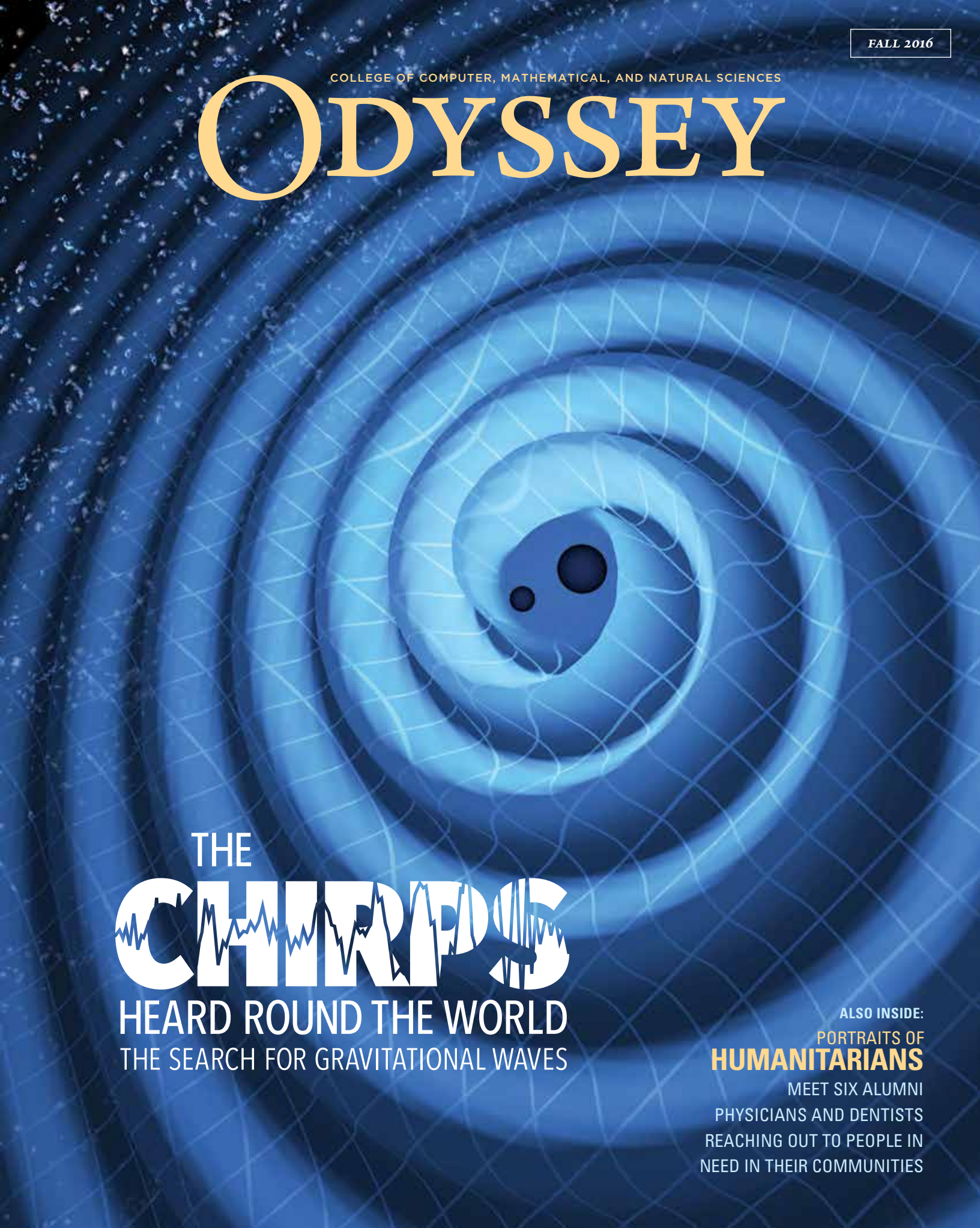
FALL 2016

COLLEGE OF COMPUTER, MATHEMATICAL, AND NATURAL SCIENCES

ODYSSEY



THE CHIRPS HEARD ROUND THE WORLD

THE SEARCH FOR GRAVITATIONAL WAVES

ALSO INSIDE:

PORTRAITS OF **HUMANITARIANS**

MEET SIX ALUMNI PHYSICIANS AND DENTISTS REACHING OUT TO PEOPLE IN NEED IN THEIR COMMUNITIES

Dear Friends,

As I celebrate my five-year anniversary as dean of this college, I continue to be inspired every day by the extraordinary accomplishments, discoveries and generosity of our alumni, students, staff and faculty members.

