

A PLAN FOR THE AGES

AS THE WPI PLAN TURNS 50,
A GROUNDBREAKING IDEA BECOMES
A GLOBAL REVOLUTION



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A PLAN FOR THE AGES

Fifty years ago the faculty approved the WPI Plan—reflections on how our project-based education has evolved.

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In memory of alumni, faculty, and other members of the WPI community

spring 2020

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WPI Journal (ISSN 1538-5094) ©2020 is published quarterly by Worcester Polytechnic Institute (WPI) in conjunction with the WPI Alumni Association. Periodical postage paid non-profit at Worcester, Massachusetts, and additional entry offices. Issues are mailed to all known WPI alumni living within the U.S. as a benefit of having graduated from WPI. This publication is guided by WPI's principles of free expression and accepted standards of good taste. Opinions expressed are those of the signed contributors and do not represent the opinion or official position of WPI or its officers. POSTMASTER: Please send address changes, Form 3579, to WPI Journal, Worcester Polytechnic Institute, 100 Institute Road, Worcester, MA 01609-2280.

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LETTERS

TO THE EDITOR

Letters to the editor may be altered for length, clarity, and accuracy. We ask that letters offer the reader's opinion without rancor. Letters that mock or insult will not be published. Opinions expressed do not necessarily reflect the views of WPI. Send your letters to wpjournal@wpi.edu.

Productive Praise

I am sure you get lots of feedback on what a wonderful communication portal the *WPI Journal* is for us alumni far and wide to WPI.

I just wanted to write and let you know how much I enjoy receiving each printed issue and the so very interesting stories you find to tell us about our Institute and its people.

I am amazed how varied and productive the alumni of WPI are, from the 103-year-old Class of '37 alum you featured in the Winter 2019 issue to the faculty (old and new) who bring new energy and perspective to WPI and the study of technology.

Personally, I am most grateful for my old friend and mentor, Professor Bill Durgin (ME Dept and Provost), who has blazed a trail from Brown University to Worcester, Cal Poly SLO, and now SUNY Poly. He was my faculty MQP advisor long ago in the nascent WPI Aero program. I have watched that program grow over the past 30 years and much of it is due to his early work with Professor Don Zwiep (ME Dept Head) in the mid-1980s.

I am very proud to call WPI my alma mater. My WPI Plan education has served me very well over the past 32 years—first as a USAF officer, aviator, program manager, and now in many other areas.

I am also fortunate to have had two amazing alumni roommates, John Joseph '86 (ME) and Glenn Mandigo '87 (CHE), who are still good friends to this day. In addition, my AFROTC classmates have done amazing things in their service to our nation and we all are still in touch (well, mostly!).

As a former admissions tour guide at Tech in the late 1980s, I am amazed how the campus has evolved and changed to better educate the future alumni of the Institute. I am sure there are some talismans of my era, but I see the photos and renderings of the new additions and marvel at the growth of my alma mater.

Keep up the good work and I look forward to many more *WPI Journal* stories and exploits.

Tom Cappelletti '87, Lt. Col., USAFR (Ret.)

I just finished reading the latest edition of the *Journal*. Congratulations! To me it has reached a completely new level of thoughtfulness, preparation, presentation, and relevance.

I now will look forward to reading future issues with a brand new enthusiasm. Cheers for the entire team.

ONWARD to 2020.

Carl Youngman '64

ON THE COVER

Fifty years after the creation of the WPI Plan, we reflect on how far this educational influence has taken us. Hearing voices from our faculty, administration, and alumni, we hope our readers will feel the importance of this endeavor—on our past and on our future.

EDITOR'S NOTE:

One of my favorite *Journal* endeavors is driving through the Vermont countryside on my way to a press check at Lane Press in Burlington. Thanks to our designer, Todd Verlander, for snapping this photo below of me gleefully reviewing the printed pages. Almost nothing compares to seeing (and hearing) our hard work rolling through the cacophony of these massive presses.





President Laurie Leshin sits down with Provost Winston (Wole) Soboyejo

WATCH VIDEO OF INTERVIEW IN ITS ENTIRETY AT WPI.EDU/NEWS/WPIJOURNAL.

LL: Welcome, Wole. There's so much happening in academics here right now. I'm really excited about getting moving on The Global School. What are your thoughts on this?

WS: I think The Global School is the next evolution for us. We are going to build on a culture of project-based education ... this blend of research and education that can inform policy and have an amazing impact on our project-based activities all across the world.

LL: We're taking WPI's famous global projects program to the next level.

WS: Yes, I think we're building on what I call "our special sauce." It's the way we approach projects, solve problems, and integrate with our partners across the world for major impact.

LL: The Global School's all about crossing disciplinary boundaries, but you're thinking about that on a much larger scale. Tell us about some of the cross-cutting themes you've been focused on.

WS: The most exciting areas in science and technology today are at the interfaces where we can have groundbreaking discoveries driving the technologies of tomorrow, and changing the lives of people across multiple generations. There are many areas we're pushing. One is looking at materials and manufacturing, which goes back to our early origins but also now connects with machine learning to create the manufacturing of tomorrow. We have groups on campus doing world-leading research, working with industry and groups of companies across the globe to drive the future of materials and manufacturing. In the bio space, we have innovations in neuroscience, new advances in biomanufacturing, and many new areas that connect the frontiers of biology and engineering.

LL: Health and medicine together with engineering and data. Absolutely. And then the smart world, of course.

WS: Smart world is this eclectic mix of robotics, artificial intelligence, machine learning, sensors, the internet of things, autonomous vehicles – all representing a new era in technology. It represents how we could collectively bring all those areas together to drive the future of technology in ways that impact the world. And the new building represents the next stage of collaborative learning as well. When you integrate these areas into global initiatives, you have a framework that supports The Global School in a way that's truly unique.

LL: All of this provides cutting-edge, educational opportunities for our students. And, of course, they're at the center of everything we do. So how are these new initiatives going to drive the future of WPI education?

WS: We connect our research to our teaching, and I think that's the sweet spot for WPI. As we look to the future of project-based education, we want to bring together cutting-edge approaches in project-based education at both the undergraduate and graduate levels, connecting them to our strengths in STEM education, and then bringing together the hands-on and theoretical components in a way that will continue to make WPI students leaders of tomorrow.

LL: Plus, we are continuing to think about new degree programs, new offerings. We now have a bachelor's degree in data science, and we are constantly innovating around our current academic offerings. And that to me is so exciting – the connection from groundbreaking research all the way to the classroom with our students. Thank you for your work in our academic enterprise. I'm very excited to see what comes next.

[CLASS*notes*]

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to staycations, promotions
to retirements...



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what you're up to!

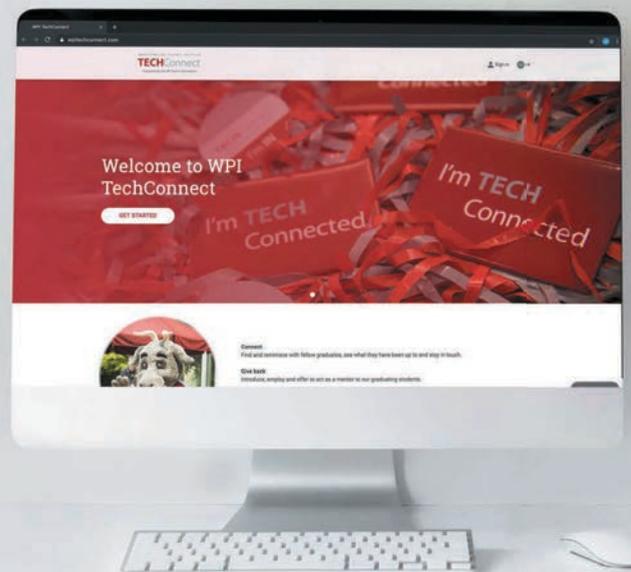
CLASSNOTES@WPI.EDU

WPI **TECH**CONNECT is *New and Improved!*

WPI's exclusive networking platform, TechConnect, has just received an upgrade. Your new home screen now features what you want to see most—updates from alumni. Many other features have been upgraded as well.

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INSIDER

MEREDITH FORCIER '20

For **MEREDITH FORCIER '20** (BS Biomedical Engineering/International and Global Studies; MS Management), the truth is self-evident. As a high school senior, her list of potential colleges was deep, yet her parents consistently pointed out that WPI seemed to be a perfect fit. Originally applying simply to appease them, Forcier then attended an overnight program on campus and later took part in the Accepted Student Day event, when her gut told her that her parents were right.

"I can't say it was one specific thing that brought me to WPI, but rather it was a feeling. I felt the sense of community and passion students had for the school and all that it encompasses," she recalls.

Based on that gut reaction, a deposit was made and a home was created for the next four years. "While it sounds clichéd, I chose WPI for the community and I stayed for the same reason," she admits. "I have always felt supported, challenged, and welcomed by my peers and professors alike."

Her biomedical engineering track was influenced by another family member—her grandmother, who'd been diagnosed with stage 4 pancreatic cancer. Forcier says that her grandmother's yearlong battle inspired her to focus within the healthcare industry, with the goal of "working toward a future with less disease and more life," she says.

Her interest in International and Global Studies stems from her love of travel, and her awareness that her work should keep a global mindset thread throughout.

"Pursuing an MBA is something I knew I wanted to do after working for a few years," she says, "and when I learned that WPI had an alternative track to an MBA through an MS in Management, I jumped at this opportunity."

With hopes of integrating a business approach to her work in healthcare, Forcier says her MS work has helped her develop teamworking skills and helped manage projects and groups more efficiently. It has her thinking in more cross-functional ways than ever before.

When asked to reflect upon the most challenging aspects of WPI, she admits that after excelling in high school, learning to embrace failure was her biggest impediment in her first year. "I failed one of my first tests, and I learned more from that failure than any test I ever previously aced," she confesses. "I learned that it is okay to not know everything, because that is how we grow, and I also realized all of the support that I was surrounded by allowed me to improve and grow, moving forward."

A key aspect to her time at WPI has been the guidance found through the Trustee Mentor Program, where she was able to make important connections and gain insight into future roles. "Joan Bolduc Szkutak '79 has been an incredible mentor and inspiration to me, and I know she will continue to be a great resource for support and guidance after I graduate."

The support system of Forcier's Phi Sigma Sigma sisters has proven invaluable as well. She says she's shared common values with them—and has given and received support when needed. "There is also a great camaraderie between the fraternities and sororities on this campus. Everyone does such great work for the community and supports each other in these causes."

Her most cherished time at WPI has come full circle in the community that attracted her in the first place. "It might be hard to believe from an outsider's perspective," she says, "but truly I think it's what makes WPI so special. There are many aspects that build the caring community—including the dedicated faculty and staff, and the unique curriculum structure supported by the WPI Plan."

HONORABLE MENTIONS

- Resident Advisor • Colleges Against Cancer • Phi Sigma Sigma
- Trustee Mentor Program • Crimson Key • Student Support Network



Think you *know* WPI?

New program—the Foisie Business School is launching a new program to help professionals harness the power of data and apply it successfully in the workplace. When thinking about grad school, consider a Business Analytics degree from your alma mater. Or explore other new programs in user experience and supply chain management.

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 business.wpi.edu



Variety is the name of the game at the Japan Project Center, which, after initially focusing only on MQPs, has grown into a hub of project activity spanning both grade levels and cities across Japan.

Professor of arts, communications, and humanities Jennifer deWinter inherited the project center a few years ago, and has subsequently built it into a project empire of sorts: it's the only project center location where students can complete their Humanities & Arts Requirement, IQP, MQP, and now, grad project. If the interest in Japanese-based clubs and independent studies on campus are any indication, the project center's popularity won't be slowing down anytime soon.

"These kids grew up on Japanese culture and media and want to participate in this sort of techno-utopia that is their understanding of Japan," deWinter says. "It's got a very strong hold on students' imaginations."

William Lucca '20, whose team created a virtual reality game to engage players in physics-based combat, is a prime example of the student she describes. He grew up playing Nintendo and Square Enix games, and was so determined to explore the technology and culture responsible for such an important part of his childhood that he ultimately made the decision to attend WPI because of the Project Center.

"Video games, like all art, are influenced by the culture they're born from," he says. "I wanted to see the place where these games were made and experience it for myself—for my own learning and because I found such a different cultural experience to be exciting."

While a passion for games and media may spark an interest in the Japan Project Center for some, the reasons students ultimately decide to attend are just as varied as the projects they work on. Students interested in immersing themselves in new cultures and traveling far from home tackled projects focusing on everything from urban and

environmental sustainability and cultural heritage preservation to cutting-edge gaming and the social and historical contextualization of Japanese hip-hop.

Audrey Berner '21, who worked with the nonprofit publication *Kyoto Journal* to increase its readership, subscriptions, and consumer awareness, says her experience was invaluable in preparing her for life after WPI.

"The IQP teaches you a lot about yourself," she says, "but also about the people you work with in your team ... if you can understand how to read team dynamics and work toward a common goal with others—especially people you don't always see eye-to-eye with—then you'll be very prepared to enter the workforce after WPI."

At WPI it's common for especially large, in-depth projects to be passed down from IQP team to IQP team, each using its own expertise to build upon the work of previous groups, but students at the Japan Project Center take this concept one step further. A 2018 IQP team worked with Kyoto VR to evaluate its GPS-based augmented reality audio guide through user experience testing, field observations, and interviews. In 2019 an MQP group took the findings of those IQP team members and began building the application they recommended.

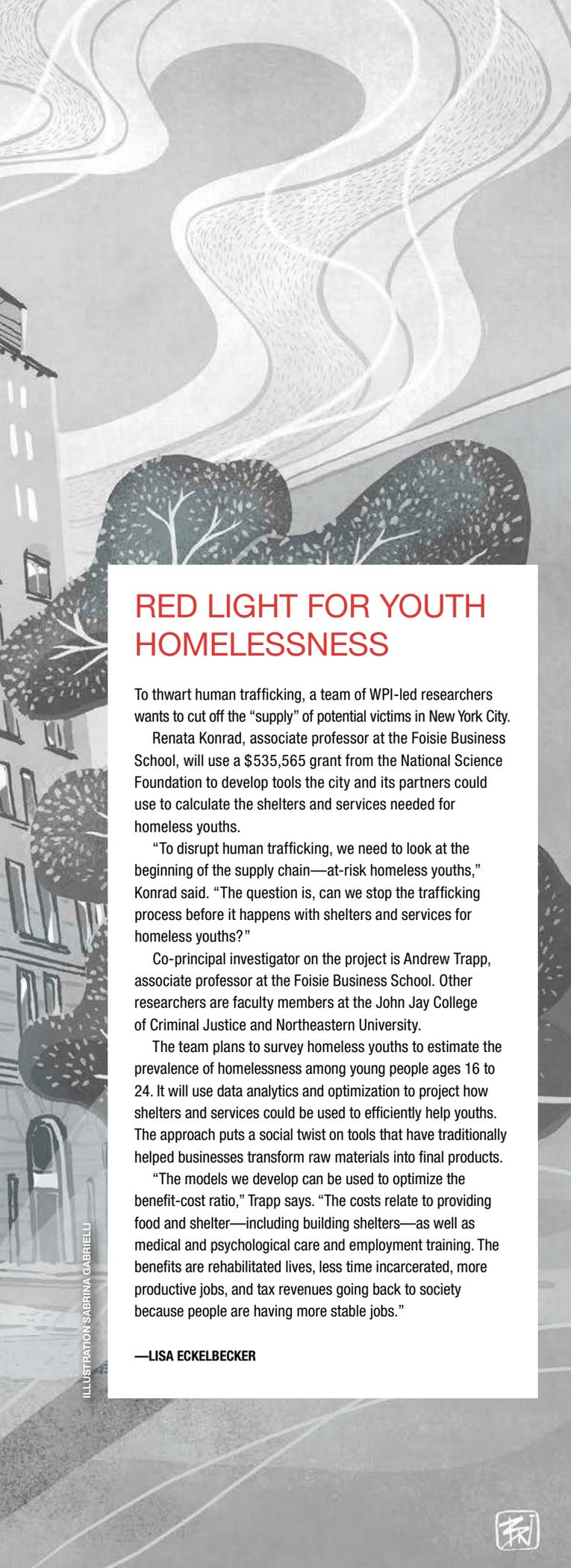
Like most aspects of their WPI education, students' time at the Japan Project Center is holistic—although they're hard at work, they still find time to explore all parts of Japanese culture, from the food ("Hands down, the food in Japan was the absolute coolest thing I've ever seen," says Berner) to the sights (Lucca and his team climbed Mount Fuji, a trek that mostly took place above the clouds and tree line, something he describes as "absolutely surreal, like being on another planet"), making for experiences more than worth writing home about.

—ALLISON RACICOT

WPI

The latest in university news, research, and commendations





RED LIGHT FOR YOUTH HOMELESSNESS

To thwart human trafficking, a team of WPI-led researchers wants to cut off the “supply” of potential victims in New York City.

Renata Konrad, associate professor at the Foisie Business School, will use a \$535,565 grant from the National Science Foundation to develop tools the city and its partners could use to calculate the shelters and services needed for homeless youths.

“To disrupt human trafficking, we need to look at the beginning of the supply chain—at-risk homeless youths,” Konrad said. “The question is, can we stop the trafficking process before it happens with shelters and services for homeless youths?”

Co-principal investigator on the project is Andrew Trapp, associate professor at the Foisie Business School. Other researchers are faculty members at the John Jay College of Criminal Justice and Northeastern University.

The team plans to survey homeless youths to estimate the prevalence of homelessness among young people ages 16 to 24. It will use data analytics and optimization to project how shelters and services could be used to efficiently help youths. The approach puts a social twist on tools that have traditionally helped businesses transform raw materials into final products.

“The models we develop can be used to optimize the benefit-cost ratio,” Trapp says. “The costs relate to providing food and shelter—including building shelters—as well as medical and psychological care and employment training. The benefits are rehabilitated lives, less time incarcerated, more productive jobs, and tax revenues going back to society because people are having more stable jobs.”

—LISA ECKELBECKER

ILLUSTRATION: SABRINA GABRIELLI



SOLAR DECATHLON

Temperatures topping 110 degrees in central Morocco did not stop a WPI-led team of students and faculty from constructing a house from the ground up as part of the 2019 Solar Decathlon.

The goal of the international competition was to challenge university teams to develop solar-powered houses that are cost-effective, energy-efficient, and attractive while incorporating the region’s unique characteristics and local resources into green buildings.

