

# Boston University **Medicine**

Boston University School of Medicine

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FY 2020  
REPORT

Dressed for **Success**

GMS  
students  
join the  
early fight  
against  
COVID-19

BOSTON  
UNIVERSITY



## Dear Alumni, Friends, and Colleagues,

The year 2020 was challenging for all of us. We experimented with new strategies, designed new curricula, and rapidly learned new online skills.

For those with young children, juggling family and job responsibilities became ridiculously challenging. For others, time saved by not commuting or participating in in-person meetings and academic travel provided a welcome opportunity to reflect creatively, not always possible previously.

As the new year begins, I'd like to express my gratitude to our community for navigating all the challenges of 2020, and especially thank:

- Our clinical faculty and alumni, who serve on the frontlines of medicine;
- Our research faculty and alumni, who initially worked at home, and then safely repopulated their labs;
- Our newest alumni, who largely graduated without the usual joyful recognition of their substantial achievements, and moved on to their new responsibilities at the most medically and scientifically challenging time in the last century;
- Our teaching faculty and students, who pivoted over two weeks in March to remote learning and new online courses;
- Our staff, who made online learning possible, cared for research animals, upgraded heating, ventilation, and air-conditioning (HVAC) equipment, and kept us compliant and safe.

I am also very grateful to our donors and friends, who supported our efforts with generous gifts. This issue of *Boston University Medicine* is dedicated to all of you.

Our cover story highlights the graduate students who helped develop a COVID diagnostic test, screen drugs for anti-COVID activity, and better understand the virus' aerosol transmissibility in the early battle against COVID-19.

We cover the development of two new cores in the Shipley Prostate Cancer Research Center, a prostate biospecimen core and a tissue microarray core. Prostate cancer tissue will be available for research on genetics, epidemiology, and mechanisms of tumor genesis.

Thanks to a generous gift from Albert and Debbie Rosenthaler, our Gross Anatomy Lab is getting a much-needed gut renovation—including a new HVAC system and LED lighting—in addition to a virtual anatomy table and state-of-the-art diagnostic ultrasounds to integrate imaging (radiology) and anatomy instruction with both clinical cases and cadavers.

Nearing its 30th year, our CityLab has been recognized with an Inspiring Program in Stem Award for expanding access to biomedical science education.

As we approach the school's 175th anniversary, we will celebrate the life of alumna Rebecca Lee Crumpler, the first Black American woman to earn a medical degree, with many virtual special events during the week of February 8, her birthday. Please stay tuned for details! Dr. Crumpler received the Wade scholarship, endowed in 1861, which continues to support women medical students at BUSM 160 years later.

We also highlight an in-depth Q&A with Professor and Chair Emerita of Anesthesiology Marcelle Willock, the first Black woman to chair a BUSM department.

As we welcome 2021, I wish you and your families good health, and hope for a return to normal human interaction, and open schools and universities—which we will certainly no longer take for granted!

We hope you enjoy the Winter 2021 issue of *Boston University Medicine*.

Happy New Year and Best Regards,

Karen Antman, MD

## Boston University **Medicine**

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**Maria Ober**  
Associate Dean, Communications

**DESIGN & PRODUCTION**  
Boston University Creative Services

**CONTRIBUTING WRITERS**  
Lisa Brown, Gina DiGravio, Sara Frazier, Art Jahnke

**PHOTOGRAPHY**  
Boston University Photography, David Keough, Cydney Scott

**Please direct any questions or comments to:**  
Maria Ober  
Communications Office  
Boston University Medical Campus  
85 East Newton Street, M427  
Boston, MA 02118



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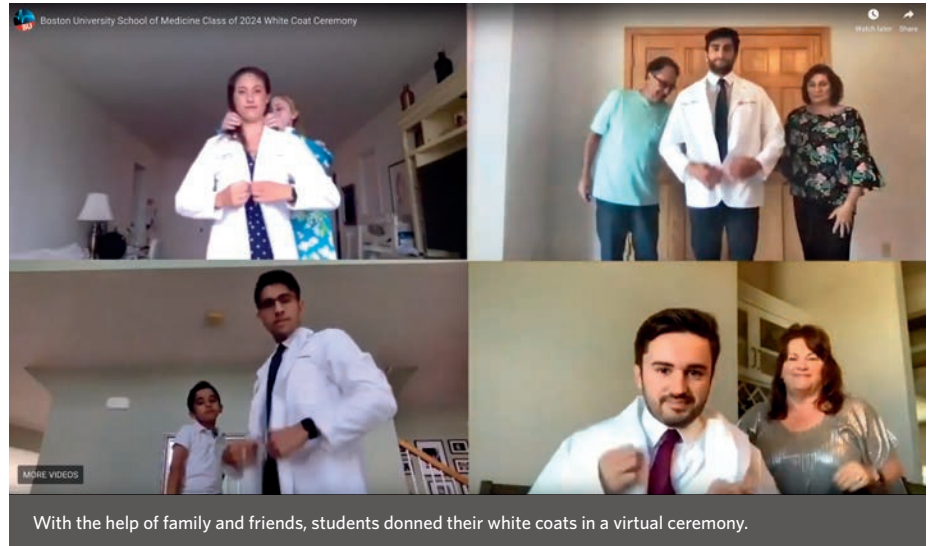
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## Welcome to Your Next Adventure: The Virtual White Coat Ceremony



**T**he unprecedented disruption of life as we know it due to COVID-19 has resulted in new and creative ways to celebrate milestones while embracing technology, and the chance to grow and learn as a virtual community.

On August 3, 2020, at 11 am, BU School of Medicine held a virtual White Coat Ceremony for the 172nd entering class, the YouTube version of which was initially viewed more than 1,300 times during the first 24 hours of posting. The 35-minute video montage included speeches from a variety of BUSM administrators, a Q&A with students sharing what they were most excited about and what they wanted classmates to know about them, a self-coating segment with family and friends assisting, and the recitation of the Hippocratic Oath, all from a variety of physically distanced, safe environments.

A symbolic rite of passage for medical students and their inauguration into the study of medicine, the White Coat Ceremony marks an important first step for students as they pledge their commitment to the profession and to the trust they must earn from their patients.

Associate Dean for Admissions Kristen Goodell, MD, warmly greeted the class and their families. "I am so pleased to be here to speak with you today as you officially join the world of medicine. In addition to, hopefully, dazzling you with facts that describe just how fabulous you all are, I'm delighted to offer my congratulations, my welcome, and my very best wishes as you begin this adventure.

"There are 152 of you in this class... drawn from a pool of more than 9,500 candidates, and you come to us by way of five different entry pathways and from 22 different states.

"Academically, you are among the most accomplished classes we have ever had, and you are also a very diverse group in many ways. Fifty-nine percent of you are not men. Thirty-one of you were born outside the United States, your places of birth include 16 different countries. One hundred and twenty-three of you—greater than 83 percent of the class—speak at least one language in addition to English; as a group, you speak a total of more than 20 different languages. Twenty-two percent of you are from groups underrepresented in medicine. Some of you have parents and grandparents in medicine, while others of you are the first member of an extended family to attend college. In cultural, social, economic, racial, ethnic, gender identity, educational, and linguistic terms, and in your life experiences, you define the pluralism that we so value on this campus and which is so central to our society," Dr. Goodell told the class.

BUMC Provost and BUSM Dean Karen H. Antman, MD, shared her insight regarding the challenges the new students might face, assuring them, "Medicine is a big tent; we need a variety of talents. You will not do everything right the first time, or the second time, or the third time. You will still be a great doctor."

Associate Dean for Student Affairs Angela Jackson, MD, also addressed the new students, telling them, "You have arrived with your enthusiasm, energy, interests, and ideals. You're ready to work hard and begin the challenging, rewarding, and—indeed—exhilarating transformation from student to physician. Please remember one thing: you are not alone in this transformative process. Faculty, staff, and colleagues will help to guide, advise, and teach you. They will listen to, support, and reassure you. But the most transformative and lasting teachers, [who will make] the most powerful and enduring mark on your professional lives, will be your patients. You will learn to partner with them in their care and in the process of learning the art and the science of medicine. Welcome to the beginning of your next adventure."



Associate Dean for Diversity & Inclusion Dr. John Polk remarked, “We look forward to you joining our community of learners, and to your contributions.”

Associate Dean for Medical Education Dr. Priya Garg then presented the student names.

“All of you have met academic and personal challenges; all of you have had successes and failures; all of you have sacrificed much and accomplished a great deal to reach this moment,” Dean Goodell said. “And as you move into the next phase of your journey—your entry

into the sacred trust that is the profession of medicine—each of you will struggle, each of you will have doubts, and, at some point, each of you will look in the mirror and wonder, ‘Can I really do this?’ What will sustain you in these difficult moments will be your own skill and talent, your own resilience and strength of character, the support of your classmates, the love of your family and friends, and the commitment of your teachers and mentors. For us as a faculty, it will be a privilege to walk this little way with you and perhaps to guide you, just a little bit.” ■

## Fifteen STaRS Share Their Summer Research



**I**n August 2020, the Summer Training as Research Scholars (STaRS) Program concluded its 10-week research experience with a virtual symposium.

Funded by the National Heart, Lung, and Blood Institute of the NIH and overseen by Graduate Medical Sciences (GMS), STaRS has trained 150 scholars and received more than 3,000 applications since its inception. Program trainees work with faculty mentors and fellow students on cutting-edge biomedical research projects, present their research at meetings, build powerful and lasting relationships, and set a course for college and career success.

After an opening welcome from STaRS Program Director and Assistant Professor of Medicine Isabel Dominguez, PhD, the virtual symposium began by acknowledging the faculty, professionals, and student mentors who contributed to the success of the program.

The scholars introduced themselves and stated their career paths before presenting their posters and discussing their work on a variety of topics, including cardiovascular disease, diabetes, mitochondrial function, amyloidosis, COVID-19, lung cancer, cancer genomics, fibrosis, immune responses, rare diseases, hearing, sleep apnea, and neuroscience.

The 2020 STaRS Scholars are Princess Maryam Abdul-Akbar, Erika Beyer, Rachel Choate, Cassie Deshong, Cisco Espinosa, Lazaro Fernandez, Cynthia Flores, Reyna Garipey, Ziko McLean, Asel Mustafa, Andrea Navarrete Vargas, Elizabeth Nelson, Joseph Waiguru, Madeline West, and Carolyn Wilson. Scholars received certificates by mail to mark the completion of the program.

Faculty mentors included Jude T. Deeney, PhD; Isabel Dominguez, PhD; Hui Feng, MD/PhD; Christopher M. Heaphy, PhD; Dennis

Jones, PhD; Jessica R. Levi, MD; Laura Anne Lowery, PhD; Jennifer Luebke, PhD; Reiko Matsui, PhD; Gareth Morgan, PhD; Karim Schon, PhD; and Kei Suzuki, MD.

During the summer, STaRS also hosted three scholars—Destinee Bledsoe, GerMya Bradley, and Ayana Gray—from the American Heart Association’s Supporting Undergraduate Research Experiences program. Deepa Gopal, MD, Naomi M. Hamburg, MD, and Ludovic Trinquart, PhD, served as their faculty mentors.

“It has been inspiring to watch the STaRS Scholars take on the challenge of developing independent research projects under the guidance of our faculty and research team mentors while confined at home,” said Dr. Dominguez. “I am very impressed with their determination and resilience. It is very gratifying to see them empowered to follow their path to graduate school and to be future scientists.” ■

## BU CityLab Recognized with “Inspiring Programs in STEM” Award for Expanding Access to Biomedical Science Education

**W**hile biotechnology jobs are in high demand, many K-12 schools lack access to the necessary laboratory facilities and curricula to inspire and prepare young scientists, something CityLab at Boston University has been working to change for almost 30 years.

Established at BUSM in 1991, this biomedical science education outreach program serves middle and high school students and their teachers with a laboratory-focused curriculum. After Dr. Carl Franzblau had an epiphany that the nation needed better-trained students to enter graduate programs in order to become the next generation of biomedical scientists, he created CityLab with a grant from the NIH Science Education Partnership Award program to provide opportunities for pre-college students to perform scientific investigations.

CityLab’s current principal investigators Drs. Carl Franzblau, Donald DeRosa, and Carla Romney are committed to sharing the excitement of science with diverse communities of students and teachers by engaging them in hands-on laboratory experiences, thereby fostering the development of a robust pool of talented scientists and physicians and a scientifically literate populace.

CityLab’s SummerLab on the Medical Campus is a weeklong program for high school students during the summer, offering different curricula that focus on understanding the clinical trials process, bacterial transformation and protein purification, and exercise physiology. SummerLab participation also allows students to join CityLab Scholars, an afterschool enrichment program that meets monthly throughout the academic year and explores more advanced topics in the biomedical sciences.

MobileLab, a fully equipped traveling laboratory serving groups such as afterschool programs, professional conferences, and K-12 schools, is another teaching tool offering equal opportunity to diverse, often

underserved, student populations by bringing laboratory science experiences into their communities.

Since 1992, more than 70,000 students participated in hands-on, discovery-oriented investigations at CityLab, and more than 50,000 students learned similarly through MobileLab. Approximately 30 percent of these students were from minority groups; 54 percent of participating students were female. In addition, CityLab’s curriculum supplements have been used by more than one million students and their teachers worldwide.

Noting their mission of encouraging girls and underrepresented students to enter the STEM workforce, *INSIGHT Into Diversity* magazine bestowed CityLab with the 2020 Inspiring Programs in STEM Award, which, the magazine states, “recognizes unique and innovative efforts for improving access to science, technology, engineering, and math for underrepresented students.”

“CityLab has delivered interactive biotechnology programming to dozens of Upward Bound Math Science students from Boston and Chelsea, many of whom have gone on to successfully earn college degrees in health sciences and engineering,” says Reggie Jean, director of Upward Bound and Upward Bound Math Science at Boston University.

A recent longitudinal study undertaken with data from the National Student Clearinghouse found that 78 percent of students who attended SummerLab went on to receive STEM degrees.

Former students reflected on the seminal role their CityLab experiences have played in their lives, one writing via email, “I started CityLab as a freshman in high school. During our labs, we were able to have hands-on learning experiments with amazing teachers and friends. My time as a scientist at CityLab has been, and is still, hands down one of the best experiences of my life and has made me want to pursue medicine.”

**Since 1991, BU’s CityLab programs—including a MobileLab that brings a state-of-the-art lab to schools, and the SummerLab program—have provided more than 120,000 students with hands-on, discovery-oriented, scientific investigative experiences.**



Another wrote, “The program gave me a hands-on opportunity to learn many cutting-edge biotechnology and medical science concepts and lab techniques in a small group of very bright and diverse peers. The final research project and poster session presentation gave me a real sense of accomplishment and inspiration. In two weeks, CityLab transformed me from a boy interested in science into a young scientist passionate about a career in scientific and medical research.”

CityLab is adapting its programs to fit the needs of online and virtual learning, with the goal of advancing its mission of increasing the number and diversity of students who eventually pursue careers in the biomedical sciences. ■

## Development of New Cores Represents Next Phase of Shipley Prostate Cancer Research Center

**W**ith the development of two critically important Cores, the Shipley Prostate Cancer Research Center is entering an exciting new era.

Founded and sustained through a gift by BU alumnus Richard Shipley (Questrom '68,'72), the center will support the development of a Prostate Biospecimen Core and a Tissue Microarray Core. Directed by Assistant Professor in the Department of Pathology & Laboratory Medicine Dr. Zhichun Lu, MD, the former will collect and preserve one prostate tumor per week from Boston Medical Center (BMC) patients with prostate cancer. The latter will focus on translational research.

Shipley Prostate Cancer Research Professor Gerald V. Denis, PhD, will represent the

center's molecular oncology themes. During his 23 years as a BU faculty member, Dr. Denis has pioneered studies of the Bromodomain and ExtraTerminal (BET) family of transcriptional regulators that are important for proliferation in lymphoid leukemias and metastatic behavior in breast and prostate cancers.

Drs. Denis, Julie Palmer, and Matthew Kulke serve as co-directors of the BU-BMC Cancer Center. A professor in the departments of medicine and pharmacology & experimental therapeutics, Dr. Denis also is a charter member of the Tumor Microenvironment Study Section at the NIH. Dr. Denis brings his experience in tumor microenvironment and shared signal transduction across diverse cancer types to the problems of early detection, progression, and biomarker discovery in our prostate cancer disparities population.

