-tuning the lab so that its sensors and mathematical algorithms can provide customized feedback and interventions—in the form of reminders, vital signs, exercise tips, and the like—to help patients follow their health goals. Working from a control room down the hall from the



1. Interactive video exercise system
2. Wristband to capture physiological data
3. Control room view camera
4. Sensors on microwave, silverware drawer, and fridge for inferring behaviors

apartment, the researchers can observe how people interact with the environment and validate the sensor data they are collecting.

They are building the infrastructure with technical support from Iman Khaghani Far, PhD, a Northeastern postdoctoral research associate who has collaborated



CHRISTINE GORDON, BA'07, MPH'11

“We’re developing the algorithms to indicate when caregivers should be pinged.”

with Jimison and Pavel since fall 2015, after they met in Finland (where the couple’s research is known) and bonded over their shared vision. “Health is very personal,” Far says. “Humans are complex, from a biological and psychological point of view. So the solutions for how you change behavior have to be very personalized.”

In the near future, the researchers plan to test their technology in “living laboratories”—that is, roughly 30 Boston-area homes with patients facing different health challenges, from smoking to traumatic brain injury—and scale up the technology from there. (See related story, p. 7)

They are also developing a curriculum to use NUHome for training students in nursing and physical therapy, in collaboration with the Arnold S. Goldstein Simulation Laboratories at Bouvé. These students will be able to practice using data captured in patients’

homes to manage health interventions from a distance. “The clinical leaders for this new model of care are going to come from nursing, physical therapy, and allied health fields—the people who are trained to do these types of interventions,” Jimison says.

Built as a sharable resource for Northeastern and beyond, the lab has potential to bring together students and faculty from additional fields such as architecture, engineering, cybersecurity, and robotics, and it will be open to industry leaders looking to innovate. The apartment was featured in Bouvé’s Nurse Hackathon, held in March 2017 to spur creative ideas around health care at home. (See more on Hackathon on p. 24 of Bouvé Updates.)

SUPPORTING CAREGIVERS

In addition to engaging patients in their health care, another key goal of NUHome is to help caregivers optimize their time and to increase



1. Faux window for controlled environment

2. Telepresence robot: “Skype on wheels” for socialization

3. Sensor devices: lamp, Amazon Echo, blood pressure cuff, universal remote for all devices

4. Smart phones and tablets

5. Wristband to capture physiological data like heart rate, accelerometry, and electrodermal activity

socialization for people living on their own.

The team is developing an “intelligent dashboard” that, using the digital information streamed from patients’ homes, would help nurses, coaches, and other formal

caregivers with large caseloads prioritize their interactions. As Program Manager Christine Gordon, BA’07, MPH’11, explains: “We’re developing the algorithms to indicate when caregivers should be pinged. We’ll be able to show them who is at risk and needs attention

now, versus who can wait until later in the day or receive the usual messaging.”

The researchers also hope their work will help family members who live far away contribute, in meaningful and productive ways,

"We need new models of care that **emphasize** prevention, self-management, and social connections to improve patients' **quality of life.**"

HOLLY JIMISON, PHD

to their loved ones' care. "Family members are a committed, interested, and yet untapped resource and should be part of the health care team," Jimison reasons, noting that loneliness is a key factor in mortality and morbidity among older Americans. Tools in the apartment can, for instance, let an adult son know when mom is sleeping (bad time to call), or when she has forgotten to take her pills. The system can also avoid over-alerting caregivers about minor issues, a situation that can lead to alarm fatigue.

The data-gathering aspects of this project may seem Big Brotherish to some, but Pavel and Jimison say that many older adults are willing to give up a certain amount of privacy, at least to trusted caregivers, in order to age in place. Well aware of these concerns, the team uses top encryption software, collaborates with NU personal health informatics experts, and plans to connect with the new Cybersecurity and Privacy Institute, which opened on campus this summer.

WHY NORTHEASTERN?

There are efforts around the country to help seniors live independently, better manage their health conditions, and avoid boomeranging between emergency departments and nursing homes, such as initiatives to expand house calls by doctors and nurses. Jimison and Pavel welcome those approaches but believe technology is essential to 21st century solutions.