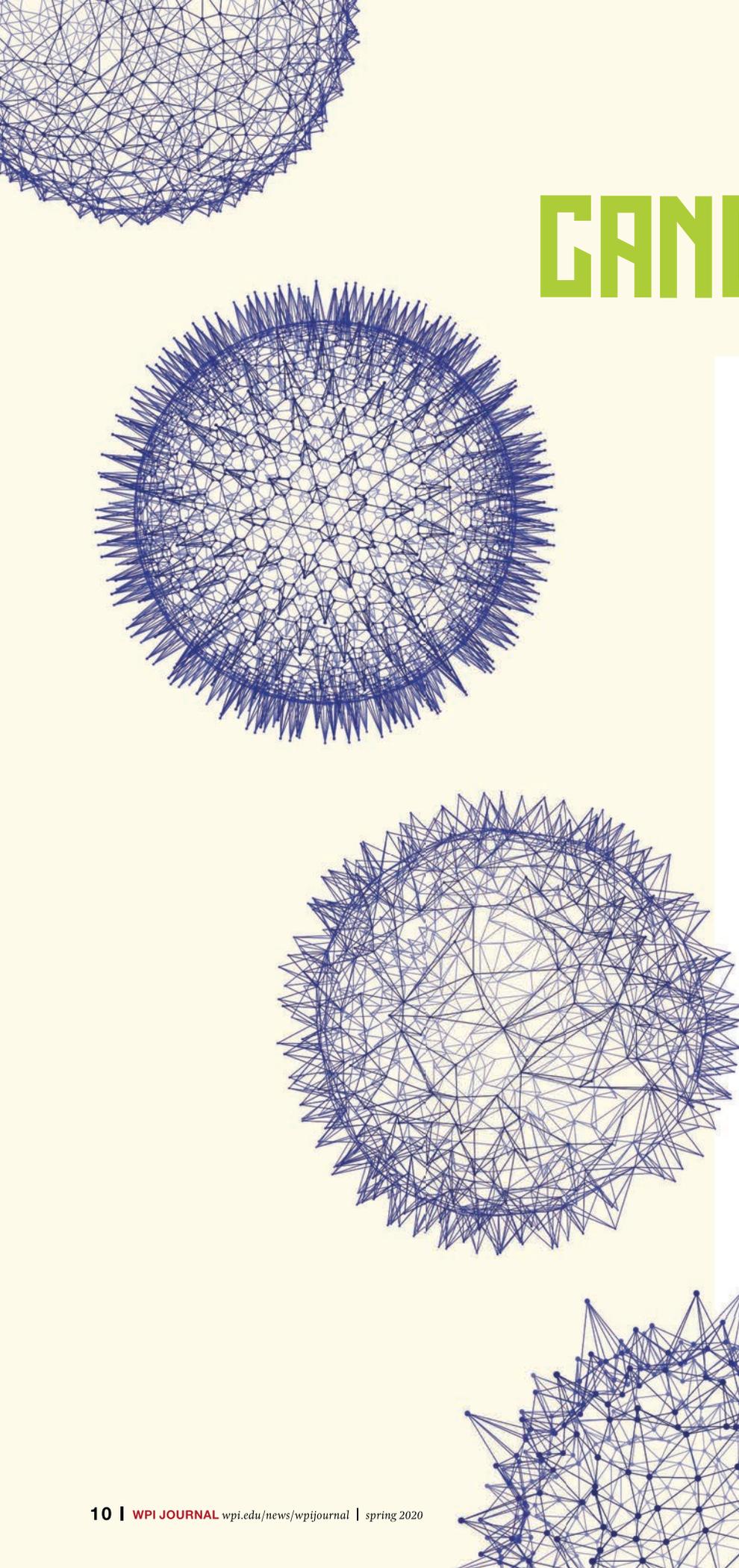
For six weeks, Team OCULUS, as the group named itself, worked with local artisans and representatives from other African schools on a house that combined traditional Moroccan architecture and modern design techniques.

From a passive downdraft evaporative cooling (PDEC) tower to a hand-woven exterior, the team challenged themselves to draw on their technical expertise and knowledge of African culture in the Ben Guerir area of Morocco. The result of this hard work: a beautiful and unique basket-like structure that placed first in the house comfort category and fourth in architecture.

Team OCULUS members included l’École Nationale Supérieure d’Arts et Métiers (ENSAM—Meknes, Morocco), l’Ecole National Supérieure d’Informatique et d’Analyse de Systèmes (ENSIAS—Rabat, Morocco), and the African University of Science and Technology (AUST—Abuja, Nigeria). The competition was sponsored by the Moroccan Ministry of Energy, Mines, Water, and the Environment (MEMEE); the Moroccan Institute in Solar Energy and New Energies (IRESEN); and the U.S. Department of Energy. WPI previously competed in the 2013 Solar Decathlon, held in Datong, China.

—COLLEEN WAMBACK





CANCER BOTS

HAICHONG (KAI) ZHANG, assistant professor of biomedical engineering and robotics engineering, believes the approximately 200,000 American men diagnosed with prostate cancer each year deserve a system to detect and monitor their cancer with the safest and least invasive means, minimizing the use of needle biopsies.

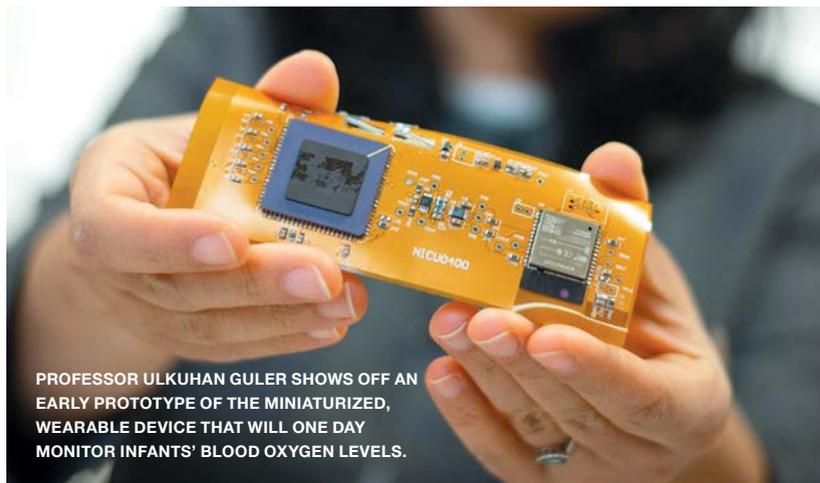
With a five-year, \$1,869,423 Director's Early Independence Award from the National Institutes of Health, Zhang is focused on doing just that. With his robotic system he hopes to detect and analyze three indicators of prostate cancer: a 3D image of any mass, high levels of a protein produced by cancer cells, and tissue with low-oxygen levels caused by cancer growth.

By simultaneously focusing on these different, but complementary, signs of prostate cancer, he expects his system will be more accurate than current tests (ultrasounds and biopsies unguided by MRIs). His work also may eliminate the need for radioactive contrast dye, which is used in traditional scans and poses other health risks.

"One fifth of men will be diagnosed with prostate cancer in their lifetime and the recurrence of it is very high," says Zhang, PI on the research project in collaboration with Gregory Fischer, professor of robotics engineering. "Right now, the best methods for detecting prostate cancer early are not nearly as accurate as we need them to be, and they are not risk-free. My goal is to create a minimally invasive, easily accessible, and cost-effective way to better detect this cancer."

Zhang also is working with researchers at Johns Hopkins University to develop a non-radioactive contrast agent used during the imaging process.

—SHARON GAUDIN



PROFESSOR ULKUHAN GULER SHOWS OFF AN EARLY PROTOTYPE OF THE MINIATURIZED, WEARABLE DEVICE THAT WILL ONE DAY MONITOR INFANTS' BLOOD OXYGEN LEVELS.

WIRELESS SENSOR UNTETHERS INFANTS

Imagine your ill newborn infant in the hospital, connected to monitors. You want to hold her, but you're afraid of those wires watching her progress, and of tangling or possibly disconnecting those important connections.

Babies in these medical situations are lacking the comfort of touch and skin-to-skin contact. According to the National Institutes of Health, those who don't receive that magical touch cry more, are more stressed, and have greater difficulty with cardiorespiratory stability, including oxygen saturation levels.

Ulkuhan Guler, assistant professor of electrical and computer engineering and director of WPI's Integrated Circuits and Systems Lab, is working to change that. She has developed a prototype sensor the size of a Band-Aid that will measure a baby's blood oxygen level—a vital indication of the lungs' effectiveness—and whether the baby's tissue is receiving adequate oxygen supply. Unlike current systems used in hospitals, this miniaturized wearable device will be flexible and stretchable, wireless, inexpensive, and mobile—possibly allowing the child to leave the hospital and be monitored remotely.

Guler was inspired by her own experience. Her firstborn child—Musa, who now is 11—had a respiratory problem and was immediately placed in a neonatal intensive care unit. Because he was hooked up to monitors for the first three days of his life, Guler was able to hold him only twice a day, each time for only 15 minutes, because he needed to be unhooked to be held.

"If the doctor had had this wireless device, he could have let me take my son home and monitored him from there to understand his condition," says Guler. "And an alarm would have alerted us to trouble so we would have been able to bring him to the doctor if we needed to."

The wearable oxygen sensor could also be useful for adults, especially people with severe asthma and seniors with COPD, or Chronic Obstructive Pulmonary Disease, which is an incurable, progressive lung disease and the third-leading cause of death in the United States, according to the Centers for Disease Control and Prevention. Guler plans to modify the wearable for adults in another phase of her research.

—SHARON GAUDIN



SENSORS FOR SOLDIERS

RANDY PAFFENROTH, associate professor of mathematical sciences, computer science, and data science, is hoping to combine advanced machine learning with traditional math to create a tiny chemical sensor the size of a fingernail to detect dangerous chemicals more quickly and dramatically drop the rate of false alarms.

He recently received a second grant from the U.S. Army Combat Capabilities Development Command (CCDC) Soldier Center to move his project closer to the goal for all soldiers to have a chemical sensor on their uniforms.

In the first three years of the project, the researcher created an algorithm that combines the nearly 60-year-old Kalman filter—that uses a series of observations over time to cut through statistical noise for a more accurate answer—with a neural network to mimic the way the human brain learns and works.

Together, the two can more easily and accurately read data input from the sensors and detect the presence of chemicals. "I could do this with a neural network alone but combining the two works better," says Paffenroth. "This is something that drives me. I like theory because it teaches you how to make things better. Theory is like a light you can shine to figure out where to go."

With the new grant, Paffenroth is working to optimize his algorithm, known as the Autoencoder Kalman Filter, to make it work faster, use less power, and produce even fewer false readings.

— SHARON GAUDIN



ILLUSTRATION ADAM KOON

EXPANDING GREEN ENERGY RESEARCH

Instead of throwing bags and bags of fallen leaves and grass clippings into the town landfill, what if you could use them to create renewable energy? That's the goal of Michael Timko, associate professor of chemical engineering. With a \$1,995,199 three-year grant from the Department of Energy and \$275,000 from the Massachusetts Clean Energy Center, he is expanding his ongoing research into turning food waste into fuel to include municipal green waste, such as yard trimmings, leaves, and twigs. By combining the two kinds of waste, which have substantial energy content, he's looking to create even more energy-dense oil that can be upgraded to a liquid biofuel.

The U.S. generated more than 262 million tons of municipal solid waste in 2015 – 34%

of that is food and green waste. Typically, it's disposed of in landfills. The problem is that landfill spaces are reaching existing limits and they leach water pollutants, toxins, and greenhouse gases (methane, for example).

One goal of the project is to develop a catalytic method for converting municipal solid waste components into an energy-

dense oil. Timko and his research team are investigating using hydrothermal liquefaction, a process that uses moderate heat and high pressure to convert wet biomass into crude-like oil. They're also researching catalyzing carbon-carbon coupling reactions, which has the double benefit of increasing oil production and decreasing the cost of treating wastewater.

—SHARON GAUDIN

THE ARCHIVIST

WPI Opened Its First Computer Lab in 1959

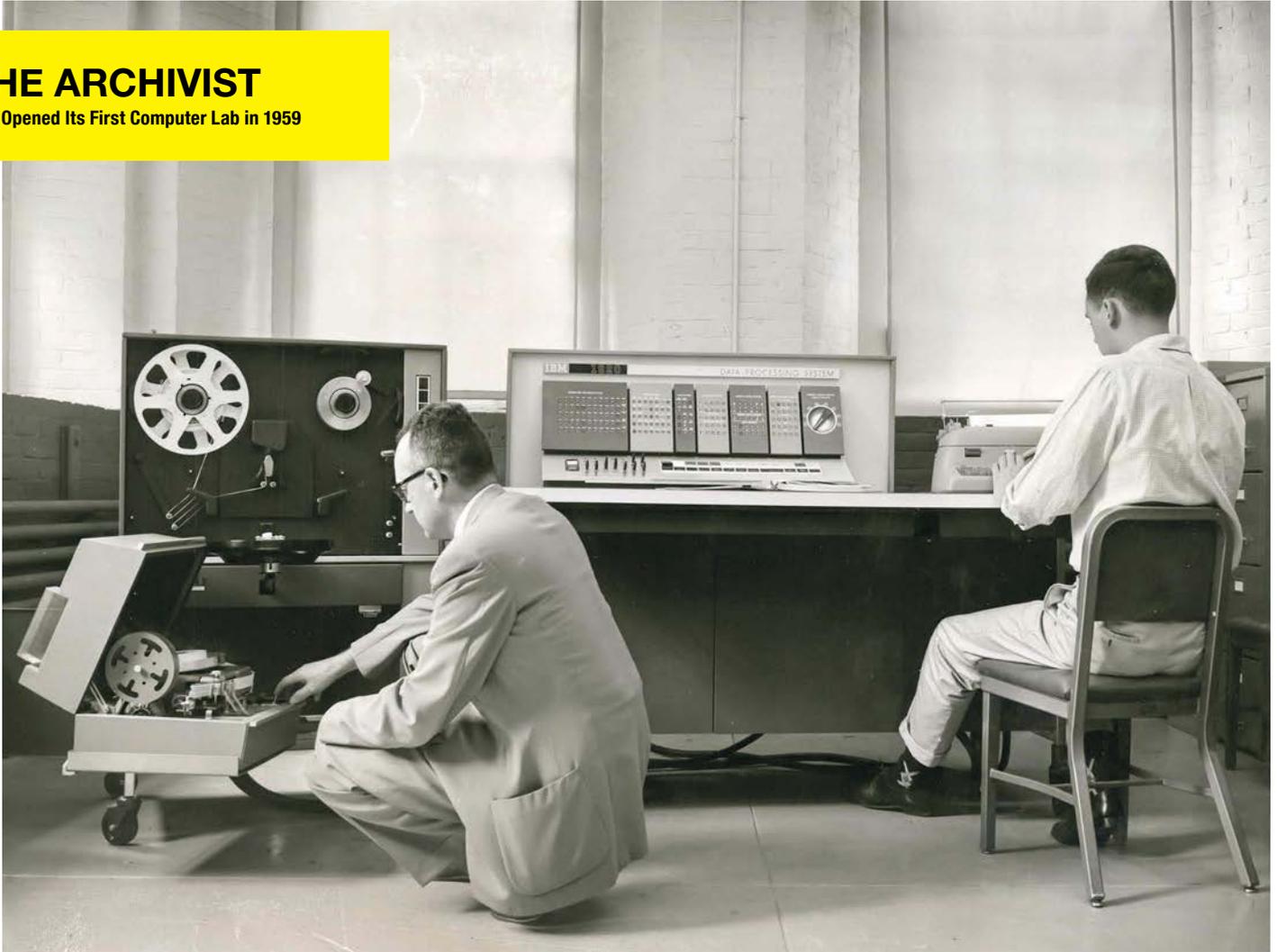


PHOTO WPI ARCHIVES

On January 21, 1959, the goals of the Computation Facility Committee were realized as Professor Elliott Buell oversaw the installation of an IBM 610 Auto-Point Computer. First introduced in 1957, the IBM 610 was among the first computers to use a keyboard; it weighed approximately 800 lbs. Buell was able to lease directly from IBM one of the 180 models (which had a price tag of \$55,000) for \$5,500 per year. Identified as a major need by every department on campus, the computer was available to any student or faculty member for research after completing a single four-hour training session. In the first three months after it was installed, 45 individuals were certified as operators, solving complex problems related to critical mass calculations within nuclear reactors, crystallography, transmission line calculations, matrix inversion, heat transfer, and harmonic analysis.

By 1965 WPI's computation facility had converted to the IBM 1620. Much smaller than the IBM 610, the 1620 was one of the first desktop personal computers—2,000 were sold between its introduction in 1959 and its

withdraw from the market in 1970. A 1965 report on the use of WPI's Computation Facility noted that the IBM 1620 was in use more than 60 hours per week on average, with the note that toward the end of the semester the machine was seemingly "always on." Realizing the increased interest in machine computing, the WPI faculty soon began plans for a dedicated degree in computer science. In 1968 Norman Sondak was hired as WPI's first computer science professor. Within two years of his appointment, MS (1969) and BS (1970) degrees were offered, with the PhD program following in 1983. Today, as WPI's computer science program embarks on the second half of its first century, its students and faculty explore new and exciting applications of technology across academic disciplines in the spirit of Buell and his fellow pioneers of computation at WPI.

—Arthur Carlson, assistant director of Archives & Special Collections at the George C. Gordon Library

KEEPING INTEL SAFE

If you are one of the billions of people who have a laptop, tablet, or smart phone with a certain type of Intel or STMicroelectronics computer chip, you have a WPI research team to thank for helping keep your data safe.

Berk Sunar, professor of electrical and computer engineering, and PhD student Daniel Moghimi are part of an international team that uncovered security flaws affecting both companies' central processing units (CPUs). If left unfixed, the flaws could have been used to steal or alter data on millions of devices.

The vulnerabilities were related to TPMs (trusted platform modules), specialized, tamper-resistant chips that computer manufacturers have been deploying in nearly all laptops, smart phones, and tablets for the past 10 years. If exploited, both vulnerabilities could have been used to conduct side-channel attacks to compromise a computer's operating system, undo encryption on critical documents, and steal cryptographic keys and information. According to Sunar, if a hacker gains control of the TPM, they've got the "keys to the castle."

Following the discovery, Sunar and Moghimi alerted Intel and STMicroelectronics about the problem and with them on fixing the flaws.

Also of note, this isn't their first discovery—they were members of a multi-university research team that found the series of security flaws behind the Fallout and ZombieLoad attacks reported in spring 2019, as well as another vulnerability known as Spoiler, which exploits side effects of speculative execution.

—COLLEEN WAMBACK



WPI SECURITY RESEARCHERS BERK SUNAR (LEFT) AND DANIEL MOGHIMI DISCOVERED SECURITY VULNERABILITIES IN COMPUTER CHIPS MADE BY INTEL CORP. AND STMICROELECTRONICS.

GRASPABLE MATH MOVES FORWARD

A TEAM OF WPI RESEARCHERS IS TAKING A SWIPE AT THE FRUSTRATION THAT CAN BEDEVIL STUDENTS LEARNING ALGEBRA.

Erin Ottmar, assistant professor of learning sciences and psychology, and Katharine Sawrey and Jenny Yun-Chen Chan, postdoctoral fellows in learning sciences and technology, have received a \$185,085 subcontract to develop and test instructional materials for a digital tool called Graspable Math.

A product of start-up company Graspable Inc. of Bloomington, Ind., Graspable Math puts algebra equations onto tablet and laptop screens. Students click or swipe to work problems, and the program gives them instantaneous feedback on their actions. Teachers can monitor students' work.

"We're trying to create activities that give kids the ability to learn algebra without boxing them into solving equations one way, because algebraic operations can sometimes be solved in an infinite number of ways," says Ottmar, who is a co-founder of Graspable. "The focus isn't so much on correctness, but on getting kids to see larger patterns."

Funding for the work comes from a two-year, \$900,000, Phase II Small Business Innovation Research grant from the U.S. Department of Education's Institute of Education Sciences to Graspable.

Ottmar, Sawrey, and Chan will work with students and teachers to create templates for Graspable Math. They will also run a pilot study involving about 800 ninth-grade students to see if algebra performance improves after using the tool.

Independent education organization WestEd will evaluate Graspable Math, as well. Ottmar says the goal at the end of two years is to have an algebra product that could be commercialized.

—LISA ECKELBECKER

MAKING A MATERIAL IMPACT

The premise sounds a bit like a cyber-adventure *Matrix*-esque movie: wave motion research that one day could lead to development of a bulletproof vest that senses the speed, angle of approach, and size of an incoming bullet.

And then—the kicker—the material inside the vest instantly changes properties to provide greater shock protection at the exact point of impact.

But this is no sci-fi caper. Rather, this is the work of Nikhil Karanjgaokar, assistant professor of aerospace engineering, who recently received a five-year, \$500,000 Faculty Early Career Development Program (CAREER) award from the National Science Foundation to conduct

the pioneering research. He is exploring the mechanical and physical properties of granular materials that can alter their shapes or change their original properties to absorb and redirect the force of an incoming bullet or object.

