

Columbia Medicine

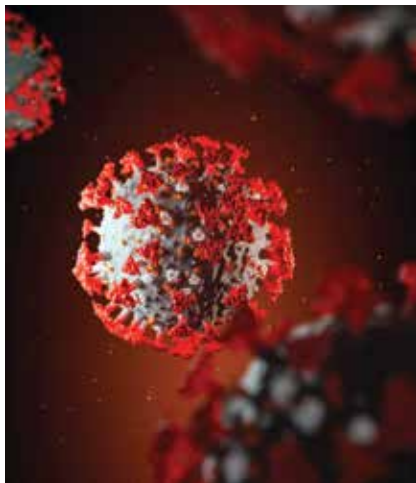
2019-2020 ANNUAL REPORT

Columbia University Vagelos College of Physicians & Surgeons



**FIGHTING
TWO
VIRUSES:
COVID-19
AND RACISM**

Features:



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At a Crossroads: Medicine and the Movement

Work toward health equality has begun at VP&S and all of academic medicine as early summer protests revealed the health disparities in medicine in general and especially in COVID-19 cases. Students and faculty share their own perspectives on the intersection of COVID-19 and Black Lives Matter.

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All Hands on Deck

Pivot was the action verb that describes how VP&S clinicians, researchers, and students confronted COVID-19 when the virus arrived in New York City. From redeploying clinicians to areas outside their specialty to graduating fourth-year students early, VP&S helped “bend the curve” at the epicenter of the nation’s pandemic.

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The Bioethics of Genomics and Justice

A new ethics division is expanding VP&S scholarship into the ethical, legal, and social implications of precision medicine. The 360-degree perspective includes “studying the studies” as researchers continue to unleash the power to treat, prevent, and cure disease. The effort also provides an opportunity to bring social science to bear on bioethical questions.



On the Cover

Steven McDonald, MD, a 2014 VP&S graduate, is one of five faculty members and medical students who share their perspectives on the Black Lives Matter movement. Read about the five and the VP&S plans to promote racial justice, Page 4.

Photograph by Jörg Meyer

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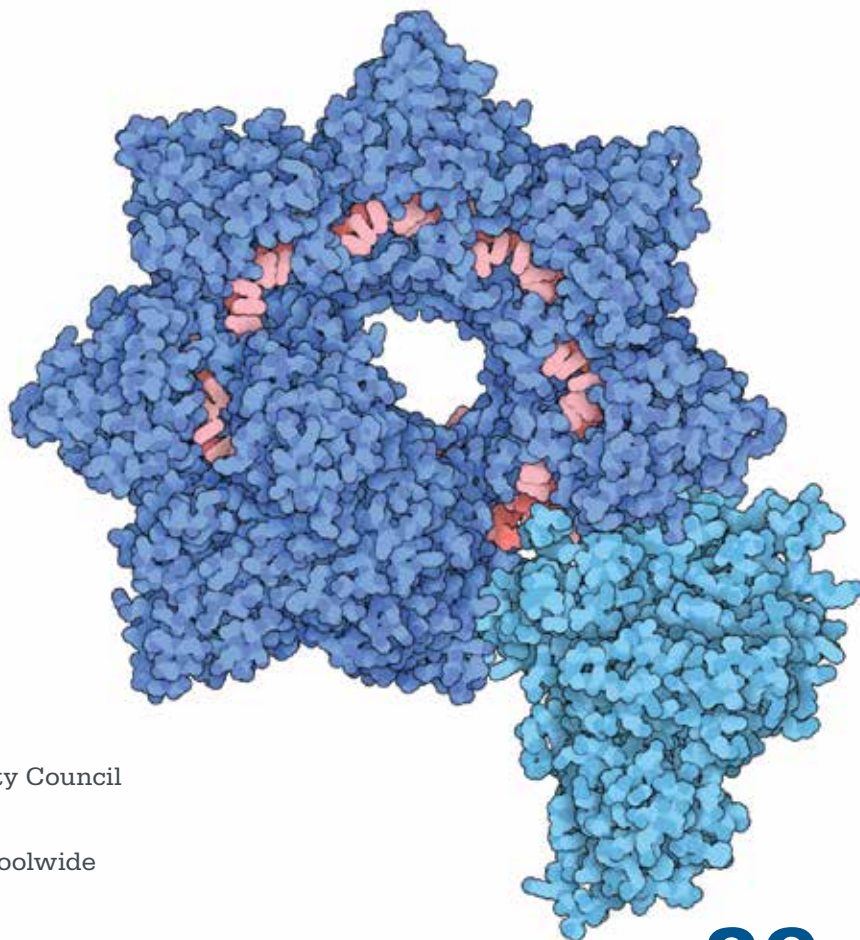
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2019–2020 VP&S Annual Report

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A YEAR LIKE NO OTHER



BARBARA ALPER

As people all over the country watched, New York City became the epicenter of the U.S. COVID-19 pandemic and all eyes were on our faculty, students, and staff, as well as our colleagues at our partner, New York-Presbyterian. Our commitment to simultaneously treat patients, test best practices for helping those patients, and research the science of the virus was on view even beyond our national borders and illustrated the strength of our great school's partnership with an equally great hospital.

A pandemic alone would have been enough to define the 2020 fiscal year described in this annual report, which covers the year that began July 1, 2019, and ended June 30, 2020. But as we started to feel some relief from fighting the virus, Black Lives Matter protests reminded us of the health disparities revealed by COVID-19 and other persistent structural racism in academic medicine and throughout society, unfortunately.

These two history-changing phenomena converged just as the Vagelos College of Physicians and Surgeons (VP&S) and the greater Columbia University Irving Medical Center were transitioning to new leadership. As Lee Goldman, MD, prepared to step down as chief executive of the medical center and dean of VP&S at the end of Fiscal 2020, I was appointed by President Lee Bollinger as interim EVP and dean. Dr. Goldman was a good teacher during the transition and continues to advise me on important matters. The last months of his tenure were unlike any other four-month period of his 14 years as dean, but he was generous with his time in preparing me for the transition.

Inside this annual report, you can read about the impact of the pandemic on research, patient care, and education and the impact of the Black Lives Matter movement on five members of our community as illustrative. A taskforce was commissioned by me with multiple working groups across the medical center in July 2020, and a full report should be available for the Fall/Winter 2020 issue of *Columbia Medicine*. I will welcome your feedback on the steps we will take to strengthen our commitment to an inclusive workplace, our pledge to eliminate health disparities, and our efforts to educate and train a generation of health care professionals who will make equality a hallmark of health care for all.

We paused most research during the height of the pandemic—with the exception of COVID-19 research, research that could be performed remotely, and clinical research that could directly benefit the patients being studied—but an impressive amount of research had been published before the first COVID-19 patient appeared. Highlights of research projects, clinical advances, educational milestones, and community engagement fill several pages of this report, and a special section of highlights is devoted to COVID-19 research.

Several research highlights show the power of cryo-electron microscopy (cryo-EM), a scientific advance for which Joachim Frank, PhD, shared the Nobel Prize in Chemistry in 2017. The research made good use of the new Cryo-electron Microscopy Center that opened in the lower level of the Hammer Health Sciences Center. The center trains researchers and provides access to the advanced instrumentation, data collection capacity, and processing support required to incorporate cryo-EM into their studies at the medical center, at Columbia's Zuckerman Institute, and at the New York Structural Biology Center campuses.

Although the final figures from the NIH are not yet available for the 2020 federal fiscal year, early indications show government support of our research remains strong, with VP&S receiving a substantial increase in NIH funding this year. If the early figures are confirmed,

The Aaron Diamond AIDS Research Center at Columbia, led by David Ho, is one of the teams trying to identify potential antiviral drugs and antibodies for use against the new coronavirus. Pictured is Kenia De Los Santos, a senior technician in Dr. Ho's lab.



JENNIFER O'ROURKE



JENNIFER O'ROURKE

we will move in NIH funding rankings from #9 in 2019 to #5 in 2020. Another measure of our research excellence is Nature Index, an annual calculation of research citations. In the 2019 index, Columbia University Irving Medical Center was No. 1 in the health care sector. We have ranked either No. 1 or No. 2 over the past five years. Among medical schools ranked by the U.S. News & World Report, VP&S tied for sixth place this year, our highest ranking in recent years.

As research advanced at VP&S during the year, so too did patient care. Most notable is the growth of primary care. The recruitment of David Buchholz, MD, as senior founding medical director for primary care at ColumbiaDoctors and NewYork-Presbyterian has expanded our strategy to provide patients greater access to primary care services across the New York metropolitan area. Plans are moving forward on new primary care practice sites on the Upper West Side, in Midtown, and in Westchester. The Washington Heights and Morningside campuses have primary care practices, part of the strategy to add 50 to 70 primary care doctors in the next five years in partnership with NewYork-Presbyterian.

Confident that in-person outpatient care will always be an option—and for some patient care a necessity—we are nonetheless heartened to see how quickly our patients have taken to telemedicine. Credit goes to our physicians and also to the leadership of NewYork-Presbyterian and ColumbiaDoctors who rolled out a new electronic health record—EPIC—just before the height of the pandemic. EPIC's rollout included plans for telemedicine, but no one could have foreseen how quickly our faculty, staff and patients would need to pivot to this technology and would do so in large numbers. The technology is here to stay.

Preparing the next generation of physicians and scientists will always be at the core of our mission, and this year's accomplishments in education were not dimmed by the changes put in place to respond to the pandemic. Even though the way we taught students shifted, it was a momentary course change and we hope to have all students back on campus next year, recognizing that many CUIMC students are on campus already. In addition to adjusting to online learning early in the pandemic, students stepped up to support our missions in new ways, whether collecting data for research teams, taking on service-learning projects to support front-line workers, performing music to provide respite for colleagues, or bringing together students from around the world to collaborate virtually.

I want to emphasize our deep partnership with NewYork-Presbyterian in multiple domains related to clinical care, graduate medical education, and community programs under the leadership of Dr. Steve Corwin, president and CEO.

Every year we publish an annual report to document measurements of growth, and VP&S during the 2020 fiscal year showed growth, adaptation, and resiliency in abundance. While the year will best be remembered for what changed us, it must also motivate the growth that will strengthen us in the years ahead.

Sincerely yours,

Anil K. Rustgi, MD

Interim Executive Vice President and Dean of the Faculties of Health Sciences and Medicine
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The Department of Emergency Medicine has been on the front lines of the pandemic since the first patients were admitted in March. Wearing full personal protective equipment are two emergency medicine faculty: Angela Mills, department chair, and Penelope Lema.

In early June, Columbia University Irving Medical Center held a vigil featuring nine minutes of silence—one for each minute that George Floyd’s life ebbed as a police officer kneeled on his neck in Minneapolis. The employees who gathered in front of university and hospital buildings—and others who paused in their work across campus or at their remote work locations—to stand or kneel were joining forces with tens of thousands of protesters who peacefully assembled across the United States and around the world to call for police reform and an end to systemic racism.

Like medical schools everywhere, VP&S felt the weight of responding—acknowledging the role of structural racism in health disparities and in patient care, education, research, and workplace environments. In the months since, VP&S and other medical schools have worked to find solutions unique to their missions: augmenting a diverse and inclusive environment for students, faculty, staff, and patients; conducting research that improves

AT A CROSSROADS: MEDICINE AND THE MOVEMENT

REFLECTING ON MEDICINE AMIDST A
GLOBAL HEALTH CRISIS AND A RACIAL RECKONING

By **Brittany King and Sharon Tregaskis** // Photographs by **Jörg Meyer**





Lisa Mellman



Jonathan Amiel

‘The protests are the necessary medicine for both ills.’

health care; combating health disparities; expanding community programs; and strengthening education and training. A task force with multiple working groups across Columbia University Irving Medical Center was formed in the summer.

The institutional reflection sparked by the summer protests coincided with the greatest public health crisis in modern history and heightened white Americans’ awareness of race-based health disparities. As COVID-19 affected Black Americans at more than twice the rate of white Americans, the social faults that give rise to disparities stood out in stark relief. Suddenly, the deaths of Black Americans—either at the hands of police or through a virus no one knew existed a few months earlier—collided, and for many protesters, the hazard of coronavirus infection paled in comparison to the brutal consequences of systemic racism. “As a Black physician,” wrote emergency medicine physician Steven McDonald, MD, in a New York Times opinion piece, “I understand that the protests are the necessary medicine for both ills.”

“The statistics of illness and death from the pandemic make clear that the virus and racial injustice are interwoven into the fabric of this part of our history,” says Anil K. Rustgi, now interim EVP and Dean of the Faculties of Health Sciences and Medicine. “Just as we have learned much about COVID-19 this year, we also have acknowledged that we are in a unique position to have an impact on health care disparities. We can work toward health equality by examining the education of health care professionals,

the way we care for patients, and how our research can improve health outcomes.”

At VP&S, 13% of students in the entering Class of 2024 are Black (an additional 9% are Latino with a combined total of 22% for underrepresented students, above the national average), compared with 7% nationally. (Slightly more than 5% of all U.S. physicians are Black.)

Students are actively involved in the work toward change. “Our VP&S students, led by our Black student leaders, brown students, and white allies and supported by faculty and administration, have catalyzed a process for effecting long overdue change,” says Lisa Mellman, MD, interim co-vice dean for education. “We are proud of our students, united in our commitment, and grateful to collaborate across the school, the campus, and with the community.”

Adds Jonathan Amiel, MD, interim co-vice dean for education: “Our responsibility to improving health care for all begins here at VP&S. We must enhance equity and justice within our own academic medical center and ensure that our training programs equip health care providers to advocate for equity and justice in their work. Our staff and faculty share this commitment with our students and are already hard at work moving ahead with curricular innovations.”

As VP&S redoubled its efforts to promote racial justice, a few Black medical students and physicians at VP&S shared their thoughts on navigating this historical moment—what one calls a “perfect storm.”

Hilda Hutcherson, MD

Senior Associate Dean for Diversity and Multicultural Affairs

When Dr. Hutcherson arrived at VP&S, she became the first Black woman resident in the Department of Obstetrics & Gynecology. “Those early days were really difficult because there were so few Black people among the residents or faculty; it was very isolating. Discussions about race, racism, equity, and inclusion didn’t take place. As a minority physician, you learned to put your head down and forge ahead.”

In the years that Dr. Hutcherson has led the Office of Diversity and Multicultural Affairs, the representation of students underrepresented in medicine has increased. For more than 10 years, Black, Hispanic, and Native American students have ranged from 20% to 24% of each entering class. “Increasing the diversity of the health care workforce is an important first step to decrease health disparities in minority communities.

“The combination of the COVID-19 pandemic and the murder of George Floyd and other African Americans by police caused us all to look squarely in the face of racism in our society and how our institution may have contributed to this social ill. As an adviser for students of color, I have heard, firsthand, the pain and anguish of implicit bias and racism. We are working hard to extinguish systemic racism at our institution and the community at large.”

Structural change often comes slowly, says Dr. Hutcherson, and depends on the synergy of collective action and strong leadership. “You need a critical mass of people getting together—where all of us, putting our energy together—say ‘The status quo is no longer acceptable. There is a need for change.’ And you have to have a leader who says, ‘This is important,’ who takes those recommendations and makes them happen. I am confident

that our current leadership, with Dean Rustgi at the helm, will make lasting systemic change that will make VP&S a place where everyone feels comfortable and supported.”

“As an adviser for students of color, I have heard, firsthand, the pain and anguish of implicit bias and racism.”



Hilda Hutcherson

Steven McDonald, MD

2014 VP&S Graduate and Assistant Professor

As the son of a physician and a nursing school dean, Steven McDonald, MD, assistant professor of emergency medicine, has long believed that working in medicine was a way to be on the “good side” of injustice. He was running the Boston

Marathon in 2013, the year a bomb went off at the finish line. He rushed to the scene to help. “I wasn’t needed,” says Dr. McDonald, “but that experience made me wish I knew a bit of emergency practice, so I went back and did a round of emergency medicine.”

The training altered his professional trajectory; today in addition to teaching at VP&S, he treats patients in three New York City emergency departments. “Emergency medicine is social justice—a majority of the patients we serve are Black and Latinx,” he says. “People who are left disenfranchised by the system are ultimately cared for by emergency medicine.”

Since the pandemic began, Dr. McDonald has expanded his focus. “As COVID started to ramp up, I felt that I needed to amplify my voice as much as possible to communicate what I was seeing.” He began speaking to the press about the intersection of his experiences

as a Black man and a doctor and penned opinion pieces for the New York Times and Atlantic magazine.

At protests, Dr. McDonald has noticed more of his non-Black colleagues present, including his

former educators. “There’s been a real societal shift since the death of George Floyd,” he notes. “I can’t tell you why it took his death over Trayvon Martin’s or Michael Brown’s, but there’s a real change in public support for the Black Lives Matter movement. To the extent that medicine is lifelong learning, my white peers are seeing that it includes learning about anti-racism.”

“To the extent that medicine is lifelong learning, my white peers are seeing that it includes learning about anti-racism.”



Steven McDonald



Taiwo Peter Alonge

Taiwo Peter Alonge '21

When fifth-year medical student Taiwo Alonge becomes a doctor, he plans to serve Black and brown communities. “When Trayvon Martin was murdered while I was in high school, I knew that if I was going to be a doctor, I needed to serve people who looked like me,” he says.

Since then, he has worked to understand our current health care system, especially the disparities between communities of color and white communities. Studying both medicine and public health (in the Mailman School MPH program) has allowed him to understand how to treat issues that plague Black and brown communities, while also working to find solutions that promote preventive care. “Oftentimes, issues like hypertension and diabetes add up in patients,” he explains. “But if we could treat those smaller things before they get too big, we can make health care better and our patients healthier. To me, that’s a doctor’s job.”

Mr. Alonge says much of the work it takes to truly understand health disparities starts when students enter medical school. For a long time, he was skeptical whether the changes he wanted to see in his field would happen.

“I think every medical institution is trying to figure out how to have these conversations, especially now. There’s this feeling that something has to shift,” he says. “But if students are going to be involved in lecture conversations about race, potentially re-traumatizing themselves to try and educate other people, there needs to be some sort of compensation. Because of what we’ve seen happen with George Floyd, Breonna Taylor, and Tony McDade—on top of being forced to stay inside for three months—future doctors will have the opportunity to learn about systemic racism in their coursework. I hate that it took this awful perfect storm for it to happen, but this change could dramatically impact what it’s like to be a person of color in America, even outside of medicine.”

“I hate that it took this awful perfect storm for it to happen, but this change could dramatically impact what it’s like to be a person of color in America, even outside of medicine.”

Ogoegbunam Brian Okolo '23

When asked what it feels like to be Black in his program at Columbia, Mr. Okolo recounts a particular struggle at the intersection of his racial and professional identity. “It is truly a privilege to be at Columbia, but as one

of a few Black med students here, I’m continuously reminded of the exclusivity associated with highly academic spaces,” he says. Born into a Nigerian immigrant family, Mr. Okolo aspires to uplift and advocate for Black and brown communities as a health care provider. Mr. Okolo chose to study at VP&S because of the sense of support he felt when visiting, especially within the BALS (Black and Latino Student Organization) community. “It is hard to imagine navigating medical school without the support of BALS. It has been particularly valuable to me now, amidst the widespread anti-Black racism that we continue to face.”

When he first heard about the murder of George Floyd, the news sat with him in a way he knew it did not for his white peers. “The weight of realizing that could be me and having to grapple with that reality, while trying to study for an exam to main-

“As one of a few Black med students here, I’m continuously reminded of the exclusivity associated with highly academic spaces.”

tain my status as a medical student was something I was really struggling with,” he recalls. “The very next day, I had to go to class as if everything was normal. It was difficult for me to balance my identity as a Black student and a med student in a space where the guise of ‘professionalism’ leaves little room for these important conversations to happen. It is vital for medical institutions to critically examine the practices that contribute to racial injustice that has been invisibilized for far too long.”



Ogoegbunam Brian Okolo

Keyanna Jackson '23

Keyanna Jackson grew up in Wilson, North Carolina, a small town where local medical care was substandard. Her family drove to a hospital 30 minutes away, one with a better reputation. But that didn't always mean better care. "My grandfather had an older white doctor who was dismissive," she explains. "He had hypertension and the doctor would speak about it as if it were normal."

Eventually the family switched doctors. The new doctor, a woman, was attentive, explained complex issues, and even allowed Ms. Jackson to shadow her throughout high school. "Having a woman pour so much into me and my family allowed me to see what was possible," says Ms. Jackson.

At VP&S, Ms. Jackson facilitates mutual support among fellow Black medical students. As president of the Black and Latino Student Organization (BALSO), the Columbia chapter of the Student National Medical Association, and the Latino Medical Student Association, she works to connect her peers and faculty to one another for academic support and mentorship. BALSO also partners with local schools to encourage children to pursue a career in medicine.

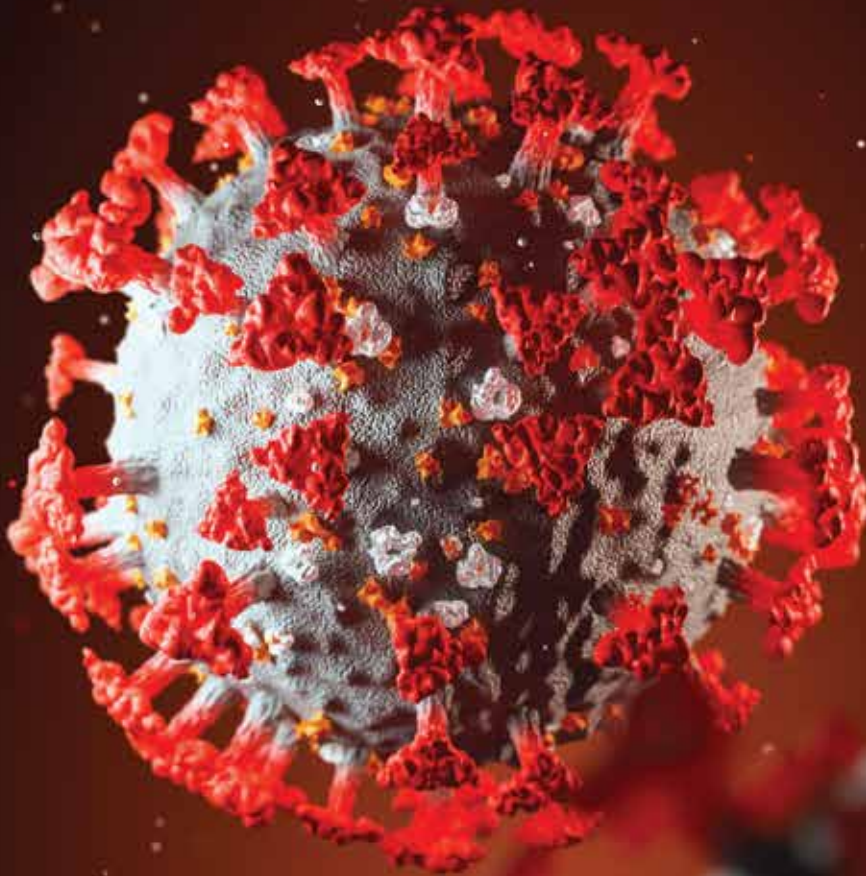
Yet Ms. Jackson laments that more robust structures were not already in place through VP&S to facilitate this work. "There needs to be a better understanding of what the invisible labor looks like for Black faculty and students to show up as mentors, or explain health disparities in our communities to our white peers," she says. "It can be hard to navigate white spaces, or sit in class and hear about how certain diseases affect my community without much context or explanation on why that might be."