In this issue, we feature six alumni medical doctors and dentists who truly embody the spirit of "doing good" in their local communities. These humanitarians provide much-needed health and dental care to people who can't afford to pay for it. You can read about these compassionate alumni on page 13.

Beginning on page 4, we highlight a half-century of research efforts at the University of Maryland to detect gravitational waves—a feat finally accomplished earlier this year by a team that included current physics faculty members Peter Shawhan and Alessandra Buonanno. This entire field began with the late Joseph Weber, who built the world's first gravitational wave detectors on campus in the 1960s and helped recruit several other experimentalists and theoreticians in the field to College Park. You can read about the university's historical and present-day contributions to gravitational wave research in this story. You are also invited to join us on November 1, 2016, for our Celebration of Gravitational Waves. Register by visiting **go.umd.edu/gravwavesevent**.

We also bring you the story of two Terps turned successful biotech entrepreneurs who teamed up to create the college's first endowed chair in the life sciences—without ever meeting each other. You can read about alumni Andrew Balo and Nicholas Simon on page 24.

Finally, I hope to see you this semester at one of our exciting events, which range from our annual Bioscience Day festivities to seeing what the students at UMD's all-women Technica hackathon create in just 36 hours. You can see a list of our upcoming events on the back cover of this magazine.

As always, we thank you for your collective support, which moves us ahead and ensures that our college continues to advance the sciences and have a positive impact in Maryland, across the country and around the world.

Jayanth Banavar
Dean
College of Computer, Mathematical, and Natural Sciences

ON THE COVER

This illustration shows the merger of two black holes and the gravitational waves that ripple outward as the black holes spiral toward each other. The black holes—which represent those detected by the Laser Interferometer Gravitational-wave Observatory on December 26, 2015—were eight and 14 times the mass of the sun, until they merged, forming a single black hole 21 times the mass of the sun.

Illustration by LIGO/T. Pyle

Jayanth Banavar photo by John T. Consoli

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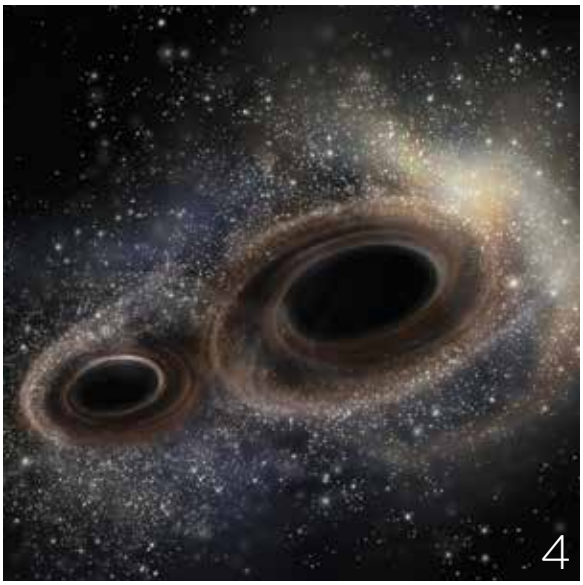