“Object” is the operative word, as this research holds promise for a range of industries, including military, construction, and sports. Karanjgaokar says hazard protection gear such as vests and helmets will be vastly improved. Shock protection systems can be developed to protect underwater infrastructure in the oil and gas and telecommunications industries.

In fact, he says, underwater missile silos or underground bunkers can be protected

from attack, and the technology could be used as a protective covering for buildings or even to protect NASA’s International Space Station.

“I want to design materials that can absorb impact,” he says. “People trying to protect themselves from bullets or shrapnel have used sandbags since before World War II to absorb impacts. I’m working from the same basic principle. How can we create a versatile material to create a barrier against any impact?”

Karanjgaokar just may have found material that transcends the next big-budget flick.

—ANDY BARON



Q&A

LGBTQ Asylum

Al Green '12 is ministry director of the Hadwen Park Congregational Church LGBTQ Task Force.

The organization helps asylum-seekers who come from places where same-sex relations and nonconventional gender identity are crimes. About 70 countries have legal penalties that can range from imprisonment to a death sentence. The asylum-seekers' stories posted on the Task Force's website are painful to read. They tell of beatings, torture, the burning of a business, or a night of "corrective gang rape." The victims' families may also suffer—or the family members may have opened the door for police officers or mobs to inflict punishment on their own children. The LGBTQ Task Force helps those who can make their way to the United States (with a valid visa) build a new life, free from fear and shame. Green, the only salaried employee, says that since 2008 the organization has helped 300 individuals through this difficult process, and not one has been denied asylum or sent back to their home country.

Does your WPI experience connect with the work you are doing now?

I majored in civil engineering, and I had visions of graduating and eventually returning to Jamaica to help progress its infrastructure. My time at WPI was busy and an emotional rollercoaster. I did four years of varsity swimming, re-started WPI's club water polo team, served as a Big Brothers Big Sisters of Central Massachusetts mentor, and worked at an engineering firm for 20 hours a week during the school year and 40 hours a week during breaks. Did I mention that I was busy? When I left Jamaica to study at WPI, I came with an open mind. I had seen, on television and in the movies, what a university was likely to be like—and I was excited! The reality at WPI was mixed. I thoroughly enjoyed being pushed by my professors, and I made some lasting friendships. However, there were some low points, such as being approached by campus police multiple times, while waiting for my friends so we could go to DAKA [for meals] together, because they had received reports of a suspicious person who "didn't look like they belonged there." I was also struggling with my identity as a gay man. Back then, there were not many, if any, visible outlets and support for LGBTQ students. I am happy that campus life is now different. I do not regret any of my

experiences. In fact, I am grateful for them. My meeting and working on projects with a diverse group of people has been beneficial in my current role as ministry director of the LGBT Asylum Task Force.

How do people find their way to the Task Force? Do you ever have to turn anyone away?

The majority of folks find out about us from others who've already received our support. I use the analogy of a person who is stranded in the desert coming across an oasis—they are relieved and will share this resource with others. Folks also find us through referrals by their attorneys and healthcare providers, or by searching for resources on the internet. We are the only organization in the U.S. that is providing such comprehensive support—housing, food, and connection to pro bono legal, medical, and mental health resources—for the duration that it is needed. It can take up to two years before asylum seekers can legally work to support themselves. If someone shows up at the church, we never turn them away. There are supporters who open their homes to folks until we have room in our housing. Regardless of where they are located, in the U.S. or internationally, we try to help folks identify resources in their area.

Do the people you've helped give back, once they're on their feet and managing their lives?

Folks that have already transitioned out of our support often mentor and support the new folks, who may have been forced out of their homes and neglected by their communities—including their own families and neighbors—in their home countries. Here, newcomers find a strong community to guide them. They also find, in the older crew, folks who have faced similar journeys and can provide unique emotional support.

You must see so much need and hardship every day. What do you do to sustain your own well-being, and prevent burnout?

I do see a lot of pain on a regular basis and it does at times become overwhelming. Whenever it gets to be too much, I take half-days off to recharge and maintain my physical and emotional well-being. It also helps that I coach swimming, visit the gym daily, and regularly see a therapist. I'm also part of Queer the Scene (queerthescene.com), a creative community that aims to bring greater diversity to local cultural and social outlets.

Learn more—and read stories of those who've escaped persecution at lgbtasylum.org.



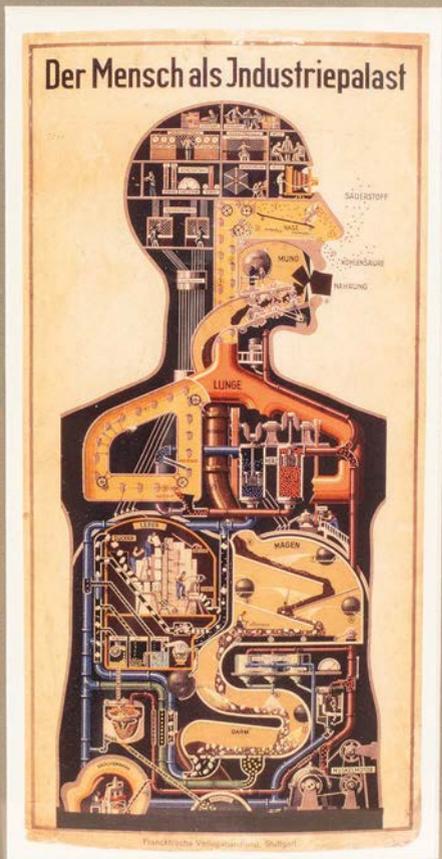
Marsha W. Rolle
ASSOCIATE PROFESSOR,
BIOMEDICAL ENGINEERING

FACULTY

SNAPSHOT

PHOTO PAT O'CONNOR

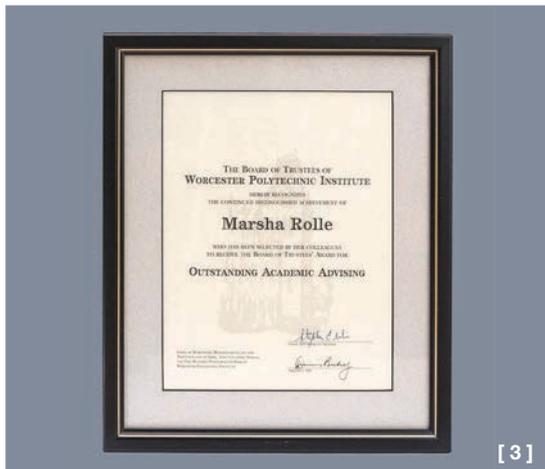
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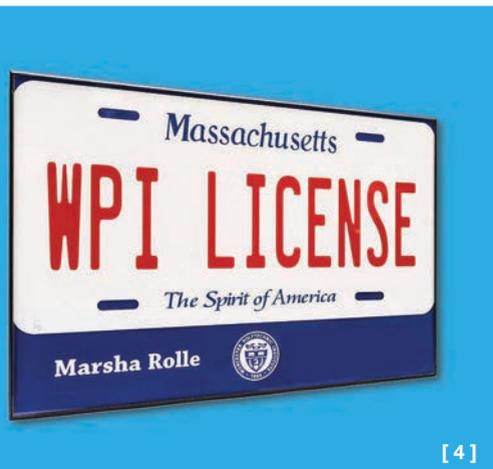
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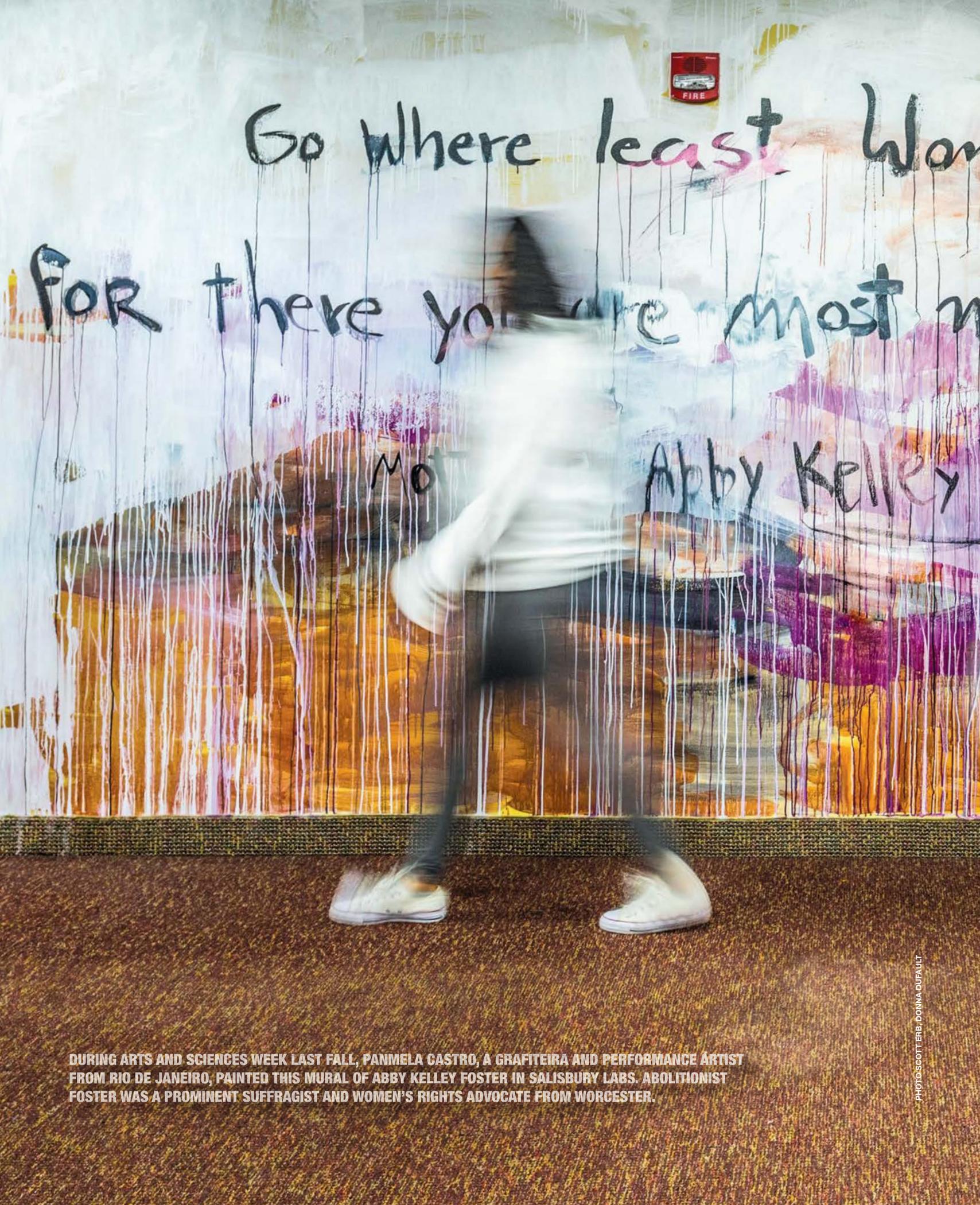


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1. I bought this print in an antique shop in Amsterdam while traveling on sabbatical. It's from a publishing house in Stuttgart, Germany, where I spent three months on a German Academic Exchange Service (DAAD) fellowship working at the Fraunhofer Institute. I love the BME relevance—imagining the organ systems of the body as parts of a factory!
2. Until a few years ago, I often played indoor soccer. One year, for my birthday, my students made this Marsha action figure when they decorated my office as a soccer stadium.
3. The best thing about WPI is our incredible students, and I really enjoy talking with my advisees about their career and life aspirations, in addition to helping them chart their independent paths. This 2012 Trustees' Award for Outstanding Academic Advising means a lot to me.
4. I have many collaborations with industry. Translating basic science to commercial/clinical products is important to me, and I have led many initiatives to infuse this mindset into graduate student training. This Massachusetts "license" was presented by Todd Keiller during a National Academy of Inventors chapter event, to commemorate my first patent license!
5. Upon obtaining tenure, a colleague gifted me this candy dish. I keep it full of candy—for students (and George Pins, who always poaches the chocolate)—usually brought back from conference trips or from international collaborators.
6. This candle was carved by AEMB officers when I was inducted into the national BME honor society (Alpha Eta Mu Beta). I served as advisor that year of this incredible group. Their nomination was such an honor.
7. Yoda was a gift from a former student, who told me he would "try" to finish and defend his thesis by a given date, and I replied, "Do or do not, there is no try." He had no idea what I was talking about (I had to explain the *Star Wars* reference), but he gave me this after he successfully defended his MS thesis, and it subsequently became the unofficial motto of the lab!



Go where least women

for there you are most needed

Abby Kelley Foster

DURING ARTS AND SCIENCES WEEK LAST FALL, PANMELA CASTRO, A GRAFITEIRA AND PERFORMANCE ARTIST FROM RIO DE JANEIRO, PAINTED THIS MURAL OF ABBY KELLEY FOSTER IN SALISBURY LABS. ABOLITIONIST FOSTER WAS A PROMINENT SUFFRAGIST AND WOMEN'S RIGHTS ADVOCATE FROM WORCESTER.



SENSE OF PLACE

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A PLAN FOR THE AGES

AS THE WPI PLAN TURNS 50,
A GROUNDBREAKING IDEA BECOMES
A GLOBAL REVOLUTION

By Michael Dorsey



Fifty years ago this spring, the WPI faculty approved the WPI Plan, a radically new, project-based approach to undergraduate education. The Plan has evolved and changed, but it has also endured and, in important ways, grown stronger. Today, the Plan stands as a potent model for academic innovation, one that could help guide further change at WPI and throughout higher education.

In 1965 WPI celebrated its centennial with pageantry and an oversubscribed fundraising campaign. With the nation enjoying a surging economy and a technological explosion, it should have been a time of optimism for the Institute.

But Harry Storke was worried. The retired three-star Army general was close to stepping down as WPI's 10th president. He'd hoped to leave the Institute on firm ground, but that would be a challenge. It was facing budget deficits and increased competition from lower-cost state schools. And tuition increases aimed at righting the ship and meeting a growing demand for financial aid had led to enrollment shortfalls.

What's more, Storke knew that with its typically rigid engineering curriculum, WPI offered little to distinguish it from its competitors or, in his mind, justify its place in the private sector. Finding little enthusiasm among its academic leadership for challenging the status quo, he turned to some of the Institute's younger and newer faculty members, who he knew shared his interest in reconsidering WPI's approach to academics.

Starting in late 1968, two faculty planning committees – the first appointed by the president, the second elected by the faculty – undertook a systematic exploration of options for WPI's future. They began by agreeing that no idea, no matter how drastic a change it would have represented, was out of bounds.

Stephen Weininger, professor emeritus of chemistry and biochemistry, was a young assistant professor when he was tapped to join the initial committee. He remembers the idea he brought to the table.

EXHILARATION AND EXHAUSTION

In 1964, armed with my newly minted PhD in organic chemistry, I accepted a junior instructorship at the University of Durham in northeast England, hoping to discover how chemistry was taught elsewhere. What I learned profoundly shaped my educational philosophy. During a three-year undergraduate program, Durham students had just two exams: one after the first year, one after the third. Of course there were other requirements, but, overall, students bore a great deal of the responsibility for their education.

What I found at WPI in 1965 was exactly the opposite. Typical of most American colleges, WPI laid out a student's entire four years. The system was rigid and paternal. Those who lagged were constantly prodded; those who could have worked independently were confined. I found the approach troubling and I considered leaving. I really enjoyed teaching the students, though, and I found simpatico colleagues with whom to discuss curricular reform. Then, in the fall of 1968, I found myself the junior member of the President's Planning Group.

For the remainder of that academic year I toggled between exhilaration and exhaustion. As we grappled with President

Storke's charge, we realized we had an opportunity to reconsider WPI's entire academic goal and structure. On a cold, snowy December evening we trudged across Park Avenue to the president's house to get his consent, which he gave after barely a minute's consideration.

The group set itself an ambitious agenda and stuck to it. Coming to meetings with one's "homework" in hand was mandatory. Discussions were intense, disagreements plentiful, civility obligatory. And there was just enough horsing around to relieve the tension. We delivered our first report in March 1969; our second, delivered that June, listed five possible objectives for WPI and the responses elicited from a cross-section of stakeholders.

I declined nomination for the elected committee for personal reasons (our second child had just arrived) and professional ones (I had signed a book contract). Participating in the planning process was a peak experience in my academic career, and I retain a continuing sense of pride and satisfaction with its legacy.

—Stephen Weininger

In its final two reports the committee zeroed in on a new curriculum that offered a dramatic contrast to WPI's traditional way of teaching. Built around project work, the new curriculum would require throwing out much of the previous academic infrastructure (the calendar, the grading system, the major degree requirements) and starting over.

The faculty was asked to make that leap of faith at the May 12, 1970, faculty meeting, when the WPI Plan was put to a vote. Faculty received paper ballots and had until May 28 to hand them in. In the final tally, announced on May 29, the program passed—barely—by just over the required two-thirds majority.

Arthur Heinricher is WPI's dean of undergraduate studies, a post first held by William R. Grogan, an electrical engineering professor who was a member of the elected faculty planning committee. Heinricher recalls that Grogan, who led the 15-year process of implementing the Plan, had a keen understanding of what made the program different.



EXPERTS IN ACTION

One of the guiding principles of the WPI Plan—one that has kept it alive and evolving to this day—is that education is not separate from life. This is what Grogan knew.

In his introduction to an external review of the Plan in the early 1970s, he contrasted its guiding principles with what still are the defining characteristics of many academic programs.

Traditional education focuses on long, narrow corridors of knowledge. But, Grogan wrote, professional life demands the integration of disciplinary knowledge.

Traditional education values individual student work, evaluating individual performance and rewarding individual accomplishment. But almost all work in professional life requires teamwork and skill in navigating the challenges and rewards of working with people from different academic backgrounds, different communities, and diverse cultures.

And traditional education provides a roadmap of requirements, leaving students little or no choice in setting direction or defining personal goals. But right out of the gate, graduates will face the challenge of choosing a direction for their career and setting their own goals.

In short, most programs do a good job imparting theory, but fall short on preparing students for the practice of everyday life. The faculty members who designed the Plan were not looking for a better way to teach content. Project work can improve or deepen student learning in the disciplines, but that was not why the Plan's designers placed projects at its core. Their goal was to align academic expectations with what life demands. They built an academic program that focused not just on gaining knowledge, but on what students could do with that knowledge.

Grogan's observations are almost 50 years old, but they're still relevant today. Higher education is facing significant challenges and there are renewed calls for colleges and universities to adapt to the changing needs of our world and our graduates. One author called on faculty to set aside their complete focus on disciplinary expertise by becoming "experts in action."

The Plan was built to develop *graduates* who are experts in action. Perhaps it's time for all of us in higher education to ask our students to do what we want our graduates to become.

—Arthur Heinricher



The Plan is a sterling example of innovation in STEM (science, technology, engineering, and mathematics) education. But the faculty members who crafted it believed strongly that non-STEM knowledge, particularly breadth and depth in the humanities and arts, was vital for success in work and life, regardless of one's field of study.

"Even the best technical solution works only if the clients fully accept and use the results," says **Lance Schachterle**, professor of literature, who was one of four fresh PhDs recruited to teach in the humanities program in the fall of 1970. "The humanities and arts help students learn to address the cultural and humanistic issues and constraints necessary to design effective and enduring solutions, and to communicate them well."

As part of the Plan, they created a humanities program ("and arts" was added to the program's name later) that offers students a rich set of study options in the human domains of cultural, ethical, historical, and esthetic experiences. They also established a humanities and arts requirement (known initially as the Sufficiency), which is essentially a six-course minor in an area of the student's choice, with some breadth and depth requirements.

Schachterle vividly recalls how that approach differed from the way WPI previously approached the humanities.