Shipley Center team members include Drs. Gretchen Gignac, Josh Campbell, Christopher Heaphy, Ariel Hirsch, and Elizabeth Duffy, who bring invaluable expertise in clinical trials and prostate medical oncology, bioinformatics, molecular biology, radiology, and pathology.

Internal Advisory Board members Dean Karen Antman, Drs. Matthew Kulke (hematology/oncology), Julie Palmer (Black Women's Health Study), Toby Chai

(urology), Minh Tam Truong (radiation oncology), and Chris Andry (pathology & laboratory medicine) will guide their efforts. Drs. David Goodrich (Roswell Park, Buffalo, New York) and Scott Dehm (University of Minnesota) will serve as External Advisory Board members.

Center funding also will support the establishment of a longitudinal cohort study of BMC prostate cancer patients involving regular collection, detailed annotation, and analysis of blood, urine, and stool for discovery and characterization of novel biomarkers for patient progression and therapeutic responsiveness. There also are two pilot proposals to develop prostate tumor organoids and investigate telomere-length alterations in prostate cancers.

This is a unique opportunity for the Shipley Prostate Cancer Research Center to address an important prostate cancer patient population and understand early molecular events associated with prostate cancer development. The center will translate those insights into novel prognostic and diagnostic biomarkers to inform treatment decisions, pioneer the national standard of care for underserved patients, and expand the team of outstanding faculty and trainees committed to improving race-based prostate cancer disparities. ■

## Gross Anatomy Lab Modernizes

**T**hanks to a generous gift by Albert and Debbie Rosenthaler, the School of Medicine's Gross Anatomy Lab is getting a major facelift.

According to Waterhouse Professor and Anatomy & Neurobiology Chair Jennifer I. Luebke, PhD, this financial gift allowed the department to make needed renovations to the lab's infrastructure. A new heating, ventilation, and air-conditioning (HVAC) system will be installed to enhance air quality and reduce noise. Visibility in the lab also will be improved with the addition of bright LED lights in a sleek new suspended ceiling.

The donation will also help the lab to go a step further and attain the most up-to-



The virtual anatomy table is the most technologically advanced system for anatomy and physiology education.

date teaching tools. "Taken together, the enhancements to the Gross Anatomy Lab made possible by this very generous gift will greatly facilitate medical education at the BU School of Medicine across all four years of education," said Dr. Luebke.

One of the new modern teaching tools is a state-of-the-art ultrasound system, which enables teaching anatomy and clinical cases on both live subjects and cadavers. This sophisticated imaging modality is commonly used in emergency medicine as a quick, noninvasive way to image structures close to the skin. Ultrasound imaging is helpful in primary care settings as well, and has historically been used in obstetrics and gynecology.

"It is very exciting to have ultrasounds in the anatomy lab, because it allows us to incorporate clinical imaging modalities into



the students' education as soon as medical school begins," said Associate Professor of Anatomy & Neurobiology Ann Zumwalt, PhD. "Thanks to the generosity of the donor, we were able to get three full-sized units, which will allow the students to interact with units that are essentially identical to what they will see in the clinic."

This donation also has permitted the lab to install monitors and cameras, making it possible for the entire class to visualize the anatomical structures in a given cadaver.

## This acquisition aligns us with the trajectory of where anatomy education is heading nationally.

-Ann Zumwalt, PhD

Faculty now will be able to effectively communicate visual material to the entire class simultaneously.

"From an anatomy education perspective, it is exciting to be able to teach about anatomical structures and then immediately image them on either living subjects or on the anatomical donors," said Dr. Zumwalt.

Last but not least, a new virtual dissection table will give students the ability to access views of the human body that are impossible with the cadaver. Users are able to visualize real human anatomy without the chemicals and smells from a traditional cadaver. As noted by Anatomage, the company that produces these tables, it is "the most technologically advanced 3D visualization system for anatomy and physiology education and is being adopted by many of the world's leading medical schools and institutions."

"This acquisition aligns us with the trajectory of where anatomy education is heading nationally," said Dr. Zumwalt. "I'm really excited about the opportunities this opens up for us!" ■



In full PPE, Dr. Ann Zumwalt shows the three full-size ultrasound machines now used in the gross anatomy lab, thanks to a generous donor.

## IN Memoriam

**Dolores Murrell**, assistant to the registrar, friend to many, and a member of the BUSM community for 27 years, passed away on September 17, 2020.

Joining the Registrar's Office in 1993, Dolores supported, counseled, and helped hundreds of students and graduates over her years of service, always with a smile. Her kindness, patience, and positive outlook guided her every day. Dolores would do anything for the students, and they loved her. For some she was a mother figure; for all she was someone who would sit with them and listen to whatever was on their minds—and, of course, give them candy.

Always gracious to her colleagues, Dolores was a consummate professional who never had a harsh word for anyone.

Dolores is survived by her partner Wayne; her three children Janaya, Miaisha, and Michael; and her two grandchildren, whom she adored. ■





**A pioneer, Dr. Willock is the first Black woman to chair a department at BUSM and the first Black woman to be named professor emerita at the school.**



Dr. Marcelle Willock

## Opening Doors: Q&A with Marcelle Willock

**A**s a bright girl growing up in a prominent family in Panama and Guyana and going to the best schools there, Marcelle Willock dreamed of becoming a doctor. Her father, who was a newspaper editor, and her mother, who exerted her own quiet power at home, made it clear that their only daughter could do anything she wanted. But then, at age 16, Willock came to the United States to attend the College of New Rochelle, a Catholic women's school in suburban New York, and the time came to apply to medical school. It was the late 1950s.

"That's when I got this awakening," says Willock (Questrom'89). "Only 6 percent of medical students at the time were women."

What's more, the Ursuline nuns who ran her college informed her that few US medical schools accepted Black students, male or female (the majority of Black physicians at the time were educated at two historically Black medical schools: Meharry Medical College and Howard University College of Medicine), and that she should apply to Howard.

"Howard was the Harvard of HBCUs [historically Black colleges and universities]," says Willock. She graduated from Howard in 1962.

After completing her residency in anesthesiology at Columbia Presbyterian Hospital in New York City, she went on to spend nine years on the faculty at New York University School of Medicine—leading the residency

program at NYU's teaching hospital, Bellevue Medical Center—before leaving to join the faculty at Columbia University. She earned a master's in higher education at Columbia Teachers College.

In 1982, after Leah Lowenstein, an assistant dean at BU's School of Medicine, suggested she apply for the job, Willock became a professor and chair of the MED anesthesiology department. She was a pioneer—the first Black woman to chair a department at the school, the first Black woman to lead the department of anesthesiology at the former Boston University Medical Center Hospital and Boston City Hospital (now Boston Medical Center, BUSM's primary teaching affiliate), and among the first women of color to lead

an academic and clinical department in the United States.

Dr. Willock, who was chair for 16 years, is credited with a number of achievements and innovations, including the accreditation of its residency program in anesthesia and standardizing guidelines for anesthesia related to patient safety. In the early 1980s, dentists were still providing anesthesia care to patients at Boston City Hospital. After a nine-year battle with hospital officials, Dr. Willock succeeded in ending the practice and ensuring that only qualified physician anesthesiologists could provide anesthesia.

"I was not going to lose that one," she says.

After several years as BUSM's associate provost for community affairs, Dr. Willock left BU in 2002 to become the first female dean of the Charles R. Drew University College of Medicine, in Los Angeles, a position she held until 2005, when she retired and returned to Boston.

In 2019, half a century after she entered Howard, Dr. Willock broke one more barrier in academic medicine at BU: in recognition of her lifetime contributions to the University, and her field, she was appointed as the school's first Black female professor emerita. (While the school currently has 54 Black female faculty members, there are no Black women serving as department chairs; two departments are chaired by Black men.)

"You are living history," Rafael Ortega, MD, chair of the department of anesthesiology, told Dr. Willock at the ceremony celebrating her appointment. Dr. Willock, who has long worked to address racial and ethnic disparities in healthcare, had opened doors for him at BU, Dr. Ortega said.

In 2019, women were for the first time a majority of students at medical schools in the United States—but Black medical students comprise only 3.2 percent of the students, according to the American Association of Medical Colleges. And Blacks comprise only about 5 percent of the physician workforce.

*Bostonia* talked with Dr. Willock about her professional journey, how she handled the barriers along the way, and how she has guided generations of young physicians and academics through their careers.

## Q & A WITH MARCELLE WILLOCK

### How did you decide you wanted to be a doctor?

That's the only thing I wanted to do from the time I was four years old. The family doctor who delivered me was a friend of our family. I loved him and I decided I was going to be a doctor, like him. My parents never told me I couldn't do something because I was a girl.

### What was your experience like at the College of New Rochelle in the 1950s?

It had just recently integrated. I think I was the sixth person of color they admitted. Every year they would take one Black and one Puerto Rican. I had a white roommate my second year. We're still friends to this day. I had one episode, in town. My roommate wanted to get her hair cut. We walked into a beauty salon not far from the campus. My roommate said, "I need a haircut." They said, "We can take you now." My roommate said to me, "Do you want to get your hair cut, too?" They said, "We will never serve you." My roommate said, "If you will not serve her, you will not serve me, and I'm going to tell the college and they're going to take you off the list." We both walked out.

### How did you end up going to Howard for medical school?

I had no idea that many schools didn't take women or minorities at the time. It was never a barrier to me personally. That's what I wanted to do. My family said, "If you want to do it, you have to study and meet the requirements, and you will do it."

My family was Catholic, and my grandfather was the patriarch of the family; he wanted me to go to a Catholic medical school. I applied to Creighton in Omaha because one of our family friends in Panama had graduated from there. Our family doctor had graduated from McGill in Canada, and he recommended I also apply to McGill.

Then the nuns brought me up to date that some of these schools did not take women or Blacks. They said I should apply to Howard. I got into McGill, but when the acceptance letter came, it was 40 degrees below there. That was too cold. I got into Creighton, too, but we

didn't know anyone in Omaha. We had family friends in Washington, so I went to Howard.

### What was your experience like at Howard?

Howard was an excellent education. It was tough. Because of limited opportunity for them to go elsewhere, the Black doctors who were the stars were all at Howard. The top Black professors were at Howard. You had to be smart to get in.

I entered Howard in 1958. Ours was the largest class of women until then. We had 10 women in our class, out of 100 students, and all of us graduated. We were always in the top half, if not the top third.

The quality of care for patients at the hospital—Freedman's Hospital—was excellent. Everybody at the hospital was Black. Doctors' wives were patients and so were bus drivers. The standard of care was to treat every patient with dignity and respect. Nobody had to tell you that.

Segregation was very obvious in Washington. When I got my first car, I went to pick it up in Georgetown. Georgetown was very, very white. A couple of my classmates went with me to pick up the car. We were stopped by the police and asked what we were doing there and told we did not belong there and to leave. You didn't argue because you didn't know what would happen to you.

### Were there women faculty you looked to as role models and mentors?

Howard had always had women faculty in both the basic sciences and the clinical faculty. Excellence was their number-one motto. You were going to be excellent in everything you did.

One of the professors of obstetrics and gynecology, Lena Edwards, was a role model. When she retired from Howard, she went down to the Texas border and started a bunch of obstetrics clinics for Mexicans. President [Lyndon] Johnson gave her the Medal of Freedom.

There was a professor of anatomy, Ruth Lloyd. She was really my mentor in the truest sense. People use the word mentor casually now. It's someone who's really invested in you. True mentorship is a long-term relationship. Dr. Lloyd stayed in contact with you a good 20 years after graduation.

I used to get god-awful periods, with really a lot of pain. There was an anatomy exam



freshman year, and I was in agony. I remember going to Dr. Lloyd and telling her, "I don't think I can take this exam." She said, "Marcelle, you want to be a doctor. The patient doesn't care if you're dying. You're a good student—sit down and do the exam."

I passed the exam.

## **I actually liked taking care of the patients, and that is sort of what anesthesiologists do when the surgeons are operating.**

### **How did you choose your specialty?**

I liked surgery and I did very well in it, so I chose surgery initially. The faculty student advisor said to me, "Marcelle, you're good at it, you like it, go for it." I had tremendous support at Howard.

Because I was a woman and a minority, I was limited where I could apply for a surgical internship. I applied to Kings County Hospital in Brooklyn and I was accepted in surgery, and then when I got there, that was probably my first experience of discrimination. I was the only woman in the surgical group and the only person of color, out of maybe 10 people.

In surgery I would get my cases taken away. Instead of being sent to the operating room, I was sent to take care of my patients on the floor. I presumed it was because I was a female. There were hardly any females in surgery at the time.

### **Was there anyone you could go to for support and guidance?**

The chief resident in medicine was a Black fellow who had been at Howard. He was a senior when I was a freshman. He was number one in the class. He was so smart that

everyone knew and respected him. He was somebody I could go and talk to. His wife had been his classmate at Howard. She was in pathology. She was very smart, too. They were like my safety net.

One of the things I found out was that I actually liked taking care of the patients, and that is sort of what anesthesiologists do when the surgeons are operating.

There were two female anesthesiology residents—one was Black, one white—who took a liking to me. They said to me, "Marcelle, this is how it is, they'll never make you a chief resident in surgery because you're a woman and you're Black. So, think about anesthesiology."

At the end of the first year, I decided I'd interview for an anesthesiology fellowship in New York. When I went for my Cornell interview, the chairman there was arrogant and condescending. He said, "I'll see who's available to show you around." He comes back with a Black guy. He said, "He's the only resident free. Let him show you around."

Then I went up to Columbia, and it was like night and day. The chairman, Emanuel Papper [founding chair of Columbia's anesthesiology department], was very gracious and welcoming. Dr. Papper was a great mentor to me.

I started in July [1963] and a month later, I went to him and said, "I want to go to the March on Washington." I had to defend my reasons because if I took the day off, it would be a burden on my classmates.

### **Why was it important for you to attend the march?**

I had an "aunt" in New York, a family friend, who I would visit often. She was an attorney and was part of a group of people who were very active in civil rights. Bayard Rustin [the civil rights leader] and A. Philip Randolph [who led the Brotherhood of Sleeping Car Porters, the first predominantly African American labor union], would meet at her house, in Hastings, in Westchester County.

You wanted to be at the march, you were expected to be there. It was like the Women's March in Boston [which Willock attended] four years ago. There were just so many thousands of people marching, in unison. It was a joyous occasion, it was inspirational.

### **What was it like when you arrived at BU?**

I was told by certain higher-ups to know my place. A couple of faculty told me they were not going to work for a Black person. I wasn't going to fire them, because then I would be accused of retaliation. I had to put up with it. When they tell you they're not going to work with you, they're going to undermine you when you're trying to set standards. You took the job, you live with it.

When I got to BU, I remember a very senior [white male] said, "Marcelle, don't speak up so much." There were three Black women who were senior administrative assistants. They were all high school graduates and very capable at their jobs. These women were soft-spoken. That same senior person told me those women should be my role models.

Growing up in Panama and Guyana, being Black was not such an obstacle, and I had opportunities for a good education. But women were still very much behind. So, for me, my gender was more of an obstacle than my race. But after I got to this country and I got further along and became more prominent, it became a battle of the two—race and gender. Both were obstacles. I think I've weathered the obstacles.

I came to Boston right after busing [court-ordered, to desegregate the city's public schools]. Some people would make comments to you. At the hospital some of the nurses [who were white] were from Southie and didn't show respect. I had a job to do and I did it. I was the boss.

### **You've mentored generations of young physicians, many of them women and people of color. What has been your advice to them?**

I tell everyone, "You are going to incur difficulties. You may not be able to overcome all the difficulties you are going to encounter, but you're going to try. Whatever you're going to do, you're going to do your absolute best. It may not be good enough because you don't have the talent or the knowledge, but your effort has to be 100 percent.

"And just because the other person is a jerk doesn't mean you have to be one. Don't hate anybody, because hate destroys you. You are wasting your time worrying about them, and they don't give a damn about you." My mother taught me that. ■

## Appointments, Honors & Awards



**Vasan Ramachandran  
Named Visiting  
Professor at  
Prestigious Charité  
Hospital, Berlin  
Institute of Health**

Vasan Ramachandran, MD, professor of medicine and principal investigator and director of the renowned Framingham Heart Study, has been named a visiting professor at the Charité Hospital and the Berlin Institute of Health (BIH). The position is funded through Stiftung Charité, an independent charitable foundation.

As part of this two-year commitment, Dr. Ramachandran will serve as a consultant/advisor for a cardiovascular research project, *The Berlin Long-term Observation of Vascular Events (BeLOVE) cohort*, the goal of which is to characterize the epidemiology of chronic heart, brain, and kidney disease and learn how best to impact the clinical course of these diseases after an acute event. As a member of the project's scientific advisory board, Dr. Ramachandran hopes to build upon and strengthen this overseas collaboration.