In recent years, VP&S has revamped its curriculum to include more anti-racist

content. Ms. Jackson says that's a start, and she would like to see more done within the curriculum to ensure that Black students alone are not forced to explain anti-racist concepts to their non-Black peers in discussions of race and medicine. "People can do the reading and take what they want from it. There should be opportunities to have these types of conversations about race," she says. "Maybe tap on those outside of the medical field to facilitate this. Students have been asking for it." ❖

"It can be hard to navigate white spaces, or sit in class and hear about how certain diseases affect my community without much context or explanation on why that might be."





ALL HANDS ON DECK

BY KRISTIN BUNDY

HOW COLUMBIA FACULTY
CHANGED COURSE
TO NAVIGATE COVID-19

PORTRAITS BY JÖRG MEYER

At the end of March, George Hripcsak, MD, had expected to attend a symposium in England for a global interdisciplinary research collaborative whose coordinating center operates out of VP&S. Instead, on March 26, Dr. Hripcsak and fellow members of the leadership committee of the Observational Health Data Sciences and Informatics (or OHDSI, pronounced “Odyssey”) launched an 88-hour virtual study-a-thon with more than 300 investigators from dozens of countries in attendance.

“This is how we shifted our efforts to COVID,” says Dr. Hripcsak, co-PI of the international OHDSI, “an around-the-clock, four-day meeting of researchers from North America, Europe, and Asia, coming together to kick off our COVID study.”

Since 2014, Dr. Hripcsak and other volunteer members of OHDSI have amassed a database of electronic health records and claims data on nearly 600 million patients worldwide. That dataset put them in a unique position to combine efforts against the new disease. With real-world data at their fingertips, they developed an observational study designed to answer questions about this novel illness, for example, *Who is getting the disease more often? Which therapies work? What are the myriad risks for complications?*

“There wasn’t a lot of sleep during those 88 hours,” says Dr. Hripcsak, but those sleepless nights yielded quick results. By early April, the use of hydroxychloroquine alone or in combination with azithromycin was under consideration as prophylaxis for health care workers. Dr. Hripcsak and colleagues alerted the U.S. Food and Drug Administration and its European counterpart—the European Medicines Agency—that the OHDSI database shows a number of sudden deaths were associated with short-course hydroxychloroquine/azithromycin among patients without COVID-19. Ultimately, government officials did not recommend this form of prophylaxis.

In parallel with the OHDSI work, Dr. Hripcsak published other COVID-related papers between April and June, including a study run by VP&S medical students and published in the *British Medical Journal* that characterized the course of disease of the first 1,000 COVID-19 patients admitted to New York-Presbyterian Hospital and a study published in the *New England Journal of Medicine*, written with Joshua Geleris, MD, and Neil Schluger, MD, demonstrating that hydroxy-



chloroquine was ineffective at mitigating the risk of intubation and death among patients with COVID-19.

Dr. Hripcsak was one of dozens of VP&S faculty who leveraged ongoing work to briskly and substantively address clinical and investigative challenges that emerged as New York City became the epicenter of the pandemic starting in March 2020.

At the Center for Radiological Research, director David Brenner, PhD, had been working on a particular wavelength region of UV light (far-UVC, 222 nm) which he had shown was efficient at killing airborne influenza virus but, unlike conventional germicidal UVC light, was safe for direct human exposure. He quickly pivoted his focus to SARS-CoV-2, the coronavirus that causes COVID-19. In a paper published in June, Dr. Brenner showed that far-UVC light, used within current regulatory safety limits, inactivated 90% of airborne coronaviruses in eight minutes and 99.9% within about 25 minutes.

“Based on our results, far-UVC light from overhead lights could be safely used to markedly reduce the ambient level of SARS-CoV-2 virus in occupied indoor spaces,” says Dr. Brenner. Unlike conventional germicidal UVC light, far-UVC light is safe for human exposure and has the potential to become as necessary as other precautions people take indoors. “Far-UVC light has great potential as a third approach, in addition to face masks and social distancing, to limit the transmission of SARS-CoV-2 and other viruses in occupied indoor spaces.”

Eric Greene, PhD, professor of biochemistry & molecular biophysics, found a way to support the pandemic response after suddenly finding himself working from home, writing papers and grants that were already in the pipeline. The Greene Lab was shut down in mid-March as Columbia and New York sought to “flatten the curve,” but Dr. Greene wanted to help, especially with so many of his Columbia colleagues on the front lines. “The worst thing in the world is to have a scientist stuck at home with nothing to do,” says Dr. Greene. “I started asking folks how I could help and found many people who were trying to figure out the same thing. Quickly—within the first week—we coalesced. That’s what really made things work.”

Through the VP&S grapevine, Dr. Greene learned about an emerging grassroots effort among VP&S researchers. Dubbed CRAC—Columbia Researchers Against COVID-19—the collective enterprise was launched by postdocs who realigned their research goals toward the pandemic after their labs were shut down. Dr. Greene and Kenneth Olive, PhD, associate professor of medicine who conducts pancreatic cancer research, became CRAC faculty advisers. “I suggested that one of the things we should do is build a Columbia-wide database, listing everybody who

is working on COVID-19-related topics and specify what it is they do, just as a way to communicate with one another,” Dr. Greene says.

In the early phases, Dr. Greene gathered names ad hoc, then learned that Andrea Califano, PhD, chair of the Department of Systems Biology, was doing the same. They collated their lists and the database was taken over by the CRAC team, led by postdoc Haotian “Howie” Wu, PhD.

This effort led to a bigger, more far-reaching project: the COVID-19 Virtual Symposia, a live, weekly online lecture series featuring eight to 10 presenters each week from Columbia and around the globe, who relay the most current science on COVID-19. “It was a way to bring people together at the university,” says Dr. Greene, “and keep everyone up to date on the latest understanding of the disease.” The Virtual Symposia series is hosted by Dr. Greene; Dr. Califano; Andrew Marks, MD, the Clyde’56 and Helen Wu Professor of Molecular Cardiology and chair of the Department of Physiology & Cellular Biophysics; and Stephen Goff, PhD, the Higgins Professor of Microbiology & Immunology and Biochemistry & Molecular Biophysics. “The symposium,” Dr. Greene adds, “would not have been possible without the truly amazing efforts of the CRAC team volunteers like postdocs Ester Cynn, Jessie Brown, and many others who run all of the behind the scenes operations. I really cannot overstate the importance of these volunteers to the overall effort.”

The inaugural symposium on Zoom was held April 1 with more than 700 Columbia scientists and clinicians in attendance. During the series, speakers reported on knowledge gleaned from the front lines in Italy, China, and Spain; others provided the latest on vaccine development and treatments; others offered commentary on evolving social issues related to the disease. Dr. Greene says much of the information was generously presented before publication. “People were very willing to share data,” he says. “It was amazing to see.” Within the first three months, VP&S hosted 13 sessions of the COVID-19 Virtual Symposia, with about 200 attendees per session.

A month into the pandemic, as the virtual symposia launched, clinicians at NYP-Morgan Stanley Children’s Hospital noticed a cluster of previously healthy children presenting with multiple and sometimes critical symptoms; the condition would come to be known as multisystem inflammatory syndrome in children, or MIS-C. “We had to rapidly recognize, investigate, and treat a whole new syndrome affecting children related to COVID-19 that very few people in the world knew anything about,” says pediatric critical care physician and cardiologist Eva Cheung, MD.



Although MIS-C shared many features with Kawasaki's disease (KD) and toxic shock syndrome (TSS), Dr. Cheung says, these novel cases were occurring at a higher rate than expected, so doctors suspected something new was emerging. "On average, we see a child with KD or TSS every several months, or even less. Since we were admitting one child after another—and, at the peak of MIS-C, many children a day—it just didn't align with those two diseases," Dr. Cheung says. "We had a suspicion this was connected to COVID-19."

Dr. Cheung characterized MIS-C in a case series published in JAMA in June. She reported that the main sign of the syndrome was fever accompanied by other symptoms, such as gastrointestinal upset, nausea, vomiting, rash, and abnormal chest X-rays. Together, Dr. Cheung says, these complications illustrated that something about exposure to COVID-19 triggered an inflammatory reaction that made children sick. Researchers believe MIS-C is rare; among the thousands of children receiving care at NYP, MIS-C was diagnosed in just 60, all of whom were treated at the hospital and have since gone home. Dr. Cheung continues her research, prospectively monitoring this cohort for long-term effects of MIS-C. She also leads an ongoing study on the MIS-C treatment given at NYP, compared with other institutions during the surge, to help pinpoint the optimal protocol for managing the syndrome.

Like their colleagues in adult medicine, Dr. Cheung and her fellow MIS-C investigators were simultaneously responding to and documenting strategies to treat COVID-19 and its complications while also adjusting to abrupt transformations in where and how they saw patients. Pediatric cases in the NYP health care system—COVID and otherwise—were centralized at Morgan Stanley Children's Hospital, where many pediatric specialists were also redeployed to care for adults. "Because children were less affected by COVID-19, we had capacity to take care of our city's children and also open our doors to adult patients with COVID," she explains. Other pediatric specialists were transferred to adult hospitals to contribute to critical care efforts there. "I don't think there was a clinician in this institution who didn't have to find a different role during the pandemic."

Reimagination was a common theme running through VP&S research programs during the pandemic's peak in New York City. Led by Muredach Reilly, MBBCh, director of the Irving Institute for Clinical and Translational Research, researchers pivoted and accelerated a years-long project. Researchers in the Irving Institute, the Institute for Genomic Medicine, and the Department of Pathology & Cell Biology with multiple other partners at the medical center, includ-



Eva Cheung

ing the Office for Research, joined forces to launch an institutional biobank sooner than planned and with a changed focus. "We were planning on going live, enrolling all patients who consented at CUIMC as of April 1 then proactively collecting samples," says Dr. Reilly. "But when COVID happened, we quickly pivoted our focus to enroll patients who tested positive

"I don't think there was a clinician in this institution who didn't have to find a different role during the pandemic."

for COVID at NYP/Columbia and preserve residual samples once the clinical laboratory had finished with the samples." The most common sample collected was serum, but others were also collected: plasma, nasal pharyngeal swabs, urine, feces, cerebral spinal fluid, and the concentrated white blood cell product known as "buffy coats," which is used for DNA extraction.

"Patients were very interested in contributing and participating in this effort," says Jennifer Williamson, MS, MPH, associate vice dean for research policy and scientific strategy, who worked with Dr. Reilly and other faculty to launch the biobank and oversee outreach to patients. The willingness of patients to help immediately made the biobank useful for COVID-19 and MIS-C research. "While other institutions said it could take up to five years before a newly established

biorepository would make an impact, researchers were using our samples just four months after the biobank began,” Ms. Williamson adds.

By the end of June, about 7,000 current and former patients with COVID had agreed to the use of their samples—approximately 70,000 total samples had been collected, including one of the largest sets of longitudinal MIS-C samples in the country—in research. Almost 2,000 other patients have consented to ongoing involvement in the biobank and agreed to be contacted for other research studies.

“With samples from the biobank and electronic health records, we can provide patients with ongoing follow-up while also trying to answer important questions such as why some people get very sick and some don’t and why some people respond to some treatments and others don’t,” says Dr. Reilly.

Insights from the front lines of patient care have informed other areas of research, including women’s health. Cynthia Gyamfi-Bannerman, MD, a maternal-fetal medicine specialist, co-authored a research letter published in JAMA that revealed social determinants associated with an increased risk of infection—namely, a higher number of people living in a household, a more crowded household, and a lower socioeconomic status—among pregnant women delivering at two NYP hospitals between mid-March and mid-April. “One may think that because New York City is so dense, there’s little that can slow the spread of the virus, but our study suggests the risk of infection is related to household, rather than urban, density,” says Dr. Gyamfi-Bannerman.

Jeremy Beitler, MD, a pulmonary intensivist and director of clinical research for the Center for Acute Respiratory Failure, developed, implemented, and published a ventilator-sharing protocol as a public health preparedness tactic to mitigate anticipated ventilator shortages at the height of the epidemic. Through thorough review and pairing of compatible patients, these breathing machines were successfully used to support two people at the same time for two days. Results from the initial series of patients were published in the American Journal of Respiratory and Critical Care Medicine, and the protocol has been adopted by hospitals around the globe. “We’re doing something that hasn’t really ever been done before, but now is the time to do it,” Dr. Beitler told the New York Times.

The successful pivot to COVID-19 research during the height of the pandemic was borne out of a shared sense of purpose and unity across departments, say researchers. “We have learned to work with our colleagues in a way that we really didn’t ever need to in the past,” says Dr. Cheung. “Health care for adults and children are very separate—separate buildings, separate hospitals. But everyone adjusted their practice and cared for so many patients in so many different locations. It was an incredible demonstration of teamwork.”

Dr. Greene shares the same sentiment from the bench. “It has been remarkable to see how many labs have coalesced to attack the problem—both at Columbia and worldwide. I’ve gotten to know so many people I would have never had the opportunity to interact with before, which has been valuable.”

The collaborations formed through a shared commitment to fighting COVID-19 are likely to endure beyond the end of the pandemic. As Ms. Williamson puts it: “Whenever you’re working on something that is so important, everyone clearly knows the mission and focuses on making it work, it is incredibly rewarding. It’s the best part of Columbia.”

Who’s Who

- **Jeremy Beitler, MD**, assistant professor of medicine and director of clinical research for the Center for Acute Respiratory Failure
- **David Brenner, PhD**, the Higgins Professor of Radiation Biophysics (in Radiation Oncology) and director of the Center for Radiological Research
- **Andrea Califano, PhD**, the Clyde’56 and Helen Wu Professor of Chemical Biology (in Systems Biology), professor of biomedical informatics, professor of biochemistry & molecular biophysics, and professor of medicine in the Institute for Cancer Genetics
- **Eva Cheung, MD**, assistant professor of pediatrics in the Division of Critical Care and Hospital Medicine and the Division of Cardiology and medical director of the pediatric ECMO program
- **Eric Greene, PhD**, professor of biochemistry & molecular biophysics
- **Stephen Goff, PhD**, the Higgins Professor of Microbiology & Immunology and Biochemistry & Molecular Biophysics and Investigator, Howard Hughes Medical Institute
- **Cynthia Gyamfi-Bannerman, MD**, the Ellen Jacobson Levine and Eugene Jacobson Professor of Women’s Health in the Department of Obstetrics & Gynecology
- **George Hripcsak, MD**, the Vivian Beaumont Allen Professor of Biomedical Informatics and chair of the Department of Biomedical Informatics
- **Andrew Marks, MD**, the Clyde’56 and Helen Wu Professor of Molecular Cardiology and chair of the Department of Physiology & Cellular Biophysics
- **Muredach Reilly, MBBCh**, the Florence and Herbert Irving Endowed Professor of Medicine, director of the Irving Institute for Clinical and Translational Research, and VP&S associate dean for clinical and translational research
- **Jennifer Williamson, MS, MPH**, VP&S associate vice dean for research policy and scientific strategy

A WHOLE NEW WORLD: PATIENT CARE THROUGH SCREENS

Virtual
Consults
Sustain
Continuity
During
Pandemic
—and
Beyond

BY BARBARA
BRODY

Before the coronavirus pandemic, few New Yorkers could have imagined getting most of their medical care via their computer, tablet, or smartphone. Until 2019, ColumbiaDoctors had merely dipped a toe into the field of telehealth. And then, in March 2020, “the world changed,” says Rosalie Long, RN, MBA, chief operating officer of ColumbiaDoctors.

Between July 2019 and January 2020, ColumbiaDoctors conducted an average of 300 telemedicine visits per month, Ms. Long estimates. In February, when the faculty practice launched Epic, a digital platform that integrates electronic health recordkeeping with scheduling and billing software and a patient portal, the plan was to “slowly optimize and bring more people into the new system, using the patient portal to expand virtual visits.”

When the COVID-19 pandemic hit New York, plans for a gradual transition were quickly scrapped. With a focus on flattening the curve by minimizing in-person interactions, doctors quickly embraced telehealth—as did patients who needed to discuss coronavirus concerns with their primary care providers, people with chronic health issues who were eager to stay in touch with specialists, pregnant people seeking prenatal care, and many, many others.

“In the entire month of February, we had 222 virtual visits. During the last two weeks of March, we had nearly 14,000,” says Ms. Long. “It was an amazing pickup. The providers were very engaged and very determined, and the patients were also very interested.” The highest use of virtual visits, not surprisingly, coincided with the peak of COVID-19 cases in

New York City in April. ColumbiaDoctors conducted nearly 40,000 virtual visits that month.

The psychiatry department, which was the pilot practice for ColumbiaDoctors’ transition to Epic, has relied especially heavily on telehealth. Many surgeons also transitioned to telehealth for postoperative checkups to assess range of motion or examine incision sites. “Patients have embraced this more than I would have predicted,” says George “Jack” Cioffi, MD, president of ColumbiaDoctors and VP&S vice dean for clinical affairs.

Because Epic is a secure, private network, few patients have expressed concerns about privacy. The bigger challenge has been getting older, less tech-savvy patients on board; in some cases, family members or caregivers facilitate remote appointments. Occasionally, providers host telephone-only appointments.

As the number of COVID-19 cases in New York began to wane and physicians welcomed patients back for in-person appointments, virtual visits naturally started to drop off. Yet telehealth usage is unlikely to ever return to pre-pandemic levels. As of July, ColumbiaDoctors was still virtually seeing about 1,600 patients per day, says Ms. Long. “We certainly want to continue to provide virtual visits and grow it as appropriate to the level of care that the patient needs.”

Among the patients who like it are patients who previously traveled from the suburbs or outer boroughs to see their providers. “It doesn’t require anyone to cross a bridge, park a car in a garage, or wait in a waiting room,” says Ms. Long.

Of course, not every specialty is well-suited for telemedicine, notes Dr. Cioffi, who is chair of ophthalmology, one of the specialties better suited for in-person visits because of the equipment involved. Ditto for any appointments that require hands-on examination, blood work, or imaging tests.

Even when a fully remote appointment is not possible, however, telehealth can play an important role: Patients can complete standard intake forms online via the Epic portal. A nurse can call a patient the day before an appointment to discuss allergies, medications, and current health concerns. Lab and imaging tests can be pre-ordered and patients can have tests completed at a location most convenient to them. Results can be reviewed by the providers before patients arrive for their in-person visits.

“Now when you get into the office, everything is aligned and pre-charted,” says Dr. Cioffi. “You’re not sitting in the waiting room filling out forms, which is safer for you and the staff. You’re not spending 20 minutes with a nurse; the nurse just checks your blood pressure and asks if anything has changed since your phone conversation. You see the doctor for half an hour and you’re out the door.”

EMBRACING CHANGE

BY BARBARA BRODY

Despite Interruptions to Classes and Clerkships, VP&S Students Didn't Let a Pandemic Slow Them Down



Tyler Wen

In March 2020, Tyler Wen'22 had just finished morning rounds at Harlem Hospital Center when he got the news. "I received an email along the lines of 'Every student who is in a clinical setting should immediately not be in a clinical setting,'" he recalls. About 15 minutes later, during which he made a hasty apology to other residents, the in-hospital experience of Mr. Wen's pediatrics clerkship was over.

Mr. Wen—who intends to specialize in emergency medicine—was disappointed that he would have to temporarily stop interfacing with patients, though he understood why it was necessary to suspend clerkships during the height of the pandemic in New York. He just needed to decide what to do in the meantime.

With the city scrambling to mobilize a vast army of health care workers, VP&S graduated the Class of 2020 a month early, so the brand-new doctors could immediately be of service. But other students got a forced timeout: They could participate in remote electives, do research, complete service-learning projects to support health systems, or study for exams.

Unwilling to sit back while the pandemic crashed down on the city, Sarah Soo-Hoo (who will graduate in 2021 with a joint MD/MBA degree) and fifth-year medical student David Edelman quickly teamed up to create the COVID-19 Student Service Corps to provide support during the COVID-19 crisis. By early April, volunteers were fielding 1,600 hotline calls a day from New Yorkers desperate for information about the new virus.

Mr. Wen and Nick Morley'22 spent more than a month answering hotline calls. "The community hotline was initially staffed by physician assistants, but they were overwhelmed by mid-March," says Mr. Morley. "Students took four-hour shifts. We provided information about coronavirus, where to go to receive

care, CDC guidelines about what constituted as symptom, and so on.”

Mr. Wen further disseminated information about COVID-19 by lending his social media skills to Craig Spencer, MD, director of global health in emergency medicine. “Dr. Spencer, who became especially well-known after he contracted Ebola in 2014, was being inundated by COVID questions on Twitter,” says Mr. Wen. “He wanted to create an educational campaign that would address the top questions in a simplified Q&A format.”

Mr. Wen and his classmate, Saurabh Sudesh’22, sorted through the incoming questions and obtained the most up-to-date information. “Then Dr. Spencer would share the answers using his unique, approachable internet presence,” says Mr. Wen. “It was a huge team effort.”

Mr. Wen also joined forces with David Van, MD, faculty supervisor for the VP&S student emergency medicine interest group, to write a case report on the impact of psychosocial stressors in COVID-19 patients.

Mr. Morley, who plans to specialize in family medicine or infectious diseases, spent a good chunk of the spring working with Magda Sobieszcyk, MD, an HIV expert who is conducting a study on whether PrEP users who receive regular text messages and short surveys are more apt to adhere to their preventive drug regimen. While Dr. Sobieszcyk, chief of the Department of Medicine’s Division of Infectious Diseases, focused on coordinating COVID-19 clinical trials at VP&S, Mr. Morley spent months building a new database that automated the process of sending out text messages to PrEP participants based on their response to the surveys. “We no longer have to have someone manually sending out the appropriate responses, which was pretty effort-intensive,” says Mr. Morley. “Now it’s easier, so we can reach and recruit more participants.”