Northeastern is a perfect place to be studying these issues, according to Jimison and Pavel. "When we were recruited four years ago, this was part of Northeastern's high-level strategic plan, to support transdisciplinary efforts to solve real problems like health and aging," they note. "We have an opportunity to work with incredible talent from both computer science and the health sciences. We're aiming to raise the bar at Northeastern for research in this area—and to advance the whole field." ■



NOT YOUR AVERAGE LAB

A simulated "smart" apartment, NUHome is helping investigators from Bouvé College and the College of Computer and Information Science tackle common health problems using both digital tools and human touch. Many of their pilot research projects focus on underserved populations. Topics include:

- » Managing hypertension among older African-American women
- » Promoting oral health through coaching around brushing
- » Supporting smoking cessation in older African-American men
- » Improving traumatic brain injury recovery at home
- » Monitoring stress by testing a chemical in urine
- » Preventing re-hospitalization after hip surgery

Though filled with artificial intelligence, NUHome is designed for easy use by clinical researchers, notes Professor of Practice Holly Jimison, PhD. "Nurses and other researchers come to us and say, 'Here is my clinical question. I want to monitor in the home and provide good feedback to help patients adhere to their health goals.' We provide technical guidance and infrastructure so they don't have to worry about the data storage, security, and transfer protocols behind the scenes. With our help, they're able to deploy and test state-of-the-art interventions."

A photograph of a man with short brown hair and a goatee, wearing a grey blazer over a light-colored collared shirt. He is smiling and looking towards the camera. The background is a laboratory with various pieces of equipment, including a microscope and a lamp with a glowing ring. The lighting is warm and focused on the man.

From Researcher to Entrepreneur

Edgar Goluch's Device Could Revolutionize Infection Testing

Chemical engineer Edgar Goluch, PhD, never intended to become an entrepreneur. But the Health Sciences Entrepreneurs (HSE) program at Bouvé College of Health Sciences, along with other programs within the University's entrepreneurial "ecosystem," helped turn him into one.

In 2014, Goluch, a NU researcher and associate professor of chemical engineering, was doing what he does best: teaching and spending lots of time in the lab—developing novel ways to detect the presence of certain cells and molecules. Although he knew his research had real-world applications, the

road to commercialization seemed too arduous.

Goluch changed his mind after a life sciences consultant said his discoveries had great potential, but that he needed a product to show would-be collaborators and investors. So Goluch went to work.

He contacted NU's Center for Research Innovation (CRI) to start the patent process. CRI put him in touch with Health Sciences Entrepreneurs, the 12-year-old program that provides structured, rigorous mentorship to graduate students, faculty, and alumni with promising health care-related products or services. HSE organized a dream team of volunteer mentors—seasoned, successful executives and serial entrepreneurs—each with a different area of expertise critical to his company's development.

"I know the diagnostic testing marketplace well, and I know how frustrated people are with how long it takes to get results back," explains long-time entrepreneur Craig Sockol, MS'79, the lead on Goluch's mentoring team. "Edgar's company has a major chance of becoming very successful and profitable. I can see it eventually penetrating the food testing market as well."

Goluch's company, QSM Diagnostics, offers low-cost tests for deadly bacteria—tests that are faster and more sensitive than current ones. Through earlier detection of bacteria, infections can be averted or at least treated more quickly.

QSM derives its name from quorum sensing molecules, which enable cell-to-cell communication and are secreted quickly and in large numbers by bacteria. QSM's device detects the presence of these molecules in bodily fluids without having to wait days for bacteria to

culture in numbers large enough for detection by traditional tests.

HAND-PICKED DREAM TEAM

Goluch's HSE mentoring team, which first met him at an event sponsored by NU's Venture Mentoring Network, helped him create a business plan, sharpen his presentation skills, and identify QSM's most auspicious markets.

“I used to go into a meeting and say, ‘Here’s how our technology works.’ Now I say, ‘Here’s what we can fix.’”

The mentors also coached him on developing a compelling pitch and connected him with potential investors. "The business side of things was very foreign to me," Goluch admits. "I used to go into a meeting and say, 'Here's how our technology works.' Now I say, 'Here's what we can fix.'"

Goluch also received invaluable assistance from NU's IDEA, a student-led accelerator that provided \$10,000 for prototype development; organized events at which Goluch pitched potential investors; and introduced him to professors from the D'Amore-McKim School of Business, who helped with interviewing CEO candidates.

And thanks to support from Goluch's mentors, he and graduate

student Hunter Sismaet, PhD'17, secured seats in two of the country's most prestigious programs for startups: the business accelerator MassChallenge and the National Science Foundation's I-Corps.

QSM's prototypes are now being tested in labs at George Washington University Hospital in Washington, D.C., Angell Animal Medical Center in Boston, and

soon, Tufts Medical Center. The company is on its way to raising \$1.5 million in funding—much of it thanks to introductions made by the HSE mentoring team. Goluch began a yearlong sabbatical in July to focus full-time on his company, and Sismaet has also joined QSM. An accomplished CEO, Phil Devlin, E'79, ME'83, is helping drive the company forward as well.

"My collaborators and I definitely wouldn't be where we are today without the Health Sciences Entrepreneurs program," says Goluch. ■

To find out more about the HSE program, visit www.neu.edu/hse or call Julie Norton at (617) 373-4839.