For more than 25 years, Dr. Ramachandran has focused his research on the genetic and nongenetic epidemiology of heart failure; population-based vascular testing and cardiac ultrasound imaging; genetic and nongenetic epidemiology of high blood pressure, cardiovascular disease (CVD) risk factors and novel biomarkers including genomic, metabolomic, and proteomic measures; as well as CVD risk estimation in the short-, medium- and long-term, including molecular markers and subclinical disease.

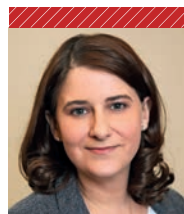
Dr. Ramachandran also is the principal investigator of the RURAL (Risk Underlying Rural Areas Longitudinal) cohort study and a professor of epidemiology at Boston University School of Public Health. He is the Jay & Louis Coffman Professor of Vascular Medicine and chief of the section of preventive medicine and epidemiology in the department of medicine.

He has received the Outstanding Mentor awards from the department of medicine, BUSM and the American Heart Association (AHA) Council on Epidemiology and Prevention, and the prestigious AHA Population Science Award in 2014.

BIH visiting professors are leading scientists in their specific fields within the life and medical sciences in the public or private sector who travel to Berlin for temporary activities at BIH and its partners, Charité Hospital and the Max Delbrueck Center for Molecular Medicine.

One of the largest university hospitals in Europe and internationally renowned for its excellence in teaching and training, Charité proudly lays claim to more than half of all German Nobel Prize winners in physiology and medicine, including Emil von Behring, Robert Koch, and Paul Ehrlich.

Stiftung Charité was endowed in 2005 by entrepreneur Johanna Quandt, who entrusted it with the mission of supporting the innovative potential and excellence of Berlin's university medicine, a rich tradition in medical research and patient care. Stiftung Charité supports BIH visiting professors with funds from its Private Excellence Initiative Johanna Quandt. ■



**Jessica Petrick  
Receives Peter Paul  
Career Development  
Professorship**

Assistant Professor of Medicine Jessica Petrick, PhD, MPH, has been selected as the recipient of this year's Peter Paul Career Development Professorship. Dr. Petrick is an epidemiologist at the Slone Epidemiology Center whose research as part of the Black Women's Health Study focuses on gastrointestinal cancers—including colorectal, liver, and esophageal—and on the nutritional and molecular factors that may contribute to racial disparities along the cancer continuum. She received her doctorate in

epidemiology from The University of North Carolina at Chapel Hill, and her master's in epidemiology and health policy and bachelor's degree from Case Western Reserve University. She completed her postdoctoral work at the National Institutes of Health. Made possible through the generous support of BU Trustee Peter Paul, the Peter Paul Career Development Professorship is presented to promising junior faculty who have been at BU for less than two years and who have held no prior professorships. ■



**Anand Devaiah Delivers  
Conley Lecture  
on Medical Ethics at  
AAOHNS Annual  
Meeting**

Anand K. Devaiah, MD, associate professor of otolaryngology-head and neck surgery, was invited to give this year's John Conley, MD, Lecture on Medical Ethics at the American Academy of Otolaryngology-Head and Neck Surgery (AAOHNS) annual meeting. The prestigious lecture is based on Dr. Conley's passion for head and neck surgery and his dedication to the highest standard of ethical behavior from physicians.

Dr. Devaiah also serves as director of the Biomedical & Health Technology Development & Transfer Domain at the Institute for Health System Innovation & Policy at Boston University.

His experience in healthcare technology and innovation spans technology development, evaluation, implementation, research, administration, regulatory science, and intersections with social determinants of health. His virtual lecture, "Shifting Action and Innovation Mindsets to Embrace Social Determinants of Health—Ethical and Practical Considerations for All," addressed various social determinants of health, including education, economic stability, and physical environment.

"These have certainly been important prior to 2020, but we have faced unprec-



edented challenges on a national and global scale this year," he said. "This has brought especially sharp focus to the health of our nation and the global population, exposing how social determinants have an important role in health, and how health equity needs to figure more prominently in our actions."

Dr. Devaiah is the first Boston University faculty member to give this lecture. Past lecturers have included heads of state, government officials, and prominent medical leaders. ■



**Lawreen Connors**  
**Named Charles J. Brown**  
**Research Professor**  
**in Amyloidosis**

Lawreen Connors, PhD, professor of pathology & laboratory medicine, has been named the

Charles J. Brown Research Professor in Amyloidosis, established by the estate of Charles J. Brown.

Dr. Connors received dual undergraduate degrees in chemistry and mathematics from Boston College, a master's degree in chemistry from Tufts University, and doctoral degree in biochemistry from Boston University. She joined the Amyloidosis Center as a postdoctoral trainee in 1994 and earned faculty appointments in the departments of biochemistry and pathology & laboratory medicine in 1998 and 2009, respectively.

Dr. Connors focuses her basic science research on uncovering the protein and genetic determinants that underlie the formation of amyloid. The early stages of her career featured structural analyses of amyloid-causing transthyretin (TTR) mutants, mainly those causing cardiac dysfunction. More recently, her studies have been focused on wild-type TTR amyloidosis, an age-related disease now recognized as an underappreciated cause of heart failure in the elderly. She has received continuous support from the NIH and foundation grants, as well as industry-sponsored research agreements, and has authored more than

100 peer-reviewed scholarly articles and book chapters.

In 2009, Dr. Connors played a major role in establishing the Amyloid Pathology Diagnostic Testing Laboratory in the Amyloidosis Center, a CAP-accredited and CLIA-certified facility that offers histologic and molecular testing for amyloid. Dr. Connors teaches GMS classes on systemic amyloidosis, and has mentored more than 20 master, doctoral, and postdoctoral students. She also has served on multiple local, national, and international committees, and is director of the Amyloidosis Center Gerry Laboratory and co-director of the Amyloid Pathology Diagnostic Testing Laboratory. ■



**Sadiqa Kendi, MD,**  
**Appointed Division**  
**Chief of Pediatric**  
**Emergency Medicine**

Sadiqa Kendi, MD, has been appointed division chief of pediatric emergency medicine

at BMC/BUSM.

In her new role, Dr. Kendi will utilize her leadership and experience to build the nation's first social pediatric emergency department. Social pediatrics focuses on incorporating patients' social context into routine pediatric emergency care, conducting high-quality translational research on best practices for applying the social determinants of health to patient care, instituting community-informed interventions in the pediatric emergency department to improve population health, and fostering racial justice and equity into every aspect of care. To this end, she will build on the multitude of innovative social programs that already exist, identifying resources to expand on them and make them available consistently to pediatric emergency department patients.

Dr. Kendi, an American Osteopathic Association (AOA) graduate of Yale School of Medicine, received her pediatrics training

from the Social Pediatrics Program at the Albert Einstein College of Medicine at Montefiore Medical Center, where she spent an additional year as a pediatric chief resident. She completed her fellowship training in pediatric emergency medicine at The Children's Hospital of Philadelphia. Dr. Kendi joined our community from Children's National Medical Center in Washington, D.C., where she was an assistant professor in the Departments of Pediatrics and Emergency Medicine at the George Washington University School of Medicine. She also was medical director of Safe Kids District of Columbia and the Children's National Safety Center.

"Dr. Kendi brings enormous energy and leadership to the Division of Pediatric Emergency Medicine, and we are fortunate to have her expertise and caliber of talent," says Bob Vinci, MD, chief and chair of pediatrics at BMC and BUSM, and the Joel and Barbara Alpert Professor of Pediatrics at BUSM.

Frequently recognized for teaching and research excellence, Dr. Kendi was recently elected to the Society for Pediatric Research in recognition for her research accomplishments. She studies injury prevention interventions using technology (such as digital car seat trainings for families), as well as structural changes in the built environment (such as providing access to safe crosswalks and green spaces in all communities), to prevent serious unintentional injuries or deaths in children. Unbeknown to many, injuries are the top cause of death in children in the United States.

Dr. Kendi is serving a three-year term on the executive committee of the American Academy of Pediatrics Council on Injury Violence and Poison Prevention. She is a Bloomberg American Health Initiative Fellow, a program providing public health training to leaders engaged with organizations tackling critical challenges facing the nation. As a Bloomberg Fellow, Dr. Kendi is pursuing her MPH at the Johns Hopkins Bloomberg School of Public Health. ■



Dressed  
for

# Success

GMS students  
join the early fight  
against COVID-19

**BY ART JAHNKE**



**On March 12, 2020,**  
**two days after** the  
*Boston Globe* reported  
92 confirmed cases  
of coronavirus in  
Massachusetts,  
Richard Giadone,  
then a PhD candidate  
in the Molecular and  
Translational Medicine  
program in Boston  
University's Graduate  
Medical Sciences (GMS),  
noticed a tweet from a  
researcher at the University  
of Washington who  
was seeking lab-savvy  
volunteers to help process  
coronavirus diagnostic tests  
in Seattle, which was the  
first US city to experience  
spread of the mysterious  
new virus.

Like the author of the tweet, Mr. Giadone was a researcher in a lab associated with a major city hospital—Boston Medical Center (BMC), BUSM's primary teaching affiliate. He retweeted the message, and that retweet was noticed by his advisor, BU stem cell engineer George Murphy, PhD, an associate professor of hematology and co-director of the Center for Regenerative



Todd Dowrey, left,  
and Richard Giadone.

Medicine (CReM), the lab where Mr. Giadone had spent the past five years working toward his doctoral degree.

Before the sun came up the next morning, Mr. Giadone and Dr. Murphy were talking through texts and phone calls about the possibility of turning the CReM into a COVID-19 test center, one that could help BMC handle the volume of testing that they would need to care for a surge in coronavirus patients. The next day, Dr. Murphy ran the idea by Chris Andry, MPhil, PhD (GRS'87-'89), BUSM chair of pathology and laboratory medicine, and chief pathologist at BMC.

Dr. Andry was worried that the commercial testing services BMC depended on would be overwhelmed by a surge in coronavirus cases. He also knew that the turnaround time for results from those services was often a week or more, rendering them practically useless to doctors who needed same-day information to properly quarantine and treat COVID-19 patients. To Dr. Murphy and Mr. Giadone, his answer was a resounding yes: *please* build a front-

The two friends say they and their lab teammates at the CReM focused on speeding every bit of the testing process imaginable up to warp speed.



line testing center, one that's able to deliver test results within 24 hours and stand up to the FDA's rigorous clinical standards.

Then came a whirlwind of around-the-clock meetings, phone calls, and Zoom conferences with scientists at BMC, Massachusetts General Hospital, and the Broad Institute, all of which culminated in a remarkable outcome. Within seven days, the CReM could perform the gold standard of coronavirus tests: a reverse transcription polymerase chain reaction test (RT-PCR). Their process was accurate and reliable enough that, with some help from BMC's pathology department, it was granted emergency use authorization from the FDA. And most important, in terms of its ability to help patients, its turnaround time was 24 hours. (In September, a paper describing the steps of the test was published in the journal *STAR Protocols*.)

CReM researchers did this, says Dr. Murphy, with the help of more than 50 volunteers from across BU's clinical and research sciences programs, many of whom worked around the clock.

"I came away from the experience with not only a tremendous sense of pride in what they did," says Dr. Murphy, "but also the realization that our team was capable of solving pretty much any problem put in front of them."

Principal investigators in labs across BU's Medical Campus witnessed a similar response: students enrolled in GMS were stepping up, asking what they could do, and then doing it late into the night. At the National Emerging Infectious Diseases Laboratories (NEIDL), in labs run by Drs. Elke Mühlberger, Robert Davey, and Florian Douam, GMS students took on the missions of searching for new detection methods, treatments, and vaccines for coronavirus, as well as a better understanding of the virus' aerosol transmissibility.

In the CReM, Mr. Giadone and his colleague Todd Dowrey were central to the COVID-19 testing efforts. They had been friends since their undergraduate days at UMass Lowell, and now they were at opposite ends of a graduate school experience: Mr. Dowrey, who had come to the lab at Mr. Giadone's suggestion, was about to begin the GMS PhD program in biomedical sciences (PiBS). Meanwhile, Mr. Giadone was nearing the home stretch of his own PhD, having spent most of spring semester preparing to defend his 150-page dissertation.

The two friends say they and their lab teammates at the CReM focused on speeding every bit of the testing process imaginable up to warp speed.

"We were competing with diagnostic companies that do similar assays all the time," says Mr. Dowrey. "They have more automated high-throughput systems. We used more of a brute force approach. We had a team of 10 to 12 people working around the clock."

The team retrofitted one room in the CReM as the center for extracting RNA, the virus' unique genetic

**“Our team was capable of solving pretty much any problem put in front of them.”**

– George Murphy, PhD

signature, from patient samples. They stocked bio-safety cabinets with enough equipment and materials needed to extract RNA from as many as 72 patient samples at any one time. To prevent the degradation of patient samples and critical reagents, they repurposed refrigerators and freezers around the CReM to house the testing materials and patient samples.

Mr. Giadone says he focused on the big picture—“always trying to figure out how to do things a little faster”—and in just one day, he developed step-by-step instructions on how to run coronavirus tests, then validated the protocol per extensive regulatory guidelines determined by the FDA and Centers for Disease Control and Prevention (CDC). Then, he immediately shared that information with other labs around the world via email, Twitter, and late night and early morning Zoom calls. Teaming up with Kim Vanuytsel, PhD, a CReM research assistant professor, they submitted an application for their testing process to receive emergency use authorization from the FDA.

At the same time, Mr. Giadone and his teammates looked for parallel methods and reagents suitable for testing, in case the supply shortages that had plagued the US and other countries around the world would threaten their ability to stick to their original plan.

“As supply chains for a number of different things went down, due to high demand, I tested new reagents and pieces of equipment to make sure we could swap them in,” he says. “And whenever you swap in or out new reagents or machines, you need to run a new set of validation studies.”

It was up to Mr. Dowrey to find sources for those substitute reagents and equipment, to identify suppliers who could be counted on, and then backup suppliers who could be tapped when those who looked reliable ran out of supplies at a future date. Several times during the initial outbreak, the lab was faced with supply chain shortages, and Mr. Dowrey scoured the web looking to see which companies had launched new COVID-19 reagent platforms.





Ellen Suder

Ms. Suder first tested the compounds against SARS-CoV-2, the virus that causes COVID-19 infections, in commercially available cells derived from kidneys of African green monkeys.

“Sourcing COVID-19 specific reagents was incredibly difficult,” he says. “Many labs across the country were trying to get their hands on them and very few companies offered them, which created a frenzy of ordering and delays in shipment. We had no idea how long we would be needed to test patient samples,

so when I found items in stock I had to project weeks ahead to make sure we could continue operating if more delays came up. Shutting down for even one day due to supply of materials was simply unacceptable.”

At one point, when RNA extraction kits were in short supply, Mr. Dowrey put out a University-wide call for help, and new kits began to appear from labs all over the Medical Campus, which normally used the kits for studying various kinds of genetic material for research purposes.

Ultimately, say Giadone and Dowrey, the team created a lab protocol that was deliberately “home-brew,” and could therefore accommodate substitutions of equipment and chemicals. It could also run as many as 300 tests in one 16-hour workday.

“What Rich and Todd did was remarkable,” says Dr. Murphy. “When I think back to the journey that

was the development of in-house testing here at BU-BMC, what I recall is that it all started early in the trajectory of the pandemic... the virus was just starting to take hold, testing, reagents and know-how were scarce, and everyone knew the storm was coming. As graduate students, Rich and Todd were put into a crucible and asked to develop an assay at light speed, under intense pressure, with pretty much everyone relying on us to make it happen.”

After providing testing all throughout the beginning of Boston’s coronavirus surge in March and April, by the beginning of May BMC’s pathology lab had its own testing system up and running, and things were going well enough that the emergency testing services of the CREM group were no longer needed.

For Mr. Giadone, the experience was doubly momentous, and doubly intense. During the hectic week that he was reimagining lab processes, his thesis committee was reimagining his defense. Its final iteration was a three-hour Zoom session, which happened to coincide with the first day that the CREM began processing patient samples from BMC. For the Zoom camera, Mr. Giadone put on a suit, and, sitting in his Cambridge apartment, opened his laptop to cross the finish line of his long journey to a doctorate. Then, of course, he drove straight to the CREM to roll up his sleeves and help crunch through a backlog of COVID-19 tests flooding in from BMC. Last fall, Giadone, the first person in his family to go to college, began work as a postdoctoral scientist at Harvard University.