Nick Morley

Despite the clear value of these interim projects, Mr. Morley, Mr. Wen, and their classmates were eager to get back to their formal medical training. Clerkships for third-year students resumed in late June, and rotations have been compressed slightly so the students can stay on track to graduate in May 2022.

This summer, Mr. Morley turned his attention to his psychiatry clerkship at the Bronx VA, participating in both outpatient and inpatient care. Most outpatient care in psychiatry is done virtually, which he describes as challenging but more convenient and safer for patients during the coronavirus. Providing inpatient care after months of isolation has been “incredible,” says Mr. Morley. “Hands-on experience is as important—and as much of a gift—as it ever was.” ❖

↘ *Additional reading on COVID-19:*

- **SPRING/SUMMER 2020 COLUMBIA MEDICINE:**
<http://columbiamedicinemagazine.org/features/spring-2020/first-60-plus-days-epicenter-covid-19>
- **CUIMC NEWSROOM:**
<https://www.cuimc.columbia.edu/news/topics/infectious-diseases/covid-19>



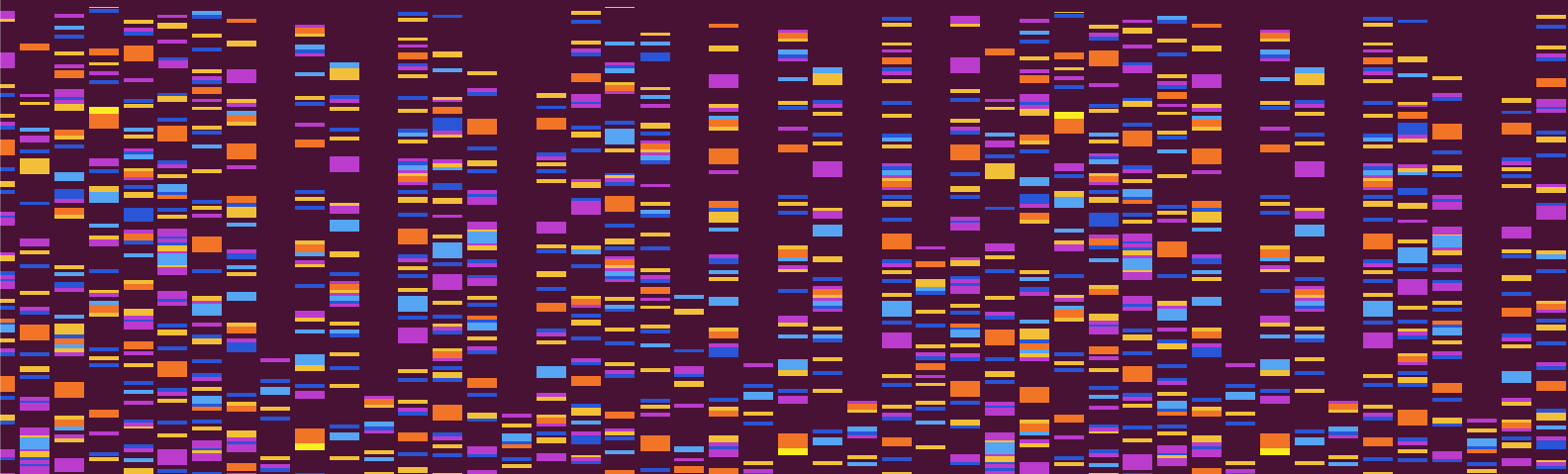
THE BIOETHICS OF GENOMICS AND JUSTICE

NEW DIVISION OF ETHICS
EXPLORES THE IMPLICATIONS
OF PRECISION MEDICINE



BY CHRISTINE YU

ILLUSTRATIONS BY DAVIDE BONAZZI



When the Human Genome Project launched in 1990, the international collaboration to sequence and map every gene in a single human being ushered in a new era of scientific and medical research and laid the groundwork for precision medicine. But in unraveling the map of our genes, researchers unearthed more than a collection of As, Ts, Gs, and Cs. Along with groundbreaking knowledge came a host of sticky philosophical and ethical questions. “Genomic technology allows us to do many different things—and the ethics is *What should we do?*” says Wendy Chung, MD, the Kennedy Professor of Pediatrics (in Medicine). “That’s a discussion we have to have in the public square, not just as doctors and scientists. Entire societies need to think about it because it affects everything from the criminal justice system to our legal system to our health system.”

Thirty years later, precision medicine has arrived at a crossroads. With such projects as the NIH’s “All of Us,” researchers continue to unleash the power to treat, prevent, and cure disease. As the field accelerates, though, so too does the imperative to grapple with the social and ethical dimensions of emerging technology and the associated research infrastructure, so as not to perpetuate or create new inequities.

Engaging the ethical, legal, and social implications—ELSI—of precision medicine requires a 360-degree perspective. In 2019, VP&S reinforced its leadership in the ELSI field with the appointment of Sandra Soo-Jin Lee, PhD, as founding chief of a new Division

of Ethics in the Department of Medical Humanities & Ethics. Trained as a medical anthropologist, Dr. Lee has long investigated the intersection of race, identity, and emerging technology articulated in such questions as, “How does genetics impact how we identify as humans and what counts as difference?”

Dr. Chung has long wrestled with such questions in her clinical work as chief of the Division of Clinical Genetics in the Department of Pediatrics. Chief among the challenges is the lack of diversity in precision medicine data: Roughly 80% of genetic samples are derived from people of European ancestry, who comprise just 20% of the world’s population.

Such discrepancies can produce skewed results that aren’t relevant to most of the world’s population. “I can tell you unequivocally that my patients of Latino ancestry or Black ancestry don’t get as much out of genetic evaluations,” says Dr. Chung, “because I cannot as readily interpret the data to help them make important decisions about managing risk for cancer or heart disease or what medication might be safest for them.”

Yet solving biomedical research’s diversity problem involves more than just recruiting historically underrepresented groups to provide samples. It requires examining what Dr. Lee calls “upstream decisions”—how individuals and groups are defined, measured, and compared; how practices to recruit, engage, and retain research participants promote or compromise goals of diversity and inclusion; and how researchers, themselves, engage communities in a long-term research relationship. She’s particularly interested in tracing the cascading effects of early decisions about how populations are defined and how researchers make comparisons among populations.

Consider, for example, the downstream effects of how samples are collected and categorized in terms of race and ethnicity. “As we’re building infrastructure for a biobank, for example, where the samples are already identified using racial categories, it’s easy then to just continue using those categories as a stand-in for genetics,” says Dr. Lee. “The downstream effects could be that researchers use race as a biological variable instead of looking at the socio-cultural aspects of those categories.”

Dr. Lee’s work often involves “studying the studies” to better understand the ELSI of precision medicine research. In her National Human Genome Research Institute-funded study, “The Ethics of Inclusion: Diversity in Precision Medicine Research,” Dr. Lee and her team observe and interview investigators, funders, and participants and examine research materials. Through this ethnographic research and analysis, the teams evaluate how those upstream decisions affect such downstream outcomes as engagement, retention, and participation. Ultimately, she hopes to produce a set of recommendations and guidance for precision medicine research going forward.

“For many years, there have been people like Sandra who have made issues related to fair representation in genomics part of their research agenda, but there’s no question it’s become more



Sandra Soo-Jin Lee



salient since the inception of ‘All of Us’ under President Obama,” says Paul Appelbaum, MD, who chaired the search committee for the new division chief. While Columbia has hubs of ELSI scholarship, including the Department of Psychiatry’s Center for Research on the ELSI of Psychiatric, Neurologic, and Behavioral Genetics founded by Dr. Appelbaum, those efforts have been scattered across departments. “There was no single locus around which it coalesced. We wanted someone who could bring people together, who had the skills to be a builder and a leader, and who brought research skills that would augment the growing focus at Columbia on precision medicine,” he says. He sees Dr. Lee as a catalyst for interdisciplinary collaboration and scholarship across the University and around the world.

Already, Dr. Lee has begun to nourish a broader ELSI community. In September 2019, she launched the Center for ELSI Resources and Analysis (CERA), a multi-institutional partnership among Stanford University, the Hastings Center, and Harvard University, funded by a \$7.1 million grant from the National Human Genome Research Institute. It’s the first international center to house

ELSI-related research, study instruments, policies and guidance, and a directory of ELSI researchers intended to promote collaboration. Columbia was set to host the fifth ELSI Congress meeting in June, but the event was postponed until June 2022 because of the COVID-19 pandemic. Instead, Dr. Lee, who co-directs the Biennial ELSI Congress, hosted an abbreviated virtual forum with more than 1,000 registrants from 46 countries. The discussion ranged from new models for the implementation of artificial intelligence in precision medicine to use of DNA databases by law enforcement and frameworks for research collaboration with indigenous communities.

Dr. Lee says she was drawn to Columbia’s institutional commitment to ethics and humanities, particularly within a medical school setting. “Support for dialogue across the humanities and social sciences is unique,” she says. Equally important, says Dr. Lee, is the focus on social justice. “This was an opportunity to build a program that addresses issues of structural racism and inequities and to bring social science to bear on bioethical questions in ways that could be creative, generative, and ultimately impactful.” ❖

“HOW DOES GENETICS IMPACT HOW WE IDENTIFY AS HUMANS AND WHAT COUNTS AS DIFFERENCE?”



HELP FROM OUR FRIENDS



Roy Vagelos and VP&S scholarship students

AS WE REFLECT on this past year, we remain more grateful than ever for the support and leadership of our friends and partners. The year began with multiple celebrations and exciting programmatic activities, from

the dedication of the newly completed Cryo-Electron Microscopy Center to events that celebrated our faculty accomplishments. Additionally, building on the support of Roy and Diana Vagelos, we continued to focus on the precision medicine initiative and the implementation of our robust, first-in-the-nation loan-free scholarship program. Fall 2019 also saw more than 1,000 riders, volunteers, and supporters gather to celebrate Velocity: Columbia's Ride to End Cancer. This third annual peer-to-peer fundraising event raised more than \$1.5 million to support cancer research and patient care at Columbia's Herbert Irving Comprehensive Cancer Center, building upon the vision and initiatives supported by the late Herbert and Florence Irving.



From left: Terry Moore, Roy Vagelos, Joachim Frank, and Michael Purdy at the opening of the Cryo-Electron Microscopy Center

Then, months later, the start of 2020 brought extraordinary, unprecedented, and unexpected change—at VP&S and around the world—as we responded to the COVID-19 pandemic.

Despite daily, sometimes hourly, changes on our campus, one thing remained constant: the generosity of our philanthropic partners. The



From left: Roy Vagelos, Diana Vagelos, Cheryl Milstein, and Philip Milstein

tremendous outpouring of support for COVID-19 research and programs has funded our world-leading efforts to advance knowledge of the novel coronavirus and develop more effective tests and treatments.

In a year where we started out together but ended apart, your vital philanthropy has allowed us to continue advancing our shared goal of educating the next generation of doctors, scientists, and teachers, while also improving the lives of our patients, communities, and populations. For that, we are grateful.

Response to COVID-19

As we began our response to COVID-19, friends and supporters from around the world immediately asked how they could help. From donations of PPE and food for our front-line heroes to support for clinical care and research efforts, our friends rallied around us.

Donors helped us pivot nimbly to respond to emerging needs and priorities. These priorities included outfitting additional research spaces to allow our scientists to work safely with the live virus, identifying new drug treatments and therapeutics, initiating a clinical trial on convalescent plasma, building a biobank of samples from patients with the virus, providing wellness resources for our physicians, and conducting research to prevent burnout. Supporters also aided our medical students who moved to the front lines as part of our COVID-19 Student Service Corps.

We extend our gratitude to this large donor community, with special recognition for the significant and generous funding from Shoshana Shendelman'05 PhD and her husband, Vlad. Dr. Shendelman is a member of the Board of Advisors and founder and CEO of Applied Therapeutics. This support allowed Columbia to invest in critical infrastructure and equipment to launch a major COVID-19 antibody testing program for employees and patients.

The JPB Foundation, Jack Ma Foundation, Tencent Charity Foundation, and Kwang Hua Educational Foundation were among other funders who also quickly responded to support the work of luminary scientist David Ho, MD, director of the Aaron Diamond AIDS Research Center at Columbia. Dr. Ho and his team are leading an effort, in collaboration with researchers across campuses and around the world, to identify new therapies for COVID-19, including new antibody treatments and



anti-viral compounds. They also are working to develop more effective tests.

Other supporters of Dr. Ho's work included Panda Cares Foundation, the philanthropic arm of Panda Express, the largest Asian dining concept in the United States. Along with the generous contribution of the popular restaurant brand's co-founders, Andrew and Peggy Cherng, Panda Cares' funding advanced Dr. Ho's research of monoclonal antibodies as a treatment or prophylactic against COVID-19. Additional funding for Dr. Ho's research projects was provided by Carol Ludwig'74 and the Ludwig Family Foundation, which contributed toward research on monoclonal antibodies and anti-viral compounds called protease inhibitors.

Drs. Roger and David Wu also provided significant funding for Dr. Ho's research on COVID-19. In addition, the brothers established a fund for critical research and laboratory activities led by Michael Yin, MD, in the VP&S Division of Infectious Diseases. The goal of this work is to improve rapid diagnostics for the SARS-CoV-2 virus and improve understanding of the health effects of the immune response to infection.

Support for students was also essential, with donors such as Drs. Sara M. Zion and Tushar Shah, who established a COVID-19

financial assistance fund for students in the doctor of physical therapy program. They also provided vital support for our Department of Emergency Medicine and the COVID-19 patient care response.

The response we received was far reaching and compelling, involving alumni around the world. In one example, the Asian Columbia Alumni Association harnessed the power of the alumni community across Asia and New York to collect PPE and raise \$2.1 million in cash and in-kind contributions from more than 300 donors. Thomas E. Lo'08, VP&S Alumni Association president, and June Wu'96, a faculty member, were among the leaders of this successful networking and fundraising effort.

Our friends also gave through innovative efforts, including a food donation program to support our front-line heroes, as well as a crowdfunding campaign for the Center for Radiological Research, which advanced cutting-edge research of a new UV light technology to kill airborne viruses. In addition, celebrities such as Stephen Colbert, Kerry Washington, Lin-Manuel Miranda, and others gave their thanks to our front-line heroes through social media.

We remain grateful for this tremendous outpouring of vital support.

Louis and Gloria Flanzer Philanthropic Trust Honored at Crown Awards

At the 10th anniversary Crown Awards gala, VP&S honored the Louis and Gloria Flanzer Philanthropic Trust for its generous gift of \$32.5 million to name



From left: Eric Kaplan, R. Dean Hautamaki, and Allan Schwartz

and endow the Seymour, Paul and Gloria Milstein Division of Cardiology at VP&S. The trust’s support provides clinicians, researchers, and educators with substantial resources dedicated to advancing the field of cardiac medicine. Committed philanthropists, Gloria and Louis Flanzer cared deeply about improving the lives of others. Their visionary investment will help Allan Schwartz, MD, chief of the division, and his team advance critical research in cardiovascular disease. Co-trustees of the Trust, Eric Kaplan and R. Dean Hautamaki, MD, accepted the award. Columbia will continue to partner with Mr. Kaplan and Dr. Hautamaki to realize the vision of Gloria and Louis Flanzer.

Gerstner Family Foundation

The Gerstner Family Foundation continued to advance the Louis V. Gerstner Jr. Scholars Program at VP&S, after launching the program in 2008 and providing additional support to sustain and expand

the program, bringing its total contribution to the program to \$10 million. The program has supported cutting-edge investigations across several clinical areas, including cardiovascular disease, oncology, obstetrics and gynecology, otolaryngology, pediatrics, cerebrovascular disorders such as stroke, and chronic conditions such as asthma and childhood obesity. To date, 52 early-career investigators have been named Gerstner Scholars and six have received the Gerstner Merit Award, designed to recognize an outstanding third-year Gerstner Scholar. Over the past 12 years, Gerstner Scholars have received more than \$166 million in additional funding.

Andrew Sabin

The Andrew Sabin Family Foundation has committed \$2.5 million to establish the Andrew Sabin Family Foundation Cardiovascular Research Laboratory Fund to support research in the Department of Surgery. The gift was matched by NewYork-Presbyterian Hospital.

Charles Adler

During his lifetime, Charles Adler was a generous supporter of VP&S, making impactful gifts to the Department of Neurology, the Taub Institute for Research on Alzheimer’s Disease and the Aging Brain, and the cardiology division. Upon his death in 2019, his estate gave VP&S gifts of \$4.6 million to support the Department of Neurology and \$5.4 million for the Taub Institute. Mr. Adler made several large contributions during his lifetime, including a gift to establish the Adler Assistant Professorship of Neurological Sciences, held by Elizabeth Bradshaw, PhD. Mr. Adler also gave \$2 million to support the recruitment of a leading physician-scientist in the Department of Neurology. During his life and following his death, Mr. Adler’s total philanthropy to VP&S was more than \$15 million. His commitment to the research of neurodegenerative diseases and

support of programs that focus on women’s cardiovascular health provide an enduring tribute to his foresight and generosity.

Estelle P. Bender, MD

A gift from Estelle P. Bender ’68 established the Estelle P. Bender, MD VP&S ’68 and T. Richard Fishbein Scholars Fund in the Division of Child and Adolescent Psychiatry in the VP&S Department of Psychiatry. The fund provides awards to assistant or associate professors with preference for those whose area of study includes research on youth suicide or child and adolescent mental health in underserved or minority communities. The first scholar is Claudia Lugo-Candelas, PhD, assistant professor of clinical medical psychology (in psychiatry). Dr. Bender serves on the Columbia Psychiatry Board of Advisors, the Council for the Advancement of Global Mental Health Research, and the Women’s Health Care Council. She is also a lecturer in psychiatry at the Columbia University Center for Psychoanalytic Training and Research.

Jim Ovia

A \$2.5 million gift from the Jim Ovia Foundation has established the Jim Ovia Professorship of Cardiology. The gift honors Christopher Irobunda, MD, PhD, the inaugural Ovia Professor. Dr. Irobunda has dedicated himself to patient care and education of medical students, residents,



From left: Christopher Irobunda, Marjorie Irobunda, Kay Ovia, and Jim Ovia

Anil K. Rustgi, director of the Herbert Irving Comprehensive Cancer Center (and now interim EVP and dean of the Faculties of Health Sciences and Medicine), welcomes riders at a 2019 Velocity start area.



Doubling the Impact

The Crimson Lion/Lavine Family Foundation created a matching gift challenge to help Velocity participants double their impact. Velocity is Columbia's annual event to raise funds to support cancer care and research. Pictured from left at Velocity 2019 are Columbia University Trustees Co-Chair Jonathan Lavine, Jeannie Lavine, Lee Goldman, Nathan Rosin, and Emily Lavine.

and cardiology trainees. The support from Jim Ovia and his family will allow Dr. Irobunda to continue his work in cardiovascular medicine while passing on his skill and knowledge to the next generation of physicians.

The NVLD Project

The NVLD Project, led by Laura Lemle, PhD, founder and chair, has given a \$1 million gift to support work in non-verbal learning disability (NVLD). NVLD is a neurodevelopmental disorder characterized by deficits in visual-spatial reasoning, which has recently been renamed developmental visual spatial disorder (DVSD). This funding will allow Amy Margolis, PhD, director of the Environment, Brain, and Behavior Lab for Developmental Visual-Spatial and Learning Disorders in the VP&S Department of Psychiatry, to codify and amplify her laboratory's work on DVSD. This includes the identification of neural markers for the disorder and development of more effective treatments. The support also funds work toward the inclusion of DVSD in the Diagnostic and Statistical Manual of Mental Disorders and to build awareness of DVSD.

Lawrence E. Golub

Lawrence E. Golub has made a generous donation to support virology research and education in the Department of Pediatrics. The gift honors Mr. Golub's late

mother, Sharon Golub, who earned a BS from Columbia University in 1959 and an MA in psychology from Teachers College at Columbia University in 1966. Sharon Golub was a professor of psychology at the College of New Rochelle and a long-time editor of the journal *Women & Health*. Mr. Golub is chief executive officer of Golub Capital and a member of the CUIMC Board of Advisors. His gift establishes an endowment that will support research and postdoctoral fellowship training in the laboratory of Anne Moscona, MD, VP&S professor of pediatrics, of microbiology & immunology, and of physiology & cellular biophysics, director of the Center for Host-Pathogen Interaction, and vice chair of basic science research in pediatrics. Dr. Moscona and her team are known for research on respiratory viruses, including recent studies on COVID-19.

Hope & Heroes

Clinicians and researchers at Columbia who are advancing treatment and developing cures for childhood cancers have been able to rely on Hope & Heroes for decades now. Founded in 1996 by Michael Weiner, MD, professor of pediatrics at VP&S, Hope & Heroes is a 501(c)(3) charitable non-profit embedded in Columbia. Over the past year alone, Hope & Heroes has raised more than \$8 million in support of Columbia's pediatric cancer initiatives. These gifts include funding to underwrite the fellowship program in

pediatric oncology, significant support for pediatric cancer research, monies for the pediatric COVID-19 emergency response, and general support for pediatric oncology. Under the leadership of board president Robert Kapito and executive director Bob Bomersbach, Hope & Heroes has built a formidable philanthropic legacy at Columbia. Previous Hope & Heroes initiatives include survivorship and psycho-social support programs for patients and families and a pioneering integrative therapies program that offers patients evidence-based complementary care, such as nutrition therapy and acupuncture. Hope & Heroes' generosity this year will strengthen its legacy and help keep Columbia's clinical and research efforts in childhood cancer and blood disorders among the best in the country.

Joseph P. Harris Fellowship Fund

Mr. and Mrs. Jeremiah J. Harris have committed \$1.25 million to establish the Joseph P. Harris Fellowship Fund in the VP&S Seymour, Paul and Gloria Milstein Division of Cardiology. The endowment payout from this fund will be used to provide fellowship support, with a focus on cardiac electrophysiology. This gift honors Jose Dizon, MD, a passionate physician-scientist who has been part of the Columbia family since 1991, when he completed his cardiology and electrophysiology training. This gift is also made in memory of Jeremiah's father, Joseph P. Harris.

VP&S Research Highlights

Alzheimer's Disease: Targeting Molecules in Innate Immune Cells

In the Department of Neurology and the Taub Institute for Research on Alzheimer's Disease and the Aging Brain, Elizabeth M. Bradshaw, PhD, has set her sights on microglia, the resident innate immune cells of the central nervous system, in the pathogenesis of Alzheimer's disease.