Jewel of a Job

Growing Diamond Pharmacy Services

Working at his parents' corner drugstore in junior high school inspired Mark Zilner, PAH'91, to become a pharmacist. But the young Zilner never imagined he would one day help transform their pharmacy in Indiana, Pennsylvania, into a versatile multi-million dollar company that serves more than 1,500 correctional facilities in 45 states and over 300 nursing homes in four states.

“Our growth is humbling and overwhelming,” says Zilner, 50, now chief operating officer and co-owner—with his parents—of Diamond Pharmacy Services, the nation's largest pharmacy provider to correctional facilities and Pennsylvania's largest long-term care pharmacy supplier. The company

fills about 16 million prescriptions a year, among its many services.

Despite its size, Diamond remains true to its original customer-focused mission, Zilner notes. “We've never lost sight of the reason we became pharmacists—to help our patients. That's the centerpiece of what we do.”

Mark Zilner, PAH'91 (third from left), and family members gathered at Northeastern in May to celebrate his accomplishments.

L-R: Cathleen Zilner (Mark's wife), Hayden Zilner (Mark's son), Mark Zilner, Gilbert Zilner (Mark's dad), Joan Zilner (Mark's mother), Cathy Zilner (Mark's younger sister)

Pharmacy is a challenging major, according to Zilner, and Northeastern prepared him for this leadership role by stretching him academically and exposing him to different aspects of the profession. One highlight was his co-op at a high-volume pharmacy that served nursing homes, where Zilner learned about clinical consulting, efficient operations, and “goals to shoot for” for the family business. As a transfer student from Duquesne University, he was also grateful for the supportive faculty and staff who helped ease his transition to Boston.

SEIZING OPPORTUNITIES

Diamond had roughly 25 employees and a handful of institutional contracts when Zilner graduated in 1991 with a bachelor of science degree in pharmacy. Guided by his Northeastern education and encouraged by his parents, he saw opportunities to bid on many more prison and nursing home contracts and add new services over the years. Today, Diamond has more than 1,100 employees and multiple divisions—including electronic health record software, retail mail order, wholesaling, medical supplies, and drug repackaging. It operates out of two large closed-door facilities, but still maintains its retail stores in town.

As COO, Zilner focuses on business development and correctional



Distinguished Alumnus

Pharmacist Mark Zilner, PAH'91, has earned local, state, and national awards for leadership in his profession and industry. In early May, he added a cherished honor: the 2017 Distinguished Alumni Award from the School of Pharmacy at the Bouvé College of Health Sciences. Acting Pharmacy Dean David Zgarrick, PhD, lauded Zilner for his initiative and dedication. "Mark took what he learned in the classroom and on his co-ops at Northeastern and applied this to the incredible foundation that his parents had provided, both in their business and in the values with which they raised Mark," said Zgarrick. "Mark and his family have not only grown a business, but have given back to their patients, profession, and community, including sharing their experiences with students at Northeastern."

customers, and he meets regularly with prison medical staff to help them manage costs and patient outcomes. Inmates, he explains, have typical health problems such as diabetes and heart disease, but they tend to have more challenging conditions than the general population; for example, hepatitis C and HIV infections are common. "They made bad decisions in life, but they are still people, and we treat them with the same care with which we treat the grandparents in our nursing homes," he says. Inspired by their faith, the Zilners choose to not provide drugs for prison executions.

Zilner loves working alongside his parents and says they never disagree on how to operate Diamond. "We trust each other's decisions," explains Zilner, the only one of

four siblings to pursue the family's pharmacy tradition.

In today's competitive job market, pharmacists must be innovative, dedicated, and business-minded, Zilner says. He enjoys mentoring Bouvé College students about the numerous career paths open to them, from clinical pharmacy to software, pharmacy management to research. His family was also delighted to help sponsor the CHATTER Symposium and Design Challenge, held at Bouvé on June 9-10 to generate ideas for autism research, an initiative that is important to them.

"I received a great education at Northeastern," Zilner says. "It shaped me to be the person I am today. It taught me to work hard and realize that anything is possible if you put your mind to it." ■

RemedyRepack, a division of Diamond, repackages pharmacy products into smaller units for use by clinics, schools, and other customers.





Bouvé Faces



Interested in joining Northeastern at the American Public Health Association (APHA) 2017 Annual Meeting & Expo?

Contact Emily Outcalt at e.outcalt@northeastern.edu for more information on “Creating the Healthiest Nation: Climate Changes Health,” happening in November in Atlanta, Georgia.



1. PharmD convocation 2017: Francesca Napolitano, PharmD'17, Cyrille Cornelio, PharmD'17, Jennifer Hum, PharmD'17, Fay Goldenshteyn, PharmD'17

2. Laura Kessel and Ben Farber participated in the June 2017 CHATTER Symposium and Design Challenge, which promoted collaboration on research and technology development for autism through building relationships.