## WHEN CRISIS PRESENTS AN OPPORTUNITY TO HELP

For Ellen Suder, a PhD candidate in microbiology in Dr. Elke Mühlberger’s Biosafety Level 4 (BSL-4) virology lab at BU’s NEIDL, COVID-19 presented an opportunity to do good. “Everyone always wants to believe that if there is a crisis, they can be there to help in some way,” she says.

Ms. Suder, who earned an undergraduate degree in microbiology and immunology at the University of California, Irvine before doing a two-year fellowship at the National Institute of Allergy and Infectious Diseases Rocky Mountain Laboratories, came to BU, she says, because of the NEIDL’s research opportunities, particularly those in the ultra-high containment Mühlberger lab, which usually focuses its work on Ebola and Marburg viruses, some of the world’s most lethal pathogens.

In March, when coronavirus infections emerged in Boston, Ms. Suder had just finished the four months of training required to work in Dr. Mühlberger’s high-level BSL-4 lab, donning an airtight suit with its own oxygen



supply to conduct research on live viruses. Ms. Suder is one of the lab's three researchers involved in what she describes, half jokingly, as "low-throughput" screening of drugs that might be effective against COVID-19. Unlike high-throughput labs, which run thousands of drugs through screenings, the Mühlberger lab narrows its search through meticulous study of research papers, identifying and focusing only on compounds that are most likely to stop the coronavirus.

Ms. Suder started out screening 31 drugs, most of which were either in clinical trials or were already approved for clinical use against other diseases. (The drugs were selected based on how promising they looked through sequencing data generated by Dr. Andrew Emili's laboratory at BU's Center for Network Systems Biology.) Ms. Suder first tested the compounds against SARS-CoV-2, the virus that causes COVID-19 infections, in commercially available cells derived from kidneys of African green monkeys.

"It was very impressive to watch Ellen work," Dr. Mühlberger says. Ms. Suder infected the cells with SARS-CoV-2, treated them with the compounds, then inactivated [the infected cells] and took them out of BSL-4. She then applied a stain that glows green in the presence of SARS-CoV-2 and looked at the cells under a microscope to see which drug compounds had been able to keep the virus at bay.

"When Ellen saw a reduction of SARS-CoV-2 infected cells, she knew that that compound might work," Dr. Mühlberger says.

Of the 31 drugs she screened, Ms. Suder found 26 of them were promising enough to advance to the next test, which used human lung cells created from stem cells in the laboratories of CReM co-directors Darrell Kotton, MD, and Andrew Wilson, PhD. In human lung cells, Ms. Suder found six compounds were able to block SARS-CoV-2 infection by 90 percent or more.

"The interesting thing," says Ms. Suder, co-author of a paper under review that describes those findings, "is that some of those that were most effective didn't work in [the first] tests with [the African green monkey kidney] cells. That's very cool, because it shows that the [stem cell-derived human lung] model we are using is able to deliver relevant [results] that otherwise might not have been found."

One of the most promising compounds Ms. Suder screened, produced by PTC Therapeutics, is entering a clinical trial to evaluate its effectiveness in treating human patients with COVID-19, and in the December 3 issue of *Molecular Cell*, she was listed as a first author on the paper "Actionable Cytopathogenic Host Responses of Human Alveolar Type 2 Cells to SARS-CoV-2."

Dr. Mühlberger says she was constantly moved by the commitment of her students like Ms. Suder. "They are passionate about their work on SARS-CoV-2. They

“They know that their work matters . . . they work extremely hard, sometimes 70 hours per week.”

– Elke Mühlberger, PhD

know that their work matters, and therefore, they work extremely hard, sometimes 70 hours a week,” she says. “If necessary, they spend the night in the lab. It’s so impressive.”

## UNDERSTANDING AIRBORNE TRANSMISSION

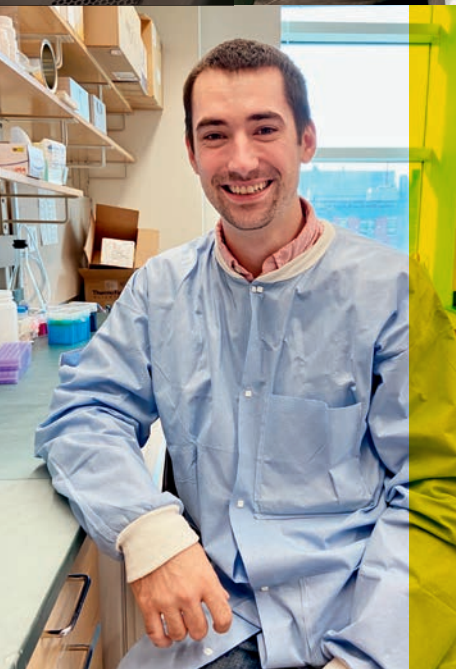
When COVID-19 made its landing in the US, Dr. Mühlberger wasted no time in inviting research labs across BU and elsewhere to collaborate on research that required the extraordinary biocontainment capabilities of her BSL-4 workspace. Among the area researchers who responded was Lydia Bourouiba, director of the Fluid Dynamics of Disease Transmission Laboratory at Massachusetts Institute of Technology (MIT). Dr. Bourouiba had been studying the survival of organisms in fluids, droplets, and aerosols—research that could lead to a better understanding of the behavior of pathogens such as SARS CoV-2, which are expelled during speech, coughing, and sneezing.

For the Mühlberger lab, which normally focused on Ebola and Marburg viruses that spread through bodily fluids, a study of a respiratory-borne virus would be a very different kind of research, requiring a whole new set of laboratory protocols. To develop those protocols, Dr. Mühlberger turned to BU GMS student Stephen Ross, a first-year student in PiBS.

Mr. Ross had long been interested in the type of viruses studied by Dr. Mühlberger and also in the RNA biology studied by Daniel Cifuentes, PhD, an assistant professor of biochemistry. Under mentorship of both researchers and in collaboration with the Bourouiba lab, Mr. Ross is now studying a question that people around the world continue to ask: what exactly is the safest “social distance” in the age of COVID-19? Six feet? Or more?



Stephen Ross, above, and Devin Kenney.



In three months of trials inside a BSL-2 lab, Mr. Ross helped develop a lengthy BSL-4 protocol for studying the aerosol transmissibility of SARS-CoV-2, laying out exactly what chemicals were required, what tools were needed, and describing the test's optimal technique.

Mr. Ross hadn't yet completed the training required to work at the BSL-4 level, so he had to devise new research processes for working with a respiratory virus in BSL-4—all from inside a much lower BSL-2 lab. To test out new protocols, he selected a surrogate virus that behaves like SARS, but is nonpathogenic to humans, meaning it could safely be used at a BSL-2 level. The workaround was neither done quickly or easily.

"I had to find methods that were conducive to work in BSL-4, where the protective gear is cumbersome," Mr. Ross says. But working with a respiratory virus like SARS-CoV-2 "requires a lot of precision work."

In three months of trials inside a BSL-2 lab, Mr. Ross helped develop a lengthy BSL-4 protocol for studying the aerosol transmissibility of SARS-CoV-2, laying out exactly what chemicals were required, what tools were needed, and describing the test's optimal technique. The next phase was to take Mr. Ross' recommendations up to the BSL-4 level to study live SARS-CoV-2.

"The first round of experiments is aimed more at showing that the method and protocols designed are robust for a virus surrogate of SARS-CoV-2," says Mr. Ross. "Then the lab will move on to study the survival of SARS-CoV-2 viruses in a more realistic setting"—that's where the BSL-4 comes into play. "This will ultimately provide insights not only into the dynamics of airborne transmission of SARS-CoV-2, but also the role of environmental conditions in such transmission."

Mr. Ross joined the lab at a very difficult time, Dr. Mühlberger says. "This was during the general lockdown, but our lab was fully operational, because we started to work on COVID-19," she says. "It was impressive to see how well he performed... despite the caveats of social distancing"

## VACCINE DESIGNS

The COVID-19 pandemic, which has killed almost two million people worldwide, has spawned what NEIDL microbiologist Florian Douam, PhD, an assistant professor of microbiology, describes as the most intense and urgent race for a vaccine in history. Dr. Douam and Devin Kenney, a second-year PhD student in PiBS, are race contestants.

Mr. Kenney, who previously worked for three years in an immunology lab at the National Institutes of Health, joined Dr. Douam's lab at the NEIDL in April—the height of the COVID surge in Massachusetts—and immediately dove into vaccine development under Dr. Douam's leadership. Their strategy is founded on a vaccine called 17D, which uses live attenuated virus to immunize against yellow fever. It's considered one of the most effective and safe vaccines known to science and has been used to inoculate more than 500 million people—an excellent choice to adapt for use with SARS-CoV-2.

"The 17D vaccine works very well," Mr. Kenney says. "Research has shown that you can replace regions [of genetic material] of 17D with regions of other viruses and have protection against those pathogens."

They are taking a slightly alternative route. They are placing genetically engineered segments of the





spike protein from the SARS-CoV-2 virus—the crown-like parts of the virus from which coronavirus gets its name—into the yellow fever 17D vaccine without removing any genes.

“We think that’s a promising and safe approach to induce potent and safe immune responses against SARS-CoV-2, and potentially contribute to preventing future COVID-19 outbreaks,” says Dr. Douam.

Their vaccine has already passed its first test. In an experiment using blood serum from mice infected with COVID-19, the vaccine elicited an immune response of B cells, one of the major lines of defense in both mouse and human immune systems. Despite the initial success, he and Dr. Douam are hoping for more—to also call in the help of the immune’s attack cells, T cells.

“Sometimes,” says Mr. Kenney, “you get a response either from B cells or T cells. We are hoping to see responses from B and T cells, which will provide a longer-lasting protection.”

“Our first pilot experiments have been promising,” says Dr. Douam. “Devin is now moving forward to perform a ‘real’ vaccination experiment, where mice will be vaccinated with our [experimental] vaccine, and then infected with SARS-CoV-2. This will allow us to evaluate the real protective ability of Devin’s vaccine.”

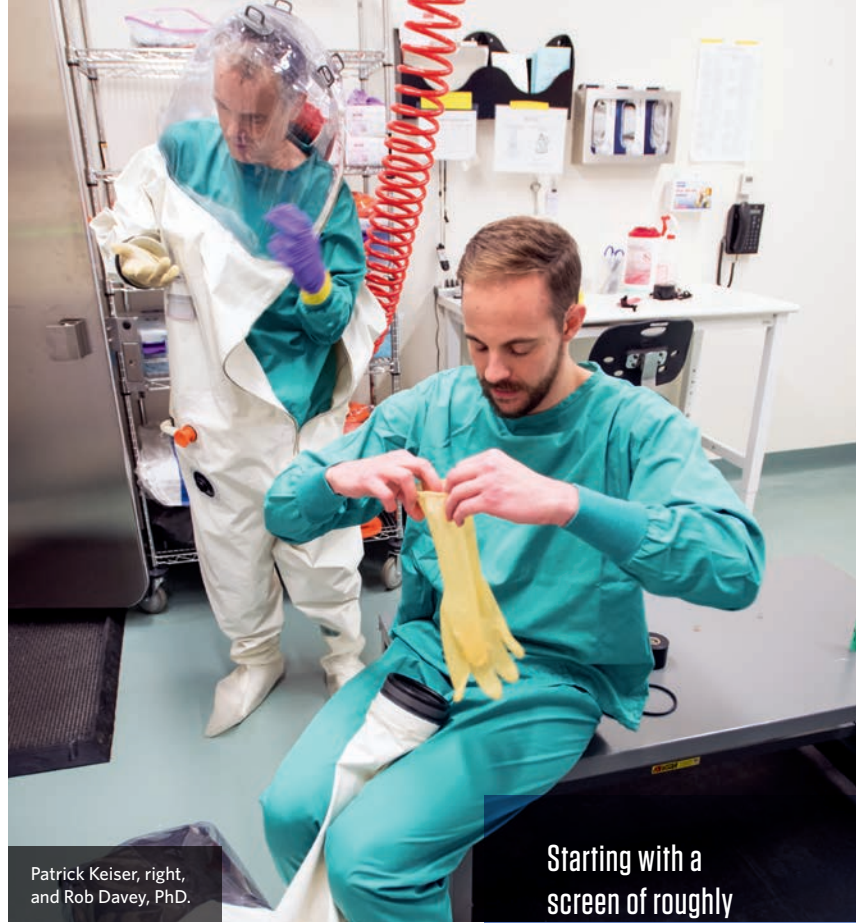
While there are more than 100 vaccines currently in development around the world, and while many of those are already in clinical studies, Dr. Douam says there is so little known about the immunology of COVID-19 that the more vaccines we develop, the greater our chance of success against the virus.

“At best,” he says, “Devin’s research will provide us with a powerful and safe technology that could play a significant role in preventing future COVID-19 outbreaks.”

## SCREENING THOUSANDS FOR A FEW PROMISING DRUG CANDIDATES

As the COVID-19 pandemic kicked research labs at the NEIDL into high gear, the BSL-4 lab overseen by NEIDL microbiologist Rob Davey, PhD, a professor of microbiology, prepared a high-throughput screening system to test more than 20,000 compounds against the mysterious new virus. It was a task for which BU GMS PhD candidate Patrick Keiser was well prepared.

Long before the arrival of COVID-19, Mr. Keiser knew the potential benefits of infectious disease research conducted in a BSL-4 lab. He also happened to know the promise of research conducted under the guidance of Dr. Davey. Both had previously worked together at the Texas Biomedical Research Institute in San Antonio, where Dr. Davey had been an adjunct professor and Mr. Keiser had been a lab technician. In October of 2018, Mr. Keiser accepted an offer from



Patrick Keiser, right, and Rob Davey, PhD.

Starting with a screen of roughly 3,200 compounds, they finally settled on the 21 most promising compounds.

Dr. Davey to work as a technician at the NEIDL, and came north with hopes of pursuing his doctorate in microbiology. He was accepted into the GMS PiBS program in winter 2019, switching gears from technician to graduate student. Then came 2020.

“When everything started to happen, I asked [Rob] if I could come in and help,” says Mr. Keiser. The answer, of course, was yes. Dr. Davey asked him to start screening more than 3,000 compounds from the lab of BU College of Arts & Sciences chemist John Porco, PhD.

Mr. Keiser began by growing cells on plates that each have 384 small wells. Then, using a robotic liquid dispenser, he squirted SARS-CoV-2 and chemical compounds into hundreds and hundreds of wells to see which drugs might slow or stop the virus from spreading.

“We infect [the plated cells] with live virus in the BSL-4 lab,” Mr. Keiser says. “Then a day or two later, we inactivate the virus and move them to a BSL-2 space.” Then, using a glowing green stain that lights up in the presence of SARS-CoV-2, Mr. Keiser looks to see how much infection has happened in the presence of different compounds.

There’s a sweet spot he’s looking for, meaning compounds that don’t do much damage to living cells but block the virus from replicating itself.

“We [aim to] see at which [dose] level the compound can still stop the virus, but keep our cells intact,” Mr. Keiser says. “Ideally, you want it to be working at very low concentrations.”

Starting with a screen of roughly 3,200 compounds, they finally settled on the 21 most promising compounds. Those that offer the most hope of stopping COVID-19, Mr. Keiser says, will be moved on to the next phase of testing, where cell biology and deep sequencing may reveal exactly how the compounds disrupt the virus from spreading. At a later date, he says, the best candidates may undergo more research and eventually advance to clinical tests.

## A FASTER, BETTER DETECTION METHOD

Callie Donahue, a third-year PhD candidate in Dr. Davey's lab, usually studies Ebola virus, but when COVID-19 arrived, Donahue's research quickly shifted from Ebola to SARS-CoV-2.

One of the most important tools for any virologist is the use of antibodies that, when applied to infected cells through a stain wash, glow or give off another detectable signal that indicates whether or not an infection has actually occurred.

"At the time we started working with COVID-19, we didn't know if any commercially available antibodies would even work for COVID-19," says Ms. Donahue. "Good antibodies take time to design and bring to market. So, I decided

**Ms. Donahue's adaptation of RNAFISH helped Davey's lab and other NEIDL researchers deliver faster and more detailed experimental results.**

to design an independent, image-based detection method that didn't rely on those antibody reagents and could be easily applied in the lab."