"Genetic studies of Alzheimer's directly implicate the involvement of the innate immune system," says Dr. Bradshaw, the Adler Assistant Professor of Neurological Sciences (in Neurology, the Taub Institute for Research on Alzheimer's Disease and the

Aging Brain, and the Institute for Genomic Medicine). "We have identified eight genetically associated proteins that may be working together in a tyrosine phosphorylation signaling pathway in innate immune cells. We now seek to identify the common interacting molecules of these eight proteins, which we believe function together in microglia and for which we already have strong supporting evidence of a shared pathway. Finding a binding partner shared by many genetically associated proteins may be an ideal therapeutic target for AD."

If Dr. Bradshaw and her colleagues can validate that the proteins are phosphorylated and that the interactions occur in situ in the Alzheimer's disease brain, they can then dissect the signaling pathway in vitro to understand functional outcomes and isolate targets for intervention. One specific target of Dr. Bradshaw's investigations is the CD33 protein. "We found a very clear change in the amount of the protein on the surface of innate immune cells based on someone's genetic background," says Dr. Bradshaw. "The influence of this genetic change related to how much full-length CD33 was expressed on the surface of innate immune cells. We then looked at functional outcomes and found a difference in peripheral monocytes, as well as monocytes that we polarized, to be more microglia-like in their ability to internalize amyloid beta (A β). We saw that this was associated with the genetic variation as well. The AD genetic risk led to more full-length CD33, as well as a decreased ability to internalize or to uptake the A β (1-42) peptide, which is the major constituent of amyloid plaques in the brains of Alzheimer patients." New preliminary data generated in collaboration with the laboratory of Franck Polleux, PhD, professor of neuroscience and principal investigator at Columbia's Zuckerman Institute, suggest a role in neuronal synapse remodeling as well.

The research team wanted to better understand CD33 and how it could be manipulated therapeutically. "We know that full-length CD33 binds to sialic acid and that the genetic variation dictates how much of two different forms of CD33 you have: One can bind to sialic acid and one



Elizabeth Bradshaw

can't," she says. "The genetic variation actually leads to more of the form that can bind to sialic acid."

The researchers conducted an unbiased screen and identified proteins that were being bound to CD33 through sialic acid. "We focused on CD45, in particular, which is another immune-limited molecule only expressed in immune cells," adds

Dr. Bradshaw. "We are now working on understanding the relationship of these two proteins and to see if there is a possible therapy in creating small molecules that disrupts the binding of the two proteins."

Dr. Bradshaw and her colleagues have since identified small molecules and antibodies that they think have therapeutic potential. With promising data from early

in vitro studies looking at target engagement, funding has been provided to accelerate the development of a preliminary therapeutic first-round molecule. The small molecule needs to be optimized for therapeutic application, but the team's journey from hypothetical to probable has garnered attention from the Alzheimer's disease community.

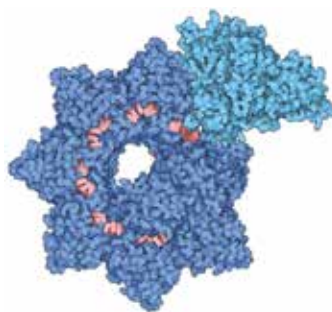
Glaucoma: Accelerating Genetic Discoveries

Only about 5% to 10% of glaucoma cases have genetic information that accounts for the disease. "It is still a wide open area for discovery," says Jeffrey M. Liebmann, MD. Dr. Liebmann and a team of clinicians and ophthalmic researchers have launched the Brown Glaucoma Genetics Initiative, a continuum of investigative and therapeutic projects focused on the discovery of novel genes, with the aim of developing treatments for specific subtypes of the disease. "For the past two years, we've been building our genetics discovery program, bringing in the requisite specialists to help us advance from the science of genetics to the development of clinical therapies," says Dr. Liebmann. Columbia has a long history of pioneering work in glaucoma research, including the development in 1996 of the groundbreaking drug Xalatan. A new recruit to the department this year is Simon John, PhD, a noted geneticist and glaucoma researcher who has pioneered the use of mice for glaucoma studies. Dr. John and his research team demonstrated that vitamin B3 potently prevents glaucoma

in a mouse model and will establish a clinical trial to further evaluate the efficacy of vitamin B3 and the role of metabolism in glaucoma. Other research includes genetic analysis of individuals with pigmentary glaucoma; development of a screening process for small molecules that can modulate LOXL1, one of the genes associated with exfoliation syndrome; and pursuit of sustained-release drug delivery for the treatment of glaucoma, such as an injection that lasts a year instead of eye drops.

First Images of an Upgraded CRISPR Tool

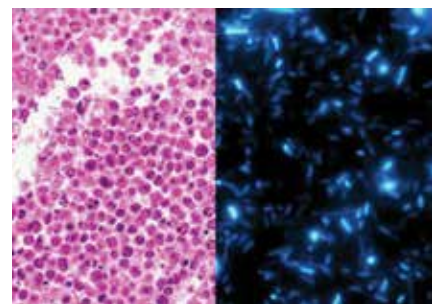
Columbia scientists have captured the first images of a new gene editing tool that could improve existing CRISPR-based tools. The team developed the tool, called INTEGRATE, after discovering a unique "jumping gene" in *Vibrio cholerae* bacteria that could insert large genetic payloads in the genome without introducing DNA breaks. Published in *Nature*, the research harnessed cryo-electron microscopy to freeze the gene editing complex in action, revealing high-resolution details about how it works. The research was led by Sam Sternberg, PhD, and



Israel Fernandez, PhD. The new gene editing tool would improve the current widespread use of CRISPR-Cas9 to quickly and cheaply make precise modifications to the genome of a cell. Most uses of CRISPR involve cutting both strands of the target DNA, and the DNA break must then be repaired by the host cell's own machinery. Controlling this repair process is still a major challenge in the field, and undesired gene edits are often introduced inadvertently in the genome. Additionally, existing tools often perform poorly at inserting large genetic payloads in a precise fashion. Improving the accuracy of gene editing is a priority for researchers and is critical for ensuring the safety of therapies developed with this technique. The new INTEGRATE system can accurately insert large DNA sequences without relying on the cell's machinery to repair the strands.

Bacteria Engineered as Trojan Horse for Cancer Immunotherapy

Immunotherapy has transformed cancer treatment, but only a handful of solid tumors have responded, and systemic therapy often results in significant side effects. Designing therapies that can induce a potent, anti-tumor immune response within a solid tumor without triggering systemic toxicity is a challenge being addressed by VP&S and Columbia Engineering researchers who have engineered a strain of nonpatho-



genic bacteria that can colonize solid tumors in mice and safely deliver potent immunotherapies, acting as a Trojan horse that treats tumors from within. The therapy led not only to complete tumor regression in a mouse model of lymphoma, but also significant control of distant, uninjected tumor lesions. The findings, published in *Nature Medicine*, create a potential for

experts to engineer bacteria to prime tumors locally and then stimulate the immune system to seek out tumors and metastases that are too small to be detected with imaging or other approaches. Nicholas Arpaia, PhD, led the VP&S team in collaboration with Tal Danino, PhD, of Columbia Engineering.

Faculty Honored for Research Excellence

Angela Christiano, PhD, Molly Przeworski, PhD, and Lorraine S. Symington, PhD, were elected to the National Academy of Sciences in recognition of their distinguished and continuing achievements in original research. Dr. Przeworski also was elected to the American Academy of Arts & Sciences. Dr. Christiano's research focuses on understanding the genetic and molecular mechanisms that underlie inherited skin and hair disorders in humans. Dr. Przeworski's work aims to understand how natural selection has shaped patterns of genetic variation and to identify the causes and consequences of variation in recombination and mutation rates in humans and other organisms. Dr. Symington studies how the cell repairs harmful DNA damage.

Velocity Ride's Record Fund Raising Support for Cancer

More than 1,000 bicyclists, volunteers, and supporters raised \$1.5 million at the third annual Velocity, Columbia's Ride to End Cancer, in October 2019. The event raises funds to support research and patient care at the Herbert Irving Comprehensive Cancer Center. The money raised was used, in part, to provide



seed funding to six Columbia cancer researchers conducting early-stage research projects.

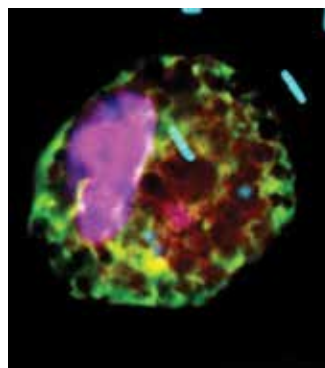
Sampling the Neighborhoods of the Gut Microbiome

Composed of hundreds of different species of bacteria, the gut microbiome is a complex community, with a spatial distribution of microbes that are not evenly distributed throughout the gut. That makes the gut microbiome like a large city, with multiple neighborhoods, each with its own mix of occupants and features. Scientists have developed a way to locate and characterize these neighborhoods, which could shed light on how microbes influence the health of their hosts. Harris Wang, PhD, led a team that took inspiration from the way plant ecologists use plot sampling to survey sites. Using small tissue samples from the GI tracts of mice, scientists added gel to fix the bacteria in place, froze the gel, then broke the tissue samples into tiny particles. Each particle preserved the species from a particular neighborhood. The researchers used new, high-throughput techniques to process the data and identify all the species present on each separate particle, testing the technique with mice who switched from a low-fat to a high-fat diet. Diet is known to change the abun-

dance of specific bacteria in the gut within days, but the new technique also revealed that the switch caused wholesale changes of microbial neighborhoods. A switch in diet in some cases eliminated specific regions of bacteria, suggesting how a change in diet may impact health. The research was published in *Nature Biotechnology*.

In Cystic Fibrosis, Lungs Feed Deadly Bacteria

Pseudomonas aeruginosa is a much-feared pathogen that easily colonizes the lungs of people with cystic fibrosis and leads to chronic infections that are almost impossible to eradicate and are ultimately fatal. A VP&S study tries to explain why *P. aeruginosa*, but not other common bacteria, thrive in the lungs of CF patients. The answer has to do with the bacterium's culinary preference for succinate, a byproduct of cellular metabolism, that is abundant in the lungs. Preventing infection by *P. aeruginosa*

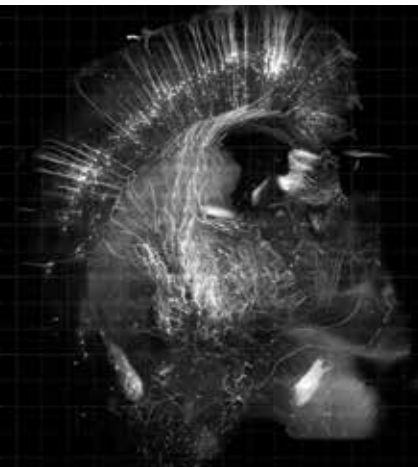


could greatly improve the health of people with CF, and the study, led by Alice Prince, MD, suggests it may be possible to control infection by targeting the bacteria's use of succinate in the lung. Findings were published in *Science Translational Medicine*.

Biology Shown at the Speed of Life

The Columbia team behind the revolutionary 3D SCAPE microscope created a new version of this high-speed imaging technology and in collaboration with scientists from around the world used SCAPE 2.0 to reveal previously unseen details of living creatures—from neurons firing inside a wriggling worm to the 3D dynamics of the beating heart of a fish embryo—with far superior resolution and at speeds up to 30 times faster. Improvements to SCAPE, published in *Nature Methods*, could impact fields as wide ranging as genetics, cardiology, and neuroscience. Elizabeth Hillman, PhD, explains the benefit of faster 3D imaging: “The faster we can image, the more living processes we can see, and imaging fast in 3D lets us see the whole biological system, rather than just a single plane, offering a clear advantage over traditional microscopes.” For example, SCAPE 2.0 can track individual neurons firing in a whole animal as it crawls around, providing insight into how neural activity guides behavior. In cardiology, SCAPE 2.0 can study how the heart develops. Pediatrics researcher Kimara Targoff, MD, uses zebrafish as an animal model to decipher the genetic mutations that can cause heart malformations in the embryo. “The problem with imaging the beating heart is that it beats fast, changing its shape as blood flows through it in a wide range of directions,” says Dr. Targoff. “With SCAPE 2.0, we can image the zebrafish embryo's beating heart in 3D and in real

time, allowing us to see how calcium signals communicate between heart cells, how the heart wall contracts, or how red blood cells flow through the cardiac valves beat after beat. Using this knowledge, we can track how genetic



mutations affect cardiac development in an environment that recapitulates the heart's natural state." One of several projects under development by Dr. Hillman's team is a miniaturized version of SCAPE for medical use, to quickly distinguish between healthy and diseased cells within a patient's body, which will give doctors a new way to guide how to perform complex surgeries in the operating room.

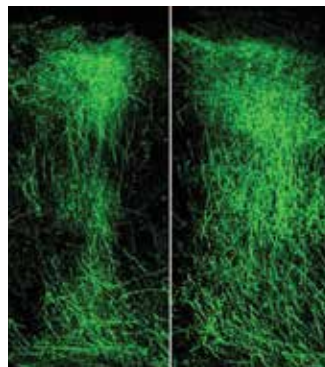
First Comprehensive Look at Neurons in Parkinson's Disease

Researchers have long tried to understand why Parkinson's disease singles out some specific population of neurons such as dopamine-producing neurons in a small region deep inside the brain known as the substantia nigra compacta while largely sparing neighboring dopamine neurons elsewhere. New techniques have

made it possible to examine these cells in unprecedented detail, and a team led by Serge Przedborski, MD, PhD, will use a new center grant from the Parkinson's Foundation to launch the first comprehensive look. Some evidence suggests that another type of brain cell, microglia, may act as an accomplice of sorts in the death of dopamine neurons in the substantia nigra compacta. Microglia have been difficult to study in the lab because they change rapidly when removed from the brain. But laboratory and computational techniques developed in the past few years have made such studies possible. Single-nuclei sequencing will give researchers in-depth details about what is happening in thousands of individual neurons, microglia, and other brain cells from Parkinson's patients. The data collected from these cells will be analyzed with a machine learning technique developed by the project's bioinformatics team to compare cells in healthy brain regions with cells from regions affected by Parkinson's. Ultimately, the goal of this project is not only to gain insights into understanding why and how specific neurons are dying in Parkinson's but also to translate this new knowledge into effective therapies for this common disorder of the aging brain.

Scientists Reverse Core Symptom of Schizophrenia in Mice

Researchers restored normal working memory to a mouse model of schizophrenia, eliminating a core symptom of the disorder that, in people, has been nearly impossible to treat.

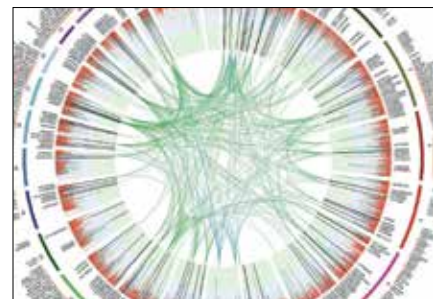


The researchers repurposed a drug currently in development for leukemia to repair the mouse model's dysfunctional brain cells. The findings, published in *Neuron*, challenge the generally accepted belief that cellular disruptions underlying memory issues in schizophrenia cannot be repaired once symptoms arise. "Schizophrenia is thought to be a neurodevelopmental disorder that begins years before it can be diagnosed, making the disease's underlying aspects extremely difficult to understand and treat," says the study's leader, Joseph Gogos, MD, PhD. "We have shown a promising way forward—a way to use knowledge from genetic studies to identify drugs that restore normal cognitive and cellular function in the adult brain after the onset of disease."

MS: Genome Map Shows Many Peripheral and Brain Immune Cells Implicated

A new study of susceptibility to multiple sclerosis has produced a genomic map of the disease, which reveals that MS begins with dysfunction in many different types of immune cells throughout the bloodstream and brain—not only in lymphocytes, as had been thought. The array

of dysfunctional cells, in combination, triggers a cascade of events that can lead to brain inflammation and, eventually, nerve cell death. By analyzing the genomes of 115,803 individuals—47,429 MS patients and 68,374 healthy individuals—the researchers identified 233 genetic variants that contribute to the onset of MS and analyzed the downstream effects of these variants to determine the sequence of molecular events in each immune cell type that eventually perturb the function of these immune

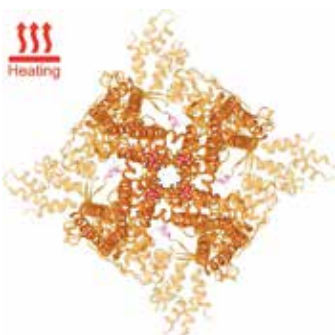


cells and make them attack the brain and spinal cord. The study, led by Philip L. De Jager, MD, PhD, on behalf of the International Multiple Sclerosis Genetics Consortium, was published in *Science*.

How Skin Senses Temperature

Researchers have captured new detailed images of a temperature-sensing molecule in its open, intermediate, and closed states. The findings, published in *Nature Structural and Molecular Biology*, elucidate the understanding of the mechanics of hot, warm, cool, and cold sensation and could accelerate the development of drugs for a variety of conditions, including inflammatory skin disease, itch, and pain. Perception of temperature and

pain is controlled by specialized sensory neurons. In the late 1990s, scientists discovered a superfamily of molecules, called transient receptor potential (TRP) channels, inside these neurons. Of the 28 known TRP channels, 11 are highly sensitive to changes in temperature. These “thermoTRPs” open and close in response to temperature fluctuations,

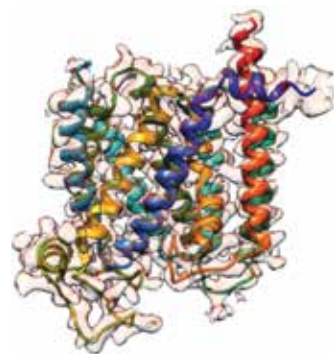


allowing ions to pass through and transmit signals to the central nervous system. “How these channels sense temperature and then subsequently undergo changes at the molecular level has remained a puzzle,” says study leader Alexander I. Sobolevsky, PhD. Since cryo-electron microscopy was first used in 2013 to image representatives of the TRP channel family, almost every type of TRP channel has been imaged. Scientists were unable to capture cryo-EM images of thermoTRP channels at different temperatures—particularly high temperatures, when heat-sensitive channels are activated—but the new study identified a mutation in one of these channels, TRPV3, that increases its sensitivity to temperature. By exploiting this mutation, the team was able to fix the channel in open, sensitized, and closed states, an essential step in understanding

a protein’s structure using cryo-EM imaging. The resulting images revealed the structural changes that happen in TRPV3 once it is activated by heat. In another study published in *Nature Communications*, Dr. Sobolevsky’s team used cryo-EM to determine the structure of crTRP1, a thermoTRP found in *Chlamydomonas reinhardtii*, a type of algae, the first time the structure of a thermoTRP has been described in a micro-organism.

New Images Show How Malaria Parasites Evade Drugs

Malaria parasites are rapidly developing resistance to front-line drugs, threatening to undo years of progress in reducing deaths from the disease. New pictures of a key mediator of drug resistance for the parasite *Plasmodium falciparum*—captured with single-particle cryo-electron microscopy by a team of scientists at VP&S—are providing clues about how to combat resistance. The study, co-led by David Fidock, PhD, Matthias Quick, PhD, and Filippo Man-



cia, PhD, was published in *Nature*. The study shows that multidrug resistance in *P. falciparum* is linked to a specific transporter and illustrates how mutations in this protein allow

the parasite to expel drugs. The new discovery may help scientists find ways to restore antimalarial potency and will allow health officials in other parts of the world to monitor for emerging resistance.

Contagious Cancer in Shellfish is Spreading

Contagious cancers discovered in shellfish have spread across the Atlantic Ocean and even into the Pacific. So far, scientists have observed contagious cancers in three types of animals—Tasmanian devils, dogs, and shellfish—and none of these cancers can be transmitted to humans. Researchers in the lab of Stephen Goff, PhD, were the first to discover contagious cancers in marine animals. In four species of bivalves (including clams, mussels, and cockles), researchers found that cancer cells could travel through seawater from one animal to another to spread the disease and “infect” a different species. In some mussel colonies, the cancer was so contagious that it had infected 13% of the population. Researchers in this study, published in *eLife*, collaborated with marine biologists in South America and Europe and found cases of contagious cancers in different mussel species along the coasts of Argentina, Chile, France, and the Netherlands. Research on how contagious cancers spread in shellfish will help biologists develop more effective plans to protect marine life. And though transmissible cancers in shellfish do not pose a threat to humans, parallels between how cancers spread in the ocean and



how cancer cells metastasize within humans could help physicians find ways to prevent cancer metastasis.

Heart Disease and Marijuana

Although the effects of smoking marijuana on the heart are not fully understood, some studies suggest that marijuana can trigger heart attacks and strokes in some users. Ersilia DeFilippis, MD, led a team that reviewed the medical literature to find out what is known and yet unknown about marijuana’s effect on the heart. The report, published in the *Journal of the American College of Cardiology*, estimates that about 2 million adults in the United States who have cardiovascular disease use or have used marijuana. With the potency of marijuana increasing steadily over the past 30 years—from about 4% in the mid-1990s to 12% in 2014—concern about the effect of marijuana on the heart is warranted, Dr. DeFilippis says. “Higher potency may translate into greater effects on the conduction system, the vasculature, and the muscle of the heart. Although we need more data, the evidence we do have indicates that marijuana use has

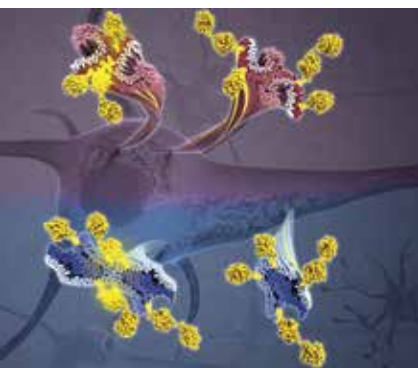
been associated with coronary artery disease, arrhythmia, cardiomyopathy, and more.”

Funding Innovative Research in Children’s Health

A new Innovation Nucleation Fund in the Department of Pediatrics will provide start-up funding for pediatrics researchers, bringing a venture capital approach to supporting new research in children’s health. “The Innovation Nucleation Fund allows our talented faculty the freedom to pursue innovative, bold ideas in research that could lead to the next major breakthrough in children’s health,” says Jordan S. Orange, MD, PhD, chair of the Department of Pediatrics.