3



4



5



6

3. Alumni, faculty, and friends from near and far celebrate the tenth anniversary of the Health Sciences degree in March 2017

4. Students practice a gait and balance test with Elaine Battis Thomas, PT'62: Kathleen Murphy, DPT'18, Brian Clancey, DPT'18, Matias Haller, DPT'18, Chris Daigneault, DPT'18, Savannah Knisely, DPT'18

5. First Northeastern alumni gathering at The Villages in Florida, where Northeastern's Department of Physical Therapy, Movement and Rehabilitation Sciences Chair Maura Daly Iversen presented research on joint replacement and exercise: Beverly Donahue, Paul Donahue, CPS'62, and Michele Forlizzi, MS'96

6. Second annual Nurse Hackathon spurs innovation in home health technologies: Dean Nancy Hanrahan, Dean Susan L. Parish, Professor Misha Pavel, and Michael Chen, PhD'14





BINKIES DO MORE THAN PACIFY

Bouvé Researcher Studies Infant Sucking as a Window into Development

Like many mothers, researcher Emily Zimmerman, PhD, has depended on pacifiers at times to soothe her two young daughters. But her interest in these parental sanity-savers is far from typical: Zimmerman, who is also a speech-language pathologist, has spent her career studying what babies' sucks can tell us about risks to their development.

“When a giraffe is born, it begins to walk immediately, but a human baby lies there like an adorable sack of potatoes,” says Zimmerman, an assistant professor in the Department of Communication Sciences and Disorders and director of the Speech and Neurodevelopment Lab at Bouvé College. The non-nutritive suck (NNS) that occurs on pacifiers and thumbs, she explains, is one of the first motor tasks babies perform and serves as a window into their growing central nervous systems.

Pacifiers can be beneficial because they help infants practice one of their most important jobs: sucking.

Sucking typically begins in utero around 15 weeks and provides important practice for the oromotor activities—those involving movement of the mouth—that await after birth. “If babies are good suckers and subsequently good feeders, then we hypothesize that they may also develop good babbling skills because these behaviors share neural pathways,” says Zimmerman. “Can problems with suck serve as a biomarker—a predictor of problems to come?”

She believes the answer is “yes,” and hopes to soon begin a study examining these early oromotor behaviors in detail across patient populations. The study will be a natural outgrowth of other research Zimmerman has done into the interplay between

feeding and the cardiopulmonary and nervous systems, as well as the factors that influence sucking, from pacifier type to environmental stimuli to genes.

PACIFIERS ENHANCE SUCK

Pacifiers are often blamed for a host of things, like nipple confusion, a claim Zimmerman debunks in a “State-of-the-Art” review she published in the *Journal of Perinatology*. Instead, she says pacifiers can be beneficial because they help infants practice one of their most important jobs: sucking. “The non-nutritive suck promotes oral feeding, makes babies more alert, and improves gastric motility—the contraction of the gastrointestinal muscles necessary for digestion,” she explains. Zimmerman also notes that the American Academy of Pediatrics recommends

that babies use pacifiers at night to reduce the risk of Sudden Infant Death Syndrome.

Sitting in her office on the second floor of the Forsyth Building, she dumps a mugful of pacifiers onto her desk and fingers them one by one, pointing out the differences in nipple shape and stiffness. One of her recent studies, a collaboration with her master’s thesis student Jaclene Forlano, MS, CFY-SLP’16, and Andrew Gouldstone, PhD, an associate professor in the Mechanical and Industrial Engineering department, used a pressure-sensitive device called a transducer to test how well different pacifiers promote healthy sucking. Designed by Zimmerman and a former NU mechanical engineering student, the device resembles a small microphone that is attached to the pacifier. The transducer is connected to a machine that records how hard and long the baby sucks,

The transducer is connected to a machine that records how hard and long the baby sucks, as well as the patterned bursts and pauses of oral activity.



Emily Zimmerman, PhD, and
Megan Foran, MS, CFY-SLP'16.
Images courtesy of ADInstruments Ltd.



as well as the patterned bursts and pauses of oral activity. This yields a graphic that looks like the peaks and valleys of an electrocardiogram. “Healthy babies can modify their suck patterning fairly quickly, but this isn’t true with babies who are medically fragile; to them these pacifier differences matter,” says Zimmerman. “If we know more about the effects of pacifier properties, the neonatal intensive care units (NICUs) will be able to offer pacifiers that are more supportive of sucking and feeding development.”

All of the research Zimmerman conducts on healthy babies is done with an eye toward how the findings can help babies who struggle with sucking and feeding, particularly those who are premature,

have Down syndrome, or are born with cleft palates.