Donahue used a technique called RNAFISH, whose reagent production relies solely on the RNA, or genetic sequence, of the virus. RNAFISH provides a fast "read out" time in just five hours, whereas other techniques can take up to two to three days. It also added another level of detail of particular interest to Ms. Donahue.

"It allows you to look at replication of the virus in a particular step of the replication cycle," says Ms. Donahue. That's important because the earlier a drug works at disabling the virus, the less time the infection can trigger inflammation and cause cell damage, two factors that have greatly contributed to lung damage in many coronavirus patients.

Ms. Donahue's adaptation of RNAFISH helped Dr. Davey's lab and other NEIDL researchers deliver faster and more detailed experimental results, and proved critical in a collaboration with researchers from Brigham and Women's Hospital and Harvard Medical School, who partnered with Dr. Davey's team to look for ways to reduce the toxicity of the drug remdesivir, a broad-use antiviral that's been effective in seriously ill coronavirus patients—but not without serious drawbacks.

Remdesivir was one of the first drugs that appeared to help hospitalized COVID-19 patients. But it works by blocking RNA synthesis, a process that is critical not just for viruses to replicate, but also a key process in normal life cycles of human cells. The BU and Harvard researchers are hoping to use gene editing to control genes that help remdesivir's toxic effects spiral out of control.

"If you can find the genes that are responsible for the [drug] toxicity, and if you can find a way to reduce the expression of those genes," Ms. Donahue says, "then we can better use remdesivir to treat COVID-19."

Ms. Donahue used the RNAFISH method to analyze the impact of two genes on remdesivir's toxicity. She found that one of those genes, when edited out of cells, not only reduced remdesivir's negative effects on normal cell processes but also interfered with remdesivir's ability to work against the virus, making that gene a poor drug target to complement remdesivir therapy.

However, the second gene appears much more promising. After editing that gene out of cells, Ms. Donahue says remdesivir was still able to prevent SARS-CoV-2 infection while there were also fewer side effects on the cells themselves. "A complementary drug could be designed against this gene, and used in a cocktail with remdesivir," Ms. Donahue says. "This could allow us to use remdesivir at higher concentrations that make it more effective [at treating] COVID-19." ■

Callie Donahue





# Largest-Ever Study of Prostate Cancer Genomics in Black Patients IDs Potential Targets for Precision Therapies

**Study finds Black patients should also benefit from recently approved PARP inhibitor therapies “if applied equitably”**

**B**lack men in the United States are known to suffer disproportionately from prostate cancer, but few studies have investigated whether genetic differences in prostate tumors could have anything to do with these health disparities.

In the largest study of its kind to date, researchers from BUSM, UC San Francisco (UCSF), and Northwestern University have identified genes that are more frequently altered in prostate tumors from men with African ancestry compared to other racial groups, though the authors say that the reasons for these differences are not known. They also point out that none of the individual tumor genetic differences that were identified are likely to explain significant differences in health outcomes, or prevent Black patients from benefiting from a new generation of precision prostate cancer therapies, as long as the therapies are applied equitably.

The newly identified gene variants could potentially lead to precision prostate cancer therapies specifically focused on men with African ancestry and will inform broader efforts by the National Cancer Institute’s Research on Prostate Cancer in Men of African Ancestry: Defining the Roles of Genetics, Tumor Markers, and Social Stress (RESPOND) study to link gene variants to health outcomes in an even larger cohort of Black patients nationwide.

Despite declines in mortality related to cancer in the US, disparities by race have persisted. One in every six Black Americans



One in every six Black Americans will be diagnosed with prostate cancer in their lifetime.

will be diagnosed with prostate cancer in their lifetime, and these men are twice as likely to die from the disease as men of other races. But it is not yet clear to researchers whether differences in prostate cancer genetics contribute to these health disparities in addition to the social and environmental inequities known to drive poorer health outcomes across the board.

To date, studies trying to figure out what genes are commonly mutated in prostate cancers often have had very few samples from racial/ethnic minority groups, despite the greater burden of prostate cancer in these populations. In May, the FDA approved a class of drugs known as enzyme poly ADP ribose polymerase, or PARP, inhibitors as a therapy for men with prostate cancers driven by specific genetic mutations, but it is not known how prevalent these mutations are in people with African ancestry. As more genetic health studies are performed in minority populations, it has become clear that other genetically targeted therapies that have been developed based on studies of predominantly white patients are at times much less effective—and in some cases cause

dangerous side effects—in other racial and ethnic groups.

In a study published July 10, 2020, in *Clinical Cancer Research*, a journal of the American Association for Cancer Research, the research team set out to better understand differences in the mutations driving prostate cancer tumors in Black versus white patients, and whether any such differences could influence disease outcomes or the effectiveness of PARP inhibitors or other targeted therapies.

The researchers collected and analyzed DNA-sequencing data from previously published studies and from a commercial molecular diagnostics company. In total, they examined mutational patterns in prostate cancers from more than 600 Black men, representing the largest such study of this population to date.

The team found that the frequency of mutations in DNA repair genes and other genes that are targets of current therapeutics is similar between the two groups, suggesting that at least these classes of current precision prostate cancer therapies should be beneficial in people of both African and European ancestry, according to corresponding author



Franklin Huang, MD, PhD, an assistant professor in UCSF's Division of Hematology/Oncology and a member of the UCSF Helen Diller Family Comprehensive Cancer Center, UCSF Institute for Human Genetics, and UCSF Bakar Computational Health Sciences Institute.

While the researchers found no significant differences in frequencies of mutations in genes important for current prostate cancer therapies, they did identify other genes, such as *ZFXH3*, *MYC*, and *ETV3*, that were more frequently mutated in prostate cancers from Black men.

"These results reinforce the idea that there can be biological differences in prostate cancers between different ancestral groups and that samples from Black patients need to be included in future molecular studies to fully understand these differences," said co-corresponding author Joshua Campbell, PhD, assistant professor of medicine at BUSM.

"The poorer health outcomes we see in Black men with prostate cancer are not easily explained by any of the distinct

gene mutations we identified in prostate tumors from men of African ancestry. This highlights the need to examine the environmental and social inequities that are well known to influence health outcomes across the board," Dr. Huang added. "On the other hand, our tumor genomic analysis also showed that current precision medicine approaches ought to be as effective in Black patients as they have been for other groups—if we can ensure that these drugs are applied equitably going forward."

Developing a comprehensive understanding of how tumor genomics and other biological factors interact with social and environmental inequities to drive poorer clinical outcomes for Black prostate cancer patients should be an important priority for the efforts to improve precision medicine for these patients, the researchers say.

"These types of studies will remain important to understand when certain therapies may preferentially benefit Black patients, who continue to remain underrepresented in clinical trials," Dr. Campbell said.

Dr. Huang, who leads RESPOND's tumor genetics studies based at UCSF, points out that in particular, the results will inform the efforts of the National Cancer Institute-funded RESPOND study, which provided funding for the new UCSF-BUSM-Northwestern study to perform targeted gene sequencing in tumors from an even larger cohort of Black prostate cancer patients.

Through partnerships with Black communities across the country, RESPOND aims to recruit 10,000 Black prostate cancer patients in an effort to better understand the drivers of the disease's outside burden among Black Americans.

"Previous studies have looked in isolation at different biological, social, and environmental drivers of well-known racial disparities in prostate cancer," Dr. Huang said. "RESPOND is a nationwide effort to integrate all these components, and ultimately identify specific steps that can be taken to eliminate prostate cancer's unequal burden in Black communities." ■

## What Sets Off Deadly Levels of Lung Inflammation in Some COVID-19 Patients?

**In human stem cell-derived lung tissue infected with coronavirus, BU scientists are studying the biological domino effect SARS-CoV-2 sets off**

**A** team of infectious disease and regenerative medicine researchers at Boston University, studying human stem cell-derived lung tissue infected with SARS-CoV-2, is discovering new insights into how the novel coronavirus kicks off a cascade of tissue inflammation in the lungs.

That reaction can be especially lethal for older people, who make up 8 out of every 10 deaths from COVID-19, the disease caused by the coronavirus. As people get older,

their risk of having an underlying health condition increases, and at the same time, their immune system is aging. Both of those factors are thought to contribute to chronic inflammation—making older people far more susceptible to the added inflammation that a COVID-19 infection sets off in the body.

The researchers' experimental data appears to confirm a theory developing among clinicians and researchers that SARS-CoV-2 initially suppresses lung cells' ability to call in the help of the immune system

to fight off the viral invaders. The delay in recruiting defensive reinforcements then backfires, the signal going off several days after infection has set in. That delay attracts an army of immune cells into lung tissue laden with infected and already dead and dying cells, dousing those inflammatory conditions with even more fuel.

Like most other scientists racing to find promising new strategies to halt the spread of COVID-19, the BU team has publicly released its data in a "preprint" paper (a draft that has not been formally reviewed and published in a peer-reviewed journal) to share its research with the scientific and medical community as soon as possible while its findings are being peer-reviewed for publication in a scientific journal.

"The data is teaching us that [the cells lining the lungs] act something like a white blood cell," a patrolling watchdog cell that's part of the immune system, after infection with SARS-CoV-2, says study coleader Darrell Kotton, MD, a lung biologist and

director of the Center for Regenerative Medicine (CReM) on BU's Medical Campus. The infected lung cells "pour out inflammatory proteins." In the body of an infected person, those proteins drive up levels of inflammation in the lungs.

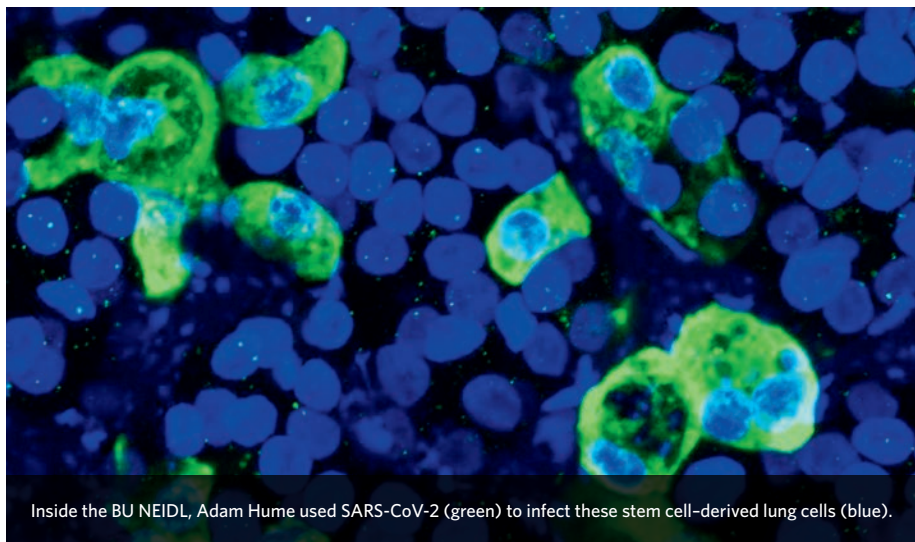
The data is based on experiments the research team performed at BU's National Emerging Infectious Diseases Laboratories (NEIDL). Dr. Kotton and other members of CReM have developed sophisticated models of human lung tissue—three-dimensional structures of lung cells, called "lung organoids," grown from human stem cells—which they've used at BU and with collaborators elsewhere to study a range of chronic and acute lung diseases.

Adapting their expertise to engineer alveolar cells, which line the inside of lungs and are difficult to extract from patients for research purposes, the CReM lung model is being infected with SARS-CoV-2 by virologists at the NEIDL. The stem cell-derived lung model provides a better model of cells found in real human lungs than, as is commonly done, using cultures of animal-derived cells to investigate disease.

"Our organoids, developed by our CReM faculty, are engineered from stem cells—they're not identical to the living, breathing cells inside our bodies, but they are the closest thing to it," Dr. Kotton says.

For more than a decade, Dr. Kotton has worked with BU regenerative medicine and stem cell engineers Andrew Wilson and Finn Hawkins—who along with Dr. Kotton are faculty members at BU School of Medicine and pulmonologists at its teaching hospital, Boston Medical Center (BMC)—to develop these state-of-the-art stem cell models. The three physician-scientists work together at BMC, caring for patients with lung disease—including, over the last several months, people critically ill from coronavirus—while leading the CReM teams that engineer lung cells and organoids for research.

Mohsan Saeed, a NEIDL virologist working on this research with Dr. Kotton and other collaborators, says organoids are extremely valuable to infectious disease researchers. "During the Zika outbreak, scientists were using brain organoids, and similarly, liver organoids have been used to study hepatitis C," Dr. Saeed says. "One of the things I noticed when the Zika outbreak came along is that when you immersed brain organoids in the virus, the infected



Inside the BU NEIDL, Adam Hume used SARS-CoV-2 (green) to infect these stem cell-derived lung cells (blue).

cells—and neighboring cells like you would find in a true brain—reacted quite differently than traditional cultured cells."

To study the novel coronavirus in lung tissue mimicking human lungs, Jessie Huang, a postdoctoral associate at the CReM, says the team adapted an experimental model previously developed to study the effects of smoking cigarettes.

"We plate all of the [lung cells] on a mesh membrane, and then we expose them to the air on the top," Dr. Huang says. Below the membrane, a liquid substance filled with cellular growth factors feeds the cells, a substitute for the blood vessel network of the human body.

At the NEIDL, virologist Adam Hume, a senior research scientist in Elke Mühlberger's lab, adds droplets of live coronavirus on top of the lung cells, infecting them from the air side of the interface, similar to the way the virus infects cells lining the inside of the lungs when air containing the virus is breathed into the body. They've been running these experiments inside one of the NEIDL's Biosafety Level 4 (BSL-4) laboratories, the highest possible level of biosafety containment used for infectious agents that pose especially high risk to humans.

Dr. Mühlberger's BSL-4 lab at the NEIDL typically handles some of the world's most lethal viruses, like the ones that cause Ebola or Marburg fevers. But since the start of the coronavirus outbreak her team has pivoted to focusing on SARS-CoV-2, collaborating with colleagues from BU and universities across New England who don't have their own infectious disease research facilities. (The BSL-4 lab they use to perform live

SARS-CoV-2 experiments is one step of containment above the required BSL-3 that the Centers for Disease Control and Prevention says is required for working with live copies of the virus.)

Since the pandemic took root in the United States, Dr. Hume has been clocking up to 30 hours a week inside the BSL-4, wearing the requisite full biocontainment suit with its own oxygen supply—an earthly version of a space suit, essentially.

He's infected hundreds of cell cultures with live coronavirus using purified, highly concentrated doses of SARS-CoV-2 that he's enhanced for experimental research purposes. The purified coronavirus removes the chance that any other cell components are present, so that other factors don't influence experimental results. The doses also contain a high concentration of the coronavirus so that each attempt to study the disease in lab cultures has an extremely probable chance of achieving infection. This level of efficiency, Dr. Hume says, is critical for coronavirus research to proceed quickly.

Dr. Mühlberger says their experimental observations in the lung model confirm that SARS-CoV-2 blocks cells from activating the immune system early on after infection has set in. The signal the cells would typically send out, a tiny protein called interferon that they exude under threat of disease, is instead delayed for several days, giving SARS-CoV-2 plenty of time to spread and kill cells, triggering a buildup of dead cell debris and inflammation.

"SARS-CoV-2 blocks interferon's response," Mühlberger says, which indicates

treatment with interferon might help protect cells from SARS-CoV-2's attack.

Interferon is already being used experimentally in some patients based on initial research conducted elsewhere that revealed that SARS-CoV-2 dampened interferon's signal in commercially available cell lines. But many of those cells have muted immune system responses anyway, Dr. Mühlberger says, because of the way they are produced and processed for mass experimental use. The CReM's lung models, on the other hand, represent true "in the wild" cell types—they behave much more like the actual cells inside the lungs of living humans.

Now, Dr. Mühlberger says, the team is planning to investigate the impact of the SARS-CoV-2 virus on a mix of lung cells and white

blood cells, the patrol cells of the immune system. Looking at both types of cells, infecting them together in coculture, is important because white blood cells, after picking up distress signals sent out by infected lung cells, travel into lung tissue to kill SARS-CoV-2. Their arrival and subsequent attack on coronavirus-infected cells can add even more fuel to a raging five-alarm fire of inflammation.

Because, early on after infection, SARS-CoV-2 appears to slow down the body's ability to call in the help of the immune system, by the time white blood cells appear, they may tip the lungs into a dangerous level of inflammation that can lead to organ failure.

"Why do some people generate this very profound response, especially elderly peo-

ple or people with underlying health conditions?" Dr. Hume says. "It's possible they are experiencing higher levels of inflammation, or that their immune systems aren't able to control the virus before inflammation takes hold."