Tau Protein Exposed in New Detail

Scientists have struggled to understand how the protein tau, long implicated in Alzheimer’s and a host of other debilitating brain



diseases, converts from its normal, functional form into a misfolded, harmful one. Researchers, led by Anthony Fitzpatrick, PhD, in collaboration with researchers at Mayo Clinic in Florida, used cutting-edge technologies to see tau in unprecedented detail in brain tissue of patients.

The researchers have revealed that modifications to the tau protein may influence the different ways it can misfold in a person’s brain cells, differences that are closely linked to the type of neurodegenerative disease that will develop—and how quickly that disease will spread throughout the brain. The study, published in *Cell*, employed two complementary techniques to map the structure of tau and decipher the effects of additional molecules, called post-translational modifications (PTMs), on its surface. These new insights could help researchers identify new biomarkers that detect these disorders before symptoms arise and design new drugs that target specific PTMs to prevent the onset of disease. Scientists previously used traditional imaging techniques to find clues to how tangles of tau are implicated in disease, but this study used cryo-electron microscopy and mass spectrometry to reconstruct the structures of tau filaments and provide new insights into how they form, grow, and spread throughout the brain.

Cryo-EM Reveals A Molecular “Latch” that Controls Neuron Activity

Scientists have captured a near complete snapshot of the gamma-aminobutyric acid (GABA) B receptor, a protein that regulates neuronal activity. Defects in the GABA_B receptor are closely related to neurological and psychiatric disorders, including epilepsy, addiction, depression, and schizophrenia. The high-resolution structure shows how different subunits of the receptor are held together with a unique “latch”

locking the protein in an inactive state. The structure also reveals that a calcium ion and two phospholipids could play key roles in the receptor’s function. The GABA_B structure helps researchers understand how the receptor maintains its inactive state and serves as a template for future drug design



efforts. The research, led by Oliver B. Clarke, PhD, Joachim Frank, PhD, and Qing R. Fan, PhD, was published in *Nature*.

Alzheimer’s: New Gene May Drive Earliest Brain Changes

A newly discovered Alzheimer’s gene may cause the first appearance of amyloid plaques in the brain, according to a study led by Richard Mayeux, MD, and published in *JAMA Neurology*. Some variants of the gene, RBFOX1, appear to increase the concentration of protein fragments that make up the amyloid plaques and may contribute to the breakdown of critical connections between neurons, another early sign of the disease. In recent years, amyloid PET brain imaging has helped to reveal that the first signs of Alzheimer’s disease—deposits of amyloid in the brain—appear as early as 10 or 15 years before symptoms of the disease appear. To find genes that drive early amyloid accumulation, the researchers examined the genomes of 4,300 people whose PET images revealed varying degrees of amyloid deposition in the brain but who had not yet developed Alzheimer’s

symptoms. A genetic analysis uncovered a link between the appearance of amyloid deposits and APOE, a known Alzheimer’s gene, and the novel link to the RBFOX1 gene.

Feared Pathogen Turns Our Lung Defenses Against Us

Superbug *Pseudomonas aeruginosa* resists many antibiotics and often causes intractable pneumonia and death when it infiltrates the lungs. A new study led by Sebastián Riquelme, PhD, and Alice Prince, MD, has revealed how *P. aeruginosa* uses our own immune defenses to multiply and persist in our lungs. Our immune system should fight off *P. aeruginosa* as it does other bacteria, but *P. aeruginosa* often resists these defenses and becomes entrenched in the lungs inside an impenetrable biofilm. The research, published in *Cell Metabolism*, shows that *P. aeruginosa* can sidestep an antibacterial substance—called itaconate—that normally helps in the fight against pathogens, ultimately adapting to generate a self-perpetuating bacterial community. “By identifying the mechanisms by which these organisms adapt and exploit our defenses,” says Dr. Riquelme, “it is conceivable that targeting these very adaptations may allow us to combat such infectious agents and prevent the devastating diseases they cause.”

“Silent” Genetic Changes May Impact Human Health

New analyses of tens of thousands of people show that genetic changes previously believed meaningless, or “silent,” may in fact play

an important but overlooked role in human diseases, including breast cancer. These silent genetic changes were first discovered when researchers in the 1960s cracked the DNA code. DNA gives cells instructions for making proteins in strings of three-letter segments, called codons; each codon corresponds to a particular amino acid in the protein. But with 64 possible codons and only 20 amino acids, most amino acids are encoded by several different codons. That redundancy means some DNA mutations will not change the amino acid sequence of the protein. Geneticists have generally ignored these synonymous DNA mutations, but recent studies have shown that synonymous mutations can influence the amount of protein that is produced; so-called “optimal” codons are faster for cells to process and lead to increased protein production. Testing the idea that synonymous mutations are not meaningless requires massive amounts of genetic data, which has only recently become available as more people have their genomes sequenced. In a new study, led by Ryan Dhindsa, PhD, and David Goldstein, PhD, and published in the *American Journal of Human Genetics*, researchers tapped into databases containing nearly 200,000 human genomes and found the first clear evidence that natural selection favors synonymous mutations that improve optimality. A closer gene-by-gene analysis confirmed that genes that are more intolerant to changes in synonymous codons include those associated with cancer, as well as those that cause disease when their

expression levels change. In BRCA1, for example, a gene well-known for causing breast and ovarian cancer, the study found that mutations that reduce codon optimality may impact the levels of the encoded protein and possibly play an important role in the disease.

New View Emerges of Ion Channel Linked to Blindness

Researchers have generated high-resolution 3D images of an ion channel that is essential for vision and smell in vertebrates. Cyclic nucleotide-gated (CNG) channels convert electromagnetic and chemical signals into electrical signals in the eye and nose, which are transmitted



to and processed by the brain. Mutations in CNG channel genes are associated with degenerative visual disorders that cause blindness or color blindness. The research, published in *Nature Structural & Molecular Biology*, used cryo-electron microscopy to study the structure of TAX-4, a CNG channel found in roundworms that is related to the human variant. The resulting images of the structure reveal for the first time how the channel is activated: When cyclic nucleotide molecules bind to the outside of the channel, a double-barrier gate located 5 nanometers away in the central cavity opens.

The images challenge a long-held theory in the ion channel field, which suggests that the activation gate is located at the external entrance of CNG channels, and provide a blueprint for mapping the locations of disease-causing mutations and elucidating how the mutations alter CNG channel structure and function. The research team included Joachim Frank, PhD, who received a Nobel Prize for development of cryo-EM.

Neural Basis for Sugar Cravings

A study in mice has shown that the brain responds not only when sugar touches the tongue but also when it enters the gut. Discovery of the specialized gut-brain circuit offers new insight into the way the brain and body evolved to recognize and seek out sugar. The findings, reported in *Nature*, lay the foundation for new ways to modulate the gut-brain circuit, suggesting new paths to reducing overconsumption of sugar. The study was led by Charles Zuker, PhD, and builds upon decades of work to map the brain’s taste system.

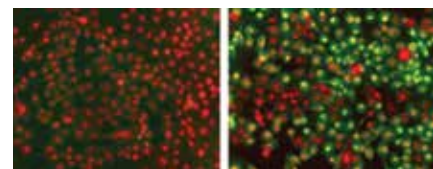
Brain Tumor Growth: How Glioma Cells Advance

It is well known that gliomas, a common type of brain tumor, can cause seizures, but a team of Columbia engineers and cancer researchers has found new evidence that glioma-induced seizures can spur the tumor’s deadly progression. Researchers, led by Elizabeth Hillman, PhD, and Peter Canoll, MD, PhD, used a novel mouse glioma model and brain imaging technology to track real-time changes in neuronal activity and blood

flow as tumors grow and infiltrate the surrounding brain. “Neuro-oncologists have focused on developing ways to selectively kill glioma cells, but we are also interested in understanding how infiltrating glioma cells change the way that the brain functions. We believe that this approach can lead to new treatments for this terrible disease,” says Dr. Canoll. The results were published in *Cell Reports*.

Starving Pancreatic Cancer of Cysteine

A drug in development for a rare kidney stone disease may have potential value in treating pancreatic cancer by starving tumors of an amino acid, cysteine, found to be critical to the survival of pancreatic cancer cells. The study, conducted in mice with pancreatic cancer, was published in *Science* and led by Kenneth P. Olive, PhD, and his PhD student, Michael Badgley. Most pancreatic tumors ramp up the production of oxidants that can kill many normal cells, but pancreatic tumors thrive under these toxic conditions by importing large amounts of cysteine into their cells. “Since pancreatic tumors appear to depend on cysteine import for their survival, we hypothesized that it might be possible to selectively kill



tumor cells by targeting this amino acid,” says Dr. Olive. The strategy worked: When the gene that controls cysteine import was knocked out in mice

with pancreatic cancer closely resembling human tumors, the tumors stopped growing. Moreover, some cells in the tumors died from an oxidative form of cell death, called “ferroptosis,” discovered almost a decade ago by Columbia’s Brent Stockwell. The researchers in the Science study achieved similar results when the mice were treated with cysteinase, an experimental drug under development elsewhere, that breaks down cysteine in blood.

Assessing the Impact of Mixed Messages in Prostate Cancer

Urologists treating patients tested for prostate cancer favor an approach that includes discussion about risks and benefits of screening and to individualize that discussion based on age, family history, ethnicity, and other factors that can affect risk. Internet-based sources and consumer advertising obscure the risk versus benefit messaging for men with regard to treatment options. Elias S. Hyams, MD, and his urology faculty colleagues searched the Internet for information regarding “ablative” therapies for prostate cancer and found substantial inaccurate and incomplete information from both academic and private practice websites. In a study of the influence of advertising on decisions about treatment with stereotactic body radiation therapy, the researchers randomly assigned 400 men, ages 40-80, to one of four arms of an online survey they created: a CyberKnife advertisement, the same CyberKnife advertisement with disclaimers, scientific information obtained from peer-reviewed literature, and an unrelated control ad. Subjects

answered questions regarding risks/benefits of CyberKnife and the likelihood of pursuing this versus other prostate cancer treatments. “We found that respondents who viewed scientific information were less likely to agree CyberKnife is superior regarding impotence and urinary dysfunction, and those who viewed the advertisement and the advertisement with disclaimer were more likely to consider CyberKnife superior. The reality is much more muddled because patients’ disease risk and susceptibility to side effects vary greatly, and there is limited comparative evidence between stereotactic body radiation therapy, or CyberKnife, and other therapies,” says Dr. Hyams, whose studies were published in *Urology* and in *Prostate Cancer and Prostatic Diseases*.

Urinary Tract Defects

Understanding the genetic origins and complications of urinary tract abnormalities is a research focus of developmental biologist Cathy Lee Mendelsohn, PhD. “Historically, developmental biologists have worked in mouse models looking at congenital abnormalities that affect a number of different organs at the same time—kidney, ureter, bladder, and urethra,” says Dr. Mendelsohn. She works with nephrologists Jonathan M. Barasch, MD, PhD, and Ali Gharavi, MD, in Columbia’s George O’Brien Urological Center, which brings together research programs in human genetics and mouse models to address the causes of congenital urinary tract malformations. Their collective investigations focus on identifying genetic mutations in mice that, in humans, are linked to causes of

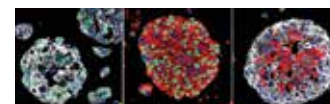
congenital urinary tract malformations. “We are like detectives going back in time and looking at genetic models to try and find out what was the first thing that went wrong in development,” adds Dr. Mendelsohn. By identifying the gene mutations, the research could help physicians determine which patients need surgery and understand what mutation may be a problem in the future.

Patient-Derived Organoids

Organoid models have grown in popularity among researchers who seek methods to accelerate the pace of drug screening to identify more precise treatment options. Organoid research at Columbia includes testing methods to improve an organoid’s congruence to human cells, testing an increasing number of tumor types, and developing a comprehensive atlas of all organoids to help researchers expedite their applications to clinical care. With success in developing organoid culture approaches in prostate cancer, Michael M. Shen, PhD, and his research team have generated patient-derived bladder organoids, applying methods and concepts from stem cell and developmental biology to a translational problem. A team led by Herbert Irving Comprehensive Cancer Center Director Anil K. Rustgi, MD, has created esophageal cancer organoids for both squamous cell carcinoma and adenocarcinoma and developed protocols to initiate, grow, passage, and characterize patient-derived organoids of esophageal cancers. With the number of patient-derived 3D organoids increasing for numerous cancers, Dr. Rustgi is pursuing development of a centralized

facility that generates organoids from different tissue types.

He cites the Cancer Genome Atlas, a project of the National Cancer Institute that catalogs



genetic mutations responsible for cancer. “That information is in the public domain. We use it all the time. My hope is that we can accomplish a similar atlas, sharing information across the country.”

New Cellular Machinery

Science Advances published a report of microscopic and biochemical evidence of a novel, mobile form of the endoplasmic reticulum. Dubbed ribosome-associated vesicle (RAV), the newly discovered organelle was directly visualized using a combination of live-cell microscopy and in situ cryo-electron tomography in several secretory cell types, including pancreatic β -cells and neurons. Found primarily in the cell periphery, RAV seems to play a role in local protein translation, suggesting a mechanism by which secretory cells throughout the body provide instantaneous, localized response to activity among cells and a means by which local translation can be rapidly activated at nerve junctions. The work provides proof of concept of novel, high-resolution imaging techniques and suggests fresh treatment strategies for diseases that trace their roots to disruptions in chemical signaling, including schizophrenia, Parkinson’s, and diabetes. Columbia researchers on the team included Joachim Frank, PhD.

VP&S Clinical Highlights

In the Eye of the COVID-19 Storm

As COVID-19 began to sweep through New York City in early March, Department of Obstetrics & Gynecology faculty moved swiftly to initiate programs and protocols to protect patients, their babies, and staff. Programs included universal screening for all pregnant patients being admitted to the hospital, creation of a virtual COVID-19

clinic, and development of an obstetric intensive care unit. Faculty published the first U.S. scientific investigations of the virus related to OB patients.

Dena Goffman, MD, professor of obstetrics & gynecology at VP&S, chief of obstetrics for Sloane Hospital for Women, and associate chief quality officer for obstetrics for NewYork-Presbyterian

Hospital, describes how universal screening developed.

“We started to recognize early on that women presenting to the hospital from our community may have been exposed to COVID-19,” says Dr. Goffman. “While we were telling everyone else to stay home, these women had to come in for routine care. In early March, we spent a lot of time brainstorming how to handle this, but on March 13, we had our first diagnosed case of COVID-19 in an OB patient. And then things escalated very quickly.

“Our first OB patient diagnosed with COVID-19 was not yet due to deliver and was initially managed as an outpatient,” continues Dr. Goffman. “A week later, two women who were presenting for routine labor and delivery care and who were asymptomatic were screened at several points when they entered the hospital and before arriving at Labor and Delivery. Our nurses went through a symptom list and each woman had a temperature check. Everything was negative, normal. No complaints. No contact. No issues.”

These two women then developed symptoms and became ill—one during delivery and the other while on the postpartum unit—then tested positive for COVID-19. “We had been caring for them for days without additional precautions or PPE. This was a huge wake-up call that we could have women presenting for routine obstetric care who didn’t screen positive based on any of the screening questions and could then expose upwards of 30 staff and team members to the virus. We realized that we had to do something different and quickly,” says Dr. Goffman. “That happened on a Friday. Starting on Sunday, we began universal testing with nasopharyngeal swabs and a quantitative



Dena Goffman

PCR test of all OB patients coming into Labor and Delivery.”

In a letter to the editor of the *New England Journal of Medicine* published on April 13, 2020, Dr. Goffman and her colleagues detailed results of the universal testing of 215 pregnant women who delivered at NewYork-Presbyterian/Columbia and NewYork-Presbyterian Allen Hospital between March 22 and April 4, 2020:

“All the women were screened on admission for symptoms of COVID-19. Four women (1.9%) had fever or other symptoms on admission, and all four women tested positive for SARS-CoV-2. Of the 211 women without symptoms, all were afebrile on admission. Nasopharyngeal swabs were obtained from 210 of the 211 women (99.5%) who did not have symptoms of COVID-19; of these women, 29 (13.7%) were positive for SARS-CoV-2. Thus, 29 of the 33 patients

who were positive for SARS-CoV-2 at admission (87.9%) had no symptoms of COVID-19 at presentation.”

Adds Dr. Goffman: “With universal swabbing we were identifying 13% to 15% of patients being admitted to Labor and Delivery who were COVID-19 positive that we would not otherwise have known about. This was important data supporting the use of appropriate PPE and helping us to make decisions about caring for the newborn. There are also many downstream effects—the rooms you place patients in, the precautions you use. We were very glad that we had made the decision for universal screening and made it quickly so that we could put safe processes in place.”

The team has now cared for hundreds of women with no cases of symptomatic vertical transmission in utero. “That’s reassuring, but we continue to follow these moms

and babies very closely,” says Dr. Goffman.

She describes the collective efforts that accomplished so much during the height of the pandemic in New York City. “There was incredible collaboration from multiple disciplines required to take care of pregnant women with a new condition that we knew nothing about just a few months earlier. It was all hands on deck. We were taking care of patients. We were reviewing the literature daily. We were meeting daily. We were writing guidelines by day and manuscripts by night to help inform others. We participated in New York State webinars. We were invited to other states’ perinatal quality collaboratives across the country to share what we were seeing in the hope that they might be better prepared when it got to them. And really, throughout the whole experience, all we were trying to do was our best to keep our patients safe and our team safe.”

Physical Rehab Goes Virtual

When the number of COVID-19 patients was at its highest, the Department of Rehabilitation & Regenerative Medicine developed a holistic virtual rehabilitation program to help recovered patients combat lingering issues, such as weakness, shortness of breath, memory loss, anxiety, and depression, after release from the hospital. Rehabilitation teams of physicians, psychologists, and therapists offered outpatient rehabilitation that made use of a rehabilitation doctor and a physical, occupational, or speech therapist to help patients regain strength and address individual medical needs during the stages of recovery. The program focused on breathing exercises, muscle strengthening exercises, activities of daily living, and swallowing exercises and/or dietary

modifications (of particular help for patients who required treatment with a ventilator during their hospitalization). After patients were discharged from the hospital, a rehabilitation doctor provided a telehealth video evaluation, followed by a telehealth therapy evaluation to allow patients to begin home-based exercise programs with telemonitoring. The patient’s physician and therapy team monitored the patients for symptoms to ensure that the exercise program was done safely at home.

A New Medical Record

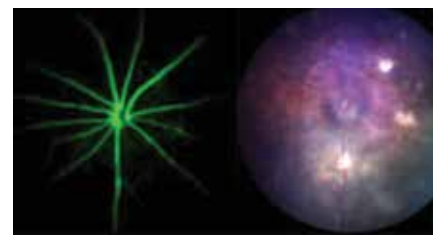
Columbia launched a new integrated electronic medical record—Epic—on Feb. 1 after years of preparation. More than 18,000 health care professionals and staff members are using Epic to document inpatient and ambulatory

clinical visits for hospital and professional billing and to provide patients with a single integrated record across Columbia, Cornell, and all NewYork-Presbyterian sites to improve the continuity of care among the institutions. All parts of NYP, Cornell, and Columbia will be fully integrated into Epic by Dec. 31, 2021. Epic, a company that has been in business since 1979, provides electronic medical record software for most of the nation’s leading hospitals and academic medical centers. The company awarded Columbia and its partners nine gold stars (out of 10) in a program that measures usage and adoption success of the EMR system.

Eye Drops May Prevent Common Cause of Blindness

Eye drops developed at VP&S could prevent vision loss after

retinal vein occlusion, a major cause of blindness for millions of adults worldwide. Nature Communications published findings from a study in mice

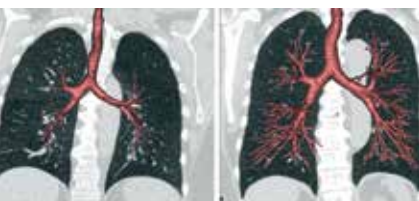


that suggest that the experimental therapy—which targets a common cause of neurodegeneration and vascular leakage in the eye—could have broader therapeutic effects than existing drugs. Carol M. Troy, MD, PhD, led the studies, which found that a highly selective caspase-9 inhibitor, delivered in the form of eye drops, improved a variety of clinical measures of retinal

function in a mouse model of the condition. The treatment reduced swelling, improved blood flow, and decreased neuronal damage in the retina.

Undersized Airways and COPD

Though COPD is often linked to smoking, one in four cases occurs in people who have never smoked. A study of lung anatomy—CT scans of more than 6,500 adults—found that people with small airways relative to their lungs’ volume, a relationship termed dysanapsis, are at increased risk of COPD. “Our findings suggest that dysanapsis is a major COPD risk factor, on par with cigarette smoking,” says lead author Benjamin M. Smith, MD. “Dysanapsis is believed to arise early



in life. Understanding the biological basis of dysanapsis may one day lead to early life interventions to promote healthy and resilient lung development.” The research was published in JAMA.

Adults with Pain at Greater Risk for Cannabis Use Disorder

Nonmedical cannabis use—including frequent or problematic use—is significantly more common in adults with pain, according to findings published in the American Journal of Psychiatry. Researchers, led by Deborah Hasin, PhD, analyzed data on marijuana use from the National Epidemio-

logic Surveys on Alcohol and Related Conditions in 2001-2002 and 2012-2013 and compared nonmedical cannabis use patterns in adults with and without pain (approximately 20% of participants in both surveys had moderate to severe pain). Nonmedical marijuana use increased from about 4% in 2002 to 9.5% in 2013, and those with pain were significantly more likely to engage in frequent nonmedical cannabis use than those without pain (5% vs. 3.5%). The risk of cannabis use disorder was also significantly higher in those with pain (4.2% vs. 2.7%).

Poor Sleep and Diet

Studies have shown that people who get less sleep are more likely to develop obesity, type 2 diabetes, and heart disease and that the relationship may be partially explained by diet. But the studies were narrowly focused on specific foods or nutrients (fish, sweets, or saturated fat) or only measured sleep duration, not sleep quality. Findings in a new study designed to get a more comprehensive picture in women by examining associations between overall diet quality and multiple aspects of sleep quality were published in the Journal of the American Heart Association. The findings among the nearly 500 women studied: Women with worse sleep quality consumed more of the added sugars associated with obesity and diabetes; women who took longer to fall asleep ate more calories and food by weight; and women with severe insomnia ate more food and fewer “healthy” fats. The research was led by Brooke Aggarwal, EdD.