OTHER INFLUENCES

Pacifier type is just one “environmental” variable Zimmerman has studied; she also investigates sensory inputs—particularly the sounds, images, and smells babies are exposed to while sucking. In one study published this year in *Acta Paediatrica*, Zimmerman recorded herself imitating a baby’s “well organized” sucking clicks and then played it to her small research subjects, hypothesizing that babies would try to mimic her patterns. They didn’t, and she theorizes that they were already proficient suckers and didn’t need auditory coaching. But she’d like to repeat

the experiment with babies in the NICU, and surmises that the results will be different. “Those babies, especially the preterm ones, are isolated in incubators and crave appropriate sensory sensation, such as sound,” she says. “My goal is always to find therapies that can translate back to the NICU and help these babies catch up to their peers developmentally.”

Zimmerman is now studying how visual stimuli affect non-nutritive suck. Because vision is the last sense to develop, there have been fewer investigations exploring the connections between sight and suck. In this study, babies are exposed to their mother’s scent (research has shown that maternal scent makes babies linger longer



on a human face), and then shown separate images of cars and women's faces. Based on preliminary data, infants suck more when looking at the faces. The study suggests ways that babies in NICUs might be helped, perhaps by exposing them to their mother's photo—not to mention scent, voice, or other forms of sensory stimulation.

ENVIRONMENTAL TOXINS AND DEVELOPMENT

Further from Bouvé, Zimmerman is involved in a transdisciplinary research collaboration in Puerto Rico, called the Center for Research on Early Childhood Development and Exposure—or CRECE, Spanish for “grow.” This multi-university center is directed by NU's Akram Alshabkeh, PhD, Snell Professor of Engineering, and José F. Cordero, MD, MPH, Patel Distinguished Professor of Public Health at the University of Georgia. The center investigates how mixtures of environmental exposures and other factors affect the health and development of low-income, underserved infants and children living in the heavily contaminated

island of Puerto Rico. Zimmerman visits Puerto Rico annually and the center is using her suck assessment on babies to measure the health of their central nervous systems.

MOTHERHOOD AND RESEARCH

Zimmerman obtained her BA, MA, and PhD from the University of Kansas, working as a speech-language pathologist while earning her doctorate. A post-doctoral fellowship in newborn medicine at Brigham and Women's Hospital brought her to Boston and eventually to Northeastern in 2013.

“I was drawn to Bouvé because of its emphasis on interprofessional work—the ability to work across disciplines and colleges,” explains Zimmerman. “These collaborations have enabled me to expand my research in ways that I could not have imagined, and that is very exciting.”

Zimmerman has always loved anatomy, physiology, neuroscience, and babies, so researching oromotor development in infants has been the perfect way to combine her passions. She says that becoming a mother has influenced her professional life—beyond the typical struggles of work-life balance. In addition to sometimes using her own two children (four-year-old Clara and one-year-old Margo) as research subjects, Zimmerman said her daughters have occasionally served as research muses.

Zimmerman describes how, after noticing an increase in baby Clara's arm movements prior to feeding, she began designing a study that explored signs of

feeding readiness. That investigation eventually morphed into one that examined changes to the autonomous nervous system, which controls unconscious functions such as breathing and digestion, before, during, and after feeding. Zimmerman has also formulated research ideas through conversations with other parents during play dates.

Having children has also made her more empathic toward parents whose babies aren't following a typical developmental trajectory, and more patient when things don't go as planned. “We ask the caregivers to come to the Speech and Neurodevelopment Lab an hour before feeding time, but inevitably, the baby ends up falling asleep or screaming the entire time. Or sometimes they get sick and can't come,” Zimmerman says with a smile, noting that visitors

“I was drawn to Bouvé because of its emphasis on interprofessional work—the ability to work across disciplines and colleges.”

are amused by the huddle of graduate student research assistants attending to a single baby and the research equipment. “It definitely takes a village, and our priority is always how to best accommodate infant and caregivers.”

The overarching goal of Zimmerman's research is to identify oromotor problems as soon after birth as possible. “The earlier we identify problems, the quicker the babies can get the targeted therapy they need,” she explains. ■



Northeastern University

“A charitable gift annuity provides secure income in retirement—and it allows us to make a meaningful gift to honor the legacy of my parents.”

Shirley G. Papp, N’74, and
Alexander Papp, III, DMSB’72

Planned Giving

In high school, Shirley Papp set her sights on becoming a nurse.

While Shirley’s parents supported her ambitions, her desire to attend college was beyond their realm of thinking, she says. With just eighth-grade educations, her mother and father had achieved much: Holocaust survivors, they immigrated to the United States in 1951 and determinedly built a new life.

Like them, Shirley, N’74, was driven and resolute. She earned a full scholarship from Northeastern, and as a student pursued wide-ranging co-ops, from pediatrics to oncology. “I wanted different experiences, to try everything,” she recalls. This mindset propelled her career as a nurse practitioner—which made her parents exceedingly proud.