ODYSSEY

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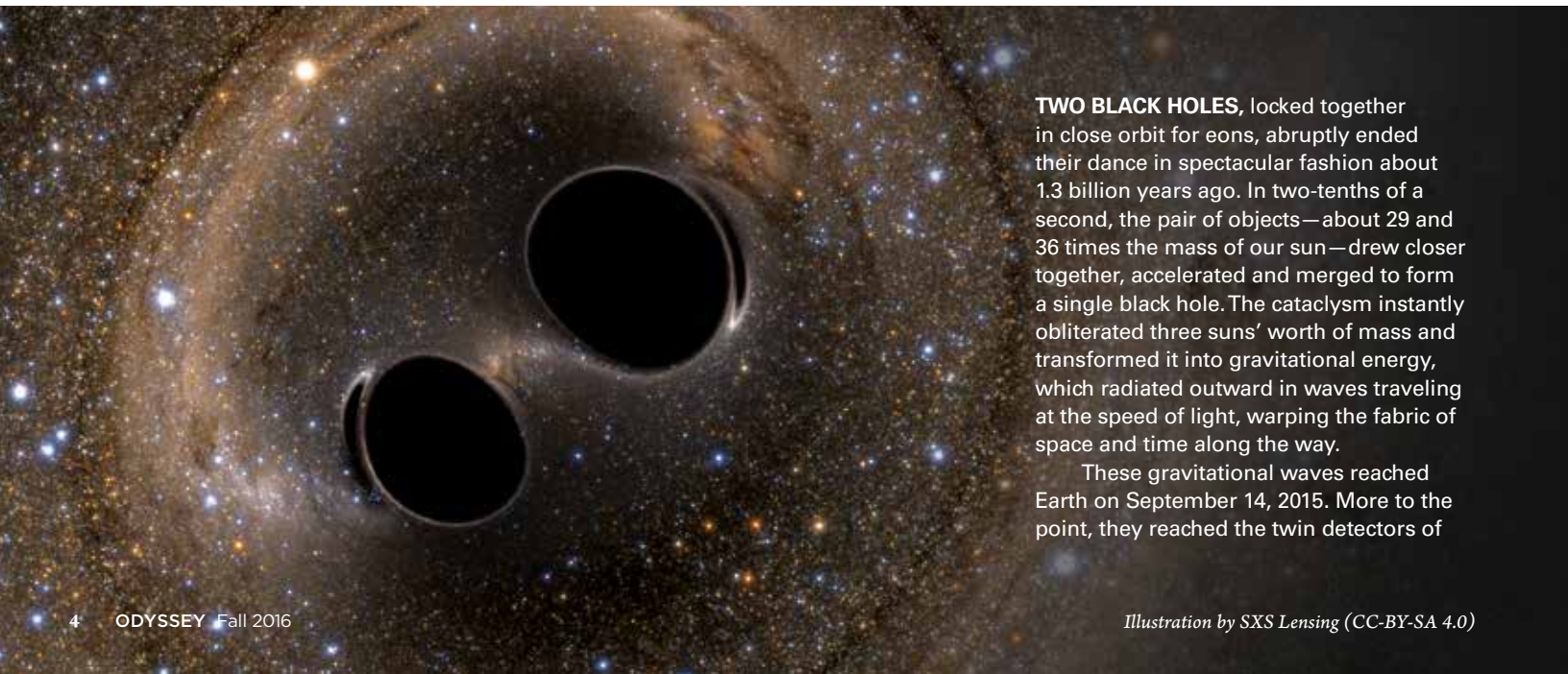
(Top) Merging black holes illustration by LIGO, NSF, Aurore Simonnet (Sonoma State U.)
(Center) Neil Brayton photo by Mike Morgan; frame photo by Stasys Eidiejus, freeimages.com / (Bottom) Amy Mullin photo by Faye Levine

THE CHIRPS HEARD

THE LONG ROAD TO THE DETECTION OF GRAVITATIONAL WAVES BEGAN AT THE UNIVERSITY OF MARYLAND AND HAS WOUND THROUGH COLLEGE PARK EVER SINCE.

THIS WAVEFORM (ABOVE), RECORDED BY THE LASER INTERFEROMETER GRAVITATIONAL-WAVE OBSERVATORY (LIGO) ON SEPTEMBER 14, 2015, REPRESENTS THE FIRST DIRECT MEASUREMENT OF GRAVITATIONAL WAVES. THE GRAVITATIONAL "CHIRP" RESULTED FROM THE CATACLYSMIC MERGER OF TWO BLACK HOLES 1.3 BILLION YEARS AGO (BELOW), WHICH CREATED A SHOCK OF GRAVITATIONAL ENERGY THAT WARPED SPACE AND TIME ALONG ITS PATH.



TWO BLACK HOLES, locked together in close orbit for eons, abruptly ended their dance in spectacular fashion about 1.3 billion years ago. In two-tenths of a second, the pair of objects—about 29 and 36 times the mass of our sun—drew closer together, accelerated and merged to form a single black hole. The cataclysm instantly obliterated three suns' worth of mass and transformed it into gravitational energy, which radiated outward in waves traveling at the speed of light, warping the fabric of space and time along the way.