Recommended Diuretic and Side Effects

Chlorthalidone, the guideline-recommended diuretic for lowering blood pressure, causes more serious side effects than hydrochlorothiazide yet is no more effective in reducing blood pressure complications in real-world practice, found a study led by George Hripcsak, MD, and published in JAMA Internal Medicine. The researchers found that patients taking chlorthalidone had nearly three times the risk of developing dangerously low levels of potassium and a greater risk of other electrolyte imbalances and kidney problems compared with those taking hydrochlorothiazide. The study of 17 years of data on more than 730,000 individuals treated for hypertension is the largest multisite analysis directly comparing the two antihypertensive drugs in the general patient population. “Until we have more studies directly comparing the two diuretics, we don’t really know whether the risk of the side effects seen in observational studies outweighs the potential cardiovascular benefits,” says Dr. Hripcsak.

Clinical Genetics of Eye Disease

Applied Genetics at Columbia Ophthalmology enables patients to pursue clinical genetic testing and interpretation of the testing by experts. Megan Soucy, MS, CGC, a genetic counselor, meets with the patient and/or family before and after testing. “Genetic mutations are very complicated and can affect multiple parts of the body,” says Ms. Soucy. “Genetic test-

ing can force a lot of people to deal with challenging issues. These test results do not just affect one person; they affect the whole family. But if you can identify the underlying cause, then you can treat the person and also identify who may be at risk in the family for developing these diseases or disorders.” Depending on the results of the clinical genetic testing, the patients may have opportunities to be involved in research projects and clinical trials at Columbia, including clinical trials for therapies and identifying new genetic causes for ophthalmic disease.

Robotic Cane for Help in Walking

By adding electronics and computation technology to a simple cane that has been around since ancient times, researchers transformed the cane into a 21st century robotic device that can provide light-touch assistance in walking to the aged and others with impaired mobility. A team of mechanical engineering and rehabilitation & regenerative medicine faculty, led by Sunil Agrawal, PhD, demonstrated the benefit of using an autonomous robot that “walks” alongside a person to provide light-touch support, much as one might lightly touch a companion’s arm or sleeve to maintain balance while walking.

Genetic Testing for Parkinson’s

Mutations in several genes increase the risk of Parkinson’s disease, but genetic testing was rarely offered until recently when studies showed that genotype can help better estimate the rate of disease progression. New drugs designed for people

with specific Parkinson's genes have entered clinical trials, including one at Columbia. "From our own genetic studies, I realized many people were eligible to enroll in such trials, but they didn't know it because nobody told them about their genetic status," says Roy N. Alcalay, MD. His idea was championed by the Parkinson's Foundation, which launched PD GENERation to offer free genetic testing and counseling to patients diagnosed with Parkinson's at Columbia and other centers across the nation. The study, which added a remote recruitment arm because of COVID-19, will test the satisfaction and impact of receiving the Parkinson's-related genetic results.

New Diabetes Gene Found

Columbia researchers have uncovered a previously unknown mechanism that allows insulin-producing cells to function properly. Using a combination of chromatin immunoprecipitation studies, RNA analysis, and comparison of human and experimental animal data on super-enhancers, researchers led by Taiyi Diana Kuo, PhD, and Domenico Accili, MD, identified a previously unknown gene, C2cd4a, which they proceeded to functionally analyze with a genetically engineered animal model. The experiments showed that the newly discovered gene, C2cd4a, plays an important role in insulin secretion. When the C2cd4a gene was removed from the beta cells of mice, the cells could not secrete enough insulin to meet the mouse's demands, similar to the way cells behave in people with type 2 diabetes.

The research was published in the Proceedings of the National Academy of Sciences.

Getting to the Heart of Norms for Elite Female Athletes

A study of 140 WNBA players shows how hearts adapt to intense physical training and provides physicians with a frame of reference when screening for cardiac problems in female athletes. The research resulted from a long-standing collaboration among cardiologists and researchers at VP&S, NewYork-Presbyterian, the National Basketball Association, the Women's National Basketball Association, and players associations for the NBA and WNBA. The group also created a screening and monitoring program for the leagues and guidelines for team physicians. The research team previously reported similar data on NBA players. The research, published in JAMA Cardiology, was led by Sofia Shames, MD.

Opening Ears to New Treatments

Because the inner ear is surrounded on nearly all sides by one of the hardest bones in the body and shielded from



substances in nearby blood vessels by a barrier similar to the blood-brain barrier, delivering drugs to the inner ear is a huge challenge. 3D-printed microneedles that pierce a tiny membrane separating the inner and middle ear may be one solution. Developed by

research teams that include Jeffrey Kysar, PhD, and Anil Lalwani, MD, the microneedle has a shaft the thickness of a human hair and the tip a radius less than 1% of a human hair's thickness. The ultra-sharp tip can pierce the inner ear's tiny membrane because it pushes aside—rather than cuts—the membrane's structural fibers. A single perforation in the membrane of guinea pigs let drugs delivered to the middle ear quickly diffuse into the inner ear. Perforations begin to heal over 24 to 48 hours, with complete closure by one week, and hearing returns to normal within a day. Their findings, published in Otolaryngology & Neurotology, take the initial steps in conquering the barriers to precision medicine of the inner ear.

Flu Vaccines in Children: Education Helps

Young children are more likely to suffer severe, even life-threatening complications from the flu, but less than two-thirds of children in the United States get the flu vaccine. A new study found that the number of children vaccinated for the flu can be increased by giving parents an inexpensive and simple pamphlet available in the pediatrician's waiting room. The study—a randomized, controlled clinical trial—was one of the first to look at the effect of educational information on influenza vaccination rates in children. "Parents' concerns and misperceptions about vaccines are on the rise," says study senior author Melissa Stockwell, MD, "but previous studies have shown that, in some cases, offering information to disprove vaccine myths

only reinforces parents' beliefs about vaccination and can even reduce the number of vaccine-hesitant parents who intend to get their kids vaccinated." Researchers in this study, published in Pediatrics, found that nearly 75% of children whose parents were given a fact sheet were vaccinated before the end of the season compared with about 65% of children who received usual care.

New Center Combats Substance Use Disorders

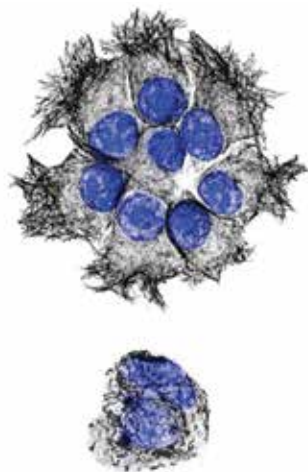
The New York State Psychiatric Institute's Division on Substance Use Disorders, the Irving Institute for Clinical and Translational Research, and Columbia's School of Social Work created the Center for Healing of Opioid and Other Substance Use Disorders-Enhancing Intervention, Development and Implementation (CHOSEN) to draw on expertise across Columbia to



develop and implement programs, policies, and practices that treat addiction. More than 30 scientists and researchers from the business school, the engineering school, the Data Science Institute, and other programs work together to find innovative solutions to a seemingly intractable problem. The center has four directors: Frances Rudnick Levin, MD, Edward V. Nunes, MD, and Muredach Reilly, MBBCh, all VP&S faculty, and Nabila El-Bassel, PhD, from the School of Social Work.

Less Toxic, More Enduring Drug for Pancreatic Cancer

Because pancreatic tumors recruit a thick layer of connective tissue called stroma that hardens the tumor and acts like a shield, most traditional chemotherapy drugs need to be used at nearly toxic levels to be



effective. Research by Kenneth Olive, PhD, and PhD student Jaime Eberle-Singh may have identified a good chemotherapy candidate, an experimental compound called PTC596 that had shown antitumor activity in mouse and human pancreatic cancer cells. The drug survives for a long time and effectively penetrates into pancreatic tumors while evading a molecular pump that many cancer cells use to expel drugs. The researchers tested PTC596 in combination with gemcitabine in genetically engineered mice with an aggressive form of pancreatic cancer that is generally resistant to chemotherapy. The mice treated with the two-drug combination lived three times longer than those treated with only a single standard agent.

A Model of Care for Aging

Patients who visit Columbia's Division of Geriatric Medicine

and Aging outpatient practice at Allen Hospital reflect the aging of America's population. With many patients in their 90s or 100s—the oldest patient is 104—the team of four geriatricians and a geriatrics nurse practitioner focuses on preventing and managing common geriatric syndromes while also managing comorbid chronic conditions. A high level of coordination among inpatient and outpatient geriatricians and nurse practitioners is paramount, says Evelyn C. Granieri, MD, division chief. Geriatrician Bindhu K. Thomas, MD, sees about two new patients per day. “The population is aging rapidly in this area. Because of the complexity of care, many primary care physicians are sending their older patients to see a geriatrician,” says Dr. Thomas, who notes that many of the patients come from the neighborhood though some patients travel as long as two hours to see a doctor in the practice. She typically sees 13 patients each day, and appointments with new patients last 90 minutes compared with the typical half hour to 45 minutes devoted to new internal medicine patients in private office visits. The ability of patients to adhere to medication regimens and polypharmacy continue to be major challenges for geriatricians, including those at Allen. “We ask patients to bring all of their medications to each visit and try to discontinue unnecessary ones to reduce pill burden. There is great marketing for multivitamins and often our senior citizens are unnecessarily taking one multivitamin plus vitamin B and vitamin C. If one looks

at these medications carefully, one can discard three unnecessary medications and encourage good nutrition instead,” says Dr. Thomas. The team partners with pharmacies in the community and uses other strategies, such as recommending pre-poured pill boxes, blister packs, and caregiver supervision, to combat polypharmacy.

Shared Decision-Making in Prostate Cancer

The multiple perspectives on prostate cancer confound physicians and patients alike as they navigate decisions on screening, diagnosis, and treatment. “There's a lot of confusion among referring physicians, primary care doctors, and certainly among lay people about prostate cancer,” says Elias S. Hyams, MD. Although many prostate cancers are slow growing and incidental to the aging process, some can metastasize or cause death and should be diagnosed early to prevent harm. “It's our job to diagnose the latter at an early point, while avoiding overdiagnosis of the former.” Also part of the mix are concerns men have about adverse urinary and sexual side effects of treatment, making it difficult to weigh the pros and cons of different treatment approaches. Dr. Hyams has embraced the shared decision-making model, which involves engaging with the patient, ensuring that the patient reviews and comprehends the educational materials and decision aids, and correcting any misconceptions they have about prostate cancer. One issue that contributes to confusion for patients is PSA screening. Working around the

limitations and drawbacks of the test, such as false-positive and false-negative results, discomfort or pain, and overdiagnosis or overtreatment is where Dr. Hyams' shared decision-making process becomes so relevant. “The challenge of screening is to identify potentially dangerous cancers during a window of curability and avoid detecting low-risk cancers not destined to cause harm. It's important to have a discussion about risks and benefits of screening and to individualize that discussion based on age, family history, ethnicity, and other factors that can affect risk.” Instead of having men go directly from PSA screening to a biopsy, Dr. Hyams and his colleagues use an approach called “risk-based” screening, using the PSA as a starting point in appropriate men to understand their risk, followed by a deeper discussion about options available for clarifying risk. “Today, there are potentially many intervening steps, such as novel blood and urine tests and imaging studies, that allow patients to avoid the discomforts and risks of a biopsy. But prostate cancer can kill and be very disabling when it's metastatic or advanced. We now have the tools to allow us to hone in on the men who are at greatest risk and treat them accordingly.”

Seizures, Coma from Synthetic Cannabinoids in Teens

Among teens treated in an emergency department for drug-related symptoms, those who used synthetic cannabinoids (also known as Spice, K2) were more likely to experience seizures and coma compared with those

who used natural cannabis, researchers found. “Synthetic cannabinoids, whether taken alone or with other substances, are associated with severe neuropsychiatric effects in adolescents and require higher acuity care than adults,” says Sarah Ann Anderson-Burnett, MD, PhD. The research was published in *Pediatrics*.

Columbia Pediatricians Join Health Equity Initiative

Two VP&S pediatricians—Stephanie Lovinsky-Desir, MD, and Jennifer Woo Baidal, MD—were selected to join an initiative to help reduce childhood health disparities in New York City, where children from low-income neighborhoods have higher rates of asthma and obesity compared with children from wealthier neighborhoods. The initiative, Health Data for New York City—HD4NYC—is a partnership of New York City Department of Health and Mental Hygiene and New York Academy of Medicine. With funding through the Robert Wood Johnson Foundation, HD4NYC gives scientists from academic centers across New York City unprecedented access to a trove of health data at the city health department and fosters action-oriented, collaborative research to promote health equity among New Yorkers.

Stress During Pregnancy: Why It Matters

Experts agree that maternal stress during pregnancy can affect fetal and child development and birth outcomes, and a VP&S study led by Catherine Monk, PhD, has identified the types of physical and psycho-

logical stress that may affect the likelihood of a male or female baby and risk of early birth. Researchers examined 27 indicators of psychosocial, physical, and lifestyle stress collected from questionnaires, diaries, and daily physical assessments of 187 otherwise healthy pregnant women, ages 18 to 45. They found that pregnant women experiencing physical and psychological stress are more likely to have a girl and to give birth prematurely than unstressed mothers.

Why Some Creams and Cosmetics Cause Skin Rash

A study led at Columbia by Annemieke de Jong, PhD, suggests that the way some chemicals displace lipids in skin cells



explains how many common ingredients in creams, cosmetics, and other topicals trigger allergic contact dermatitis. The research was published in *Science Immunology*. Many allergic reactions begin when the immune system’s T cells recognize a chemical as foreign. T cells do not directly recognize small chemicals, and research suggests that these compounds need to undergo a chemical reaction with larger proteins

to make themselves visible to T cells. “Many small compounds in skin care products that trigger allergic contact dermatitis lack the chemical groups needed for this reaction to occur,” says Dr. de Jong. Researchers suspected that CD1a, a lipid binding molecule that’s abundant on Langerhans cells (immune cells in the skin’s outer layer), might be responsible for making the chemicals visible to T cells. By studying human cells in tissue culture, the researchers found that several common chemicals known to trigger allergic contact dermatitis were able to bind to CD1a molecules on the surface of Langerhans cells and activate T cells, causing an immune reaction. The study raises the possibility that allergic contact dermatitis could be stopped by applying competing lipids to the skin to displace the compounds triggering the immune reaction.

Many Who Die Waiting for a Kidney Had Multiple Offers

Most patients who die waiting for a kidney, or who are removed from the transplant waitlist for poor health, had multiple opportunities to receive a transplant, but the offered organs were declined by patients’ transplant teams and subsequently transplanted in someone lower on the waitlist. “Presumably, these offers were declined primarily because centers were expecting patients to get a better offer in a timely manner,” says study leader Sumit Mohan, MD, whose research was published in *JAMA Network Open*. “In some cases, a decline may have been the right decision, but our data suggest that many others probably

would have been better served if their transplant center had accepted one of the offers.”

Diagnosing Cardiac Amyloidosis Earlier in Marginalized Communities

VP&S researchers are sharing an NIH grant to establish a screening program for cardiac amyloidosis in minority communities to respond to research that shows that heart failure related to transthyretin cardiac amyloidosis disproportionately affects older Black and Hispanic Americans. Until recently, the amyloidosis was difficult to diagnose and was perceived to be very rare, but the researchers, co-led by Columbia’s Mathew Maurer, MD, will test the hypothesis that highly sensitive heart imaging and blood tests may help diagnose the disease earlier.

Ex-Smokers, Light Smokers Not Exempt from Lung Damage

People who smoke fewer than five cigarettes a day cause long-term damage to their lungs, according to a new study led by Elizabeth Oelsner, MD. The study found that a light smoker could lose about the same amount of lung function in one year as a heavy smoker might lose in nine months. The study also tested an assumption, based on a 40-year-old study, that the rate of decline in lung capacity “normalizes” within a few years after quitting smoking. The new study shows that although lung capacity declines at a much lower rate in ex-smokers, the decline doesn’t stop for at least 30 years. “There may be anatomic differences in the lung that persist for years after smokers quit and gene activity

may also remain altered,” says Dr. Oelsner. The research was published in *Lancet Respiratory Medicine*.

Senior Founding Medical Director for Primary Care

David Buchholz, MD, joined VP&S as senior founding medical director for primary care at ColumbiaDoctors, Columbia’s faculty practice



organization, and NewYork-Presbyterian. He leads an expanded primary care strategy that will provide greater access for patients to primary care services across the New York metropolitan area. The goal is to add 50 to 70 primary care physicians by 2025. Primary care physicians are opening practices in 2020 on the Upper West Side, Midtown, and Westchester and adding to existing practices in Harkness Pavilion and Morningside.

Young Breast Cancer Survivors and Fertility Preservation

A study from VP&S oncologists found that referrals for fertility-preserving services remain low among female chemotherapy patients, despite recommendations from the American Society of Clinical Oncology and the American Society of Reproductive Medi-

cine. Researchers led by Jason Wright, MD, looked at insurance claims data for services provided to female cancer patients between the ages of 18 and 45. Nearly 90% of individuals included in the study were treated for breast cancer. Among women 18 to 35 years of age, only 12% received a fertility evaluation, and patients in the South and those living outside metropolitan areas were least likely to receive fertility evaluation or services compared with patients in other regions.

Columbia Announces 1,000th Lung Transplant

The Lung Transplantation Program at Columbia marked a major milestone: 1,000 transplants since 2001, with medical director Selim Arca-soy, MD, surgical director Frank D’Ovidio MD, PhD, and chief lung surgeon Joshua R. Sonett, MD, transforming a small service into one of the country’s top centers for lung transplant care. Columbia’s team performs 80 to 90 lung transplants annually, which makes the program one of the highest-volume lung transplant centers in the United States.

Most Prescribed Blood Pressure Drugs May Be Less Effective

A new multinational study shows that the most popular first-line treatment for hypertension is less effective and has more side effects in real-world practice than an alternative that’s prescribed much less often. The researchers, including Columbia’s George Hripsak, MD, and Patrick Ryan, PhD, analyzed electronic health records and

claims data from nearly 5 million patients who had begun drug treatment for hypertension. They found that patients who were first prescribed thiazide diuretics had 15% fewer heart attacks, strokes, and hospitalizations for heart failure, compared with those who were prescribed ACE inhibitors. Patients who began with thiazides also experienced fewer side effects. The research was published in *Lancet*.

Predicting Alzheimer’s with Combined Smell and Cognitive Tests

Performing well on two brief tests that measure cognitive ability and ability to identify odors indicates very low risk for Alzheimer’s, according to research led by D.P. Devanand, MD. The research, published in *Alzheimer’s & Dementia: The Journal of the Alzheimer’s Association*, analyzed data from 749 older adults with mild cognitive impairment without dementia in an urban community. The participants were followed for an average of four years; 109 of the participants developed dementia, and the vast majority of them received a diagnosis of Alzheimer’s disease. The researchers found that 96.5% of the participants who performed well on both tests failed to develop dementia during the period studied. Among those with good scores on the tests, no one aged 70-75 or 81-83 years had transitioned to dementia during the study period.

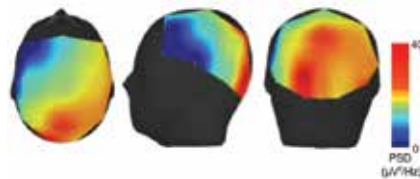
Hearing Loss, Even When Slight, Linked to Lower Cognition

Slight levels of hearing loss, even those too slight to be

diagnosed as hearing loss, are associated with measurably lower levels of cognition in older adults. Justin S. Golub, MD, led a team that analyzed data from the Hispanic Community Health Study and the National Health and Nutrition Examination Survey. Data from 6,451 adults showed that every 10 decibel decrease in hearing was accompanied by a significant decrease in mental ability. The largest decrease in cognitive ability occurred in those whose hearing was just starting to become impaired, just 10 decibels off the perfect mark. The study was published in *JAMA Otolaryngology-Head & Neck Surgery*.

Overactive Brain Waves Trigger Essential Tremor

Research published in *Science Translational Medicine* shows that essential tremors are caused by overactive brain waves at the base of the brain, raising the possibility of treating the disorder with neuromodulation to calm the oscillations. Previous studies identified changes in brain structure in people with essential tremor but not how those changes caused tremors, says research leader Sheng-Han Kuo, MD. Among



20 essential tremor patients examined with cerebellar EEG, most had strong oscillations in the cerebellum that were not found in any of the 20 control subjects. Patients with more severe tremors had stronger

oscillations. “Using cerebellar EEG as a guide, we may be able to use neuromodulation techniques such as transcranial direct-current stimulation or transcranial magnetic stimulation to reduce tremor,” says Dr. Kuo.

Risk of Overdose After Medical Treatment Ends

Among people treated with buprenorphine continuously for six to 18 months, about 5% needed medical treatment for an opioid overdose in the six months following the end of buprenorphine treatment. Columbia researchers say the true rate may be higher when taking into account overdose events that did not occur in health care settings. A study led by Arthur Robin Williams, MD, and published in the *American Journal of Psychiatry* found that the longer patients continued with treatment, the lower their risk of other types of adverse outcomes, suggesting that buprenorphine treatment may be most effective as a long-term therapy for those with opioid use disorder and discontinuing buprenorphine may be a life-threatening event.

Refined Carbs May Trigger Insomnia

An estimated 30% of adults experience insomnia, and a study led by James Gangwisch, PhD, suggests that diet may be partly to blame. The study found that postmenopausal women who consumed a diet high in refined carbohydrates—particularly added sugars—were more likely to develop insomnia. Women whose diet included higher amounts of vegetables, fiber,

and whole fruit (not juice) were less likely to have insomnia. The study was published in the *American Journal of Clinical Nutrition*.

Fitness Class for Cancer Patients

CancerFIT is a free exercise class offered by the Herbert Irving Comprehensive Cancer Center for cancer patients and survivors. Founded by physical therapy students—one a breast cancer survivor, the other a woman who lost her father to cancer—CancerFIT helps participants counter emotional and physical stresses associated with diagnosis and treatment. The weekly classes, paused during the pandemic, combine high-



intensity aerobics, stretching, and strength-training and are led by physical therapy graduate students. In addition to providing an evidence-based workout, the class serves as a support group for participants going through similar experiences.

Putrid Compound May Have an Up Side

Putrescine is a compound responsible for perhaps the foulest odor in nature—the smell of decomposing flesh—but it also may be a remedy for atherosclerosis and other chronic inflammatory diseases, according to a study led by Ira Tabas, MD, PhD, and published in *Cell Metabolism*.