*This research is supported by Evergrande MassCPR awards, the National Institutes of Health, a CJ Martin Early Career Fellowship from the Australian National Health and Medical Research Council, an I. M. Rosenzweig Junior Investigator Award from the Pulmonary Fibrosis Foundation, a Harry Shwachman Cystic Fibrosis Clinical Investigator Award, the Gilead Sciences Research Scholars Program, Gilda and Alfred Slifka and Gail and Adam Slifka funds, a Cystic Fibrosis Foundation grant, and a Fast Grants award. ■*

## Center for Translation Neurotrauma Imaging Creates New Research Avenues for Neuroscience Community

**T**he Center for Translation Neurotrauma Imaging (CTNI) at BUSM has revolutionized brain imaging and greatly enhanced neurotrauma research, thanks to a \$4.9 million Massachusetts Life Sciences Center (MLSC) grant and new state-of-the-art equipment.

Housed in the core facility of the Center for Biomedical Imaging (CBI), the CTNI is led by co-directors Stephan Anderson, MD, and Lee Goldstein, MD, PhD, who were awarded a competitive grant from the MLSC to help revamp the CBI and build upon BU's world-renowned chronic traumatic encephalopathy (CTE) research.

"While the broader mission of the center is to look at all the organs of the body, we do have a particular interest in problems of the brain, specifically those that lead to injury of the brain and long-term degenerative problems associated with the brain," said Dr. Goldstein, associate professor of psychiatry, radiology, neurology, and pathology & laboratory medicine, who also co-leads the Biomarker Core at the Boston University Alzheimer's Disease Research Center. An area of focus is on neurotrauma and how it triggers CTE and exacerbates Alzheimer's disease.

In addition to their scientific focus, the center serves the imaging needs of the

scientific community, including academics from BU and beyond, corporate-sponsored research, and investigators who have a need for high-end human or animal imaging.

### New & Improved Tools

The center's cutting-edge imaging tools include a 3T Philips Ingenia Elition MRI, a 9.4T Bruker BioSpec MRI, and a Verasonics Vantage 256 Ultrasound System.

The 3T Philips MRI offers unrivaled imaging quality as the human MRI clinical instrument. Featuring a 70 cm bore and full digital acquisition platform, as well as the most up-to-date software packages, the machine acquires data incredibly quickly and efficiently.

"It has features that optimize the imaging of the brain. In addition to the brain, it can image every other part of the body," explains Dr. Anderson, professor and vice chair for research in the department of radiology.

The 9.4T MRI from Bruker is ideal for imaging small animals, thanks to its high spatial resolution and high signal-to-noise (SNR) ratio. Its cryogenically cooled surface coil is incredibly rare, and optimizes the machine for mouse brain imaging.

Additionally, the CTNI provides ultrasound capabilities with a highly flexible research platform, the Verasonics Ultrasound System.

Now, the center is equipped to offer optimized brain and human body imaging that was not possible with the old CBI system, as well as a live animal imaging instrument with much more advanced capabilities.

"We've taken a quantum leap in the capabilities of the clinical system," Dr. Anderson says. "So now, we're opening up new avenues for the neuroscience community to pursue."

### One-Stop Shop

Typically, revolutionary research instruments like the 3T Philips MRI and 9.4T Bruker MRI would be distributed among various centers focused on different arrays of diseases. Focusing on neurotrauma and neurodegenerative diseases in one general-use facility places the CTNI apart from other scientific institutions, and at the forefront of neurotrauma research.

"What we've done is paired state-of-the-art research imaging capabilities with world-class clinical, pathological, and research operations focusing in this area," Dr. Goldstein says. "This is clearly the best facility in the world for doing this type of work."

The CTNI is open for business to those looking for these advanced imaging capabilities, from researchers in biomedicine and neuroscience to software engineering and magnetic resonance physics. ■



## RESEARCH AWARDS

### ■ Rhoda Au Receives \$2.8M Award from AHA, Bill Gates

The American Heart Association—the world’s leading voluntary organization dedicated to a world of longer, healthier lives—and global philanthropist and technology visionary Bill Gates have committed to advancing the scientific evidence base related to brain health and dementia by funding a \$3.3 million health technology research joint initiative. Specifically, the project will fund a new brain health and dementia technology research center at Boston University. It also will support the global exchange of research data to help scientists around the world collectively work in accelerating new discoveries related to heart and brain health, including the early detection and treatment of Alzheimer’s disease and related dementias.

The new initiative is part of the Association’s Strategically Focused Research Network on Health Technologies and Innovation, first launched with four centers in April 2020. A multidisciplinary team of researchers at BU has been selected to establish the fifth research site, a brain health and dementia technology research center, funded by a \$2.8 million grant from Bill Gates and the American Heart Association.

Led by Rhoda Au, PhD, professor of anatomy & neurobiology, neurology and epidemiology, the new team will focus their work on the connections of heart and brain health, specifically in the areas of dementia and Alzheimer’s disease. They will work on new technology to better identify and track early health behaviors that can affect brain health and lead to chronic diseases, use advanced computational and artificial intelligence analytics to more specifically determine who is at risk for those diseases, and ultimately find ways to prevent the behaviors or triggers that lead to them. One major aim is to use passive data-collection technology, requiring minimal action on the part of the participant, to be more sustainable over time. This can be especially beneficial in historically excluded populations that often don’t have the means for costly wearable health technology.

In addition to the new research center, the joint initiative also will provide \$500,000 to support the efforts of all five centers in a collaborative project to enhance how research data is shared through interoperable technology platforms, advances that could ultimately streamline and fast-track solutions to patient care and treatment.

Findings from this joint research project will be added to the database of Alzheimer’s Research UK’s Early Detection of Neurodegeneration. Through this global initiative, scientists from around the world are collecting, sharing, and analyzing clinical and digital health data to detect diseases like Alzheimer’s in the brain years before the symptoms of dementia start. More than 5.7 million Americans currently live with Alzheimer’s, one of the most common forms of dementia, and that number is expected to nearly triple by 2050. ■

### ■ Lindsey Farrer, Rhoda Au Receive NIH Grant to Create New Framingham Heart Study Brain Aging Program

Since 1976, the Framingham Heart Study (FHS)—the longest-running, multigenerational epidemiological study in the world—has followed participants for incident dementia. Findings have helped to analyze the differences between normal, age-related changes in thinking, and disease-related pathological alterations. Including many of the original participants’ children and grandchildren (known as the second- and third-generation cohorts) has also provided an opportunity to explore genetic factors related to Alzheimer’s disease (AD) and vascular dementia.

Now, thanks to a five-year, \$26.56 million grant from the National Institutes of Health, a new program called the Framingham Heart Study Brain Aging Program (FHS-BAP) will continue the surveillance and evaluation of FHS participants for dementia (including cognitive assessments and brain imaging) and invigorate the FHS brain donation program and brain bank. The program will also establish a platform to promote data sharing that will accelerate AD research using FHS data and conduct three interrelated projects using FHS data and specimen resources.

Lindsay Farrer, PhD, chief of biomedical genetics, one of two principal investigators of the award, will lead the research. “The primary goal of this new program is to continue dementia surveillance, bring added resources to the brain donation program including neuropathological examination to identify new and expand on known AD-related genetic and other risk factors and biomarkers, and to pursue innovative research about the vascular and inflammatory basis of AD,” he explained.

The FHS-BAP will feature three interrelated projects that focus on vascular and inflammatory contributors to AD. One project will identify factors that are associated with AD risk and resilience using longitudinal analyses of FHS data including various genetic, clinical, imaging, lifestyle and other traits; a second will investigate the link between AD genetic vulnerabilities and chronic inflammation; a third will study the impact of variants in genes affecting immune function on AD-related brain changes and cognitive performance. All of the projects will leverage the unique features of this family-based cohort and up to 70 years of follow-up data collected from study participants.

Principal Investigator Rhoda Au, PhD, professor of anatomy & neurobiology, neurology and epidemiology, who will coordinate research participant engagement in this program, noted that, “FHS-BAP investigators will apply interdisciplinary approaches that maximize use of a wide array of clinical, lifestyle, biomarker and ‘omic’ information collected from three generations of FHS participants over the course of their adult lives to develop strategies that preserve cognition and memory and to identify novel therapeutic targets.”

“This program will promote using FHS-BAP data, especially by early stage and by investigators not currently working in the AD field, using a pilot projects program and through enhanced and proactive data-sharing efforts,” said Dr. Farrer.

His research has led to more than 450 publications on genetic risk factors for several familial neurodegenerative and other chronic diseases. In collaboration with other laboratories worldwide, his group has identified genes and delineated mechanisms causing a variety of rare and common disorders including AD, age-related macular degeneration, substance use disorders, Wilson disease, Machado-Joseph disease, Waardenburg syndrome, and hypertension.

Dr. Au has been involved in FHS research related to cognitive aging and preclinical/clinical dementia since 1990; the limits of standard neuropsychological testing led her to apply the Boston Process Approach (BPA) to increase the sensitivity of these tests. The BPA includes tracking error and extraneous responses, and she has exponentially expanded the scientific potential of the BPA approach by introducing digital technologies to detect changes in cognition much more effectively than traditional, paper-pencil tests do. FHS is the first to apply the BPA method to epidemiologic research. Dr. Au is currently focused on building multisector ecosystems to enable solutions for chronic disease prevention generally, and optimizing brain health specifically, and moving the primary focus of health technologies from precision medicine to a broader emphasis on precision health.

The FHS has had a major impact on public health by establishing links between cholesterol and heart disease and blood pressure and stroke, as well as precursors to a variety of other diseases of the elderly. ■

#### ■ Andrew Wilson Receives American Lung Association Grant

Andrew A. Wilson, MD, associate professor of medicine and a pulmonary and critical care clinician-scientist, received a two-year, \$200,000 grant from the American Lung Association (ALA) that he will use to determine whether smoking and the use of e-cigarettes makes the body more susceptible to COVID-19.

Dr. Wilson's lab forms part of the Center for Regenerative Medicine (CReM). An important area of his research involves the use of induced pluripotent stem cells (iPSC) to study human lung diseases. Together with CReM Director Darrell Kotton, MD, and their CReM associates, Dr. Wilson uses iPSC to develop sophisticated, three-dimensional models of human lung tissue called "lung organoids" to model in vivo patient biology and test potential therapeutic agents.

Since the outbreak of the COVID-19 pandemic, CReM researchers have been collaborating with scholars based at BU's National Emerging Infectious Diseases Laboratories (NEIDL) to study the exposure of these organoids to the live coronavirus in the NEIDL's Biosafety Level 4 (BSL-4) laboratories, which are used for experiments involving highly infectious agents, like the ones that cause Ebola and Marburg fevers. The co-location of facilities for the study of stem cells and these highly infectious viruses gives BUSM unique capabilities for dealing with COVID-19.

In the ALA-funded study, Dr. Wilson will draw on these resources to test the hypothesis that cigarette smoke or e-cigarette vapor

exposure renders human lung cells susceptible to infection or injury from SARS-CoV-2. ■

#### ■ Boston University Researchers to Develop New Breast Tumor Models

Breast cancer is the second most common cancer diagnosed in women in the United States after skin cancer, and women with comorbidities often fare worse in terms of their breast cancer. Researchers believe that comorbid conditions such as diabetes, obesity, and metabolic disease may alter the biology of the nonmalignant cells of the tumor microenvironment and may promote progression.

BUSM researchers Gerald Denis, PhD, Andrew Emili, PhD, and Stefano Monti, PhD, together with Beth Israel Deaconess/Harvard Medical School researcher Senthil Muthuswamy, PhD, have been awarded a five-year, \$2.5 million National Cancer Institute UO1 grant to develop and analyze breast tumor organoids (models). Specifically, the award will support their project, "Multiscale analysis of metabolic inflammation as a driver of breast cancer."

According to the researchers, the patient population at most safety net hospitals often presents not just with invasive breast cancer of a specific stage and molecular subtype, but also with comorbid conditions such as type 2 diabetes, which accounts for a 40 percent worse overall survival compared to nondiabetic women.

"This comorbidity burden is disproportionately high among vulnerable cohorts, such as patients at Boston Medical Center (BMC), where it can affect half of the patient population. Unfortunately, current models of breast tumor progression and immunotherapy are based on data from metabolically healthy cancer patients, ignoring metabolic/inflammatory components of type 2 diabetes," explained Dr. Monti, associate professor of medicine and biostatistics.

"Currently, the standard of care is built on data from patients who do not have these complications, thus these patients are understudied. Our goal is to produce new models that represent women with these conditions and hopefully lead to improved outcomes in their survival," added Dr. Denis, the Shipley Prostate Cancer Research Professor.

"This project leverages the strengths of a unique, transdisciplinary team with complementary strengths in molecular oncology, organoid modeling, bioinformatics, and systems biology to address a major unmet clinical need," said Dr. Emili, the founding director of the Center for Network Systems Biology at BU.

Other researchers on the project are Naomi Ko, MD, MPH, a medical oncologist at BMC; Kimberly Bertrand, ScD, from BU's Slone Epidemiology Center, who will analyze patient clinical data for outcomes of breast cancer; Anna Belkina, MD, PhD, an expert in multiparameter flow cytometry, who will focus on the T cell function of the breast cancer immune infiltrates; and Joshua Campbell, PhD, a computational biologist, who will analyze single-cell RNA sequencing data from the tumors, T cells, and organoids. ■

## Rebecca Lee Crumpler Scholarship Fund to Honor First Black American Woman Physician

In 1864, a 33-year-old woman named Rebecca Davis Lee (Crumpler) became the first Black American woman to earn a degree in medicine, awarded by the New England Female Medical College, a pioneering institution that became Boston University's School of Medicine (BUSM) in 1873. Following her graduation, Rebecca worked with the Freedmen's Bureau in Richmond, Virginia, created at the end of the Civil War to help recently freed enslaved people gain access to food, housing, and medical services. She returned to practice family medicine in Boston, and later published *A Book of Medical Discourses*. Although she encountered prejudice and hostility as a Black woman doctor, she persisted in her life's mission: combating illness in women and children.

Born on February 8, 1831, Dr. Crumpler was able to attend medical school due to a scholarship from the Wade Scholarship Fund. The need for financial aid is just as pervasive today for medical students. Black students made up only 8.4 percent of applicants to medical school, and just 5 percent of active US physicians from 2018 to 2019 were Black. Scholarships are one critical way to expand access to medical education and the medical profession.

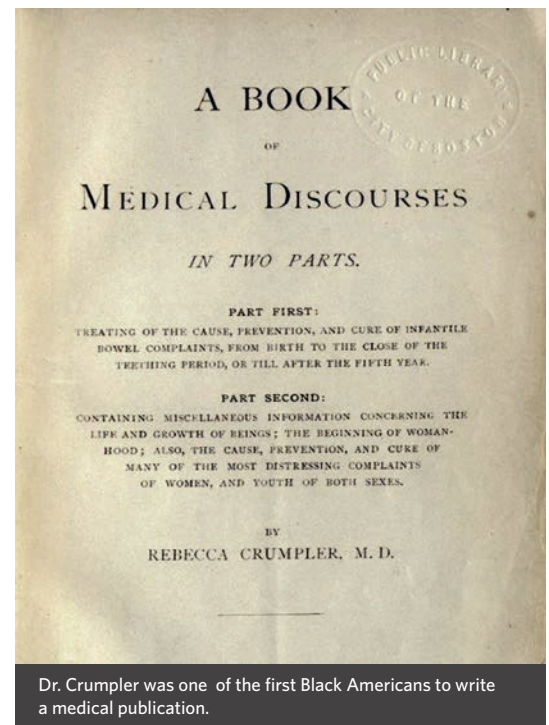
**Dr. Louis V. Sullivan (MED'58)**, a member of the Dean's Advisory Board, was able to attend BUSM due to scholarship support from alumni and has decided to donate to the Rebecca Lee Crumpler Scholarship Fund. "I want to give back, and especially help Black students with need," he said.

**Patricia J. Williams (MED'89)**, a member of the Dean's Advisory Board who is a lead donor to the scholarship fund, said, "As a proud alumna of BUSM and a woman who dedicated my medical career to the care of women, I am thrilled to support efforts to

**DURING THE WEEK OF February 8, 2021, BUSM will celebrate Rebecca Lee Crumpler's 190th birthday with a virtual symposium and discussions to raise additional scholarship funds in her name for students demonstrating financial need, with first preference for Black women and second preference for students from underrepresented communities who are Black or Hispanic/Latinx.**

memorialize Dr. Crumpler's incredible pioneering spirit and dedication to patient care. At a time when healthcare professionals are combating the COVID-19 pandemic and the medical inequities we face in our society, it is of the utmost importance that we ensure Black students receive the support needed to pursue a quality medical education."