A BROADER BASE OF SKILLS

The Plan was implemented in stages over two years, with some students following WPI's traditional curriculum during that period. As is still standard practice at many technological universities, that curriculum included required humanities courses.

I taught a required English sequence several times. I felt that I had accomplished something if at the end most students could analyze the difference between an Italian and an English sonnet, even though I knew they would not carry that skill far into future studies.

The fully implemented Plan abolished all such required courses (students knew they needed some mastery of preliminaries before getting much out of more advanced courses).

When humanities colleagues at other schools ask me what's it like to teach at WPI, I always start with the great merits of allowing students to select the area of the humanities or arts they like best. When they ask why we have no required writing courses, I remind them of what most already know: those requirements rarely lead students to become good writers.

Yes, students at WPI can avoid humanities and arts courses with heavy writing requirements, but their required major projects contain their own high

expectations for written and oral communications—written reports and, often, presentations—and on topics into which they invest great personal energy.

WPI's humanities and arts requirement has been refined over the decades, as have our focus areas, which now include courses and project work in depth in art history (including architecture and digital studies), English (including theater and writing), history, music (including digital studies), philosophy, and religion.

We also prepare students well for WPI's expanded focus on a globalized education, with opportunities to pursue language and culture studies in Arabic, Chinese, English for international students, German, and Spanish, and an option in international and global studies. Humanities faculty members also frequently advise teams at off-campus project centers, lending their expertise to complement their STEM partners.

Along with the Plan's other requirements, the humanities and arts requirement provides the broad base of skills necessary to complement STEM expertise and prepare our graduates as effective and much sought-after problem solvers throughout the globe.

—Lance Schachterle





From the beginning, the Plan has required students to complete two major projects. The faculty members who developed the program defined two project types: what became known as the Major Qualifying Project (MQP), a design or research experience in the student’s major field, and what is now called the Interactive Qualifying Project (IQP), an interdisciplinary exploration at the intersection of science and technology and societal needs and concerns. The IQP first became a requirement for students graduating in 1981, more than 10 years after the Plan was approved (until then, students were permitted to complete two MQPs).

The IQP has rightly been called the most distinctive element of the Plan. Since 2000, as a result of changes in accreditation requirements, virtually all engineering students in the United States now complete something like an MQP, but the IQP is unique to WPI.

Richard Vaz ’79, ’84 (MS), ’87 PhD, professor of interdisciplinary and global studies and co-director of WPI’s Center for Project-Based Learning, says the IQP has undergone an “evolutionary adaptation” that has helped it mature into the university’s signature experience. Its evolution was tied to the rise of WPI’s Global Projects Program, which Vaz led for many years as dean of the Interdisciplinary and Global Studies Division.

“What started as an investigation into questions of science and technology policy has, for most students, become a research-based immersion at one of more than 50 sites around the globe,” he notes.

THE SOUL OF THE PLAN

I’m told that WPI’s first residential project center, launched in 1974 in Washington, D.C., was motivated, in part, by desperation; faculty were worried about running out of ideas for IQPs. At first, off-campus activity grew slowly, driven by a handful of enthusiastic faculty members. By the late 1980s, there were about a half-dozen project centers, mostly in the United States and Europe; there were about a dozen by the mid-’90s, with about a quarter of WPI students participating.

The benefits of off-campus projects were by then becoming clear: students were highly motivated to tackle authentic problems for local organizations. Evidence of the superior quality of off-campus IQPs, in terms of both results and learning, became impossible to ignore. Away from campus distractions for seven weeks, students and faculty could immerse themselves in new environments that shaped their solutions and broadened their world views.

In the late 1990s, the Global Ambassadors, students who’d recently returned from off-campus IQPs, spread across campus to tell their stories of accomplishment, adventure, and personal growth. They went into classrooms and residence halls; they met with freshman groups and clubs. The results were stunning: in one year,

applications for off-campus IQPs doubled. As Bill Grogan once said about a key moment in the development of the Plan, the olive was out of the bottle’s neck.

Last fall, over 95 percent of the sophomore class—about 1,100 students—applied to do off-campus IQPs in 2020, facilitated in no small part by the Global Projects for All scholarship that each received upon matriculation.

These students will go to such places as Albania, Iceland, Japan, and Paraguay to tackle local problems under faculty guidance. They’ll be out of their element, navigating new surroundings and cultures. They’ll struggle with new ideas. They’ll develop such skills as communication, critical thinking, and collaboration. And they’ll come back to campus, we hope, stronger and wiser.

Having students deeply engage with problems at the intersection of science, technology, society, and human need was a radical idea in 1970, and it’s still pretty radical today. Adopting a place-based format for the IQP, where students seek locally appropriate solutions to messy problems around the globe, has been transformational—for students and for WPI. If the MQP is the head of the WPI Plan, and the humanities and arts requirement is its heart, the off-campus IQP is its soul.

—Richard Vaz





The WPI Plan has stood the test of time, remaining true to its founders' vision over the course of half a century. But it has hardly been static. In fact, the program that shook WPI to its roots in 1970 has undergone some important shifts along the way. Some facets evolved: the grading system, for example, became a bit more traditional. Some were discarded: most significantly, the Competency Exam, the ultimate pass-fail (more accurately, graduate/not graduate exam that was administered until the mid-1980s. Some were added (including the Great Problems Seminar, which brought project-based learning to the first year).

The changes that have transformed the Plan have led some to ask just what the WPI Plan really is. What makes the Plan the Plan?

"To me, the Plan is more a philosophy than a curriculum," says **Kristin Wobbe**, professor of chemistry and biochemistry and co-director of the Center for Project-Based learning. "And that philosophy, more than most approaches to formal education, honors the students—their ability to decide, know, and learn outside the confines of courses and requirements."

Wobbe played a central role in launching the Great Problems Seminar, has taught in the program since its inception, and directed it for many years as associate dean of undergraduate studies.

THE PLAN FLEXES

The introduction of the Great Problems Seminar was a significant testament to the Plan's philosophy. Students told us their first-year experience did not challenge them; it was too much like high school. They desired earlier opportunities to engage in the most challenging and exciting elements of the WPI education; they wanted projects.

There were lots of models of first-year programs out there to emulate, but our faculty took a distinctively WPI approach to improving our first-year opportunities. At an institution that values the abilities of students to work in teams to solve significant problems that cross disciplinary boundaries, it wasn't such a stretch to arrive at team-taught courses that ask student teams to engage with one of the world's big problems and design potential solutions that would improve the situation for a given population.

The Plan was the very DNA of this idea. And it works.

Faculty and students alike have grown and developed through participation in the Great

Problems Seminar. Team teaching breaks down barriers between disciplines and allows for new creativity, interdisciplinary partnerships, and more fun in the classroom.

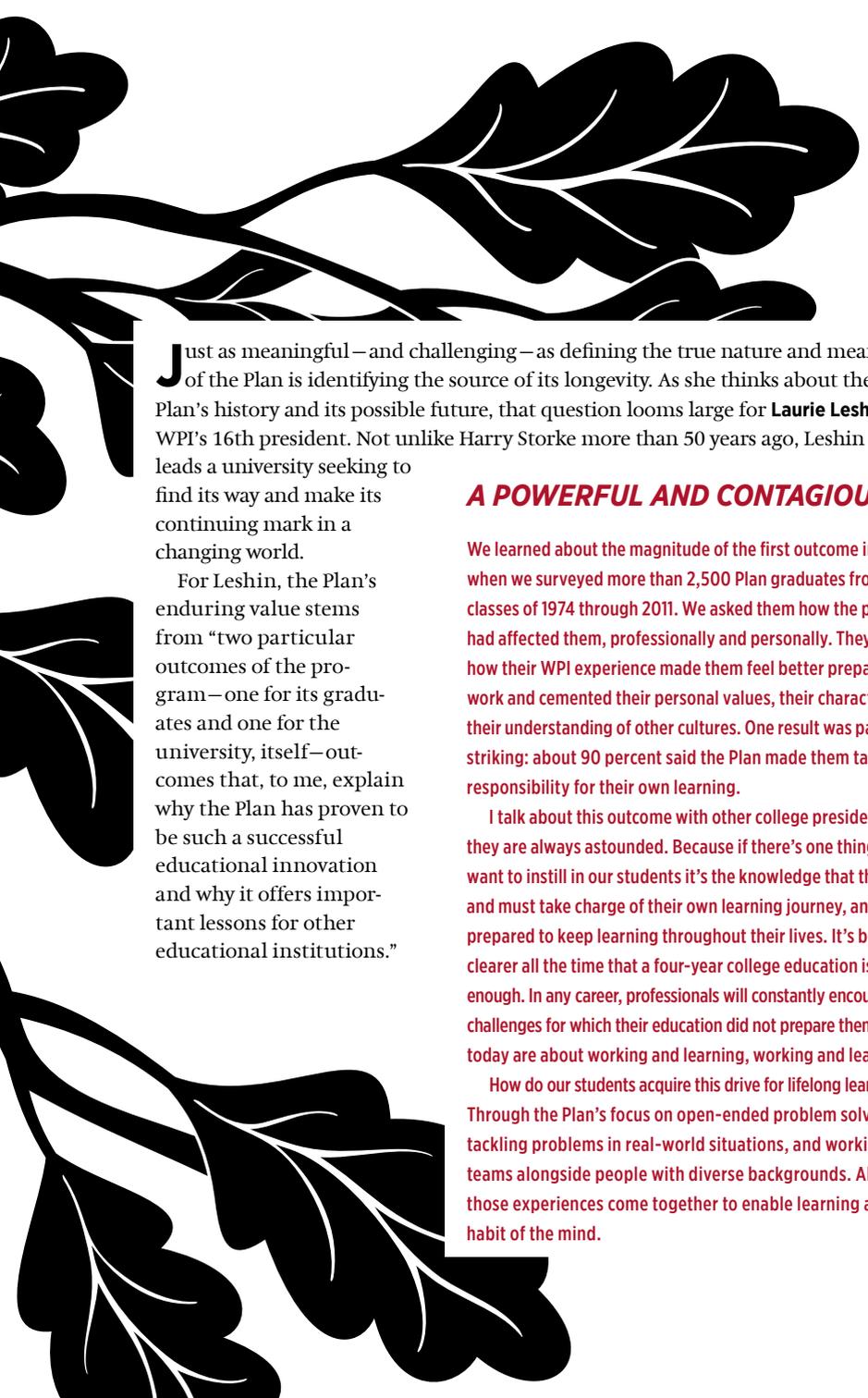
Students in their first year learn that they are capable of making a difference in the world; that they are more than up to the challenge of working in teams on complex problems. They have fed the hungry, provided water to the thirsty, created lasting change on campus—and learned.

They have developed skills in working equitably on teams and communicating in oral, visual, and written forms. They've learned that finding good solutions requires a lot of listening, that frequently optimum and ideal are not the same, and that diversity leads to better ideas.

The gift of confidence is a wonderful thing to give our first-year students.

The Plan flexed in 2007 to include the Great Problems Seminar, and in so doing, it got stronger.

— **Kristin Wobbe**



Just as meaningful—and challenging—as defining the true nature and meaning of the Plan is identifying the source of its longevity. As she thinks about the Plan’s history and its possible future, that question looms large for **Laurie Leshin**, WPI’s 16th president. Not unlike Harry Storke more than 50 years ago, Leshin leads a university seeking to find its way and make its continuing mark in a changing world.

For Leshin, the Plan’s enduring value stems from “two particular outcomes of the program—one for its graduates and one for the university, itself—outcomes that, to me, explain why the Plan has proven to be such a successful educational innovation and why it offers important lessons for other educational institutions.”

A POWERFUL AND CONTAGIOUS PHILOSOPHY

We learned about the magnitude of the first outcome in 2012 when we surveyed more than 2,500 Plan graduates from the classes of 1974 through 2011. We asked them how the program had affected them, professionally and personally. They told us how their WPI experience made them feel better prepared for work and cemented their personal values, their character, and their understanding of other cultures. One result was particularly striking: about 90 percent said the Plan made them take responsibility for their own learning.

I talk about this outcome with other college presidents, and they are always astounded. Because if there’s one thing we all want to instill in our students it’s the knowledge that they can and must take charge of their own learning journey, and be prepared to keep learning throughout their lives. It’s becoming clearer all the time that a four-year college education is not enough. In any career, professionals will constantly encounter challenges for which their education did not prepare them. Jobs today are about working and learning, working and learning.

How do our students acquire this drive for lifelong learning? Through the Plan’s focus on open-ended problem solving, tackling problems in real-world situations, and working in teams alongside people with diverse backgrounds. All of those experiences come together to enable learning as a habit of the mind.

The other outcome of the Plan that stands out to me is how it has infected the entire WPI curriculum with the spirit of project-based learning. The framers of the Plan centered the curriculum on the major projects—the MQP and the IQP—because they knew students would need to have hands-on project experiences that would move them closer to the real world.

But in the years since the Plan was implemented, as the faculty members have observed the benefits of project work (especially how open-ended problem solving in teams drills home all the critical skills students gain from their WPI education), they have brought project work into their courses. Today, close to three quarters of our classes are project-based or have a project component. I don’t think that is something we could have foreseen 50 years ago.

Through our Center for Project-Based Learning (see box, below), WPI has been sharing its “secret sauce” with other colleges and universities (more than 130 so far) through a summer institute, on-site consulting, and several other programs. As we do so, I think it is important to share this lesson: that project-based learning is a powerful and contagious philosophy.

And it’s OK to start small. Chances are it will spread through the curriculum to transform teaching and learning. Fifty years on, that may be the Plan’s most important takeaway.

— Laurie Leshin

HIGHER EDUCATION’S JOHNNY APPLESEEDS

At the heart of WPI’s time-tested curriculum, the WPI Plan, is a simple notion: that education is more powerful, and learning more durable, when students put knowledge into practice through project work. Established in 2016, WPI’s Center for Project-Based Learning is dedicated to sharing what the Institute has learned about this effective approach to teaching and learning and helping other colleges and universities implement project-based learning on their campuses. Like academic Johnny Appleseeds, the center’s faculty spread the wisdom gained from hard-won experience in hopes that students around the nation and the globe can benefit from what has grown from the seeds of innovation planted at WPI five decades ago. Learn more: wp.wpi.edu/projectbasedlearning.

The WPI Plan was born in a time of upheaval. As the 1960s drew to a close, Americans worried about a growing environmental crisis, ongoing wars and global conflicts, poverty and income inequality, and battles over racism, sexism, and human rights. Fifty years later, those issues remain, although they loom larger now, due to our increasingly interconnected and shrinking globe, which can turn local problems into global problems and vice versa.

Furthermore, 50 years since the launch of the WPI Plan, higher education institutions are once again facing questions of access, cost, fairness, and value. As they prepare their graduates for the future of work, they find that they must build a compelling case for the need for and worth of their programs. Hence, within this context, WPI's decision to launch The Global School represents a timely and important next step in the preparation of globally engaged STEM leaders who have the skills and perspectives needed to address complex local and global problems.

The Global School will build on WPI's platform, which President Leshin has called "a true global polytechnic." Like the Plan, The Global School was initially envisioned by a faculty committee: the Global Impact Division Implementation Advisory Group. The committee's vision was further refined by WPI faculty and The Global School Implementation Committee in a process that involved extensive inputs from the faculty, staff, administration, and trustees. WPI's new provost, **Winston Soboyejo**, says he believes these inputs produced a vision for The Global School that we could ignite a new revolution in globally engaged higher education here at WPI over the next few years.

SPREADING THE SPIRIT OF GLOBAL ENGAGEMENT

Like the WPI Plan, itself, The Global School is a unique product of WPI's heritage of applied, purpose-driven education and research and further evidence of the university's proven role as a pacesetter in higher education. In many ways, the new school represents an extension of WPI's pioneering contributions to undergraduate education and project-based learning, as well as an effort to translate those successes into our graduate and interdisciplinary research programs.

The school will begin by integrating and enhancing the many academic programs at WPI that already have a global focus. Most significantly, it will build upon the infrastructure of the Global Projects Program, particularly its network of more than 50 residential undergraduate project centers that span six continents. This will be done by creating a global network of hubs to support learning, research, and project work at all levels.

The Global School will also draw upon the extensive knowledge and global insight represented by existing programs that will become part of The Global School (including the Interdisciplinary and Global Studies Division, the Great Problems Seminar, the Global Impact Lab, and the Office of Global Partnerships). It will also capitalize on the faculty's expertise in such areas as China, Latin America, Africa, and Western Europe, as it helps students make more intentional connections across global majors and minors, seminars, courses, and projects.

As a full-fledged school, The Global School will have its own faculty and programs. It will also forge strong connections and collaborations with WPI's other schools (Arts and Sciences, Business, and Engineering) and its other programs with expertise critical to The Global School's mission, including the

Environmental and Sustainability Studies Program, the Grand Challenges Scholars Program, and the Center for Project-Based Learning. These ties will be important over time as the school develops new academic programs in global public health; science, technology, and policy; and climate change adaptation.

In large measure, what will distinguish WPI's Global School from programs and schools with similar missions at other universities is that it will not simply engage faculty and students with global issues and policy discussions, it will enable them to truly connect with the world, itself—to understand and collaborate with its citizens, and to directly tackle the most pressing global challenges.

This may seem like a small distinction, but I truly believe it will make all the difference in the world. Decades ago, WPI pioneered the concept of global project-based education and demonstrated the remarkable transformation that students can experience when they move out into the world to see its human and technological needs firsthand. That spirit of global engagement and problem solving will infuse The Global School, creating an entirely new kind of academic enterprise.

Will The Global School answer the questions now swirling around American higher education? Will it become a powerful engine for global problem solving? Time will tell.

But if there's one thing we can learn from the history of the WPI Plan, it's that a powerful idea is like a seed. If, through careful thought and execution, that idea proves to be exquisitely tuned to its time and to the needs of students and the world they will inhabit, it can grow and strengthen and flower in remarkable ways.

— Winston Soboyejo



Visit the online WPI Journal (wpi.edu/+Journal) to read alumni reflections on the Plan and to delve into the program's history with our WPI Plan reading list.



In each issue you'll see how WPI students put theory into practice through projects.

PROJECTS

LIQUOBOT

An autonomous solution to underwater microplastics

THE BIG IDEA:

An estimated 80 million tons of plastic enter the ocean each year. The majority of the efforts to clean up ocean plastics focus on surface plastics; however, most lie beneath the surface as microplastics that are no larger than five millimeters. Millions of these pieces pollute oceans, and harm marine life therein. This Great Problems Seminar (GPS) project offered a solution to address the underwater microplastic contamination by proposing a submersible autonomous robot capable of filtering microplastics from the water. Through this process, not only will the amount of plastic pollutants be reduced in these natural systems, these plastics will also be available for recycling into a sustainable, closed-loop process.

PARTICIPANTS:

- **Maya Angeles '23** Robotics Engineering
- **Noelle Crump '23** Mechanical Engineering
- **Katrina Marsden '23** Mechanical Engineering
- **Patrick Mejia '23** Computer Science
- **Tyler Sanderville '23** Mechanical Engineering

HOW IT WORKS:

The ballast tank fills with water and submerges the robot to 200m. The pump then pushes contaminated water through the filter, collecting plastics. Once the flow sensor determines that the collection compartment is full, it sends a signal to resurface. The ballast tank then fills with air from compressed air tanks and resurfaces the bot. Once the bot signals the crew members, they replace the filter and refill the compressed air tanks. The bot recharges using its solar panels and resubmerges.

WHAT'S NEXT:

Contacting potential sponsors; securing funding for the next stage in LiquoBot's development; creating a family of products for river cleanup, lake/pond cleanup, and ocean cleanup; working with experienced engineers to refine the design further and creating a production-ready draft; and adding features such as internal filter cleaning and plastic storage to expand operating time.





Pfizer's kilo lab manufactures the first batch of new medicines for Phase 1 clinical trials. This is the first step in the journey to develop breakthrough therapies for patients.