For Shirley’s husband, Alexander, DMSB’72, Northeastern opened his eyes to the professional world. An industrial relations major, he instead discovered a passion for sales and marketing—and a short-term position with the U.S. Postal Service became a fulfilling lifelong career with the agency. “I never thought of my job as work,” he says.

To honor the perseverance of Shirley’s parents, the Papps established a charitable gift annuity to further Holocaust awareness through Jewish studies. “It was my parents’ mission to keep their story alive,” explains Shirley. “Our gift will accomplish this.”

For more information on this and other gift options, please contact the Office of Gift Planning at (617) 373-2030, or by visiting www.northeastern.edu/giftplanning.



IN EVERY ISSUE

Gifts in Action

SCHOLARSHIP HONORS JANE AROIAN'S DEDICATION

Jane Aroian, EdD'86, MSN, BSN, devoted more than 40 years to Bouvé's School of Nursing as a teacher, researcher, mentor, and director of the Nursing Administration master's program. During her distinguished career, she inspired thousands of students at all levels of education, including undergraduate, graduate, and PhD candidates. Aroian and her son, Michael, have established a scholarship to honor her commitment to her students and their futures as health care professionals.

BORG FAMILY SUPPORTS STUDENT GLOBAL RESEARCH

An influential and deeply engaged presence in the Northeastern community, Joanna Borg, HS'17, was inducted into the Huntington 100 and appointed to the Young Global Leaders in 2017. As a student, she became an ambassador for the Bouvé College of Health Sciences, serving as a student partner for projects such as *Vital Signs*

and speaking at parent events. She also conducted research in Stockholm, studying neuropsychology and juvenile idiopathic arthritis with Professor Maura Daly Iversen, PT, DPT, SD, MPH, FNAP, FAPTA. Now, Joanna and her family have created a fund to build upon her foundation of service and enable future generations of Bouvé students to participate in international research experiences.

FRAZIER SCHOLARSHIP REFLECTS GRATITUDE TO PHARMACY PROGRAM

Ophelia and Gary Frazier, PAH'81, have continued their legacy by establishing another scholarship to recognize students in the School of Pharmacy who excel in academics and/or business skills development. Their gift continues the Fraziers' steadfast support of the school, which includes a significant gift to the 50th Anniversary Scholarship Fund in 2012. The new scholarship reflects Gary's gratitude to the school, as well as the couple's confidence in Dean John R. Reynolds, PharmD, as a leader and scholar.

ZANES INCLUDE BOUVÉ IN ESTATE PLANNING

Ellen Zane, trustee emerita of Northeastern University and former president and chief executive officer of Tufts Medical Center, and her husband, Peter, have graciously remembered Bouvé in their estate plan. This gift recognizes the Zanes' connection to the University and their support of health sciences.

NU HEALTH STARTUPS BENEFIT FROM TIMBROOK GIFT

A generous gift from Todd Timbrook, PH'91, will support the day-to-day operations of the Health Sciences Entrepreneurs (HSE) program at Bouvé. The HSE program promotes health sciences innovation within the Northeastern community by providing students, faculty, and alumni with resources to build successful companies through specialized education and hands-on mentoring.

Pictured above: Jacob Borg, DMSB'20, Joanna Borg, HS'17, and President Joseph E. Aoun

DEAN'S CIRCLE MEMBERS

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J. Andrew Skirvin

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Dean's Circle Members support Bouvé College with an annual donation of \$1,000 or more. Donors listed as of June 30, 2017. To find out more about becoming a member of the Dean's Circle, please call Julie Norton at (617) 373-4839.



Dean Susan L. Parish, Elaine Dors, N'67, UC'69, Prince Nnah of IntelyCare, Inc.



Bouvé Updates

Director of Nurse Innovation & Entrepreneurship Rebecca Love, RN, MSN'08, ANP, and Chris Ford, DMSB'73, advisory board member to the Nurse Innovation & Entrepreneurship initiative and Health Sciences Entrepreneurs, at the Nurse Hackathon 2017

APPLIED PSYCHOLOGY

Honoring Two Beloved Professors

The Department of Applied Psychology bid farewell to two long-serving, retiring faculty members recently: Emanuel (Manny) Mason, EdD, and William (Bill) Quill, PhD.

Mason joined NU as department chair in 1996, a position he held until the fall of 2004. He also served as Bouvé's interim associate dean for research from September 2011 to September 2012, and led the department again as interim chair from July 2012 to July 2013.

He was particularly adept at helping students who were struggling with their dissertations. He served as the “closer” —stimulating them to think about the important contributions they could make to psychology and encouraging them all the way.