Discovery of the potential benefit of putrescine came from an investigation into the body’s process for removing dead cells using macrophages to avoid inflammation and tissue death. The process of removing dead cells is usually initiated within minutes of cell death, but studies have suggested that the task is impaired in atherosclerosis, resulting in buildup of dangerous arterial plaque. Researchers set up human macrophages and dying cells in a dish and watched the process unfold. Macrophages, they found, reclaim arginine and other amino acids from the dead cells they engulf and use an enzyme to convert arginine into putrescine. Putrescine then activates a protein that signals the macrophages to eat more dead cells. In further studies in mice, researchers found that mice with worsening atherosclerosis had a short supply of putrescine because they didn’t have enough of a key enzyme to make the compound. By adding putrescine to the animals’ drinking water, macrophages got better at eating dead cells and the plaques improved. The authors also showed that the same key enzyme was reduced in human atherosclerotic plaques as they become more dangerous. If putrescine could be used to treat atherosclerosis and other conditions characterized by chronic inflammation and impaired clearance of dead cells, such as Alzheimer’s disease, inflammatory lung diseases, and lupus, researchers note that dissolving putrescine into water, at least at the dosages needed to improve the plaques, eliminates the odor of rotting flesh. “The mice drank

it without any problem and show no signs of sickness,” says Dr. Tabas.

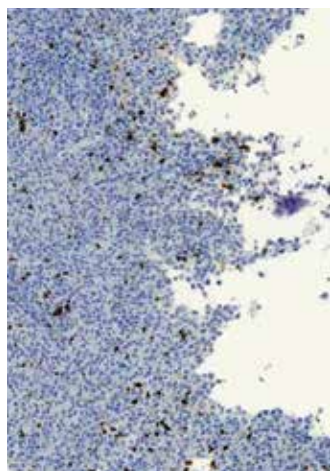
Treatment for a Rare Twin Syndrome

Monochorionic twins are at risk to develop a rare and serious complication called twin-twin transfusion syndrome (TTTS). Left untreated, the risk of losing at least one twin with severe TTTS is about 70% to 90%. Maternal-fetal medicine physicians at the Carmen and John Thain Center for Prenatal Pediatrics care for the highest volume of TTTS cases in New York. The center is one of a select group of centers in the country that offer fetoscopic laser surgery for this disorder, which changes the statistics to a more favorable survival rate of at least 80% for one or both twins. Under epidural anesthesia, the doctor inserts a fetoscope (a long camera) into the recipient twin’s amniotic fluid sac, within the uterus. The placenta can then be directly inspected, and abnormal blood vessels between the twins that are potentially disease-causing can be visually mapped. The proceduralist then uses laser energy to photocoagulate blood within the abnormal vessels, thereby interrupting the blood transfusion from one twin to the other, says Russell S. Miller, MD, medical director of the center. Before the development of the fetoscopic laser surgery, amniotic fluid volume reduction was the primary therapy for TTTS, but it was only a temporary solution with lower success rates. Studies have shown that laser surgery is more effective than amnioreduction for improving twin

survival and reducing the risk of long-term neurologic disability among survivors.

Designer Probiotic Treatment for Immunotherapy

Researchers at Columbia Engineering, in collaboration with VP&S scientists, have engineered probiotics to safely deliver immunotherapies within tumors. These include nanobodies against two proven therapeutic targets—PD-L1 and CTLA-4. The drugs are continuously released by bacteria to attack the tumor, even after just one dose, facilitating an immune response that ultimately results in tumor regres-



sion. The versatile probiotic platform also can be used to deliver multiple immunotherapies simultaneously, enabling the release of effective therapeutic combinations within the tumor for cancers that are more difficult to treat, such as colorectal cancer. The study, published in *Science Translational Medicine*, was led by Tal Danino, PhD.

Prenatal Pediatrics Milestone

The Carmen and John Thain Center for Prenatal Pediatrics celebrates its 10th anniversary

in 2020. The center, which evolved from a concept of collaborative care initiated at Columbia in 2004, was created to bring together in a single location all specialists that pregnant women and their families may need after a significant birth defect or genetic condition has been detected. The center’s guiding principle is that caring for babies with abnormalities starts before birth and continues into childhood, with neonatal and long-term pediatric follow-up. Maternal-fetal medicine experts also work as part of the Mothers Center, which is directed by maternal-fetal medicine physician Leslie Moroz, MD. The center, created in 2018, provides coordinated care to women who require specialized care because of pregnancy complications. Specialists across various medical and surgical subspecialty areas collaborate to customize treatment plans to meet patients’ needs. Services include coordinating appointments with specialists, providing counseling, and establishing a care management plan. The Mothers Center is the first center of its kind in the country and serves as a national model for the care of medically and surgically complex pregnant women. The Mothers Center team also conducts research to advance care and education to improve the health of women everywhere.

Exercise as Intervention for Cerebellar Ataxia

Doctors across the country are writing exercise prescriptions for patients—but not just for high blood pressure or diabetes. Studies are increasingly exam-

ining the relationship between exercise and neurological disorders, specifically the ability of exercise to decrease symptoms and delay disease progression. Scott A. Barbutto, MD, PhD, leads an exercise training intervention for patients with spinocerebellar ataxia, which typically causes a gradual loss of coordination, impaired balance, gait deviations, and severe progressive disability. In a pilot study, Dr. Barbutto and colleagues randomized 20 patients with degenerative cerebellar disease to either aerobic or balance training five days per week for four weeks. “When we compared aerobic training to balance training, we found that the two groups had similar benefits in terms of balance and gait speed but that the aerobic training group did better in terms of ataxia severity and fitness level. The aerobic training group showed improvement in ataxia, which is the primary complaint of these patients.” Balance training to improve motor skills and functional performance has been standard treatment, but little evidence exists that balance training can effect change on the molecular level in patients with degenerative cerebellar disease. Now experts are examining the role of exercise training as front-line, instead of adjunct, treatment. The team hypothesizes that although both aerobic and balance training will improve function, only aerobic exercise will affect disease progression and slow cerebellar atrophy. Animal studies show encouraging results, and a study at Columbia is the first of its kind to examine the benefits of aerobic exercise as a primary outcome in this patient population.

Mammogram Frequency

New data reported by researchers at the Herbert Irving Comprehensive Cancer Center concluded that more frequent mammograms among women treated for early-stage breast cancer might not confer additional benefit at the expense of potential harm. The research, which was presented at the annual meeting of the American Society of Clinical Oncology, was co-led by Katherine D. Crew, MD, and Julia McGuinness, MD. Based on the findings, Columbia has modified its mammography screening protocol to recommend annual screenings for breast cancer survivors. Women treated for early-stage breast cancer with lumpectomy remain at risk for local recurrence, and the previous standard practice for these patients was to obtain screening mammograms of the ipsilateral, affected breast every six months for two to three years after diagnosis, based upon consensus opinion rather than data from randomized controlled trials. Dr. Crew’s team examined the relationship between frequency of ipsilateral surveillance and rates of false-positive biopsy and local recurrence among women treated with breast-conserving therapy or lumpectomy. The study analyzed mammography screening frequency among over 1,400 women with early-stage breast cancer and found that women screened every six months vs. yearly had a two-fold increase in false positive breast biopsies with no difference in detection of local recurrence. The researchers suggest prospective studies to determine optimal screening strategies among breast cancer survivors.

VP&S Education Highlights

2020 Graduates Take on COVID-19 in New Hospital Roles

Julie Hwang's honeymoon in Bora Bora, with her husband and classmate Michael Chun, was postponed. Instead, she spent the two months before the start of her anesthesiology intern year at NewYork-Presbyterian coordinating patient transfers from the command center at Columbia's Baker Athletics Complex at 218th Street, where a field

"Columbia and NYP have been very conscientious about how to put us into effective roles that are not beyond the scope of what we can handle," Dr. Hwang said during her assignment.

Two other graduates, Randy Casals and Tyler Cooke, helped create a centralized telemetry station and developed a protocol for responding to alerts in a newly converted intensive care unit so that all heart monitors can be seen from one location on the sprawling floor.

"These months are supposed to be like a release valve on the stress of medical school before the stress of residency starts," Dr. Casals said. He has felt a little angry, he admits, at this virus and this pandemic, and the opportunity to help was a salve. He has since started his residency in urology at Wake Forest Baptist Medical Center in Winston-Salem, North Carolina.

Another 2020 graduate, Mary Raddawi, spent her pre-residency project at her parents' dining room table in Illinois, speaking mostly Spanish over the phone with discharged COVID-19 patients. With faculty physician supervision, she monitored each patient for seven to 14 days. She advised them to take their temperature, provided instructions on how to adjust oxygen levels for those discharged with a tank, and listened to their concerns.

"There were a few on my panel that I could tell were waiting for the call. It was very comforting for them," Dr. Raddawi said. "They could then relax and spend the rest of the day knowing 'I'm OK today. Everything is going in the right direction.'" Dr. Raddawi has since started her internal medicine residency at Massachusetts General Hospital in Boston.



Vagelos Education Center

hospital opened in April for recovering COVID-19 patients from overburdened wards nearby.

Dr. Hwang was one of 88 graduates from the VP&S Class of 2020 who graduated early on April 15 to start work to support health care workers at NYP. Many of the roles for the newly minted doctors were remote assignments, and other graduates continued their work with the COVID-19 Student Service Corps. Dr. Hwang was among the graduates who offered to fill on-site roles to assist overstretched front-line workers.



From left: Tyler Cooke, Randy Casals, and Julie Hwang

JENNIFER O'ROURKE

Maggie Bogardus worked from her parents' home in Connecticut before returning to New York City for her residency in obstetrics & gynecology at Columbia. She reviewed variables in patient charts to input into national, state, and local COVID-19 databases. "I knew I was not the one making the biggest sacrifices in

terms of dealing with COVID-19," Dr. Bogardus said, "but we were doing important work, so I don't want to minimize it."

Working in the command center at 218th Street gave Dr. Hwang a view of the front lines: A television live stream allowed her to communicate with doctors in full PPE in the field hospital. That view made

her realize the magnitude of challenges that hospitals face but also showed the progress being made. Three patients were transferred on her first day of work at the command center. After she and colleagues developed a new protocol to make it as simple as possible for the front-line physicians to approve, daily transfers tripled.

Students Honored for Commitment to Diversity

A group of VP&S students was honored at the annual Martha A. Hooven Awards for Excellence. The awards honor contributions to the medical school's workplace and community. More than 100 individuals and groups were nominated for awards presented in January 2020. The Diversity Award was given to the First Generation Low Income Partnership (FLIP), which students established in 2017 to build community and promote the well-being and visibility of medical students who come from a low income background and/or are the first generation in their family to attend college. FLIP has developed several initiatives

for the work that they do to support the VP&S community and promote diversity within our campus," said Hilda Hutcherson, MD, senior associate dean for diversity and multicultural affairs.

Student Wins International Poetry Prize

Lauren Fields, a student in the VP&S Class of 2021, tied for second place in the health professional category of the 2020 International FPM-Hippocrates Prize for Poetry & Medicine. Inspiration for her winning poem, "A Laying on of Hands in the OR," came during her surgery rotation in her major clinical year. "The difficult cases that we saw really exemplified the trust that patients have in their team of surgeons, anesthesiologists, and nurses. There was a coming together that was unique to those particularly stressful situations and that was the spirit behind the poem." Ms. Fields heard about the Hippocrates Prize from Owen Lewis, MD, who teaches the narrative medicine course, "Poetry: Close Reading and Craft." Narrative medicine, a division within Columbia's Department of Medical Humanities & Ethics, helps students deepen their self-awareness, clinical attunement, collaborative skills, and cre-



ative capacities. Dr. Lewis is a 2016 Hippocrates Prize winner.

A Laying on of Hands in the OR

Today, it feels like prayer –
the pause
for a moment of peace
before the raising of voices.
We bow our heads over
an impossibility,

over the bifurcation of life
and something that is not life.
Today, it feels like a call
and response
of masked voices across

a body broken, across
blood. We asked her to believe,
to trust
the work of hands and metal
in this sterile sanctuary,
where the buzzing of cautery
is a hymn,
and a single, drumming heart
keeps time.

Delivering PPE

Columbia medical student Adedeji Adeniyi joined other medical center students to help procure and deliver more than 10,000 pieces of personal protective equipment to area hospitals as a way to help after their classes were moved online at the height of the COVID-19 pandemic. Students also raised funds to supply health care workers around the city with PPE. Their GoFundMe campaign—



"Mask On, March On!"—raised thousands of dollars for PPE for hospitals in COVID-19 hotspots in New York City.

Precision Ophthalmology 2020

The Department of Ophthalmology in December 2019 hosted the first conference to focus on the role of genetics in ophthalmology, "Precision Ophthalmology 2020: Applying Genetics to Eye Care Today." "We presented cases that describe how the physician made the decision of which type of genetic testing to order and how to interpret the



to fulfill its objectives, such as hosting conversations and panels on relevant topics, welcoming first-year students to the community, and coordinating financial planning workshops. "We commend FLIP

results to form a diagnosis,” says Jeffrey M. Liebmann, MD, who hopes to establish an ophthalmic genetics fellowship at Columbia to increase the current number (six) of individuals trained in human genetics and ophthalmology in the United States.

Caring for Older Patients

At Columbia’s outpatient geriatric practice at Allen Hospital, the average patient age is 87, and the practice continues to grow in numbers of older adults being seen. That makes the practice an excellent training ground for internal medicine interns who learn to navigate the complexities of multiple geriatric syndromes and chronic conditions, especially dementia, polypharmacy, and challenges related to medication adherence. Four internal medicine interns rotate for two two-week blocks with the geriatric inpatient and outpatient teams that include the geriatrician and the geriatrics nurse practitioner. “The interns work with us in both inpatient and outpatient rotations. We go over assessments, what to look for in dementia, medications, function, and how to discuss advanced care planning,” says Bindhu K. Thomas, MD, a geriatrician at the practice. Geriatric house calls twice a month are a large part of the teaching curriculum for first-year residents. The residents are often able to experience home safety evaluations for new patients or do follow-ups with patients after they are discharged. Thus, the interns are able to experience the vital comprehensive nature of care for older adults and transitions of care.

Musical Mondays

The VP&S Musicians’ Guild played on during the pandemic. Starting April 6, the musicians continued their “Musical Mondays”—30-minute concerts featuring both live and pre-recorded musical pieces performed by students, faculty, and staff—every week through Zoom and the Musicians’ Guild Facebook page. “Our mission is to deliver respite and comfort to the CUIMC community at large through messages and music played by members of the Columbia community. During moments of crisis, fear, and sorrow, music can play an important role in healing spiritually and emotionally at both an individual and communal level. While social distancing measures drive us apart physically, technology and music can help bridge those distances to provide comfort and hope



in an uncertain time,” say Musicians’ Guild leaders. The group publishes a newsletter that describes the past week’s music and includes video clips.

Two Share Interim Education Dean Role

After Ronald Drusin, MD, stepped down on Dec. 31, 2019, as vice dean for education after 11 years, two other members of the education team were tapped as interim co-vice deans for education:

Lisa Mellman, MD, and Jonathan Amiel, MD. Dr. Mellman, senior associate dean for student affairs, oversees admissions, diversity, financial aid, and global health programs as interim co-vice dean. Dr. Amiel, senior associate dean for curricular affairs, oversees education programs, finance, administration, and the simulation center as interim co-vice dean.

Two Graduation Events for VP&S Students

In late March, only a few weeks after all medical students were sent home to continue their education remotely, VP&S announced an early graduation for the Class of 2020. Offering diplomas about a month early gave the graduates an opportunity to join the front lines of the pandemic in a variety of roles. Students in the Class of 2020 formally graduated April 15 (the original ceremony was scheduled May 20) and were offered temporary employment at NewYork-Presbyterian Hospital (until the beginning of students’ residencies) to increase the physician ranks during the COVID-19 pandemic. A March 26 email to students explained the dire situation: “In this time of local and national need, physicians and other health care professionals around the world are providing care for patients of the coronavirus pandemic under extraordinary circumstances. The number of confirmed cases in the New York City area climbs every day, and we have begun redeploying physicians and clinical staff to help us manage the surge of seriously ill patients in our emergency department

and on our hospital inpatient units. Many of you have asked how you can help in this time of great need. At this point in your education, each of you has demonstrated that you possess the knowledge and clinical skills to play a vital role in this effort. With this in mind, and given the urgent need for additional physicians, Columbia University has decided to move up the VP&S graduation to April 15.” Fourth-year students who had not yet taken the capstone Ready for Residency course were offered the course in an accelerated format. A Zoom celebration on April 15 was a lighthearted sendoff for students who grad-



uated early to join health care workers at NewYork-Presbyterian and provide support during the COVID-19 pandemic. Graduates put their creative flair on display at the ceremony with a musical performance, poetry reading, and reflections about their time in medical school and the pandemic. On May 6, MD and PhD graduates participated in a more formal ceremony via Zoom, gathering as the traditional “Pomp and Circumstance” music played. Graduates listened to traditional speeches, the class history, and congratulatory remarks. MD graduates recited the Hippocratic Oath while family and other spectators watched videos submitted by graduates.

2020-21 Vanneck-Bailey Scholar

Devon Rupley, MD, received the 2020-21 Vanneck-Bailey Award from the Virginia Apgar Academy of Medical Educators to help redesign the Ready for Major Clinical Year course. Dr. Rupley, assistant professor of obstetrics & gynecology, will collaborate with William



Fuller, MD, assistant professor of medicine, to redesign the course that marks the transition between the pre-clinical and clinical settings. Dr. Rupley wants to make the course more of a longitudinal experience for students, including a simulation curriculum that ties to all aspects of how students form their professional identity. The VP&S Virginia Apgar Academy of Medical Educators promotes, rewards, and supports education for medical students, residents, fellows, and faculty.

Welcoming the Class of 2023

The 140 members of the Class of 2023 were welcomed to VP&S at the White Coat Ceremony in August 2019. Gerald E. Thomson, MD, the Samuel Lambert Professor Emeritus of Medicine and Robert Sonneborn Professor Emeritus of Medicine, spoke at the ceremony. “We are recognizing not only that you are starting as



a medical student but also that you are joining the profession of medicine today,” Dr. Thomson told the first-year students, noting that 2019 marked his 60th year as a physician. He emphasized the values of medical ethics and medical professionalism as “superior guides for physicians” and urged students to always advocate for putting the patient first. The ceremony was the first overseen by a new senior associate dean for admissions. Anne Armstrong-Coben, MD, was appointed to the role after serving as interim dean for nearly a year and helping to select the Class of 2023. The class has 50 women and 21% of the class members are under-represented minorities.

Moving the Class of 2022 to Major Clinical Year

In January 2020, second-year medical students participated in the Steven Z. Miller Student Clinician’s Ceremony to mark the start of their patient-centered training, not knowing that their rotations would end a few months later when the pandemic led Columbia to ask all students to leave campus. Since 1998, the annual ceremony has helped VP&S students shift



from classroom education to seeing patients in hospital and ambulatory settings, including NewYork-Presbyterian Hospital. Several students in the class received awards, and awards were given to faculty, residents, and other clinicians to recognize their teaching. The late Steven Z. Miller, a 1984 VP&S graduate, founded the first transition ceremony at VP&S.

Graduate Precision Medicine Fellows

Six graduate fellows and 26 associate graduate fellows from across Columbia University were selected to participate in the Precision Medicine: Ethics, Politics, and Culture Project for the 2019-2020 academic year. The interdisciplinary project brings together faculty from medicine, humanities,



social sciences, and law with international visiting scholars to discuss scientific, social, and humanistic questions that could inform policy and future research in precision medicine. The fellows are enrolled in master’s degree or PhD programs in bioethics; biological sciences; cellular, molecular, and biomedical studies; epidemiology; genetic counseling; health administration; narrative medicine; neuroscience; nursing; public health; sociology; and sociomedical sciences.

Preventing Sexual Harassment in Higher Ed

Columbia University Irving Medical Center has joined Columbia University’s member-

ship in the National Academies of Sciences, Engineering, and Medicine’s Action Collaborative on Preventing Sexual Harassment in Higher Education. Columbia is a sponsoring member of the collaborative, joining the effort as part of its commitment to foster an environment free from gender-based discrimination and harassment, including sexual assault and all other forms of gender-based misconduct. The medical center’s participation in the collaborative will facilitate additional partnerships and joint action to address and prevent sexual harassment and damaging behaviors, such as bullying and incivility, to create a climate of respect for everyone. The collaborative builds on the National Academies’ 2018 report that found that between 20% and 50% of female students and more than 50% of female faculty and staff experienced sexually harassing behavior while in academia. The CUIMC representation is led by Anne Taylor, MD, vice dean for academic affairs at VP&S and senior vice president for faculty affairs & career development at CUIMC. All four CUIMC schools as well as NYP have agreed to participate.

Genetic Counseling Program Welcomes First Students

Columbia’s Genetic Counseling Graduate Program welcomed its first class of 12 students in August 2019. The new two-year program immerses students in clinical genetics, counseling, communication, genomic medicine, precision medicine, and the social implications of advancing technologies. The program is one of 49 accredited genetic counseling graduate programs in North

America. Students in the program were selected through the Genetic Counseling Admissions Match, which places applicants in North America into master's-level genetic counseling programs accredited by the Accreditation Council for Genetic Counseling. The 12 students enrolled in Columbia's inaugural Class of 2021 have a variety of educational backgrounds, including biology, psychology, philosophy, global and public health, bioethics, molecular and medical genetics, bioengineering, performing and



media arts, music, and mathematics. They have collectively engaged in diverse human service initiatives such as serving in the Peace Corps, volunteering in food pantries, participating in global medical service trips, working with homeless and disadvantaged populations, and advocating for survivors of sexual assault and domestic violence. One member of the class, Denise Ma, was chosen as the first recipient of the Steinhardt-Goldman Family Scholarship, established by Jill and Lee Goldman to honor Alice and Roger Steinhardt (a counselor and a physician). The scholarship is for students who have overcome substantial obstacles to pursue life goals and have already shown academic merit and a commitment to genetic counseling. Ms. Ma was born in southern China and immi-

grated to New York City at age 10. She speaks three dialects of Chinese and is the first in her family to attend college. After graduating with a bachelor's degree in biology from Cornell University in 2017, she took a job as a research coordinator and genetic counseling assistant at the Center for Neurogenetics at Weill Cornell Medicine. "I was 12 the first time I met a genetic counselor and was accompanying a family member for an appointment," she says. "I remember the experience being pleasant and we communicated by using a phone interpreter. After that appointment, I wondered if there were any bilingual genetic counselors available. I did some online research and couldn't find any in my area. Ever since then, my interest in the field grew as I learned more by speaking to and shadowing genetic counselors. I hope to combine my multilingual skills with my passion for genetic counseling to expand care to non-English speaking families."