A PHARMACEUTICAL PATH

Lynne (Cox) Handanyan '86
Navigates Therapies at Pfizer

BY JULIA QUINN-SZCESUL
PHOTOGRAPHY MATT FURMAN

When infusion drug therapy alleviates multiple sclerosis symptoms, or a daily round of antibiotics clears up a child's painful strep throat, the activity is fairly solitary, and it's often over quickly. But in each of those drugs is a decade-long history of dozens of people working together to develop, test, and get those drug therapies into the hands of the people who need them most.



Lynne Handanyan thrives on this kind of collaborative approach—and has since her days at WPI. “Drug development is a team sport,” she says. “You have to come together to navigate and solve problems and overcome challenges.”

As vice president of global Chemical R&D for the biopharmaceutical company Pfizer, Handanyan knows each potential drug tasks her team on many levels. “Our teams are increasingly challenged by the molecular complexity of new drug candidates,” she says. “They have to come up with new solutions—chemistry, technology, tools—to successfully manufacture the compounds so they can be studied in clinical trials.”

With so much on the line, time pulls both ways. For human safety, the drugs, no matter how urgently people need them, can't be rushed through development and testing. Handanyan says innovation and commitment are the pillars of getting new drugs to market.

“We recently worked on a candidate for over eight years,” she says. “The molecule required 37 chemical transformations to convert starting materials to the target drug candidate—in comparison most drugs require 12.” The complexity of developing new drugs only begins there.

“The team needed to work with companies with unique capabilities for purification and isolation to manufacture the drug,” she says. “Creativity, perseverance, patience, teamwork, collaboration—all were required to solve the challenges this program presented.”

IT'S ABOUT PEOPLE

For all the complex science, engineering, technology, and marketing that goes into developing medications, therapies, and vaccines, Handanyan says the endgame focus is simple and specific—patients. She says the patients who depend on pharma's continued progress—those with life-threatening or life-altering diseases, illnesses, or conditions—are always foremost in the minds of the teams responsible for new drug developments.

“We are working on lots of drugs to treat various forms of cancer—from early clinical trials where you can see the impacts those drugs have on people,” she says. Her team's dedication is rooted in motivation. They internalize the urgency and work intensely for years to get that drug manufactured, registered, and into the hands of people who need it.

For more than three decades, Handanyan's career has grown at the global pharmaceutical powerhouse, giving her enough choices that she never went to another company. "My career has always been fresh," she says. "I've been exposed to new learning opportunities. And WPI prepared me really well for teamwork and strengthened my ability to work effectively with people having different points of view."

She knew learning diverse, yet relevant, skills would help her move up in Pfizer's ranks. "I would volunteer for new responsibilities as a way to learn a new aspect of our business, work with a different group of people, or solve a problem," she says.

A NATURAL CHOICE

By the time Handanyan's feet hit the Hill in 1982, there'd been women students on campus for more than a decade. There wasn't exactly a preponderance of women in the classroom, but they did band together to navigate the WPI Plan and college life. That camaraderie with other chem eng students (the majority were women), gave her an instant circle of others who loved chemistry and math and wanted to learn.

"I was a very introverted student in high school," she says. "WPI and its curriculum gave me a platform to feel more confident in myself. I learned to communicate my work effectively and to feel comfortable collaborating in a group."

When she got to Pfizer in 1986, she found similar ratios. "Of the 100 or so engineers on staff at Pfizer when I started, maybe five or six were women," she says. "Now we are in positions of leadership, and we're hiring more and more female talent into R&D. There are more of us, percentagewise."

As a woman in a leadership role, Handanyan says supervisors and mentors guided her path by offering greater responsibilities and indispensable advice.

Her earliest office mate at Pfizer, John Hanley '82, was one of those mentors. He says he was impressed by her academic achievements at WPI, and that even today he recalls one particular comment that heralded what was to come. "I remember her saying that if she was hired, she would want to focus on learning the job really well," he says.

"WPI and its curriculum gave me a platform to feel more confident in myself. I learned to communicate my work effectively and to feel comfortable collaborating in a group."

Hanley, now a quality assurance validation manager with 37 years at Pfizer, helped Handanyan navigate new responsibilities as a production manager. Working in solvent recovery, she oversaw chemical operators working on manufacturing bulk pharmaceutical active ingredients in Pfizer's Groton, Conn., office (still Handanyan's base). The facility's large chemical division manufacturing site produced products such as penicillin, citric acid, caffeine, food enhancers, and many active ingredients for clinical studies for new potential medications.

Hanley says when Handanyan began working with R&D to head the commercial scale-up of a new product, her impressive work "kick-started her rapid advancement." Hanley's support was invaluable. "I felt like everyone was invested in my being successful," she says.

With that experience under her belt, Handanyan applied for a research scientist role. "I decided to take a chance," she says, even though she didn't know if her qualifications matched. Intrigued by greater responsibilities and a new path, she knew the move would be beneficial. Pfizer agreed.

ROLLING WITH CHANGE

Handanyan acknowledges that she's in a rare circle of employee longevity when job hopping is the norm. But she believes in Pfizer's mission and is proud of being part of this life-saving process. Pfizer, in turn, has nurtured Handanyan's career through difficult periods.

"The biggest challenge I had was balancing a demanding career with my responsibilities as a mother of three," she says. She and her husband (James Handanyan '86—they met while waiting in line for their first class registration) have three sons, ages 26, 24, and 19, and time was always too short to accomplish what she wanted. In a demanding field that attracts perfectionists like herself, Handanyan found that making work-life trade-offs, and acknowledging they were necessary, took some adjustment. "Learning what was good enough and then accepting that it was good enough was a big challenge," she says.

Today, Pfizer's global Chemical R&D department spans two countries and has several sites in the United States. Since 2000, Pfizer has merged with or has acquired various companies, allowing Handanyan opportunities to travel to and work with partners internationally.

In the shifting organizational landscape, she had tough decisions to make in deciding how to integrate capabilities across legacy companies. Many times, she had to understand quickly evolving technologies to make the best investments for her current and future lab and manufacturing teams.

FROM COLDS TO CANCER

Handanyan's department has produced a range of products on their journey to be a new medicine: from Xalkori to Xeljanz; Chantix and Ibrance, Vyndaqel and Inlyta. Looking at therapies in the pipeline—including vaccines for many cancers, devastating *Clostridium Difficile* [C. diff] bacterial infections, plus drug therapies for cancer or alopecia areata—the potential human impact is significant.

When Handanyan talks about pharmaceuticals and people, she has the faces and stories of actual patients and their families in mind. Occasionally, she and her team are fortunate enough to meet those whom the drugs have helped. "Sometimes patients come in," she says, "and we hear of their journeys with a certain disease and the impacts the products we have developed have had on their lives."

As a mom, she says parents talking about the pediatric cancer medications leave a profound impression. She remembers one mother who created whimsical messages and images with her son's overwhelming number of medication bottles to offer an underlying and poignant message about medical treatment. The effect demonstrated just how long, grueling, and painstaking these journeys are. "They are battling such challenges," she says of the patients.

When a drug is successful, it's a game changer for some. The FDA approved Pfizer's recent drug LORBRENA (lorlatinib) in November 2018. Its trial results were so positive for treatment of ALK positive metastatic non-small cell lung cancers that the challenge became an urgent need to get it to market. Her team, along with other Pfizer teams, managed to get the drug from development to final approval





“There’s been so much innovation in the work process so that we can now successfully do work in five years that 25 years ago we never could have done.”

in five years—lightning-fast speed in the pharmaceutical world, where the usual track of development to market is normally twice that long.

“We’ve done a lot of investing in innovation and how we do our work over the years,” Handanyan says. “There’s been so much innovation in the work process so that we can now successfully do work in five years that 25 years ago we never could have done.” Drug development walks a fine line of faster production without compromising quality—and then teams must replicate the process on a much larger manufacturing scale to meet commercial demand.

Modern labs look to equipment with automation and data collection to boost innovative results. Seeing this trend, Handanyan championed a \$15 million investment in equipment to advance Pfizer’s R&D capabilities and pioneer new drug development. “These capabilities have been game changing for us,” she says.

Innovation brings a faster concept-to-customer path. LORBRENA marked Pfizer’s third FDA-approved oncology treatment within a two-month period, two of which were for lung cancer—the leading cause of cancer deaths.

LEARNING FROM SUCCESS AND FAILURE

This success is one of many for Pfizer, but it also amplifies a gaping need. “What I have learned about oncology is that cancer is very complicated,” says Handanyan. “The same disease can manifest with different mutations. Drugs are designed to attack one specific mutation and that helps to find a target patient population.”

The drugs that begin in R&D aren’t always successes, but they are opportunities. “I would love it if every drug we developed became a success, but many don’t and we have to accept that,” she says. “Some are spectacular failures, but you reflect on what you do learn and how you will approach the next project in the future.” The science and engineering methodology in drug development, even if it didn’t produce a drug, is often still incredibly valuable. Failure means the next iteration of the process may succeed.

“It’s exciting to work in development when a discovery leads to a compound nominated for development,” she says. Her team sees the full breadth of portfolios across multiple therapeutic areas, including oncology, inflammation and immunology, internal medicine, rare disease, and hospital products—from the earliest inquiry and discovery stages through collaborations with the manufacturing division to produce active ingredients, progress the formula into a deliverable form, and manage regulatory applications for registration.

“I get to do the work I love, and I get to work with talented and dedicated people,” Handanyan says. “The relationships I’ve forged doing work that I love and that’s meaningful to society—I can’t ask for any more than that.” [3]

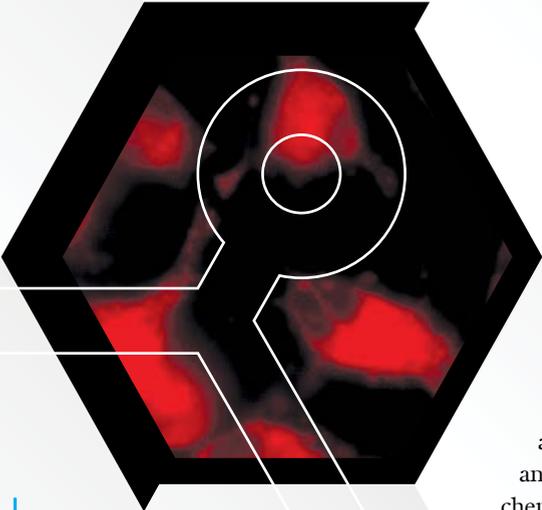




STEERING THE CHEMISTRY

PROFESSOR ANITA MATTSON DIDN'T BECOME
A CHEMIST BECAUSE SHE WANTED TO CURE
CANCER. SHE BECAME A CHEMIST BECAUSE
SHE LOVES CHEMISTRY.

By Joan Killough-Miller



“UNLIKE MOST PEOPLE, I FIND ORGANIC REACTION MECHANISMS REALLY FUN,” MATTSON ADMITS. “I WAS NERVOUS ABOUT TAKING ORGANIC CHEMISTRY IN COLLEGE. ALL I KNEW ABOUT IT WAS PEOPLE SAID IT WAS HARD. BUT FOR SOME REASON I JUST HAD A NATURAL KNACK FOR IT.”

At the back of her mind was the notion that a chemistry degree would one day enable her to become a doctor. Instead, she became intrigued by complex organic reactions and set out to discover the optimal catalysts to “steer” the formation of chiral molecules—that is, molecules with stereogenic centers—that can form as one of two mirror-image compounds.

Mattson came to WPI in 2016, bringing her groundbreaking work on catalysts to produce dimeric chromanones—a class of naturally occurring compounds that hold strong biomedical potential. These complex molecules have been shown to have activity against a wide range of diseases, including tuberculosis and malaria, and they also can be effective antibiotics. Within a year she had secured NIH funding to work on techniques to more efficiently produce the desired isomer of these complex molecules in the lab. Her “Tricks for Noncovalent Catalysis” (a 2017 piece in *Science* magazine) highlighted unique approaches to using catalysts that could lead to life-saving medical discoveries.

At WPI her “knack” for synthesizing bioactive natural products has become the foundation of an interdisciplinary research collaboration on the interface of synthetic chemistry, pharmacology, and cell biology. Researchers at WPI and UMass Medical School are working together to explore new approaches for developing drugs to treat cancer, especially when the cells have become resistant to first-line therapies.

COLLABORATING ON CANCER

Cisplatin—the standard treatment for several cancers, including ovarian—is initially successful in causing apoptosis—or programmed cell death—in cancer cells. But in up to 75 percent of patients the tumors become drug-resistant, and the patient dies. “There is often no alternative treatment,” says Mattson. A promising avenue for developing new drugs is a dimeric chromanone called phomoxanthone A, which can be extracted from *Phomopsis longicolla*, a fungus that grows on teak trees in Northern Thailand. “Others have demonstrated its cytotoxicity,” Mattson explains, “but no one fully understands its mechanism of action, or what it targets in the cancer cell. Many of

these natural products have good biological activity, whether it’s anti-cancer or anti-bacterial or anti-malarial. It’s what they call, in chemistry, a ‘privileged’ structure.”

Naturally occurring phomoxanthone A is costly and complicated to isolate. It’s also

notoriously difficult to synthesize in the lab. That’s where Mattson’s bonding “tricks” come in. Her breakthrough work on catalysts has made it possible to create a reliable supply of the biologically active formation, making sustained, in-depth experimentation possible.

The phomoxanthone A molecules synthesized in Mattson’s lab are being developed for use as probes that will let researchers see inside cells to pinpoint and analyze the anticancer action of the molecule within different cell lines—including lymphoma, oral cancer, and ovarian cancer. The researchers will also compare the response of cells that are still cisplatin-sensitive, and those that have become resistant. The team expects that the data gathered will shed light on the phenomenon of drug resistance, and open up pathways for new drug discovery.

The inquiry is focused on proteins and lipids found in the inner membrane of the mitochondria, a structure within the cell. Of particular interest are BCL2, a protein that regulates cell function, and cardiolipin, a phospholipid that, in oversupply, can disrupt the normal properties of the membrane. The hypothesis is that a better understanding of these targets could inspire the creation of drugs that work by controlling the production of these, or other biomolecules—which might offer a new target for halting the reproduction of cancerous cells.

Two doors down from Mattson’s office is her friend and mentor Suzanne Scarlata, professor of chemistry and biochemistry. The Scarlata lab studies the localization and movement of proteins and small molecules in cells. “Because phomoxanthone A is fluorescent,” she notes, “its interactions with cells can be easily followed on a high-resolution fluorescence microscope.” Students in the Mattson/Scarlata lab have observed the drug being taken into cancer cells. “By tagging different cell organelles with different color fluorophores, we find that the drug anchors itself into the double lipid membrane of cell mitochondria. Because the mitochondria are critical in providing energy to cells, cells containing the drug become fatigued and die.” She adds that future studies will attach potential partners of phomoxanthone A with different color fluorescent tags to follow their associations in living cells.

At UMass Medical School, assays by the high-throughput screening facility led by Professor Paul Thompson, along with mass spectrometry

studies led by Professor Scott Shaffer, will provide data to validate the targets and action mechanisms. “Once we identify the biomolecules of interest, and figure out where the active site is, we can begin to confirm how those molecules are coming together, on a molecular level,” Mattson explains. The intent is to transform phomoxanthone A from an interesting exotic natural product to a known actor that can play a leading role in future drug discovery.

THEORY AND PURPOSE COALESCE

Early in her career, Mattson says, “I became really interested in hydrogen bond donors – designing my own and seeing how they could be used to solve problems of complex molecular synthesis.” Her first breakthrough on exploiting noncovalent bond formation to favor the production of a desired isomer was in using silanediols – compounds containing silicon bonded to two OH groups.

One of the challenges in synthesizing chromanones is that conventional catalysts, which work by forming strong covalent bonds with their target molecules, are often not effective because it can be difficult to form covalent bonds with chromanones. What is needed are molecules that can form weaker hydrogen bonds with anions, or negatively charged regions of the target molecule.

Mattson’s group was the first to show that the ability of silanediols to recognize anions in other molecules and to act as so-called hydrogen-bond donors gives them great potential as enantioselective catalysts, capable of controlling the synthesis of chromanones so that the process produces only the desired stereoisomer. Working with students in her WPI lab led her to realize better outcomes by using copper bis(oxazoline) as a catalyst, in the presence of a ligand.

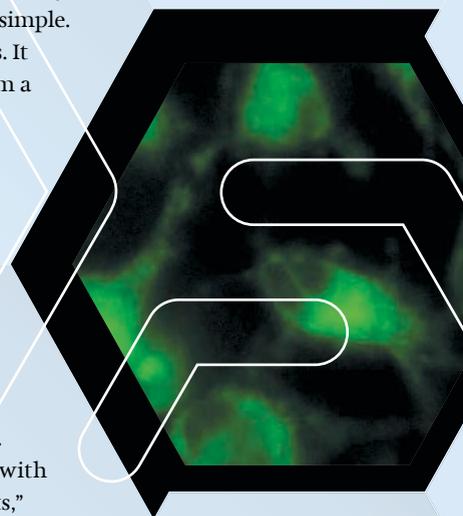
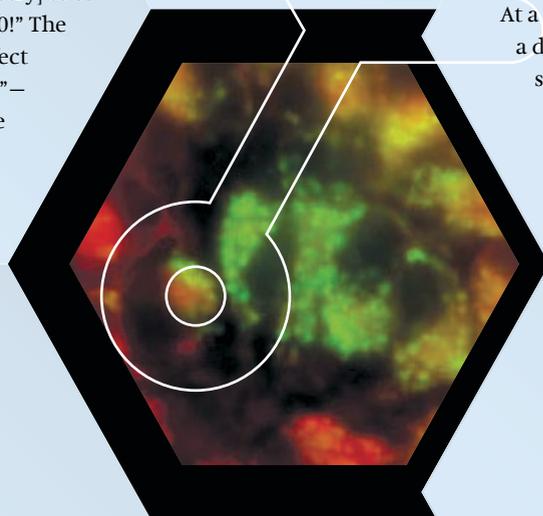
“With the silanols, we were hitting a wall, in terms of the effectiveness of stereocontrol,” she says. “We could control it [the stereochemistry] to 57 percent—but you want it to be 100!” The copper catalyst, with almost perfect results, is now her “go-to method”—the breakthrough that makes the work on phomoxanthone A possible. Mattson’s “tricks” make it possible to create a library of closely related analogs—that is, similar compounds that are more readily synthesized, but that still have the key bioactive properties.

While naturally occurring molecules such as the chromanones offer a good starting point to inspire drug discovery, structurally simplified bioactive derivatives can serve as more accessible scaffolds to study the relationship between structure and biological activity. The analogs that prove to be the most cytotoxic will be employed in photoaffinity labeling assays to determine exactly what is necessary to get the anti-cancer activity.

“I’ve been trying to get into drug discovery for a long time,” Mattson says. “I’ve had my eye out for years on how to blend my chemistry with useful target molecules.” Some of her early work intersected with cancer research at various points along the way. In her first independent position as an assistant professor at The Ohio State University, she received an American Cancer Society Institutional Seed Grant to apply her hydrogen bond donor catalysis techniques to drug discovery. She collaborated with the medical school on an inhibitor for a protein that has been linked to pediatric brain tumors. “Doesn’t that sound very noble?” she asks. “It was a good project, but the molecules were very simple. We could use very standard reactions. It wasn’t intellectually stimulating, from a synthetic standpoint, because the chemistry was very easy.”

On the synergistic collaborations at WPI and in Worcester she says, “I think a lot of people want to hear that maybe I planned the whole thing. But I couldn’t have predicted this. I think I’m lucky that I came to WPI and found Suzanne. She’s such a great mentor for me. for me.