Dr. Sullivan echoed Dr. Williams' sentiment. "COVID-19 has revealed deficiencies in our healthcare system, in particular a discrepancy between the health outcomes of white and Black people, making it more important than ever to assist underrepresented minorities going into the medical field," he said.



Dr. Crumpler was one of the first Black Americans to write a medical publication.

"You can't have a strong economy and nation without a healthy population."

Dr. Crumpler's story is already prominent on BUSM's "history wall" and we now will honor her with endowed scholarship funds in her name to support Black women who aspire to become physicians. Crumpler scholarships will be awarded to students demonstrating financial need, with first preference for Black women and second preference for students from underrepresented communities who are Black or Hispanic/Latinx.

To make a gift, contact [busmdev@bu.edu](mailto:busmdev@bu.edu). ■



## Endowed Scholarship Honors the Lives of Frank Yuen Yee and May Seto Yee

**D**r. Andrew Yee recently established the Frank Yuen Yee and May Seto Yee Scholarship at BUSM.

This endowed scholarship was created in loving memory of Dr. Yee's parents, who raised a family of seven children in San Francisco and knew that love meant giving to others. Frank and May lived their lives always giving—of their time, of their energy, and of their optimism—to their children and community.

"I have been helped so much by my loving parents," Dr. Yee said. "So, I want to pay it forward to help my kids, and to help other people, too."

Dr. Yee's daughter recently graduated from BUSM. He was so impressed by the members of her class, whom he met during her White Coat Ceremony, that he decided to establish the scholarship.

**This endowed scholarship was created in loving memory of Dr. Yee's parents, who raised a family of seven children in San Francisco and knew that love meant giving to others.**

worked in private practice as a pulmonologist and now works in primary care for the state of California.

He knows firsthand the importance of a medical education and recognizes that there are financial barriers for many students interested in pursuing a career in medicine.

As a volunteer faculty member with Western University of Health Sciences in California, Dr. Yee enjoys working with third-year students and watching them gain the confidence needed to build their medical skills. He previously



May Seto Yee and Frank Yuen Yee

"I wanted to take a little bit of the edge off of the stress of financial burden, so the students have more energy to evolve emotionally, psychologically, and academically and won't have to worry so much about the bills," he said. "Hopefully, my little part will help." ■

## Walmart Foundation Commits Additional Support for Women Veterans

**T**he Walmart Foundation has made a grant of \$100,000 to launch Building Reintegration from Dreams and Goals to Execution and Success (BRIDGES), an extension of the Women Veterans Network (WoVeN). Supported by the foundation since 2017, WoVeN works to forge connections among women veterans to decrease isolation and increase well-being. BRIDGES seeks to extend this support to active-duty service-women on the verge of separating from service.

An evidence-based initiative that leverages the mentorship of women veterans in the WoVeN program, BRIDGES will provide support and guidance for women separating from service and navigating the difficulties inherent



in reintegration. The program is now being piloted in small-group settings.

"The BRIDGES expansion of our successful WoVeN program," said program director Tara Galovski, PhD, associate professor of psychiatry and director of the Women's Health Sciences Division of the VA's National Center for PTSD, "fills an important gap in services for transitioning female service members. By welcoming female service members into our strong and supportive community of women veterans, we hope to mitigate and even pre-

vent risk factors for poor outcomes such as isolation and loneliness that our women veterans often experience."

Since 2017, the Walmart Foundation has provided more than \$800,000 for WoVeN and BRIDGES. "The Walmart Foundation has made it possible for us to reach well more than 2,000 women veterans over the last three years. This support has been instrumental in improving the lives of women veterans nationwide, particularly during the pandemic and the subsequent increased social isolation," said Dr. Galovski. ■

## Toffler Charitable Trust Gift to Enable Future-Focused Brain Science

**B**UMC Provost and BUSM Dean Karen Antman, MD, and the BUSM Dean's Advisory Board view donations that enable researchers to take risks and explore their most adventurous ideas as especially valuable, making the news of a \$40,000 grant from the Karen Toffler Charitable Trust to implement the Toffler Scholar Program particularly exciting. The award will provide funding to researchers working on early-stage, future-focused brain science through an internal competition at BUSM.

**The trust aims to support cutting-edge, highly impactful ideas that will push the future of humanity in a brighter, more hopeful direction.**

A nonprofit organization focused on health, medicine, research, education, and technology and prioritizing dementia and Alzheimer's diseases research, the Karen Toffler Charitable Trust continues the legacy of Alvin and Heidi Toffler, world-renowned futurists and global best-selling authors who focused on virtually every

facet of modern society. In this spirit, the trust aims to support cutting-edge, highly impactful ideas that will push the future of humanity in a brighter, more hopeful direction.

BUSM's wide range of clinical and epidemiological Alzheimer's disease research within the Alzheimer's Disease Research Center, the Framingham Heart Study, and the New England Centenarian Study piqued the trust's interest. The Toffler Scholar Program will fund a new BUSM scholar every year, helping young researchers to build promising new bridges to the future. ■

## CTE Center Receives Largest Foundation Gift in Its History

**T**he Chronic Traumatic Encephalopathy (CTE) Center, one of BUSM's most distinctive, influential, and widely known research programs, recently received a \$1M anonymous donation, the largest foundation gift in its history.

CTE is a degenerative brain disease that occurs in people with a history of repetitive mild head trauma—including concussion and asymptomatic subconcussive impacts—such as contact and collision sports athletes, military service members, and others. These injuries cause a cascade of changes in the brain and lead to the progressive destruction of brain tissue. CTE cannot yet be diagnosed with certainty during life, and there are no effective therapies.

The CTE Center is the world's leader in the study of this disease. Director Ann McKee, MD, has developed the world's largest repository of the brain tissue of individuals with a history of repetitive brain trauma, defined the diagnostic criteria for CTE, and done pioneering research on the etiology and natural history of the disease. Robert Stern, PhD, director of clinical research at the center, has examined risk and protective factors of CTE, as well as the clinical mani-



Ann McKee, MD

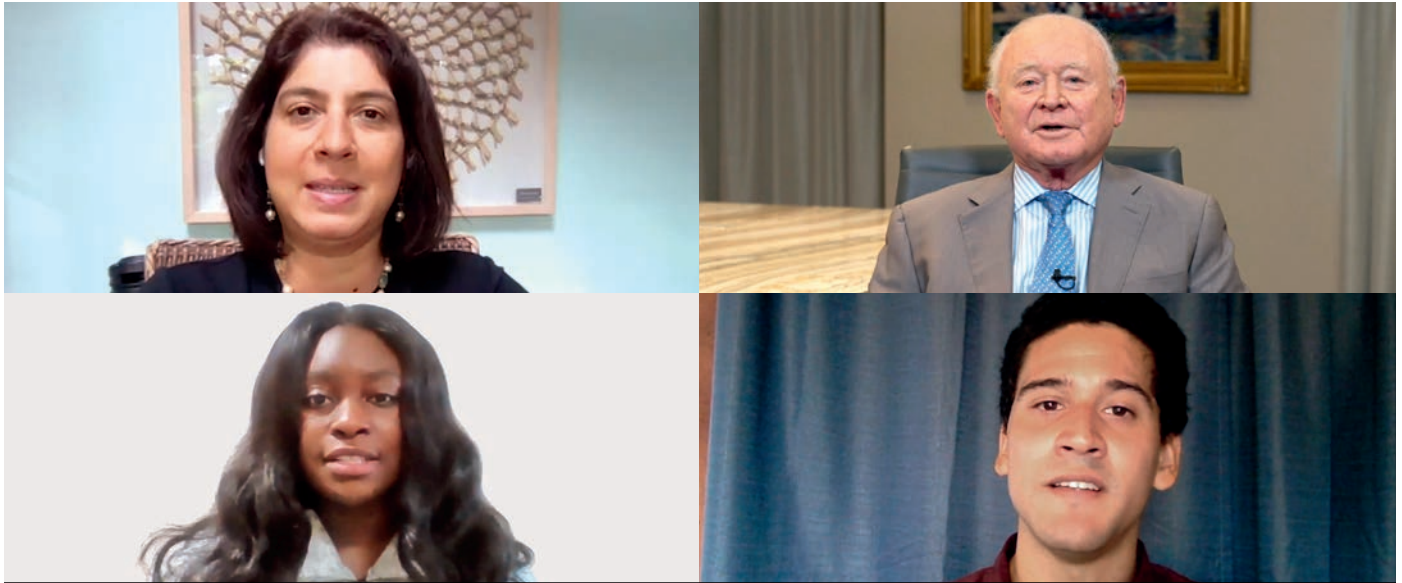
festations of the disease and methods of diagnosing it through fluid and neuroimaging biomarkers.

The gift is intended to support the center in two ways. First, it will enable Dr. McKee to obtain a digital imaging scanner that will allow the team to create ultra-high resolution digital images of tissue samples, study them using AI-enhanced analytical methods, and circulate them through the scientific community without loss of detail or fidelity. As more scientists have access to the cen-

ter's slides, it will enable an acceleration of the search for diagnostics and therapies for CTE, and perhaps other neurodegenerative diseases as well.

Additionally, the donor contributed the funding needed to support three, two-year postdoctoral fellowships. Postdocs are the lifeblood of the CTE Center, essential to both the completion of the work it is currently doing and to the extension of this critical line of research as fellows mature into independent scholars. ■

# At Virtual Scholarship Event, Grateful Students Thank Donors for Financial Support



Clockwise from top, Reshma Kewalramani, MD (CAS'98, MED'98), Stephen Karp (CAS'63), James Valderrama (MED'23), and Oge Nwanegwo (MED'21).

**W**hile this year's scholarship night didn't quite look like previous gatherings, thanks to Zoom, the "Celebration of BUSM Scholarship: An Evening of Gratitude" provided a virtual opportunity for students to thank their scholarship donors.

Dean Karen Antman, MD, kicked off the celebrations by announcing the new scholarships created since last year's BUSM Scholarship Dinner, including the Early Medical School Selection Scholarship, BU Loan Forgiveness Scholarships, and the Rebecca Lee Crumpler Scholarship.

"Now more than ever, we need to diversify our physician classes to serve all Americans," Dean Antman said, referencing Rebecca Lee Crumpler and her trailblazing path as the first Black female physician.

Students took center stage at this year's event as 18 participants recorded remarks to thank their scholarship donors for helping them along their medical education journeys. Donors Dr. Reshma Kewalramani and Stephen Karp then shared testimonials on

their passion for helping medical students through financial support.

The first female CEO of a major biotechnology company, Vertex Pharmaceuticals, and a graduate of the Boston University Seven-Year Liberal Arts/Medical Education Program, Dr. Kewalramani created a scholarship to benefit women and underrepresented students looking to enter the medical field.

"I think we can all agree that it is absolutely critical we do everything we can to build a diverse, inclusive, and equitable society, working with our educational institutions and carrying through to our workforce," she said.

Mr. Karp graduated from Boston University with a degree in government in 1963 and now serves as CEO of New England Development. Recognizing that pediatric doctors make less money than their counterparts in other specialties, the Karp Family Foundation created the Karp Family Scholarships in Pediatrics and the Karp Family Professorship in Pediatrics at BUSM as part of an effort to

**Students took center stage at this year's event as 18 participants recorded remarks to thank their scholarship donors for helping them along their medical education journeys.**

minimize the financial burden on those who choose to enter the field.

"We look to the future of the pediatricians that will be taking care of the kids of America," Mr. Karp said.

Dean Antman then introduced this year's student speakers, Oge Nwanegwo (MED'21) and James Valderrama (MED'23), both of whom discussed their unique paths to BUSM and sincere appreciation for their financial support.

"As I reflect on my time here, I realize that one of the main reasons I have made it so far, the reason I have had all these experiences, is because of the financial support I have received from donors like you," Ms. Nwanegwo said.

Mr. Valderrama noted that donors influence more than just individual medical journeys: "You also shape our careers and the experience of our future patients." ■



# DONOR REPORT

Thank you, donors.

**The Chester S. Keefer, MD Society** • The Chester S. Keefer, MD Society was established as a means of recognizing individuals whose personal philanthropy has helped advance the dual research and education missions of Boston University School of Medicine. The society is named in honor of Dr. Chester S. Keefer, whose foresight and determination in roles as chairman of the Department of Medicine, dean of Boston University School of Medicine, and director of the Medical Center, were responsible for laying the foundation for the Boston University Medical Center. In memory of his spirit, we honor those donors whose lifetime contributions have reached \$50,000 or more at the School of Medicine. Names in **bold** are new members.

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## GIVING LEVELS:

### \$50,000-\$99,999

#### Mercury members

- Invitation to the spring Chester S. Keefer, MD Society Dinner
- Honorary plaque

### \$100,000-\$249,999

#### Bronze members

- All of the previously listed benefits
- Invitation to and preferred seating, when available, at select BU/BUSM events throughout the year

### \$250,000-\$499,999

#### Silver members

- All of the previously listed benefits
- Personalized tour of research/clinical area of your choice at BU Medical Campus

### \$500,000-\$999,999

#### Gold members

- All of the previously listed benefits
- Direct communication with the recipients of your generosity (students, faculty, researchers)

### \$1,000,000+

#### Platinum members

- All of the previously listed benefits
- Private lunch with the Dean and other leadership of the School of Medicine

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 Christopher S. Rose ■  
 Richard F. Rose (MED'73) and Molly Rose  
 Richard Roseff (MED'80) ■  
 Yael L. Rosen (MED'06)  
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 Lynn A. Rosenberg (GRS'65) ■ ■  
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 Jaime A. Rosenthal (MED'20) ■  
 Louis E. Rosenthal (MED'71)  
 and Mary S. Rosenthal ■  
 John E. Rossi and Sandra K. Rossi ■  
 Ann Chatham Rote (Wheelock'78) ■ ■  
 Kate Roth ■  
 Larry H. Roth (MED'75, CAS'72)  
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 Alyssa Rotman ■  
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 Vincent J. Russo (MED'64, SPH'83)  
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 and Lucille A. Williams ■  
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**\$50,000+**  
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 AbbVie Inc.  
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 Alzheimer's Association  
 American Academy of Allergy, Asthma, and  
 Immunology  
 American Cancer Society  
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“

Attending BU led to a fantastic career that’s not only been successful, but brought me great joy and happiness.”

## Robert Novelline (MED’69)

### A BEQUEST INTENTION

For Robert Novelline, attending Boston University School of Medicine set him on a career path that embraced his twin passions: biology and the visual arts.

“BU had a wonderful faculty, and provided an incredible clinical experience, especially at Boston City Hospital, which at the time was a mecca for teaching,” he says. Back then, he explains, the city’s three top medical schools all had medical services there. “I learned from the greats,” he says.

An accomplished artist, Novelline grew up in the Boston area and studied at the Museum of Fine Arts, Boston, as a teenager. Early on, he thought he might become a painter. “And then, in the third year at medical school, when I read my first radiology book and learned about the importance of radiology in clinical care, I realized that this was the career for me because it put my two great loves together: the visual and the science.”

Now, he says, he wants to give back, so he has made a bequest intention to endow a scholarship for a fourth-year student with a preference for those specializing in radiology.

Novelline is a professor emeritus of radiology at Harvard Medical School and former director of the Massachusetts General Hospital Division of Emergency Radiology, among other leading roles. He is also the author of numerous books, including the fourth through seventh editions of *Squire’s Fundamentals of Radiology*, the world’s most popular radiology textbook for medical students.

“BU made all of this possible,” he says. “For the first time in my life, I could focus on medicine, which was my goal in life and my dream.”

## CLASS NOTES

### 1956

**Daniel Powers** of Potomac, Maryland, writes, "As one of the last members of the Class of 1956 to be chosen and one of the youngest, I remember that first anatomy class prior to dissection, when I was the first one called upon to discuss the pectoralis major—and virtually repeated the description from *Gray's Anatomy* word for word and sat down. I guess I was ready to face what, for then, was the daunting task of all the material that we would have to learn during the next four years. Anyone else out there from the Class of 1956?"

### 1958

**Joseph Gaeta** of East Greenwich, Rhode Island, writes, "Finally retired at the end of 2018 after 54 years of practice in internal medicine/cardiology. Enjoying retirement with my bride Carol of 52 years, two great sons, and four grandchildren. Eternally grateful to BUSM for giving me my lifelong professional opportunities."