Global and Population Health Research

Nobel Laureate Harold Varmus, a 1966 VP&S graduate, returned to Columbia in September 2019 to speak with students who spent that summer conducting research through the Program for Education in Global and Population Health (Global Pop). Dr. Varmus recalled spending a few months during medical school in an apprenticeship at the Clara Swain missionary hospital in Bareilly, India, where he observed the medical staff treating patients with leprosy, advanced tuberculosis, and other diseases infrequently

observed in New York City. Though his interests eventually shifted to research, specifically to cancer viruses and cancer genes, "that experience in India as a student was instrumental in some important decisions I made later in life," he says. "For example, during my time as director of the National Institutes of Health, my interest in building research programs in Africa that would have an impact on tropical diseases, such as malaria, was driven in part by what I had seen as a student in Bareilly." Dr. Varmus also made a gift to establish the Varmus Global Scholars Fund through the Global Pop program. The new fund provides stipends to a few VP&S students to conduct novel global health research projects at international sites for eight weeks to one year. In the summer of 2019, 56 students from across the medical center conducted global and population health projects: Half of them carried out research projects, and the other half participated in cross-cultural fluency and community health-related projects. The program offers educational opportunities in research, language immersion, clinical rotations, and program development and evaluation in the United States and abroad. Among the topics presented at the September event were lung cancer in Ethiopia, sexual health in the Dominican Republic, and oral hygiene in Washington Heights. The Global Pop program exposes students to global and population health topics early, when they are in the first year of their medical, dental, public health, nursing, and nutrition degree programs. Students prepare for their summer projects by taking a course,

"Introduction to Global and Population Health," before applying to the Global Pop program. Students accepted into the program take a research methods course to plan their work. Most students conduct research



abroad at established sites where Columbia faculty members have ongoing projects.

Sharing Pandemic Experiences with International Peers

This year's eight-week online summer exchange program—"International Collaboration and Exchange Program—Preparing Global Leaders for Healthcare"—focused on COVID-19 experiences. The 70 students participating from 12 universities around the world included 16 medical, dental, and pre-medical students from Columbia University. The exchange program started in 2014 in the Department of Pathology & Cell Biology to offer medical, premedical, and dental students early international experiences, both in person and online, throughout the school year. This year's program, says Anette Wu, MD, PhD, director of the program, gave students a rare opportunity to have an international exchange about a global pandemic of historical dimensions. The summer portion of the program typically includes in-person travel exchanges, but the pandemic brought the students together

virtually with peers and faculty from Austria, Canada, Japan, United Kingdom, Taiwan, and other countries for online small group discussions, collaborative group work, large group student debates, and faculty presentations followed by Q&As led by student moderators, including Columbia's Adedeji Adeniyi'23. In college, Mr. Adeniyi received a Fulbright Scholar Award to teach English in Taiwan, and he had hoped to expand his experiences in the country during the summer of 2020. Connecting through the exchange program with students and faculty members

from the National Taiwan University online provided a good alternative to travel for peer networking, improving cultural competency, and practicing international collaboration.

Student Health Service on the Move

The Student Health Service moved to a new 10,000-square-



foot facility on the second and third floors of 100 Haven Ave. (Tower 2) in August 2019. The facility has exam rooms, administrative offices, and common areas for students and health service staff. The new space provides enhanced privacy and accessibility to enhance patient experience and increase capacity. The previous offices of the Student Health Service were spread out over several rooms in 50 and 60 Haven Ave.

Faces of the Frontline

"Faces of the Frontline," both an Instagram account and a website, was created at

the end of March as a grassroots project, the brainchild of VP&S student Vibhuti Krishna. "Faces" provides digital platforms for sharing



and disseminating stories from the COVID-19 front line and collecting words of affirmation for health care heroes. The website is at www.facesofthefrontline.org.

VP&S Community Highlights

A Commitment to Mental Health in the Community

A psychiatrist with one foot in the Department of Psychiatry and the other foot in the Washington Heights community was honored this year with the Martha A. Hooven Community Service Award, one of a group of awards for excellence that honor contributions by members of the VP&S community.

Warren Y.K. Ng, MD, professor of psychiatry, was honored for more than two decades of community service, ranging from formal patient care to oversight of school-based psychiatry services to participation on a task force addressing suicide among youth in the community.

Dr. Ng is medical director of outpatient behavioral health at the medical center

and NewYork-Presbyterian Hospital. He oversees community psychiatric services for adults, adolescents, children, and families through programs embedded within schools, primary care clinics, and community-based partnerships. He has provided training to hundreds of community social service providers, health clinics, and mental health programs. He has served on New York City's Children's Services Accountability Review Panel since 2008 to improve the care system for children in foster care.

Dr. Ng contributed to the community's response to youth suicide through an initiative led by Lou Baptista, MD, vice chair of clinical services in psychiatry, in 2014. The Task Force on Youth Suicide created

a partnership with clinicians, researchers, community providers, and NYP to implement new strategies to address the community crisis for Latino youth. Beyond serving on the task force, Dr. Ng has continued to work with Community Board 12 and Northern Manhattan Agenda's Behavioral Health Committee on evolving needs of the community and has provided updates on clinical services to generate a dialog for voicing and sharing community priorities and needs.

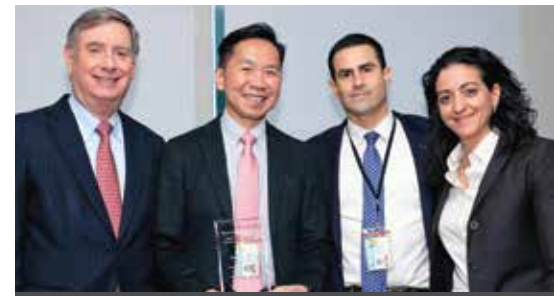
"He contributes to the efforts to improve the quality of care for children who are maltreated and abused. He is a well-rounded, interested psychiatrist who truly embodies the principles of community

service while serving the local community,” said Jeffrey A. Lieberman, MD, psychiatry chair, in nominating Dr. Ng for the award.

As the director of clinical services for child and adolescent psychiatry and having led the Special Needs clinic, Dr. Ng has contributed to state and city groups that focus on HIV and children’s mental health. He has been the lead physician for the department in NYS’s Delivery System Reform Incentive Payment Program, which focuses on redesigning Medicaid reimbursement to improve mental health services in northern Manhattan. The program has focused on improving access, decreasing emergency room visits, and integrating primary care and mental health. He has developed new community-

based services, such as the Critical Time Intervention Team and Crisis Hub, to improve community access to quality care. Added Dr. Baptista in his nomination of Dr. Ng for the award: “Over the past year, Dr. Ng has been critical in partnering with NYP in meetings with several community agencies such as CB12 and several local legislators to enhance engagement and continue to pledge VP&S and NYP’s commitment to the community in important issues such as teen suicide and access to mental health care. His passion is community psychiatry and improving access to care for ethnic minority, underserved, and communities affected by mental illness.”

New York Gov. Andrew Cuomo nominated Dr. Ng to serve on the state’s Behav-



Pictured at the January 2020 awards ceremony are Dean Lee Goldman, Dr. Ng, Dr. Baptista, and Rudina Odeh-Ramadan, then interim vice dean for administration.

ioral Health Services Advisory Council, giving him another opportunity to contribute to public mental health issues within our communities.

An Academy for Community and Public Service

The longstanding commitment of VP&S to public service was formally recognized with the launch of the Academy



of Community and Public Service. The new academy recognizes faculty who have made substantial contributions to promote and improve community health, particularly among residents of Washington Heights and Inwood, Upper Manhattan, and parts of the Bronx. The academy welcomed 21 faculty as founding mem-

bers in February. Members were nominated by department chairs and center directors for their community service efforts. The academy joins other VP&S academies that recognize the contributions of educators (the Virginia Apgar Academy of Medical Educators) and clinicians (the Academy of Clinical Excellence). VP&S is the first medical school in the country to establish an academy for community and public service. The academy was created through the Office of Community Service Programs, which aims to build upon the medical center’s ongoing community service efforts to improve the health and education of adults and children in local communities. Under the direction of Rafael Lantigua, MD, the office has held a range of community engagement and health promotion activities. Dr. Lantigua, professor of medicine and associate dean for community service in VP&S, was among the academy’s inaugural inductees.

Bringing Books and Love of Reading to Neighborhood Children

Literacy Inc.—also known as LINC—is on a mission to improve the reading abilities of children across New York City. This year, a \$3,500 grant from the Medical Center Neighborhood Fund helped LINC expand its programming in Washington Heights and Inwood. The Medical Center Neighborhood Fund is supported by voluntary donations made by employees of Columbia University Irving Medical Center, NewYork-Presbyterian, and the New York State Psychiatric Institute. LINC connects families to literacy programs at schools, libraries, and other community spaces in their NYC neighborhoods. The organization’s comprehensive model starts with the very youngest children and moves readers incrementally to independent reading, instilling in them a pre-literacy foundation to become strong readers by

age 8. At the same time, parents are provided with strategies and tools to help them be advocates and early teachers for their children. In 2019, LINC engaged 13,520 children and 6,810 parents and distributed 18,712 books. In upper Manhattan, LINC programs have included Reading Buddies at PS 189 in Washington Heights and a bilingual English-Spanish parents workshop at the Fort George Enrichment Center. Another program, Literacy Zone, identifies community partners, ranging from the corner barbershop to the New York Yankees, to provide free books in public spaces or to host read-aloud events.

Welcome Haven

Before the pandemic closed group activities around the city, about 650 members of the medical center’s community and neighborhood residents from Washington Heights gathered in the new Haven Plaza in October 2019 to view new



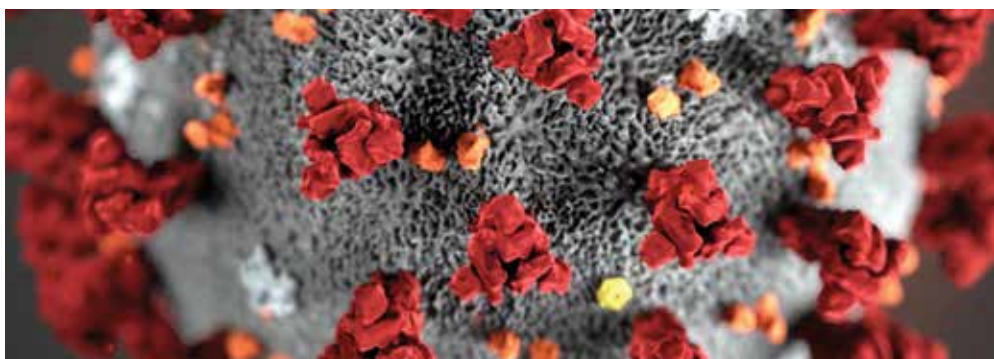
public art, sip apple cider, and enjoy the crisp autumn day. Art depicting the biodiversity of the flora and fauna of Upper Manhattan illustrates Haven Plaza's bollards, the large concrete blocks at each end of the plaza, which extends from 168th Street and Fort Washington Avenue to 169th Street and Haven Avenue. Washington Heights artist Emely Perez was

selected to create the hand-painted illustrations as part of the Bollard Beautification Project. Some of the bollards were unveiled at the October event. Her goal is for each bollard to represent a species of plant or animal native to the area, from easy-to-spot aster flowers and cardinals to the lesser known species of dutchman's breeches and trilobites. "My illustra-

tions are my attempt to create environmental awareness," says Ms. Perez. "We keep forgetting that Manhattan is unrecognizable from what it used to be. I want people to know about the plants and animals that came before the skyscrapers and everything else." The artist grew up in Mexico City and moved to New York City to attend the School of Visual Arts.

VP&S COVID-19 Highlights

Researchers at VP&S began publishing papers about COVID-19 within weeks of the first patient arriving at Columbia in early March. By late May, 36 papers with Columbia first or senior authors had been published in 18 high-impact peer-reviewed journals, with many more awaiting publication. This section highlights some of the research findings and innovations that came out of Columbia during the first few months of the pandemic.



Heartburn Drug as Potential Remedy

Famotidine, a common heartburn drug, may have potential to fight COVID-19, according to a study published in *Gastroenterology*. The retrospective study found that hospitalized COVID-19 patients at Columbia were twice as likely to survive if they received the drug. Unpublished data from Wuhan, China, found better outcomes in COVID-19 patients who took famotidine while hospitalized, and a more recent study published

in the United States showed similar findings. The potential mechanism remains unclear. The Columbia study was led by Daniel Freedberg, MD, and Julian Abrams, MD. A randomized clinical trial is underway.

Connecting Patients and Families

Members of the anesthesiology, surgery, and radiology departments helped connect the sickest patients with their families. Maya Hastie, MD, EdD, and Yefim Vilnits, MD,

developed the Family Liaison Service to facilitate communications between the clinical team and families of patients in the OR-ICU. A second group, the Compassionate Care Connectors, founded by chief radiology resident Elizabeth West, MD, facilitated phone and video calls with loved ones for patients affected by the no-visitor policy.

Keeping the Virus Out of Lung Cells

Lowering testosterone could lessen the severity of COVID-19

disease by preventing the virus from entering lung cells, according to an analysis by David Goldstein, PhD, and Xinchun Wang, PhD, that was published on preprint.org. Two human proteins—TMPRSS2 and ACE2—help SARS-CoV-2 to enter human cells. "The new coronavirus cannot enter cells without the help of the TMPRSS2 proteins on our lung cells," Dr. Goldstein says. "Our analysis suggests that decreasing testosterone will lower TMPRSS2, interfere with viral

entry, and reduce the severity or duration of COVID-19.” A randomized clinical trial is testing the effect of reducing testosterone in COVID-19 patients at VA hospitals in pandemic hotspots.

Care for Newborns

Columbia and NYP launched the COVID Nursery Clinic, led by pediatricians Minna Saslaw, MD, and Melissa Stockwell, MD, in April to offer high-quality, safe newborn care within the first week after birth to babies delivered at the hospital. In addition, pediatrician Katie Keown, MD, lent her clinical support. Using Columbia’s new telemedicine infrastructure, mothers in quarantine with COVID-19 connected with health care providers to stay informed about the health of their newborns. After an initial consult, doctors followed the baby as needed to ensure the newborn’s health until they could enter care in the community after the 14-day quarantine period. The clinic also connected mothers, as needed, to mental health professionals, social service providers, and other resources. Melissa Glassman MD, of NYP’s Newborn Clinic was instrumental in the creation of the clinic and has taken its current operations under the Newborn Clinic with her nurse practitioner Andrea Hercules.

Framework for Difficult Conversations

Shunichi Nakagawa, MD, authored a three-stage protocol in Mayo Clinic Proceedings as a framework for conversations that prioritize the values and wishes of patients as they confront difficult decisions about their care during a serious illness. The protocol’s three

steps: Share the prognosis, clarify the patient’s care goals, and decide on a treatment plan. Dr. Nakagawa, who worked in the emergency department with COVID-19 patients unlikely to recover, says, “I always try to stick to this protocol because if I don’t, the conversations get muddled and the patients and their families get confused.”

Applying Computational Methods to COVID-19

A team led by Andrea Califano, PhD, applied computational methods to study host cell aberrations implicated in COVID-19 and to evaluate FDA-approved drugs that might interrupt infection. The work, published in BioRxiv, adapts Dr. Califano’s Darwin OncoTreat algorithm and identifies several drugs that show promise as potential COVID-19 treatments, including drugs used to treat rheumatoid arthritis and several kinase and transport protein inhibitors. In a separate effort, Sagi Shapira, PhD, and Barry Honig, PhD, developed P-HIPSTer, a computational method (published in Cell) that leverages the supercomputing infrastructure at Columbia to identify key interactions between all human-infecting viruses (including coronaviruses) and the cells they infect. In addition to studying vaccine design, they are using the information to identify FDA-approved drugs that may be repurposed and immediately deployed.

Helping the Helpers

The COVID-19 Healthcare Personnel Study will survey tens of thousands of employees on the front lines of care in New York State—from doctors and nurses to hospital food service work-

ers—to assess how the pandemic affects the physical and mental health of health care workers. Data from the registry, led by Guohua Li, DrPH, MD, will be used to evaluate interventions made available during the crisis and to inform policymakers. Follow-up surveys of the study will query respondents who report high levels of moral distress, a response that arises when a person is forced to take actions that challenge or violate core ethical beliefs. Many health care workers feel forced to make triage decisions about scarce resources, such as operating rooms, intensive care unit beds, or ventilators. “The idea is to understand and learn from individuals who have been burdened with these feelings,” says Rita Charon, MD, PhD, “and to find out what interventions are helpful.”

Studying Heart Manifestations

Early reports from China suggested that the risk of blood clots is greater for COVID-19 patients than other severely ill patients. Behnood Bickdeli, MD, and Mahesh Madhavan, MD, gathered experts in cardiology and thrombosis from around the world to create consensus recommendations for preventing and treating clots in COVID-19 patients. The recommendations were published in the Journal of the American College of Cardiology. People with preexisting heart disease have a four-fold greater mortality risk from COVID-19, says Sahil Parikh, MD, who was a coauthor of the international guidance document. These investigators along with Sanjiv Sethi, MD, were awarded an American Heart Association grant to study thrombotic events in COVID-19 patients.

IMPROVE-COVID, a clinical trial led by Dr. Parikh and these investigators, aims to assess the optimal strategy of preventing major clotting events in critically ill COVID-19 patients.

Adapting Technology for a New Rapid Test

Researchers at Columbia’s Fertility Center developed a rapid, one-step diagnostic test that detects COVID-19 in saliva. The test, which has a single tube that contains all of the materials needed to provide reliable results in about 30 minutes, was adapted from technology used by fertility experts to look for genetic abnormalities in embryos before implantation. “We realized that the same technology that we use to help create lives could be repurposed to help save lives during the COVID-19 pandemic,” says Zev Williams, MD. The research was published in MedRxiv.

Simplifying the Search for Trials

The web-based COVID-19 Trial Finder helps users search for COVID-related clinical trials. The tool is based on DQueST, a trial finder developed by the lab of Chunhua Weng, PhD, and described in the Journal of the American Medical Informatics Association. The online program generates user-specific questionnaires to dynamically filter out trials. Dr. Weng and collaborators adapted DQueST to create COVID-19 Trial Finder, which can reduce a large set of potential trials to only a handful based on answers to five or six eligibility questions. A visualization of the geographic distribution of returned trials is provided to potential trial participants.

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Associate Dean for Clinical and
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Lawrence Hospital
Bronxville, NY

FACTS & STATISTICS, FY20

MEDICAL SCHOOL ENROLLMENT, FALL 2019

Total medical school enrollment	580
Enrollment of in-state residents	190
Enrollment of international/nonresident students	18
Enrollment of men	294
Enrollment of women	286

ENROLLMENT BY YEAR

	MALE	FEMALE
First-year class	68	70
Second-year class	75	63
Third-year class	60	77
Fourth-year class	91	76
Total enrollment	294	286

MEDICAL SCHOOL ETHNICITIES

Hispanic/Latino	73
Black or African American, non-Hispanic/Latino	48
White, non-Hispanic/Latino	265
American Indian or Alaskan Native, non-Hispanic/Latino	1
Asian, non-Hispanic/Latino	131
Native Hawaiian or other Pacific Islander, non-Hispanic/Latino ...	1
Two or more races, non-Hispanic/Latino	20
Race and/or ethnicity unknown	23

OTHER STUDENTS

MD-PhD students	103
PhD students	406
Other students (PT, OT, Nutrition, Informatics, Genetic Counseling)	486

DEGREES GRANTED, FY20

MD	147
PhD	91
Physical therapy	59
Nutrition	73
Occupational therapy	59
Certificate in psychoanalysis	7

APPLICATIONS (ENTERING CLASS 2019)

Number of applicants	7,914
Number of applications considered	7,080
Number of applicants interviewed	1,073
Number of acceptance letters issued	278

FACULTY, 2019-2020 ACADEMIC YEAR

Full-time faculty	2,119
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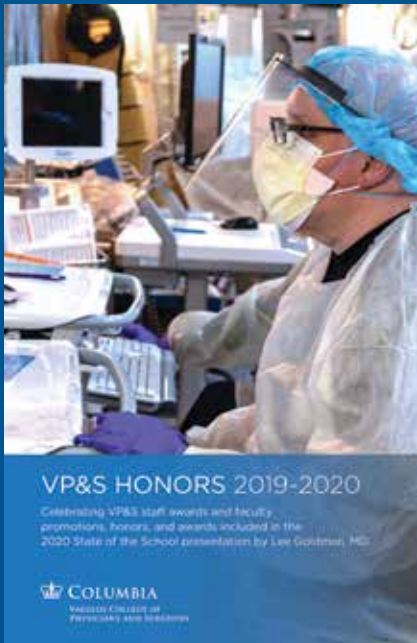
FACULTY HONORS (AS OF OCTOBER 2020)

Nobel Prize in Medicine	3
National Academy of Sciences	24
National Academy of Medicine	53
American Academy of Arts and Sciences	26
Howard Hughes Medical Institute	6

FINANCIALS, FY20 (EXCEPT WHERE NOTED)

Budget	\$2.3 billion
Philanthropic support	\$201 million
Endowment	\$2.1 billion
Endowed chairs/professorships	305
NIH research support (Federal FY 2019)	\$422 million

CONGRATULATIONS TO VP&S FACULTY who received top honors in their fields this year, including faculty elected to the National Academy of Medicine, the National Academy of Sciences, and the American Academy of Arts and Sciences.



2019 National Academy of Medicine

- Rui Costa, DVM, PhD, Neuroscience
- Anil K. Rustgi, MD, Medicine

2020 National Academy of Medicine

- Sonia Yris Angell, MD, Medicine
- Wendy Chung, MD, PhD, Pediatrics (in Medicine)
- Kam W. Leong, PhD, Systems Biology

2020 National Academy of Sciences

- Angela Christiano, PhD, Dermatology and Genetics & Development
- Molly Przeworski, PhD, Systems Biology
- Lorraine S. Symington, PhD, Microbiology & Immunology and Genetics & Development

American Academy of Arts and Sciences

- Molly Przeworski, PhD, Systems Biology

MANY OTHER MEMBERS OF THE VP&S FACULTY WERE HONORED THIS YEAR with lifetime achievement awards, election to national association leadership positions, awards for distinguished service at VP&S and the world beyond, honorary degrees, and awards recognizing teaching, research achievements, and mentoring excellence. Other faculty were inducted into the new Academy of Community and Public Service and two existing academies, the Academy of Clinical Excellence and the Virginia Apgar Academy of Medical Educators. Many others received tenure or were promoted. The full list of 2019-20 faculty honors is available online at ps.columbia.edu/facultyhonors.

CAMPUS MAP