At a large state university with a dozen organic chemists,” she jokes, “we’d talk only to ourselves. Here, I’m forced to talk to others. Turns out that’s advantageous!” Speaking seriously about the collaboration, she says, “It’s a multifaceted approach that requires a lot of different kinds of expertise. That’s why so few people do this kind of work—because it requires such different skills. But I think that’s where all the great science is—on the interface! It’s in the two complementary skill sets coming together to solve a problem you couldn’t solve by yourself.” [J]



WHITESIDE POINT

Late in the 1970s, when the *Boston Globe* would be tossed onto **JOHN WHITESIDE'S ('80)** porch, he couldn't help but notice the excess of employment ads in the computer industry. Feeling the pinch of his psychology teaching salary falling behind with inflation, he decided his long fascination with computers might be his ticket to a healthier bottom line. That's when he hit the switch on a career turn to computer science at WPI.

Immediately upon earning his MS, Whiteside found a position within the industry that tripled his academic salary—but he didn't leave his psychology mindset behind. "My specialty was designing computers so they'd be easier to use," he explains. "This was a new field; I got to help create it."

Fast forward to the early 2000s and Whiteside again tuned his career toward a refreshingly different direction.

"I'm good for about 10–15 years in a particular job or field," he admits. "Then I get itchy and in need of learning and doing something new."

Beginning with the art of custom furniture making, he then transitioned into another of his passions, the art of lutherie—otherwise known, less glamorously, as guitar making.

At his North Road Guitars shop, nestled in a barn at the back of his vintage schoolhouse residence in New Hampshire, Whiteside builds handmade guitars and teaches the craft in a fully equipped shop.

"Guitar designing, building, playing, and teaching others how to make guitars is the

most fun I've ever had. I get to work with the finest woods in the world, create objects that both sound and look beautiful, and meet wonderful people I'd never otherwise have met." His students run the charts from professional musicians, engineers, surgeons, and radiologists to a US Marine fighter pilot, a state trooper, and a dog trainer from the Seabrook Park racetrack.

WPI provided the artisan the capacity to apply complicated, multi-step processes through flow charts, solving theorems, and writing code—now lessons he uses in guitar building. By utilizing hundreds of steps that demand completion in an interdependent order, Whiteside says his WPI education helps him analyze problems from an engineering perspective, which he then applies to guitar making through both structural and acoustic engineering.

In all of his career turns, Whiteside has taken his love of learning and reinvented himself in harmony with his own interests, advice he gives to young students considering their own future careers.

"Learn how to learn," he says. "The world is changing at such a fast pace that any set of skills you acquire will become out of date sooner or later. You will have to keep getting re-educated for the rest of your life. Start with something you find intriguing for its own sake, not just because it happens to be a field with a lot of jobs at the moment. Do what you love, and the money will follow. Never sell your soul for a paycheck."

—DOREEN MANNING





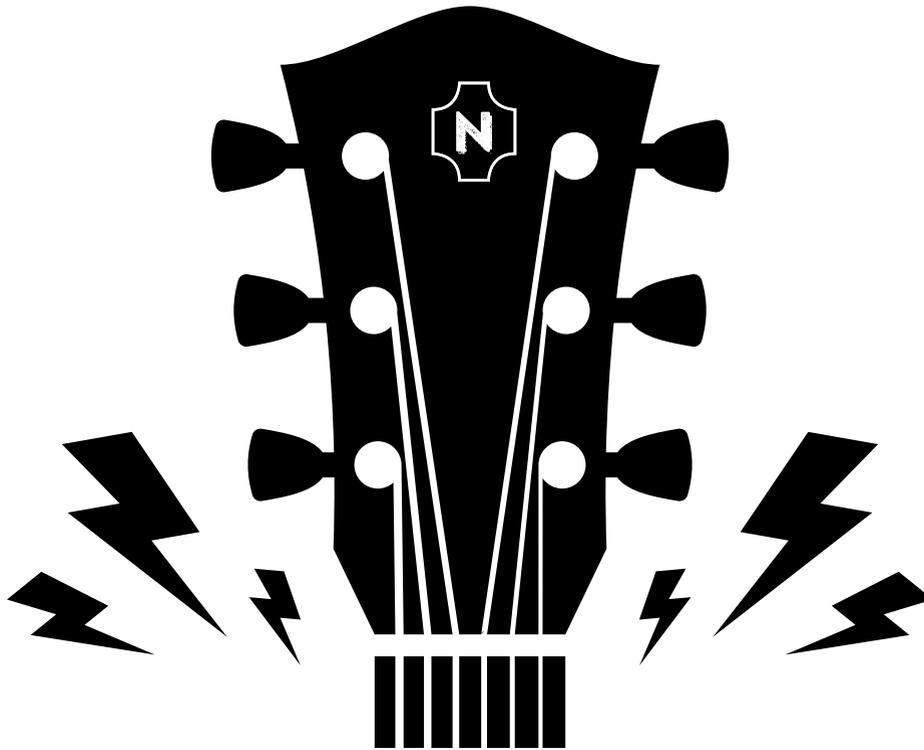
**WHERE
THE VOICE
RESIDES**



**RECORDING ENGINEER
NEAL CAPPELLINO '87
SHEPHERDS SOUND
IN MUSIC CITY**

By John Martin
Photography Matt Furman

Outside his Nashville recording studio, Cappellino's retrofitted Avion trailer serves as a guest apartment.



NEAL CAPPELLINO GIVES THE SAME ADVICE TO ALL THE ARTISTS HE RECORDS AS THEY WRESTLE WITH THE MULTIPLE TAKES OF THE CREATIVE PROCESS: “KEEP GOING, WE’LL HEAR IT WHEN IT COMES.” HE SAYS HIS JOB AS A SOUND ENGINEER IS TO PLAY WELCOMING HOST TO THE BIRTH OF A SONG—OR WHEN RECORDING A VOCALIST, TO CREATE A SPACE FOR THE VOICE TO RESIDE IN.



He works in Nashville, where the five-time Grammy winner owns and operates a recording studio called The Doghouse. A recording engineer and producer by trade, at the studio he wears all the hats—owner/operator, technician, business manager, salesperson, you name it. “It’s a small business operation, so you do what’s needed,” he says.

Tech skills notwithstanding, he says the most important part of his interaction with creative (and sometimes famous) people involves psychology and personal chemistry. “The studio is a sanctuary, where artists feel safe to show up unmasked, vulnerable, experimenting, failing ... all without fear of judgment or interruption. We’re here to shepherd that process, support it ... to be neutral, funny, quick, patient, and competent.”

Cappellino loves the work and the collaborative vibe of Music City. “It’s a great time recording live in the studio, there’s nothing like it.

I’ve been fortunate to ride shotgun to a lot of special sessions—Alison Krauss, Vince Gill, Dolly Parton, Joan Osborne, Brad Paisley ... and a whole lot of important people that nobody knows.”

Growing up in Rochester, N.Y., he caught the music bug early. His grandfather was a musical savant; Cappellino started on violin at age 3, then piano at 5. He played in bands through high school. “My parents allowed our bands to practice in the house,” he says. “Only now, as a parent, can I relate to the selfless devotion they demonstrated, because we were loud, and not very awesome to listen to for hours at a stretch.”

⚡ TECHIE FROM THE GET-GO ⚡

Auguring what was to come later, he also used to build DIY projects from Heathkit electronics—one of which was an audio mixer he used for homemade recordings. Math came naturally to him, and he took programming courses in high school. “Computers and electronics



were the way forward, so it made sense to apply myself in that direction," he says. "I was encouraged by my father that this would be a valuable path in education."

WPI was a simple choice. "It offered a combination of everything I viewed as valuable in higher education," he says. "I preferred the smaller engineering college experience. The project-based learning format of the Qualifying Projects resonated with me. The opportunity to combine work experience through the Co-op Program turned out to be extremely valuable. And the Humanities and Arts Department having a music studies program was essential; being able to do the Sufficiency project in jazz was a big bonus."

He cites one faculty member's influence in particular. "I can't say enough about Rich Falco, as both an enthusiastic music educator and a willing mentor. I had an instinct to blaze another path professionally, but I wasn't sure what to do with it. I went to Rich to confess my sins

and he let me bend his ear. That was a pivotal conversation."

More than 30 years later, the mentor remembers the mentee. Falco is director of jazz studies and an assistant teaching professor of music at WPI. "Neal was the perfect WPI student—enthusiastic, curious, engaged, and brilliant—and his obvious musical gifts were a perfect fit for the WPI Jazz Ensemble," Falco says. "With his love of sound—what jazzers call 'big ears'—and his knowledge of technology, he seemed destined to become a world-class recording engineer, and I was proud to introduce him to associates in the field who could bring him real-life experience."

Falco opened a significant door for him, introducing him to the studio manager at Long View Farm recording studio in North Brookfield, Mass., where the likes of Aerosmith, Mos Def, and the J. Geils Band recorded, and where the Rolling Stones rehearsed and recorded "Tattoo You" during a six-month residency.

"They hired me as a full-time assistant engineer solely on Rich's recommendation and the fact that I had a BSEE—they figured, well, if he's no good at recording maybe he can fix stuff," Cappellino says. "I never looked back. Somehow, I was completely at peace with a job paying \$5.35 an hour."

He still fixes stuff at The Doghouse, where analog multitrack tape machines and vintage vacuum tube technology sit side-by-side with digital hardware and software. "You have to be fluent in all of it," he says. "Understanding signal flow is of paramount importance to an audio engineer. It's also valuable to understand things at the component level, whether for operating equipment or troubleshooting and repair. I've saved many sessions from going dark by being able to wield a multimeter and soldering iron."

⚡ VARIETY IS THE SPICE ⚡

Cappellino says there is no typical day in the studio. His activities range from the solitary process of mixing an album, where he's cocooned in the control room for days on end, to the energy of working with a roomful of musicians in a live recording session. The variety suits him just fine. "The most priceless learning I took from my co-op experience was the realization I was not cut out to participate in the mainstream job marketplace."



He takes a traditional approach to his craft, mostly recording real instruments played by real people in a room together. He and the artists learn the song or arrangement, agree on an approach, and hit the record button; the process is called tracking. After the bulk of the instruments are captured, he moves into overdubs. “This is where you layer in sounds on top of what you’ve recorded—strings, vocals, soloists, percussion, programmed sounds, etc.,” he says. “When you’ve finished adding things—and probably taking away some things—you go into the mixing phase, where you balance all the instruments, adjust their volume, tone, and placement in the stereo field, and print to a stereo master.”



Then comes the real test. “We have the odd ritual of taking a copy of the mix to listen to in the car, to see if it sounds like it should. After spending thousands of dollars to get an acoustically proper studio environment, we still defer to the brutal litmus test of the car ... it’s funny.”

⚡ LIFE HAPPENS ⚡

Cappellino says that what drives him has changed over time. Initially it was pure enjoyment, and participation in the music community. Then

it became a business, being in service to the creative goals of the artist. Next came supporting a family.

“In every layer, there was always a desire to be recognized by your peers and the people you do work for,” he says. “You want to know that you’ve done your best, that you care, and experience the pride and fulfillment of being associated with something that is lasting and meaningful. Later on, success meant achieving a sustainable balance between work and non-work, because you can lose yourself in it and leave things behind that really matter, like being there for your children.”

He’s learned to deal with tough times along the way. In 2008/2009 the economy tanked at the same time the music industry was undergoing its



own disruption. “We lost everything but our house, and you really question the viability of your career,” he says. “I had made peace, though, with the idea of material things being secondary to the health and well-being of my family. It was difficult and liberating at the same time. But we survived the war of attrition, and I rebuilt and revitalized my career, and I’m very thankful for the studio and the clients that I have now, and that continue to come.”

➤ ART VS. CLICKS ⚡

Post-disruption, today’s music industry is a democratized landscape, with low barriers to entry. The trick is getting heard. “The music business is using social media metrics to find new talent, and there are thresholds to be attained before you get the attention of a label, publisher, or booking agent,” he says. “You have to achieve a certain amount of success on your own before you can solicit actionable interest from a company.”

Cappellino says that doesn’t measure creativity. “Rather, it tends to indicate someone who can multitask and has well-rounded skills, and who maybe has the time and resources to engage in such relentless tasks as self-branding and advertising.”

It doesn’t do justice to the artist. “Being an artist is something one is captured by; an urge, a compulsion to pursue a certain way of life,” he says. “Can you imagine if we imposed the modern concepts of social media branding and self-advertising on the great artists from years ago? Who would’ve been left out? Most everyone.”

➤ SCREENING OUT LIFE ⚡

Cappellino tempers his embrace of technology, both as parent and recording engineer. He limits his teenage daughters’ screen time, and urges recording professionals to stop “looking” at sound and start listening to it. “With the advent of music on computers, we became fascinated with how we could manipulate music on-screen. That’s sometimes necessary, and very creative things happen this way. The trouble comes when we can’t divorce ourselves from the screen when we need to focus on listening.”

He says when some perceptual capacity is taken up visually, you don’t give full attention to the experience of listening; you’re not fully “there,” to feel what might be evoked at a deeper level. When you see music represented on screen—its color and amplitude, or the song arrangement—you’re looking at the math of it.

“You can actually see what’s coming on screen before you hear it, so you’re prejudging based on visual math,” he says. “It’s detrimental to enjoying, or especially judging, a musical performance, which is what engineers and producers are tasked with doing—making decisions based on what they’re hearing and how it makes them feel.”

In recent years Cappellino has taken an interest in the healing arts: alternative therapies and energy medicine. “I’m certified as a Reiki Master practitioner,” he says, “and as a natural extension of my music career, I integrate sound with the energy work.” [J]



TEACHING

I created a mentorship program called your~Sound as a solution to the many requests from aspiring engineers to shadow me in session. Unfortunately, I always had to decline in consideration of my clients, but recognized the need for a hands-on learning experience. There are many schools and resources available now, but none address the unique challenges someone has in their own work environment, on their own projects, and within the limitations of their equipment. I offer a service where, locally, I’ll go to someone’s studio or workspace, help them work through whatever problems they’re struggling with, and get their skills to the next level. Outside the area, we still work within their setup and on their material, but it’s facilitated through Skype.

GIVING

The Melodic Caring Project is a nonprofit organization based in Seattle; it was founded by dear friends Levi and Stephanie Ware. MCP brings the virtual experience of a live-streamed concert performance into the hospital rooms of infirm children. I sat on its board for several years, and still avail myself where I can. This is one of the most giving, service-oriented examples of music as medicine that I’ve ever come across. The shows are curated to address the kids as very special guests of the artist: the artists are fully complicit in giving the children the spotlight, identifying them during the show with song dedications, shout-outs, audience support, a chat room feature onscreen, etc. The results have been tangible for so many young lives, many of them cancer patients with difficult diagnoses and awaiting treatments or surgery. It gives them hope and the strength to hold on and fight through their next stage. The parents of these courageous children are no less affected.

—NEAL CAPPELLINO

revisit.
reunite.
relive.

ALUMNI WEEKEND @ WPI
MAY 28-31, 2020

The perfect opportunity to explore the nostalgic
and the new, and to celebrate your time at WPI.

Registration is now open at wpi.edu/+alumniweekend.

— Reunion events for undergrad classes ending in 0 or 5! —

ALUMNI NEWS



Meet the Student Philanthropy Ambassadors

University Advancement (UA) recently launched WPI's first Student Philanthropy Ambassador program. These 30 students, selected through an application process, support the university's long-standing culture of philanthropy. They educate their peers on campus by promoting UA's work and sharing the countless examples of philanthropy at the university. The ambassadors offer in-person messages of gratitude to WPI supporters at events ranging from one-on-one donor visits to campuswide events like the annual Evening of Gratitude, Homecoming, and Alumni Weekend.

"Each of my interactions with donors on campus has left me with a new way to look at life and my time at WPI. I'd like to show WPI donors my gratitude and how their support has allowed me to love my time here, just as much as they loved theirs."

Brittany Henriques '22 | Computer Science | Cortlandt Manor, NY

"I understand the need for philanthropy since I am one of four children who have attended well-known universities. The academic scholarship I was provided greatly helped to ease the expense of four tuitions for my family."

Matthew Kirejczyk '21 | Aerospace Engineering | Mansfield, MA

"I am a member of the Pep Band, and just recently a donor purchased new uniforms and percussion instruments for us to use ... I want to be able to express my personal gratitude to WPI donors."

**Matthew Bisson '21 | Mechanical Engineering,
Electrical and Computer Engineering minor | Manchester, NH**

"Moving to the United States four years ago, I never dreamed I'd be able to attend such a prestigious institution. Thanks to donor support of my scholarship, I will be an engineer. I want to help strengthen WPI's relationships with its donors and alumni."

Anxhelo Ripa '22 | Mechanical Engineering | Worcester, MA

"It would not have been possible for me to study at WPI if it wasn't for the donors, as their scholarship support funds most of my tuition. I am really looking forward to playing a part in supporting our donors."

**Sami Saif '21 | Biomedical and Electrical and Computer Engineering
Lahore, Pakistan**

"I joined the Student Philanthropy Ambassador program to show people how donor support affects the whole campus and to encourage new people to consider becoming donors to WPI."

Alexis Rock '22 | Biology and Biotechnology | Littleton, MA

"I think it is important to acknowledge and thank WPI donors and to let them know that their help is truly appreciated."

Emma Burkhardt '22 | Biomedical Engineering | Leominster, MA



GIVING DAY 2019

WPI community rallies for Giving Day

Dec. 3 was an incredible day at WPI! Giving Day arrived—and so did winter, with piles of snow blanketing the Hill. But no amount of snowfall could dampen the Giving Day spirit. In 24 hours, the WPI community gave generously to support students and faculty—1,300 gifts totaling more than \$275,000. With \$100,000 in challenge funds from trustees, the grand total for the day reached nearly \$400,000.

Giving Day Challenges also achieved success:

- The Club Sports Challenge was crushed, surpassing 400 gifts—far exceeding its 250-donor goal—and unlocking \$10,000 in challenge funds for the Club Sports general fund.
- The Greek Challenge reached nearly 400 donors, unlocking \$10,000 in challenge funds for Greek Life.
- The Reunion Challenge came in just shy of its 200-donor goal.

The Student Alumni Society incorporated fun and educational activities into the day this year, with the Wheel of Traditions, Pin the Horns on Gomepi, a photobooth, and the opportunity to write a thank-you note to a donor in exchange for a root beer float or hot chocolate. The Student Philanthropy Ambassadors were also on hand to talk with students, faculty, and staff about why giving to WPI is so important.

If you missed Giving Day, you can still make your gift! Visit wpi.edu/+give to support WPI students and faculty.



From the Desk of



MARK MACAULAY '89, '94 MS
ALUMNI ASSOCIATION PRESIDENT

To Do

- Register for Alumni Weekend, May 28-31
wpi.edu/+alumniweekend.
- Sign up for WPI TechConnect, the online portal just for WPI alumni wpi.edu/+techconnect
- Be part of WPI's tradition of giving wpi.edu/+give

Congrats

- To WPI on the 50th Anniversary of the WPI Plan!
- To the WPI community for crushing the Goat Nation Giving Challenge!

Coming Soon

- Second annual Research, Discovery, and Innovation (ReDI) Symposium at WPI, May 18-19
- Watch the Red Sox with us at Fenway, May 24
- TouchTomorrow, WPI's festival of science, technology, and robots, June 13
- Homecoming, Sept. 25-26
- So many events, activities, and opportunities for involvement this spring and summer—wpi.edu/+techconnect

3 Things All Great Alumni Do

- GO TO WPI EVENTS
- GET INVOLVED WITH WPI
- GIVE TO WPI

wpi.edu/+alumni
wpi.edu/+give



The Evolution of Engagement

ANDREW ABERDALE '18 spent the first five of his undergraduate and graduate years as an EMT for WPI Emergency Medical Services. You might consider his volunteer work as payback—he quite literally owes his life to WPI.