These gravitational waves reached Earth on September 14, 2015. More to the point, they reached the twin detectors of

Illustration by SXS Lensing (CC-BY-SA 4.0)

ROUND THE WORLD

BY MATTHEW WRIGHT

the Laser Interferometer Gravitational-Wave Observatory (LIGO): one in Hanford, Washington, and another in Livingston, Louisiana. The waves altered the distances between LIGO's mirrors by about one-thousandth of the width of a proton—just enough for the freshly upgraded detectors to take notice. A second event, the merger of two smaller black holes, set off the LIGO detectors again on December 26, 2015.

The "chirps" registered by LIGO simultaneously proved Albert Einstein to be both right and wrong. While his theory of general relativity predicted that gravitational waves exist, Einstein himself did not believe humans could ever build a detector sensitive enough to observe them.

The LIGO team's discoveries marked the pinnacle of a scientific quest more than a half-century in the making. By twice detecting gravitational waves, LIGO earned its status as a true observatory and ushered in a new age of gravitational wave astronomy. Now, astrophysicists no longer need to rely solely on electromagnetism—radio waves, visible light, X-rays and gamma rays—to observe some of the most explosive events in the cosmos.

The historic detections resulted from the hard work and insights of more than a thousand scientists, engineers and technicians from around the world, including many affiliated with the University of Maryland. In fact, the effort to observe gravitational waves began more than 50 years ago in the College Park laboratory of the late Joseph Weber.

Widely regarded as the first to accept Einstein's challenge, Weber launched the first concerted effort to detect gravitational waves. His tenacity and passion sowed the seeds for a vibrant gravitational research group at Maryland that carries on to this day.

Around the time Weber began his experiments, he worked with Physics Department Chair John Toll to recruit Charles Misner—already a big name in gravitational theory—to Maryland from

Princeton. At UMD, Misner mentored an entire generation of talented gravitational theorists, including many who went on to make direct or indirect contributions to the LIGO effort. The successful combination of experimentation and theory at Maryland created a rich academic environment matched by few other institutions at the time.

"Maryland was one of the only places where gravitational work was being done both theoretically and experimentally. It was a real center of thought," says Richard Isaacson, Ph.D. '67, physics, a student of Misner's who went on to steer the LIGO funding effort as a program officer at the National Science Foundation (NSF). "At a time when general relativity existed solely in the realm of math and theory, Weber was one of the first to think we could see gravitational waves experimentally. And Misner was a fabulous mentor who got the absolute best out of each one of his students."

UMD's influence in gravitational research continues today, with alumni and current faculty members engaged in the LIGO project and related work. As the quest for gravitational wave observation gives way to the age of gravitational wave astronomy, UMD scientists and alumni continue to lead the way with new technical innovations and theoretical insights.

#EinsteinWasRight

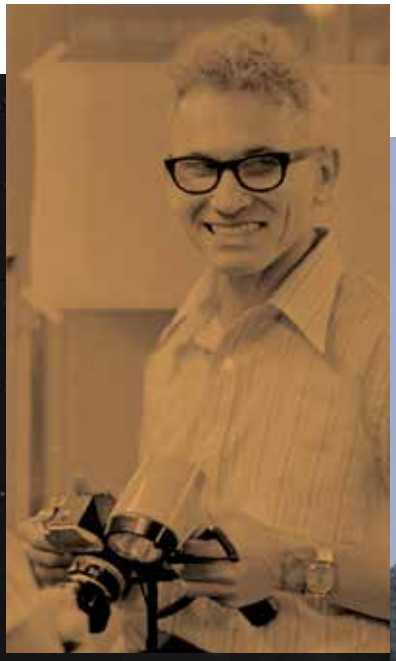
The LIGO Scientific Collaboration and the NSF announced the first detection of gravitational waves at a press conference on February 11, 2016. Almost immediately, scientists and enthusiasts all over the world took to Twitter, celebrating with the hashtag #EinsteinWasRight. Their excitement was well warranted; for the first time, physicists had direct experimental evidence for the last remaining major theoretical prediction of Einstein's theory of general relativity.