He was a consummate collaborator, sought out for his expertise in research methods, statistics, measurement, and psychometric scaling. Mason authored numerous books and papers and was founder and president of the Society for the Study of School Psychology.

Quill, the longest-serving member of the department, started working at Northeastern in 1968. His

scholarship centered on counseling psychology, and he pursued research in theoretical psychology, historical psychology, philosophy of mind, epistemology and metaphysics, and philosophy of science. He, too, authored several books.

Quill developed a master's degree program in human resources counseling and led the master's degree program in school counseling with distinction. He was held in high regard as a teacher and never slowed down, even teaching seven courses in his final year at Bouvé.

COMMUNICATION SCIENCES

AND DISORDERS

Speech-Language Pathologists Share Insights in Uganda

Lorraine Book, PhD, and six recent graduates of the Master of Science in Speech-Language Pathology (SLP) program, presented a workshop



L-R: Linda Juppe, SLP Graduate Program Director Lorraine Book, and alums Stephanie Carozza, Leah Diamant, Leah Burkholder, Jessica Davi, Carly Turner, Chelsea Monfalcone

to ministry officers, physicians, parents, educators, and other professionals in Kampala, Uganda, in May. Book is an assistant clinical professor and SLP program director. The workshop focused on early identification of autism spectrum disorder (ASD) and early intervention strategies for young children with disabilities.

The group also conducted research on Ugandan professionals' knowledge of ASD and spent two weeks

providing staff training and services to children at Tunaweza Children's Centre, which provides therapy, education, and day programs. Book plans to continue her research in Uganda and pursuing collaborations with Titi Pamela, Tunaweza's founder and CEO.

In other Communication Sciences and Disorders news, Clinical Instructor Susan Fine, MA, presented her work on early literacy to faculty and students in the Division of Communication Sciences and Disorders at the University of Cape Town, South Africa, in May.



Master of Science Speech-Language Pathology students volunteered as team leaders at the Collaboration Highlighting Autism Through Technology for Emotion & Relationships (CHATTER) event at Northeastern in June. Pictured are Caitlin McDonough, Danielle Alu, Nicole Garrote, and Emma Justice

HEALTH SCIENCES

New MPH Director, Grads Make their Mark

Neil Maniar, PhD, MPH, who was recently appointed professor of practice in the Department of Health Sciences, has been named director of the department's Master of Public Health (MPH) program. He succeeds Shan Mohammed, MD, MPH, who will serve as interim department chair.

As a part-time Bouvé faculty member since 2014, Maniar has developed and taught courses in the MPH program and served as a capstone committee member for several public health students.

Before joining Northeastern, Maniar was vice president of health systems in the New England division of the American Cancer Society. He was previously director of health equity programs at Brigham and Women's Hospital's Center for Community Health and Health Equity and founding director of the Massachusetts Youth Violence Prevention Program at the Massachusetts Department of Public Health. He is a director of the Massachusetts Public Health Association.



Master of Public Health Program Director Neil Maniar, PhD, MPH

Maniar received his PhD from the Johns Hopkins University Bloomberg School of Public Health in 2005 and his MPH with distinction from the Yale School of Public Health in 1998.

This was a banner year for Health Sciences. In addition to the undergraduates who were accepted into outstanding graduate programs, 12 students will attend medical and dental school this fall. Their matriculating schools include



Health Sciences graduates bound for medical school at a Future Doctors celebration included:
 Back Row: Max Oyer, Max Morin, Brandon Barrett, Hussein Antar, Jason Keshian. Front Row: Meghan Jastrzembki, Candice Quarella, Abbey Dallas

UMass Medical School, Tufts University School of Dental Medicine, UConn School of Medicine, Mayo Clinic School of Medicine, Northwestern University Feinberg School of Medicine, The Warren Alpert Medical School of Brown University, and University of New England College of Osteopathic Medicine.

Kate Lena, MPH'16, published an article entitled “Curbing Opioid Overdose Using Programmatic and Geospatial Data” in the Winter 2017 issue of the *NACCHO Exchange*, a publication of the National Association of County and City Health Officials. Lena was invited to contribute based on her presentation at the 2016 Harm Reduction Conference in San Diego. That presentation drew upon data she had gathered during research for her MPH degree.

The PhD Program in Population Health has graduated its first two students. Trenton Honda, PhD'16, MMS, PA-C, is program director

of the Physician Assistant program at Bouvé. His dissertation focused on long-term air pollution exposure and cardiovascular risk factors in older Americans and the need to strengthen connections between public health and clinical practice. Lindsay Tallon, PhD'17, wrote her dissertation on the impact of air quality and lifestyle on biological markers of cardiovascular disease and measures of cognitive function in older adults.