Aberdale's parents, Andy '89 and LindaLeigh Richert Aberdale '88, met at WPI 34 years ago as undergraduate transfer students.

"We always tease Andrew that the reason he exists is because of WPI," LindaLeigh jokes. "That's another reason we feel we owe WPI a lot. Andy's and my lives have been changed immensely because of WPI."

The couple supports WPI through philanthropy and leadership. Andy is co-vice chairman of WPI's Board of Trustees. LindaLeigh is an executive board member of the Women's Impact Network (WIN). Both sit on the Foisie Business School's Dean's Council of Strategic Advisors, which she co-chairs.

WPI was their son's first choice of colleges, but back in the 1980s, his parents took a somewhat circuitous path to the Institute. Andy studied criminal justice at Westfield State College but was excelling in chemistry. The department head encouraged him to transfer to a college strong in STEM.

WPI accepted Andy as a second-year chemical engineering student in January of 1986. Around the same time, LindaLeigh was frustrated by the slow pace of working toward her bachelor's degree while holding down a full-time job. Her father's employer offered a scholarship to WPI, so she applied. She was thrilled to be accepted as a second-year student majoring in management with computer applications.

Although they began their WPI careers at the same time, the two didn't meet until the following fall when both were living on the first floor of Founders Hall. Andy was pledging Alpha Chi Rho and, coincidentally, LindaLeigh had rented a room in the fraternity house over that summer and had become active with the fraternity.

One day as Andy was walking behind LindaLeigh in Founders Hall, he called out, "Hi, LindaLeigh!" She spun around and was pleasantly surprised to see him. Although she didn't know who he was, she deduced he was with AXP by the shirt he was wearing. For the rest of the term, Andy went out of his way to accidentally bump into LindaLeigh at breakfast. They started dating in December of that year.

Both were serious students, determined to finish their coursework in three years, despite losing credits in their transfers. They made their personal deadlines. Andy went to work for W.R. Grace as a process engineer, and LindaLeigh took a VMS systems manager's job with Digital Equipment Corp. while working toward a master's in systems engineering at Boston University. The two continued dating for three years while living on opposite coasts.

They married and settled in California, where their son, Andrew II, was born several years later. Andy earned an MBA from St. Mary's, and LindaLeigh became a software engineer, eventually specializing in cybersecurity. The family moved a couple of times following Andy's career. Life went on, and WPI receded further into their past.

But when they moved back to Massachusetts, they gradually reconnected with their

alma mater. By this time, Andy had become a turnaround expert, helping struggling or transitioning companies to excel. He was one of the original members of WPI's newly established Tech Advisors Network. He recognized how well WPI had prepared him for his career.

Andy proudly says, "I'm probably not the smartest person in the room, but I can understand most things because of my WPI education. I got my intense work ethic from my parents, but WPI pushed it to a new level."

Andrew arrived on the WPI campus in 2014. He double majored in management information systems and management engineering. His parents were careful to give him room to find his own way, which he did very well. Coincidentally, he pledged Alpha Chi Rho, the fraternity that first established his parents' bond.

To show their appreciation, LindaLeigh designed and created stained glass window panels for the fraternity house depicting the AXP coat of arms and its original chapter, Delta Sigma Tau. The family built the frames, and those panels were installed just before Andrew graduated.

This is just one more example of the Aberdales' commitment to the WPI community. Andrew, who will earn his master's in data science this spring, says, "They took the opportunity to build on WPI long after their time at the university was over and just as mine was starting. I'm really proud of the work they both do."

— SHARRON KAHN LUTTRELL

Commitment to a Cause

PHILANTHROPY PROPELS A RESEARCH POWERHOUSE

Back in 2003, Neil Heffernan, William Smith Dean's Professor of Computer Science and director of the Learning Sciences and Technologies Program at WPI, launched ASSISTments, a free online math learning tool designed to reinvent the way students learn and, in turn, how teachers teach.

The platform allows students to receive immediate feedback as they complete their homework to avoid making the same mistakes repeatedly. In the meantime, this information is sent to their teachers, who then can create a more focused lesson plan that addresses what students struggled with most, making for a stronger classroom experience for all.

Heffernan and his wife, Cristina Lindquist Heffernan, have made great strides in their work, from being invited to the White House in December 2016 to present on ASSISTments to launching their own nonprofit organization, the ASSISTments Foundation, in 2019.

Since its inception, ASSISTments has not only become an integral tool in classrooms around the world, but a sandbox in which researchers can test ideas that will lead to improvements in education technology. Heffernan hopes to apply future funds to the process of personalizing homework feedback for students, as well as utilizing ASSISTments as a tool to crowdsource different teacher, researcher, and student ideas.

"By crowdsourcing content from teachers all over the country," he explains, "we'll be able to use diverse educational techniques to enhance our platform and help students learn."

It's important work that's made possible not only by the passion and drive of the Heffernans, but the commitment to their cause seen through myriad grants and donations. The most recent came in the form of a \$2 million grant from the Eric and Wendy Schmidt Fund for Strategic Innovation, a California-based nonprofit with a focus on supporting ideas ranging from the educational to the commercial, all leading to societal improvements around the world.

Like Heffernan, the Schmidt Family Foundation possesses a people-first focus, asking important questions about what's needed, and what role it can play in filling that gap. With this grant, 60 researchers will be able to accelerate the development of their projects as they work to craft new ideas further benefiting students and teachers.

Jean King, Peterson Family Dean of Arts & Sciences at WPI, cites the forward thinking and subsequent funding from the Schmidt

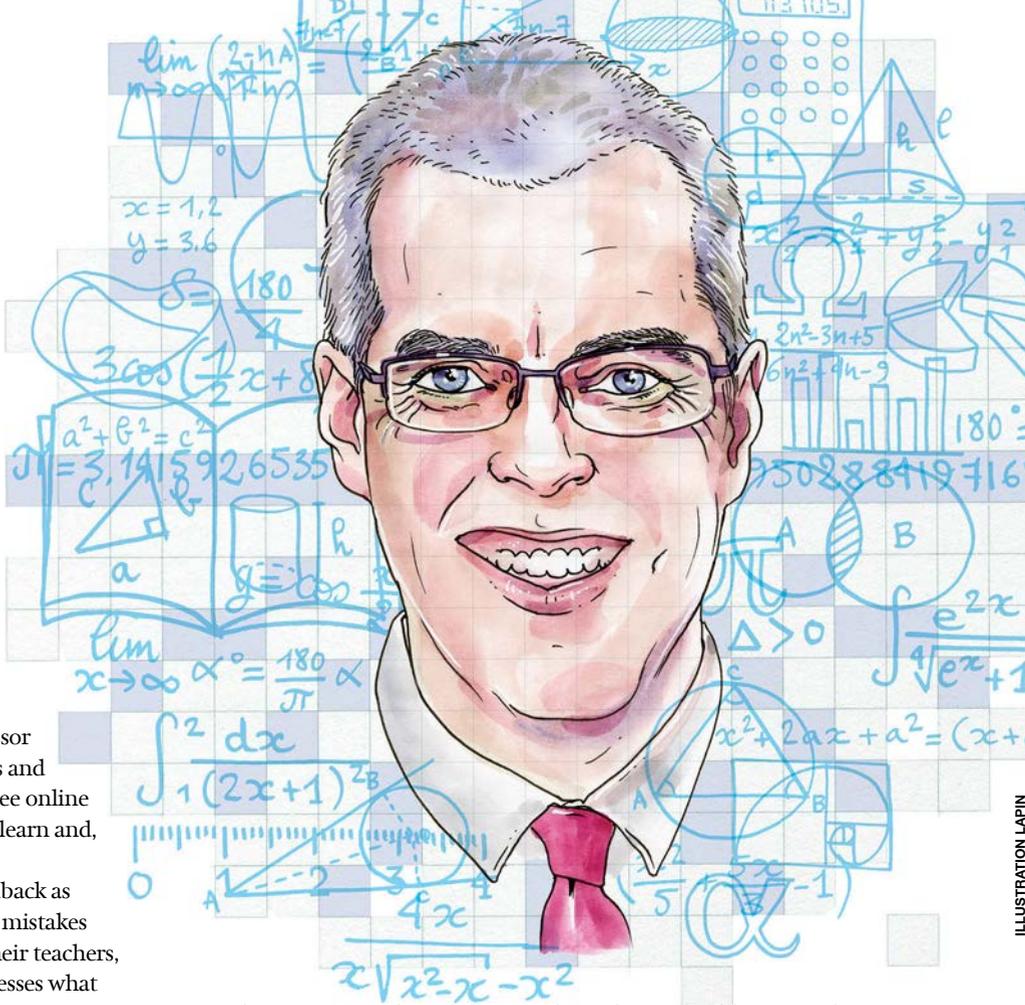


ILLUSTRATION LAPIN

Foundation as crucial to working with teachers in tackling specific concerns that may not be on the initial radar of researchers. "By addressing these questions, we'll allow students everywhere to access a free platform and themselves be integral to the research meant to benefit [their peers]."

Couple this latest grant with Heffernan's status as William Smith Dean's Professor of Computer Science, a donor-supported appointment that allows him to delve deeper into and take more risks with his research, and you've got a collaborative, research-driven powerhouse that only stands to get better and, subsequently, help more students.

The work of Heffernan and other WPI researchers may not be tangible, but it'll be felt around the world. Through the generous support of individuals like Williams Binns Smith, whose bequest to WPI was realized in 2015—decades after he made his remarkable commitment—and foundations like the Schmidt Family Foundation, WPI faculty are more readily able to apply WPI's motto, *Lehr und Kunst* (Theory and Practice), to their own work, taking the theories of their research and putting them into practice.

In just a couple of years they'll have a new locale in which to do just that. WPI's under-construction five-story building (described as "an apex of connectivity" by President Laurie Leshin) will serve as a backdrop for Heffernan and his fellow faculty researchers as they combine their passions with those of others to further revolutionize the fields of health, energy, transportation, and more. Donors are also helping make this new facility a reality through their generous support.

While future achievements and partnerships are still to come, they're guaranteed to be game-changers in more ways—and fields—than one.

—ALLISON RACICOT

CLASSNOTES

submit your class notes to
CLASSNOTES@WPI.EDU

R CLASS REUNION YEAR

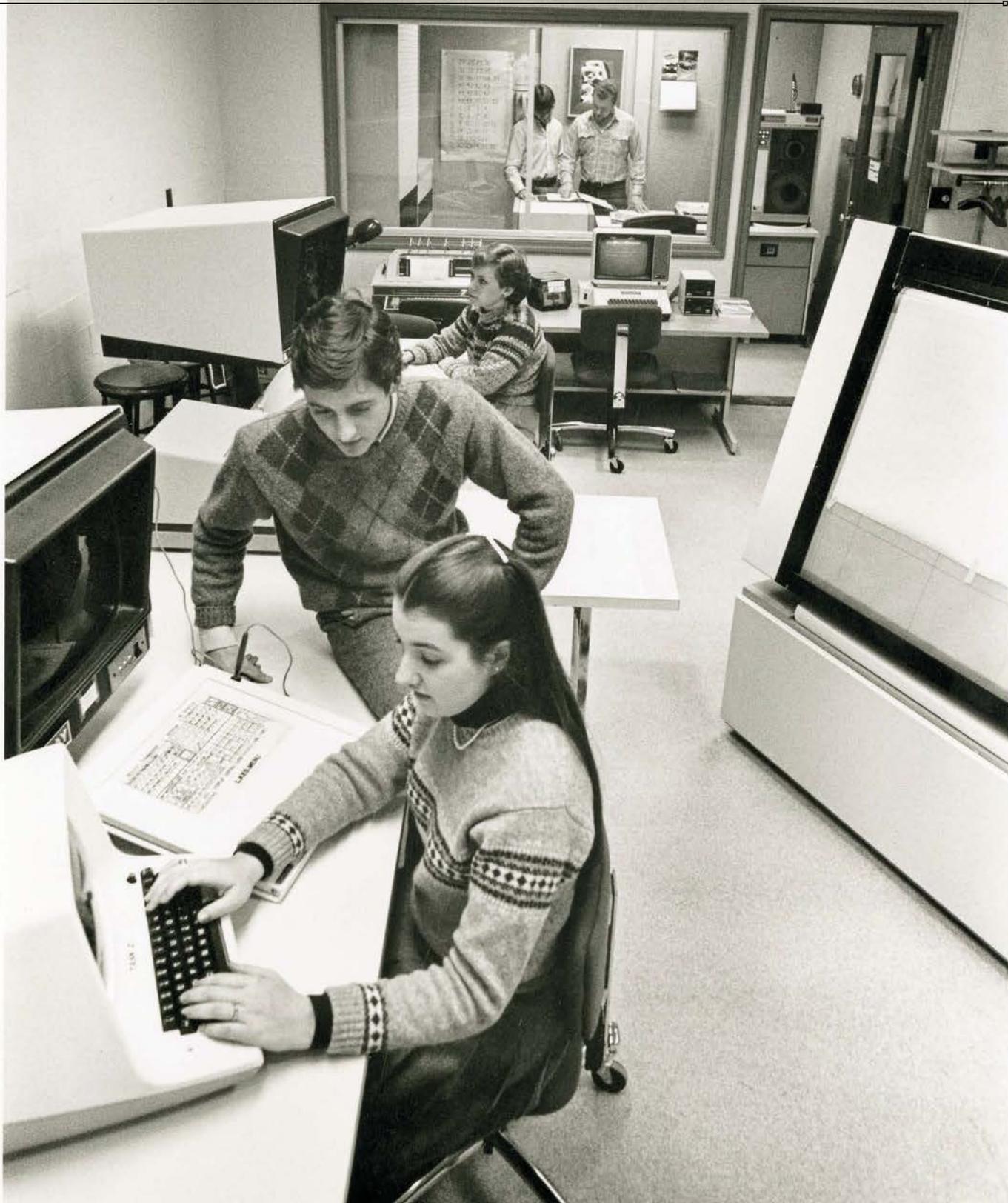


PHOTO FROM THE WPI ARCHIVES

submit your class notes to
CLASSNOTES@WPI.EDU

R CLASS REUNION YEAR

1951

Dick Davis writes, “Turned 91 in November and going strong. Still treat 10 to 20 patients every Tuesday, using chiropractic medicine and acupuncture. Living in rural Missouri in a fascinating community of French heritage started in 1732. We built our home 12 years ago in 134 acres of forest. Still love my education at WPI. Engineering is a great mental approach to problem solving.”

1952

Edgar Van Cott ▲ writes, “I was one of 30 veterans on a Phoenix, Ariz., Honor Flight in September 2019 to view war memorials in Washington, D.C. Service during the Korean War period qualifies one for the flight. The trip was especially rewarding as a member of the last class entering WPI that included over 50 percent returning WWII veterans. They were great guys (all men in those days) to learn from and made my college days even more educational.”

1953

David Hathaway writes, “Having moved from Lexington to the next town (Bedford, Mass.) into a senior retirement home called Carleton Willard Village, two and a half years ago, we find ourselves among everyone who are now dear friends. We were lucky enough to manage our finances well enough to be accepted, and to be in a state of health needed for acceptance. More than that, we were lucky to have a son and daughter both nearby (within 20 miles). In September WPI classmate **Don Oliver** and 20 other



▶ EDGAR VAN COTT '52

Lexington High School classmates celebrated our 70th high school reunion here at CWV.

My wife and I were both hit by serious health problems days before we were to leave for Paris and a boat trip down the Seine River. Fortunately, I have managed to get my bone marrow to work properly, and Harriet is learning to deal with a stroke that mostly took away some eyesight so that I have become the chauffeur these days. And I have had to leave my wonderful motorcycle that gave me much pleasure for 37 years. One winter I removed the transmission for overhaul with great trepidation, but successfully. My greatest pleasure was meeting fellow riders all over the northeastern USA and finding among them nobody who would ask, ‘Why do you ride a motorcycle?’”

1956

James Prifti's granddaughter, Rebecca Barolli '16, '17 (MS FPE) informs us of his death on July 30, 2019, after a brief battle with cancer. He is survived by his wife of 61 years, Dorothy Kiritsy Prifti. Rebecca writes, “Jim graduated with a BS in

mechanical engineering and later earned a master's degree in ME from Northeastern University. He spent his career working as a supervisor for the U.S. Army Natick Labs. He was a 32nd Degree Mason and member of the Morning Star Lodge and Scottish Rite for 59 years. Jim was also an active member of St. Mary's Assumption Albanian Orthodox Church, where he served on the board of directors as president and treasurer. He volunteered as a tax preparer at the Greendale Men's Club and the Holden Senior Center. He enjoyed spending time with his family and always enjoyed a great card game, bowling, and golfing.”

1957

Ed Dennett shares some sad news: “My wife, Katherine (Kay) Dennett, passed away on Nov. 4, 2019. We were married 62 years.”

1958

Roger Litman's son, Pete, writes to inform us of his death on Nov. 1, 2019. His obituary noted his 61-year marriage to the former Beverly “Bevi”

Weinstein, and his early career as an engineer for firms in Massachusetts, New Hampshire, and Nuevo Laredo, Mexico. Upon the death of his father, Roger took over the management of North Shore Fuel Inc. in Revere, Mass., at the site where his grandfather, Jacob Litman, an immigrant from Russia, founded North Shore Ice and Coal in the 1920s. Roger ran the company for 45 years expanding from oil to HVAC contracting. “Good weather” for him meant a clear, 10-degree day in January, because “they are burning oil.” An early user of a beeper, at a time when they were rarely carried by anyone who was not a doctor, he could always amuse himself when it went off by shutting it off and saying, a bit too loudly, “Let the patient die,” to horrify those nearby. Pete's note adds, “He often spoke very fondly of his time at WPI, or, as he always called it, ‘Worcester Tech.’”

1959

Richard Keats's daughter Leslie informs us of his passing on Nov. 13, 2019. Predeceased by his wife, Maxine Lebowitz Keats, he leaves three children and his loving



▶ RICHARD BREWSTER '60

companion, Linda Wartow. “He was very proud of WPI, and shared that love with all of us,” Leslie writes. “We have a lot of wonderful memories of Homecoming games, parades, and just being on campus.”

1960 ▶ R

Richard Brewster ▶ writes, “The newest Mercy Ship will sail on its maiden voyage next spring. I have been accepted as part of the crew. In the photo, I am second from right in the back row.”

Bob Fitch shares, “Retired from real estate in Southern California, sold our real estate company, moved to Florida to live at The Villages in November 2017. The Villages is a retirement heaven, 684 holes of golf, 2,000 activities per month. The greatest retirement community in USA! I could not be happier.”

1965 ▶ R

The *Class of '65 News* continues to welcome biographies from classmates. The newsletter, sent every four weeks to members of the class from president **Pat Moran**, includes 3–5 bios in every issue. Each issue also lists the classmates who have passed away.

“I’m pleased that 41 classmates from all 11 fraternities and Independents have sent bios,” says Pat, “but 171 have not. It would be great to hear from them before our 55th reunion, May 28–31, 2020.” To submit a bio, get back issues, or get on the mailing list, contact Pat at WPIClassof65@gmail.com. To submit an update to be seen by all alumni, email to ClassNotes@wpi.edu.

1968

Bill Belisle ▶ writes, “Belinda and I celebrated 50 years of marriage with a 35-day Viking Cruise along the coast of Asia. Ending in Cambodia, countries along the way included Japan, Taiwan, Hong Kong, Vietnam, and Thailand. The highlight was seeing the famous religious sites of Angkor Wat and Angkor Thom.”

1970 ▶ R

Robert Plante was presented with the Albert Nelson Marquis Lifetime Achievement Award by Marquis *Who's Who*. His profile notes his service as a professor of management and dean at Purdue University. He holds a PhD from the University of Georgia.

▶ BILL BELISLE '68



1972

Lesley “Lee” (Small) Zorabedian writes, “It is with great sadness that I write to inform you of the death of my husband, **John (“Jack”) Zorabedian '72**, on Nov. 30, 2019.”