### 1960

**Walter McLean** of West Falmouth, Massachusetts, writes, "In December, I will celebrate the second year of my retirement from the active practice of medicine. After my rotating internship at Chelsea Naval Hospital, I was assigned flight training at Pensacola, Florida, where I was awarded my designator as a naval flight surgeon. I saw duty in that capacity at Ream Field, California, and wintered at McMurdo Station, Antarctica. Training in pediatrics at Chelsea Naval Hospital and allergy/immunology at Boston Children's Hospital led to postings at Chelsea Naval Hospital as chief of pediatrics and then, as director of the Navy Allergy/Immunology program at Bethesda Naval Hospital. After Navy retirement (20 years), I established an allergy practice in Falmouth, Massachusetts, and

had a second retirement from that practice after another 20 years. For the last 20 years, I have practiced addiction medicine at Gosnold Center in Falmouth, clean slate recovery in Plymouth, and aviation medicine as an aviation medical examiner at Bramblebush Medical Offices near Falmouth Hospital. I am so grateful to Boston University School of Medicine, which afforded me such wonderful training by its dedicated faculty."

### 1967

**Peter M. Glassman** of San Antonio, Texas, writes, "Retired from an anesthesiology practice and clinical trials drug development career to become an author of military, medical, crime, history, and drama-genre fiction. With 15 published books since 2009, my recent historical thriller about an old west physician and the plight of the Comanche Indians, *The Silver Concho*, follows the exploits of Dr. Jacob Cotter, first seen in the saga *COTTER*. As the organizer of the San Antonio Writers Meetup, I have written over 176 short stories, some of which are in two anthologies entitled *Coffee & A Short Story*. We all experience writable facets of life, and I want to impart my factual story lines in entertaining, fictional style."

### 1969

**Michael Salcman** of Baltimore, Maryland, writes, "It took five years to get a publisher for my fourth poetry collection, and when *Shades & Graces: New Poems* came out from Spuyten Duyvil in New York on June 1, 2020, it was in the middle of a pandemic when it's not possible to do public readings! Great timing. My book is the inaugural winner of the Daniel Hoffman Legacy Book Prize; he was a good friend of mine and a former US poet laureate (1973). But being quarantined at my age hasn't been all bad: I've had to learn how to give virtual readings over

Zoom and since March 15, have completed 25 plague poems, five of which have already been accepted by literary journals. I also read *The Plague* by Camus for the first time, a frighteningly predictive work of fiction with a physician as the narrator. I did have excellent timing in closing my practice after 50 years on September 30, 2019, and can't imagine the stress of doing neurosurgical procedures under the present circumstances, though I still remember the first brain biopsies we performed when Creutzfeldt-Jakob disease and HIV became significant clinical concerns. As my mother always said, 'everything happens for the best,' by which I think she really meant, there's no use worrying about problems if we can't make fundamental changes in the situation. I've had a really good run and no ulcers."

### 1971

**Steven J. Block** of Pebble Beach, California, writes, "I've remained in solo, private practice in cardiology since 1976. I practice in a small, northern California town and have remained busy with a large patient population. The pandemic hit the county hard, requiring me to temporarily rely on telemedicine. Many patients embraced the necessity, but others (preferring face-to-face visits or for fear of venturing out) preferred to wait, knowing that I was reachable by phone through my staff. The net effect was more free time for me during this awful crisis. I had previously written a number of screenplays and published two nonfiction books, and recently a novel, entitled *Chromoman—The Beginning*. This extra time allowed me to conceive and execute the sequel, *Chromoman—Corona arcenum, The Ultimate Weapon*, which is currently in production and will soon be available. The book is fiction, but the story allowed me to acquaint the reader with easily understood, accurate scientific information regarding coronaviruses."

CLASS NOTES

**1972**

**Maureen E. Sims** of La Canada Flintridge, California, writes, "Corona the Monster Virus" by Dr. M. Sims

On the nearby campus of which we are fond  
 The new ICM students were happy and forming a bond  
 Multidiverse, with hair yellow, black, and brown  
 The weather was warm, snacks were plenty, not a single frown  
 The students had finished their gap years, taken all their prelims  
 And they were all happy now that they were in ICM

They were...until Corona the virus, the monster of all,  
 Decided its rule in Wuhan was too small.  
 I'm ruler, the destroyer, of all that I see  
 But I need to infect. That's the trouble with me  
 With humans as vectors I move in the crowd  
 With tight jam-packed places and beyond.  
 If my droplets could travel faster and beyond, how much greater I'd be!  
 What a monster! I'll try to ruin ICM at Keck USC!

But the ICM team, it could not defeat  
 The students kept up with learning and would not retreat  
 They kept up their spirits and their education  
 As scientists encouraged masks and social isolation

All mine, Corona cried. Oh the thing I now rule  
 I'm king of LA County, I'm king of Keck Medical School  
 I'm king of the USC clinics and even its chorus  
 And even king of the entire library at Norris  
 I'm Corona! Oh marvelous me!  
 For I am the ruler of all USC

But Group 12 would not remit  
 Not one of the students or instructors would quit  
 There would be no fails  
 Shelby kept answering every single one of my emails

Julian showed he knew syphilis because his pts had parts that blistered  
 Despite Covid, Madeline was funny and stayed quite unfiltered  
 Juan pressed onward, did not flee, planned on a career in neurology  
 Tamara thought Peds, Sam OB  
 We will be doctors, we will all bloom  
 We will keep learning with the virtual aide of Sims, Sims, and Zoom

**1975**

**Louis J. Scheinman** of Toronto, Ontario, writes, "The best outcome of the COVID-19 pandemic was that it provided me with an unexpected, but opportune, time to retire. After almost 49,000 surgical cases it was the right time. I'm now doing full time what I've always done part time—trading equity options—and thoroughly enjoying every minute of it. Mary and I are enjoying our grandkids and hoping that life gets back to some kind of 'normal' soon. I also hope to get back to Boston and visit BUSM once pandemic and travel circumstances allow us to do so. I'm otherwise well and hoping that old friends and acquaintances from BUSM are also. Regards to all."

**1976**

**Mark Goulston** of Los Angeles, California, writes, "*Why Cope When You Can Heal? How Healthcare Heroes of COVID-19 Can Recover from PTSD*, authored by Mark Goulston, MD, and Diana Hendel, PharmD, with a foreword by Quint Studer, published by Harper Collins Horizon, December 2020, introduced to the world the approach of Surgical Empathy to help people with PTSD begin to heal from their inside out."

**1977**

**Steven H. Rosenberg** of Torrance, California, writes, "Still practicing Ob-Gyn. I have a son in med school at Temple, another son in pharmacy school at Northeastern, and a daughter who just graduated from the University of California, Santa Barbara and will be applying to nursing school."

**1978**

**Thomas L. Higgins** of Longmeadow, Massachusetts, writes, "Recently appointed as interim chief medical officer at the Soldiers' Home in Holyoke, Massachusetts. I am an owner and consultant at the Center for Case Management in Natick and continue to practice critical care part time at Baystate Medical Center in Springfield."



## CLASS NOTES

**1980**

**Andrew M. Wexler** of Pacific Palisades, California, writes, “For over 25 years as a craniofacial surgeon, I have operated and taught in some of the poorest countries on Earth. I retired from my longtime, full-time position as chief of plastic surgery at Los Angeles Kaiser at age 65. Retirement has given me more time to spend working abroad for a number of different organizations, including my own 501c3. I was packed to spend two months in Malawi, then COVID hit and put an end to my travels. I have found, however, that with modern technology, my work could continue. Recently, I livestreamed lectures and engaged in dialogue on facial trauma with surgeons in nine different African countries. I also am able to respond to consults via email from my colleagues and friends around the world. The world is a smaller place now than it was when we graduated. I am also proud to report that I was awarded the Lifetime Achievement Award, the highest honor given by The American Society of Maxillofacial Surgeons, for my contributions to the field of maxillofacial surgery. I look forward to once again being able to travel, to be of service, and to teach in person. Meanwhile, I will work at being a grandfather.”

**1981**

**Melody T. McCloud** of Roswell, Georgia, writes, “I participated in an *NBC Nightly News* segment regarding Dr. Rebecca Lee Crumpler, the first Black female physician, who graduated in 1864 from (what is now) BUSM, where there is an exhibit in her honor. In 2019, Virginia Governor Ralph Northam declared National Doctors’ Day in her honor; in 2020, Friends of the Hyde Park Library placed a headstone at her and her husband’s grave at Fairview Cemetery. As a result of all this, BUSM has now initiated a scholarship in her name. I also have a new literary agent and am working on two books, one about ethnic health disparities and the other on physicians’ ever-noble call to care, even in a profession under siege.”

“**While there have been negative aspects to COVID, there are also positive ones, which, I believe, will make us stronger both in healthcare and as a country.**”

—**Robert Falcone (MED’84)**

**1983**

**Paul E. Kalb** of Washington, D.C., writes, “As some of you know, I left the practice of medicine many years ago following my residency and a year at Memorial Sloan-Kettering to pursue my interest in law. I’m now living in Washington, D.C., with my wife and teenage daughter, heading the Healthcare and FDA practice at Sidley Austin, a global law firm. It’s been a great professional experience, and despite my focus on law, I still draw heavily on my clinical background. The pandemic has brought to the fore just how critical our physicians and all of the others who comprise our healthcare system are to the proper functioning of the rest of society. I’m not on the front lines like so many of you, but I’m grateful for my training and early experience during the AIDS crisis—both have given me a unique set of insights into our current experience.”

**Arnold I. Pally** of Towaco, New Jersey, writes, “Happy to add a Population Health Medical Directorship role for Partners in Care ACO (piccorp.com) in New Jersey. I am a medical director for my family practice

group, a member of Consensus Health (changebridgemedical.com), a midsized, multispecialty medical group in New Jersey, and also for VaxCare (vaxcare.com), headquartered in Florida. I continue as founder and associate director of the Genomic Medicine program at Atlantic Health for 10 years now. Last year, I was appointed to the American Academy of Family Medicine Commission on Education, where I serve as a national delegate. On the home front, my wife Robin and I are proud grandparents of two boys and a girl living in Charleston, South Carolina, and here in northern New Jersey. Stay safe in this pandemic!”

**1984**

**Robert Falcone** of Warren, New Jersey, writes, “While there have been negative aspects to COVID, there are also positive ones, which, I believe, will make us stronger both in healthcare and as a country. Experiencing adversity is necessary throughout our lives, since the experience and outcome only makes us better as individuals and collectively.

I am happy to report that I have experienced a very positive benefit during this pandemic—I have been fortunate to be directly involved in contributing to the success of a COVID vaccine trial. Our clinical research practice in New Jersey was selected to participate in one of the large Phase 3 COVID vaccine trials.

Another positive aspect is the number of patients who volunteered for this trial, which reinforces my faith and confidence in Americans. In six weeks, we enrolled 240 patients—which is significant for a clinical research site—but it only occurred because of all these individuals who want to contribute to a solution for this pandemic.

As a physician, I am very fortunate to be the principal investigator for this critical study, where I have ultimate responsibility and oversight. Being involved in this trial and acting as the PI has become the most important and satisfying work in medicine during

## CLASS NOTES

my 36 years as a physician, which started after graduating from BUSM in 1984.

The education that I received from BUSM provided me with an excellent medical foundation on which to build my career as a physician. I will forever be indebted to BUSM for this education, which allowed me to achieve success in so many diverse aspects of medicine."

**David J. Sherer** of Chevy Chase, Maryland, writes, "My third book, *Hospital Survival Guide*, was released in August. My next, *What Your Doctor Isn't Telling You*, will be released in February of 2021. I write a blog of the same name for *BottomLineInc*, a consumer-oriented print and online news source. I enjoy not working in clinical medicine anymore—too much third-party intervention. The doctor-patient relationship has been breached and I hope that will not stay, although I have my doubts. Medicine has changed forever, and not for the better. I enjoy travel, fitness, my piano, and watching the world go by. I wish you all well."

**1985**

**Nicole Simone Gibran** of Seattle, Washington, writes, "2021 brings the end of an incredible surgical journey that started at BU, where I completed both medical school and a surgery residency (1990), and ended at the University of Washington, where I have enjoyed my surgical avocation for 30 years as an academic burn surgeon, researcher, and administrator. I am grateful for all of the mentors, colleagues, and friends who have buoyed me over the years. With my retirement, my husband Frank Isik, MD (BUSM Surgery Residency, 1990), and I move back to Massachusetts, where we hope to revive our hobbies and actually attend a Class of '85 reunion."

**1997**

**Matthew Brackman** of Longmeadow, Massachusetts, writes, "Self-published my first science fiction novel, *Regal and The*

*Galaxy Hound*, on Amazon Kindle Publishing under the pen name Burt Land. Published two nonfiction works, *Med Mal* and *The MD Score*, also available on Amazon Kindle, under the name Matthew Brackman, MD."

**2000**

**Pradeep Prabhakara Nazarey** of Shrewsbury, Massachusetts, writes, "I have been a pediatric surgeon and assistant professor of surgery and pediatrics at the University of Massachusetts Medical Center for the last 10 years. Just prior to the COVID-19 outbreak, I had contemplated a career change. As the outbreak hit Massachusetts, I was offered a position as a medical director in the Gastroenterology Business Unit of Takeda Pharmaceuticals, an opportunity to work on multiple therapeutics to help people with Inflammatory Bowel Disease. At the same time, I was able to be home with my wife and children and be my kids' teacher in a new, virtual world. These interesting times have afforded new opportunities and ways to connect with my family. My best to everyone."

**2003**

**Rakesh Choudary Navuluri** of Chicago, Illinois, writes, "I'm an associate professor of vascular and interventional radiology and the program director of the Interventional Radiology residency at The University of Chicago. In March 2020 I was elected to fellowship in the Society of Interventional Radiology, an honor awarded to fewer than 10 percent of members. Unfortunately, the induction ceremony in Seattle, Washington, was cancelled due to the COVID-19 pandemic."

**2020**

**Charles Joseph Surette** of New York, New York, writes, "The past six months have proved incredibly arduous for all of us. We have endured unprecedented challenges in our personal and professional lives, and we continue to face uncertainty as we

contemplate the next steps. Even in the face of loss and tribulation, we can find some positivity, and maybe even a few blessings in disguise. I have treasured the opportunity to spend more time with family, especially just prior to moving away to start residency. I have seen people give of themselves to help their fellow human beings, and I am cheered by the resolve of individuals to persevere, even in the face of a global crisis. My hope is that we have grown closer as human beings and that we can carry this community spirit forward, well past the end of this pandemic." ■



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# “We All Stand on the Shoulders of Others.”

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**Sarkis J. Kechejian (MED'63)** was born and raised in Queens, New York. His parents were immigrants and survivors of the Armenian genocide who worked hard, were involved with their church community, and were happy with their new life in America.

“I have memories of cracking and preparing walnuts for 100 trays of my mother’s baklava donations to the church,” recalls Dr. Kechejian. His parents’ hard work and dedication to others would be instilled in his way of doing things, and ultimately, his inspiration for giving.

After attending NYU, Dr. Kechejian made his way to Boston University for medical school. He worked summer jobs, received financial aid, and ended up graduating with only \$10,000 in debt.

In the '90s, Dr. Aram Chobanian invited him to be a member of the School of Medicine Board of Visitors to provide guidance and support for students and the school.

“I couldn’t believe how much tuition costs had risen. Dedicated students shouldn’t be burdened with a mountain of debt.”

By the 2000s, Dr. Kechejian made two generous \$1 million donations. Recognizing the significant need for student financial assistance, he established the Kechejian Family Scholarship Fund—the first of its kind for BUSM students.

“We all stand on the shoulders of others—we didn’t get here alone. I have always been very grateful for the excellent education I received at the medical school. It truly is one of the many shoulders I still stand on today. I hope my scholarships, in turn, will inspire students to do the same when they are able,” he said. Students who receive funds from Dr. Kechejian are encouraged to write to him about themselves so he can learn more about their background and journey to becoming a doctor.

Today, Dr. Kechejian is a cardiologist, president of K Clinics, located in North Texas, chief executive officer and chairman of the board of Alliance Health, Inc., and president of the Kechejian Foundation.

At 81 years young, Dr. Kechejian has a few words of advice for his peers who may be on the fence about donating: “Don’t give until it hurts...give until it feels good. Also remember, the last suit we wear doesn’t need any pockets.”



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