NURSING

Nursing the Spirit of Entrepreneurship

Entrepreneurship is thriving at the School of Nursing, thanks to the Nurse Innovation & Entrepreneurship initiative, launched in June 2016 with support from Exergen Corporation. As a Mission Sponsor, Exergen supported the initiative at the highest level. The initiative has held 14 events in the past year, engaging more than

1,000 participants. Its March 2017 Hackathon brought together 200 participants and 60 mentors—seasoned executives who coached the teams during three days of innovation, creation, collaboration, and pitching. The winning team, Heera Care, designed a medical device to treat and manage incontinence.

Based on the Hackathon's success, IBM invited a Northeastern expert panel to its “Startup Weekend” on health in March. The group, which advised competing teams about the real-world applicability of their ideas, included Director of Nurse Innovation & Entrepreneurship Rebecca Love, RN, MSN'08, ANP, School of Nursing Director of Global Health Valeria Ramdin, BSN'92, MSN'95, PhD'16, and alumnae Hiyam Nadel, BSN'81, MBA, and Christine O'Brien, BSN'96, MS'13.

In May, the Nurse Innovation & Entrepreneurship initiative held its inaugural “NurseSharktank,” when a dozen nurse-entrepreneurs

pitched ideas to a panel of investors. Senior nursing students won “most impactful nursing idea” for their incontinence scale.

July’s NP Conference was attended by 100 nurse practitioners from around the country. The conference centered on helping NPs learn essential business skills for building a successful practice. Sponsors included Meditech, IntelyCare, Exergen, Massachusetts Educational Financing Authority, connectRN, and Orbis Education. Follow the initiative at <http://www.northeastern.edu/nurseinnovation/>

PHYSICIAN ASSISTANT

Combined PA/HI Degree Is Country’s First

Bouvé’s Physician Assistant (PA) and Health Informatics (HI) programs have launched the first combined PA/HI program in the nation. This transdisciplinary collaboration will enable students who are passionate about transforming health care and health information technology to combine their interests in a

dual-degree program. Graduates will be prepared to become leaders in managing and using information technology to improve health care. Students will examine technological issues in clinical practice and develop expertise in quantitative methods and the use of scientific evidence and information technology to optimize clinical coordination and workflows.

PHYSICAL THERAPY, MOVEMENT AND

REHABILITATION SCIENCES

Leading the Way in Advocacy and Service

In April, Department of Physical Therapy, Movement and Rehabilitation Sciences faculty member David Nolan, PT’97, DPT, MS, who coordinates the physical therapy delivered at the Boston Marathon finish line, and several other faculty members and students, provided care at the Marathon. The faculty members were Stephen Clark, PT, DPT’12, MS, Mary Hickey, PT, DPT, MHP’00, and Christopher Cesario, PT, DPT’12, MBA. Nolan and two of the department’s sports residents



#MovementMatters Scope of Practice Day at the Massachusetts State House. (L-R) Pamela Donlan, Ann Golub-Victor, Eric Folmar, Debra Bangs, Maureen Watkins, and Diane Fitzpatrick

provided similar services at the Special Olympics Massachusetts summer games in June.

The PT Club received an honorable mention in the national Marquette Challenge, a fundraising competition. The club collected \$3,200 to support the Foundation for Physical Therapy’s research scholarship and grant program.

In May, Clinical Professor Diane Fitzpatrick PT’79, DPT’06, led a team of faculty and students in the American Physical Therapy Association of Massachusetts #MovementMatters Scope of Practice Day at the Massachusetts State House. With physical therapists from across the state, they visited legislators to discuss the association’s public policy priorities.

Students in the “Psychosocial Aspects of Healthcare” seminar conducted wellness programs for Boston area youth and older adults with and without disabilities. The course and its partnerships received a 2017 NU Community Engagement Award, presented to Clinical Professor Ann Golub-Victor, PT, DPT’06, MPH, for building meaningful and sustainable partnerships with citywide community-based organizations.



Northeastern faculty and students accept a 2017 NU Community Engagement Award. (L-R) John Tobin, Derek Lumpkins, Becca Berkey, Lorna Hayward, Hilary Sullivan, Ann Golub-Victor, Colleen Holohan, and Carl Barrows



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CALLING ALL GOLDEN GRADS!

Join us in celebrating your 50th reunion at Bouvé next May.

For more information, call Emily Outcalt (617) 373-3547 or email at e.outcalt@northeastern.edu



The class of '67 School of Nursing Golden Graduates celebrates 50 years

(L-R) Greta Soucy Paulhus, Rosanne Sidman-Karp, Catherine V. Burgess, Terry Ayers Kurdzionak, Elaine Dors, Dean Hanrahan, Jeanette Ives Erickson, Mary Lou Lyons Linnemann, Carol Crossen Murphy, Deena Kaplan David, Diane Fortnam O'Brien, not pictured: Gloria H. Cater