Jack’s obituary notes his service in the U.S. Naval Reserve and the Massachusetts Army National Guard. He retired from GE Healthcare in Westborough, Mass., in 2019. In addition to Lee, he leaves four children and six grandchildren.

1973

Russell Smith has been busy traveling. “Last adventure was a tour of WWII battle sites in Normandy sponsored by the National WWII Museum in New Orleans,” he writes. “Earlier in the summer of 2019, I traveled to Colorado for a family reunion, to Las Vegas for a friend’s retirement, and to San Diego for two Red Sox games.”

1974

Holly Keyes Ault (MS, '78 PhD), associate professor of mechanical engineering, was interviewed by *Design World Online* about the dynamics of computer-aided design systems driven by direct modeling. In the article, “Parametric Modeling: Still going strong thirty-one years on,” Ault likened changing a solid model to working directly with clay.

Will McBride writes, “My big news is that I am a grandfather of a boy: Owen Juniper McBride-Barber. I recently completed my third cycle of the National Electrical Code, for the 2020 NEC, where I represent IEEE as the principal member on Code Making Panel 14. I am still working, although part-time, as the electrical administrator for CONAM Construction Co. (mostly I do engineering work for the Alaskan Oil & Gas industry.) I shipped a truck to the Big Island of Hawaii and hope to develop a lot I purchased there to build a family vacation dwelling. I still have my second home outside of Phoenix, Ariz., and my main residence in Anchorage, Alaska. I have a collection of Shelby Dodge cars that I need to start trimming down, since my kids do not want them.”

1978

John Bourassa accepted a senior principal engineer position with the Test Engineering group at Northrop Grumman in Linthicum, Md.

1979

Laurel (Wijanen) Holland ▶ writes, “Although my path didn’t shape up to be a conventional engineering path, I’ve been helping others engineer more fulfilling lives with greater meaning and authenticity. As a therapist turned life coach, I have truly loved my professional life since making this big change at 40 – it’s been more than 20

years now! I think I had the courage to take on projects like writing two books and building online courses because of the project work I completed during my undergrad experience. I am always grateful for my WPI days!”

Gail D’Amico Mason writes, “Greetings from the Great White North! My science and problem-solving education at WPI has served me well. I became a board-certified veterinary internist and the co-owner of two multi-doctor practices. I recently merged my specialty practice, and am now the chief medical officer of Portland Veterinary Emergency & Specialty Care in Portland, Maine. I’m lucky enough to still love my work, and have raised three sons who are successful in their own right. Though I’m still working (more than) full time, I am enjoying sneaking out to show my horses at the national level. Life has been good to me!”

1982

Although **Jim Diemer** and his wife, Maureen, continue to enjoy life in Houston, Texas, (where Jim continues his career in energy infrastructure development with Sempra LNG), he reports, “Over the past decade in Houston we continued to feel a strong pullback to the Atlantic beaches. So this past spring we purchased a beach house just a few steps from the beach on 82nd Avenue in Myrtle Beach, S.C. Little did we know our next door neighbor is another WPI alum, **Bob Purple**, Class of 1957! Bob retired to Myrtle Beach almost 20 years ago after a long career with GE.”

1984

Keith MacNeal writes of a busy 2019 in the MacNeal family. “Son Gavin MacNeal graduated from WPI in May 2019 with bachelor’s degrees in Robotics Engineering and Computer Science. Daughter Samantha (MacNeal) Cornwell completed her

master’s degree in Mathematics Education at WPI. Our first grandson arrived in October, born to daughter Annie (MacNeal) Baker-Streevy and her husband, John Baker-Streevy, who was commissioned a pastor in the United Methodist Church in May.” Keith traveled to West Virginia in July with 26 Scouts and 3 leaders from Central Massachusetts and the Cape & Islands to attend the World Scout Jamboree. He was inducted into the Worcester Rugby Hall of Fame in October during Worcester Rugby’s 40th anniversary celebrations.

1986

John Joseph and **Greg McHale ’07**, co-founders of Datanomix, announced a recent funding round for their manufacturing analytics start-up. They write, “Our Fusion platform delivers quick and impactful productivity wins for discrete manufacturers using a production scoring technology known as Fusion Factor. The company is located in Nashua, N.H., and has a broad set of customers deploying the technology across their production floors.” Learn more at datanomix.io.

1987

Eric Wolff is associate director, engineering business operations, or Collins Aerospace, a supplier of engine nacelles and aerostructures in Chula Vista, Calif.

1988

David Picarillo is a board member of the Clay Soper Memorial Fund, a Winchester, Mass., nonprofit dedicated to honoring the life of Clay Soper and raising awareness of the dangers of mixing prescription drugs and alcohol. Through the Fund, David has focused his time on its documentary, “If They Had Known,” an account of Soper’s death, through the eyes of his friends.



▶ **KAY O’SULLIVAN ’89, ALLISON (MORAN) PELOSI ’89, AND ANNE (MANNARELLI) GREGORY ’89**

“I knew Clay from the day he was born,” says David. “His untimely death really shook me to the core as I had children around the same age as Clay, and I was one of those parents that thought I had a finger on the pulse on my kids and their life. I think that it is so important to get the word out about mixing prescription drugs and alcohol. I am very proud and honored to be able to serve on the board of this foundation. If we can just have one set of kids understand and perhaps make different decisions, I feel that we are a success.” The film is traveling to high schools and colleges across the U.S to educate adolescents about the fatal dangers of recreationally mixing drugs and alcohol. Learn more at claysopermemorialfund.com.

1989

“Reliving our days of watching college football,” writes **Kay O’Sullivan**, ▲ of a Midwestern reunion of three WPI friends. “**Allison (Moran) Pelosi** was attending the BC vs. Notre Dame game on the same day that **Anne (Mannarelli) Gregory** and I were there to visit her son and see the game. Always so great to see friends from WPI, no matter where it happens to be!”

1990 ▶ R

At the 92nd Annual Technical Exhibition and Conference of the Water Environment Federation in Chicago, **Paul Dombrowski** was recognized with the Ralph Furman Medal for Outstanding Water Quality Academic-Practice Collaboration for his contributions to advancements in the science and application of biological phosphorus removal.

Pennie Turgeon (MBA), former director of academic technology and distance learning at WPI, joined New York Institute of Technology in October 2019 as vice president for information technology and chief information officer. She previously held the same position at Clark University. “What attracted me to New York Tech is its focus on student outcomes, an ongoing commitment to the long-term success of its graduates, and President Foley’s strategic vision,” she said. “Working in collaboration with faculty, staff, students, and alumni, I am eager to reposition IT at New York Tech as a strategic partner and an agent of institutional transformation.”



▶ SPENCE COCANOUR '95

1992

"Hi to all my fellow friends from WPI '91/'92," writes **Kamal Zamli**.

Jeff Mathieu was been promoted to senior vice president, operations manager at Tetra Tech, based in Santa Maria, Calif. He leads an operation that includes engineers, master planners, and scientists working with Department of Defense clients nationwide and internationally.

Stephanie O'Brien (MS CE) joined Consigli Construction as a project executive, where she is responsible for team management and delivery of projects from pre-construction to closeout and assist, for business development projects in the healthcare market. She brings more than 25 years of industry experience and expertise in serving as the

primary contact for all project procurement, subcontract administration, and scheduling, as well as ensuring overall jobsite safety and quality control.

1995

On July 3, 2019, **Roy and Lisa (Cigal) Schletzbaum** ▲ and their two sons watched the Red Sox play the Toronto Blue Jays in the Rogers Centre, Toronto. The game marked the 30th and final MLB Ballpark on their five-year quest to visit them all. Roy is quick to point out that a park in Atlanta has opened since their visit, and a new park in Arlington, Texas, is opening soon.

Spence Cocanour ▲ recently retired from the Air Force after more than 24 years of service. He went out in



▶ ROY AND LISA (CIGAL) SCHLETZBAUM, CLASS OF '95, AND FAMILY

style, executing one last military free fall jump during his retirement ceremony at Hurlburt Field, Fla., before being pinned by wife, Amy. According to an Air Force Special Tactics press release, he served for six years as an electrical engineer, then "felt drawn to the idea of doing 'cool things,' such as jumping out of aircraft, combat diving, and bringing the fight to the enemy from the ground." He then cross-trained into the elite field of Special Tactics. In the words of Brig. Gen. Claude K. Tudor, "He's served in war and in peace, and no matter what the challenge, no matter how high the mountain, no

matter how wide the river—Spence has managed to cross it every single time."

"To the men and women of Air Force Special Operations Command and Special Tactics—it has been an absolute honor to work with you," Cocanour said. "Former Secretary of the Air Force, Heather Wilson, said it very simply and it resonated with me—'Always leave the wood pile taller than you found it.' I hope I have lived up to that simple proverb."

In a note to his WPI friends, he adds, "I need to thank WPI swim team and coach Whit [Griffith] who helped me get into swimming shape so I could try out for Special Operations (that is a

"I STARTED GIVING TO WPI BEGINNING WITH MY SENIOR CLASS GIFT AND HAVE CONTINUED EVER SINCE. I GIVE TO HELP OTHERS MAKE THE MOST OF THEIR TIME AT WPI, THE SAME AS ME.

I've invested in Global Scholarship program because my IQP experience in London enriched my life and provided me with different perspectives than I would have had otherwise. All students should have the opportunity to travel without worry for additional costs.

WPI is as much about what you learn in the classroom as what you learn outside of it. Investing in WPI students is a great way to invest in the world."

Elizabeth Schweinsburg '00
Computer Science
Security Engineering Manager, Facebook



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longer story). This also led to my love of racing triathlons. I raced on the Air Force Team from 1997 to 2011 and coached the team from 2000 to 2019. In October I traveled to China for the CISM World Military Games, where I am on the technical committee for the sport of triathlon. This was my last official function in uniform.”

Tucker Griffith joined the Boston office of Lathrop Gage as a partner in the Intellectual Property Transactions group, where he focuses on highly technical mechanical and electro-mechanical systems and products. He received his JD from the University of Connecticut School of Law in 1998; he earned an MA in Liberal Studies at Wesleyan University in 2010.

1996

Doug Borden (MME) retired from federal service after five years at the U.S. Department of Labor. His previous employment included nearly nine years as a management consultant with Booz Allen Hamilton supporting a variety of federal agencies, including the U.S. Coast Guard, FBI, Federal Highway Administration, and the U.S. Army Installation Management Command. Before that, he was with several small consulting firms after completing a nearly 22-year career

with the U.S. Coast Guard. Doug continues to serve WPI in his second term as a member of the Advisory Board for Arts and Sciences.

Mike Caprio writes, “After five years of consulting with scientists and staff at the American Museum of Natural History on new applications of bleeding edge technology for its research, I am now employed full-time as a senior software engineer with Discovery, LLC, ‘the new global leader in real life entertainment.’ My role includes the launch of its direct-to-consumer streaming service and other digital innovations.” Mike and his wife, Diana, celebrated their second wedding anniversary Dec. 16. They continue to live in Brooklyn, N.Y., with their beloved cat, Gau Underfoot.

2002

Todd BenDor is professor of City and Regional Planning at the University of North Carolina at Chapel Hill.

2005

Adam Daniels was appointed a shareholder of national law firm Polsinelli, in the firm’s Los Angeles office. His practice involves all aspects of intellectual property, representing clients on matters involving patent

portfolio development (domestic and foreign), intellectual property litigation, license agreement negotiations, and due diligence in the context of new product releases, mergers and acquisitions, and investments.

2006

Christopher Sweeny joined **Cozen O’Connor** as a construction law attorney in the firm’s Washington, D.C., office. He initially used his WPI degree as a design-build engineer and project manager for a structural steel and concrete subcontractor. After earning his JD at the University of Maryland School of Law, he now leverages that experience in claims involving breach of contract, design and latent defect issues, differing site conditions and delay claims, payment and performance bond disputes, mechanic’s liens, and claims for equitable adjustment. He has represented clients on projects ranging from home renovation and repair to the design and construction of multibillion-dollar structures and facilities. The cases have involved a nuclear power plant, as well as hospitals, data centers, transit facilities, and museums. He

has been identified by *Super Lawyers* as a “Rising Star” for the past two years.

2011

Linnea Palmer Paton continues to play an active role in the development of energy policy in New York City and in building awareness of the importance of energy efficiency in her community. Her work detailing strategies for energy managers to improve their building’s *EnergyStar* scores was published in the *Mann Report*, a commercial real estate magazine, and she was a leader in 350NYC’s successful campaign to divest \$5 billion of New York City pension funds from fossil fuels. An energy manager at Jones Lang LaSalle, she was named 2019 International Young Energy Professional of the Year by the Association of Energy Engineers.

Brad Richards is product manager of Powders for AMETEK SMP Eighty Four, one of the six metallurgical businesses comprising AMETEK Specialty Metal Products (SMP), in Collegeville, Pa. His role includes growing the company’s portfolio of water-atomised and specialty metal powders, as well as developing differentiated products for the automotive, industrial, and defense markets. He holds a master’s

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WPI



▶ LINA (TRAN) AND CHRIS XIA '15

and a PhD in materials science and engineering from the University of Virginia, Charlottesville.

Michael Riggieri writes, "I have started a new position at Knight-Dik Insurance Agency in Worcester, as a client services manager."

2015 **R**

Lina (Tran) and **Chris Xia** ▲ share news of a very special wedding. "We met during our freshman year at WPI in A-Term Chemistry lab. We've had no troubling 'bonding' since then. We recently got married in Cancun, Mexico, with our closest friends and family in attendance. We are so lucky to have such an amazing group of friends from WPI who came all that way to celebrate our special day with us. It was a blast to reunite and catch up with our friends in paradise!"

2016

Thomas Buonomano and **Vanessa Beutel '18** celebrated their wedding on Oct. 5, 2019, in Leominster, Mass. The newlyweds met as undergrads at WPI and became engaged in 2018 on Earle Bridge. They say they're thankful for their WPI family in supporting them as they begin their new journey together with their 3-year-old black lab, Luna.

2019

Marc Printz, CEO of Growbox, made BostInno's Hall of Fame innovators list of 25 Under 25. His citation noted that the start-up he's launching with classmate **Nathan Rosenberg** began with Marc's high school experiments with hydroponic and vermicomposting systems. He grew plants and distributed the plant food he made at home to friends and neighbors. Growbox leases semi-automated container farms to small farmers to help them keep crop yield consistent and compete with larger, commercial producers. "We want to support farmers so they can produce veggies year-round," Marc says, "which helps money go back into the local economy."

Doreen Manning is using her MBA degree in her role as editor of the *WPI Journal*. She misses late night study groups with her amazing cohort, but is keeping busy advising her grown children with counsel they often choose not to follow, roller skating on the half pipe in her antique barn, and training for her first-ever full marathon. She made this plea with only a slight whine in her squeaky voice, "I hope by writing my own class note that others will emulate and send in their own!" classnotes@wpi.edu



TECH ADVISORS NETWORK

The Tech Advisors Network (TAN) puts aspiring innovators and entrepreneurs (all members of the extended WPI community) shoulder-to-shoulder with experienced innovators, entrepreneurs, and investors who are faculty, staff, friends, and—the majority—WPI alumni. **Scott Harris '82** (right) and **Bob Mason '94** are among the more than 80 advisors who volunteer up to 10 hours a month to provide support through a phased approach, from defining expectations to informal follow-up. Members of the TAN "virtual incubator" meet monthly at the Foisie Business School to review progress of current teams and hear pitches from new start-ups.

At the group's November 2019 meeting, Harris and Mason led a panel discussion (along with Bill Desmarais of Momenta Pharmaceuticals) on the topic of Fundraising and Acquisitions. To date, some \$7M in funds has been raised for new ventures. The program assists more than 60 WPI community members each year.

"TAN is what happens when you mix entrepreneurs with great potential, and mentors with extensive experience, and let things happen," says Harris. "I have been impressed by TAN's energy, broad-reaching inclusion and productivity. TAN has become an amazing resource for WPI students, faculty, alumni, and area colleges. By helping a large spectrum of start-up companies form and develop, the Tech Advisors Network is truly a valuable asset for the Worcester area and I am delighted to be part of it."

Mason adds, "I volunteer as a TAN mentor because I fundamentally believe in the socio-economic benefits of entrepreneurship. And WPI's project-centric education is the perfect incubator to turn innovative endeavors into emerging companies. For myself, I stumbled into the world of start-ups with my first job when I graduated in 1994. I've been fortunate with my career, building industry-impactful companies with amazing teams. I find it fun and gratifying to help students and alumni find their own path through innovation and entrepreneurship."



Charles Bean '44 CHE
George Ferrera '45 ME
William Rice '47 CHE, '48 MS CHE
Roger Williams '47 EE, LAMBDA CHI ALPHA
Harold Okun '48 EE, ALPHA EPSILON PI
Robert Green '49 CHE, SIGMA ALPHA EPSILON
Richard Johnson '50 ME, ALPHA TAU OMEGA
Walter Keyl '50 ME, ALPHA TAU OMEGA
Stanley Lindberg '51 CHE, SIM, ALPHA TAU OMEGA
Roger Wye '51 EE, PHI SIGMA KAPPA
Walter Dziura '54 ME, SIGMA ALPHA EPSILON
Melvin Holmgren '54 EE, Sitka, AK
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George Storti '61, '64 MS, PH, ALPHA TAU OMEGA
Charles Belanger '62 PH, ALPHA TAU OMEGA
Kenneth Homon '62 EE, ALPHA TAU OMEGA
John Szymanski '62 CHE
James Davis '63 CHE, SIGMA ALPHA EPSILON
Kevin Casey '64 ME, PHI SIGMA KAPPA
Victor Dolat '64 PH
James Krusas '64 CE, '76 SIM, PHI SIGMA KAPPA
George Holland '65 CE
George Preston '66 EE
David Spencer '66 CE
Narendra Patel '67 MS CE
Bruce Rogers '67 CHE, TAU KAPPA EPSILON
James Lambert '70 MS ME
Sally Earle '71 MS MAS
Peter Markunas '71 ME, TAU KAPPA EPSILON
John Zorabedian '72 CHE, SIGMA PHI EPSILON
George Kingsley '75 CH
David Jacqmin '78 ME
Edmund Reilly '78 SIM
Dalia Ivaska '79 MNS

Milton Steen '79 SIM
Marianne Wessling-Resnick '80 CH
Jeanne Coughlin '81 MGE, PHI SIGMA SIGMA
Robert Titus '82 ME, '89 MS EE
Elizabeth Villiard '82 MNS
Michael Weeks '84 CS
William Cahalane '85 CH
Craig Stearns '85 ME
Thomas Raimondo '86 CE
Susan Bernard '90 MS MA
Richard Doppler '92 ME
Michael Zarozinski '93 CS, SIGMA PI
Carol SaNogueira '12 MS, SYS
Michael Warms '18

The WPI community also notes the passing of these friends of the university: **Kathleen Adams, James Barys, Ruby Johnson, John Lifter, Muriel Simmons, and Ruth Taylor.**

Complete obituaries can usually be found online by searching legacy.com or newspaper websites. *WPI Journal* will assist classmates in locating additional information. Contact jkmiller@wpi.edu or call 508-831-5998.



“MY TIME AT WPI WAS IN THE 1950s AND WE DIDN'T HAVE IQPs OR FEMALE STUDENTS.

My daughter, Kim, graduated from WPI in the '80s and the Institute had successfully embraced both. My WPI experience and military service instilled confidence and a Can Do (Navy Seabees motto) approach to my work and life. I believe Global Projects for All will uniquely prepare students in the same way. Through a beneficiary designation, I established the Professor R. Berg '59 and Kimberly Berg Kitchens '83 Endowed Global Scholarship to show my support for WPI. “

— BOB BERG '59

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