Einstein published his theory, known to most physicists simply as "GR," in 1915. More than a century later, GR remains the best description of gravity's behavior available to science. It has repeatedly stood up to theoretical challenges, and most of its tenets—including the idea that the gravity of massive objects can observably warp space and time—have been verified by experimentation. But the fact that gravity itself can travel through space and time in the form of waves had yet to be directly observed.

"With Einstein, there were certain things he didn't have any doubt about. To him, it was almost irrelevant whether gravitational waves could be confirmed experimentally, because he knew the theory was right," says Dieter Brill, professor emeritus of physics at UMD who overlapped with Weber and Misner and also mentored a number of talented gravitational theorists.

Early in his career, Brill helped build a theoretical case that gravitational waves did carry energy—and thus could be observed with a sufficiently sensitive instrument.

"I didn't share Einstein's dismissive feelings about the necessity of detecting gravitational waves. It was really a wonderful thing to see them confirmed," Brill adds.



JOSEPH WEBER, 1971

DARRELL GRETZ, 1966

JOHN GIGANTI, 1960

JEAN-PAUL RICHARD, 1971

CHALLENGE ACCEPTED, EINSTEIN.

UMD RESEARCHERS, INCLUDING THOSE PICTURED HERE, PAVED THE WAY TOWARD THE DETECTION OF GRAVITATIONAL WAVES SINCE THE LATE 1950s. (LOWER RIGHT) LIGO DETECTED GRAVITATIONAL WAVES FROM A SECOND BLACK HOLE MERGER, DEPICTED IN THIS IMAGE, ON DECEMBER 26, 2015.

Photos courtesy of the University of Maryland Archives

The sense of excitement and accomplishment rippled throughout the scientific community, including UMD's students, alumni, and current and emeriti faculty.

"My preferred name for this first big event is the 'Hallelujah Chirp,'" says Misner, professor emeritus of physics. "Thousands of people had been working on this for decades and, until now, nothing had come from it. It was a great relief when finally something appeared. LIGO did what it was designed to do. I was madly excited when I heard the news."

For Alessandra Buonanno, a UMD College Park Professor of Physics and LIGO principal investigator, the results were monumental.

"What we're observing with LIGO is so spectacular. It stands next to many of the other great things human beings can do—like any great masterpiece in music or art," says Buonanno, who also has an appointment as director at the Max Planck Institute for Gravitational Physics in Potsdam, Germany. "The fact that we can detect an event that lasted a fraction of a second, far across the universe, is amazing. It's almost magical."

The House that Weber Built

At the February 2016 press conference, LIGO Co-founder Kip Thorne of Caltech name-checked UMD's Joseph Weber as a pioneer of the search for gravitational waves. It was an expected and appropriate nod, given Weber's undeniable contributions to the field. However, Weber's achievements and leadership are often overshadowed by another aspect of his legacy: he claimed to have detected gravitational waves in 1969, but despite a flood of efforts, no other researchers were able to replicate his results.

"I think Weber did truly believe that he had found gravitational waves," says Misner. "But either way, he absolutely inspired a lot of other people when he claimed discovery. Everyone will agree that he did a great service because he gave us hope."

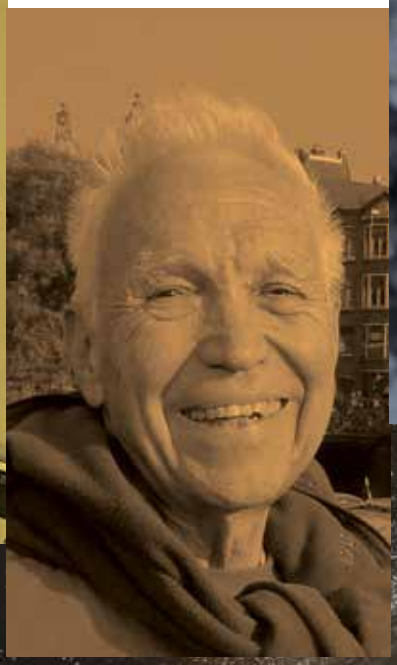
Weber not only spurred experimentalists to follow suit in his search for direct evidence, but also drove many important theoretical advances that aimed to predict the behavior of gravitational waves.

"What we're observing with LIGO is so spectacular. It stands next to many of the other great things human beings can do – like any great masterpiece in music or art. The fact that we can describe an event that lasted a fraction of a second, far across the universe, is amazing. It's almost magical."

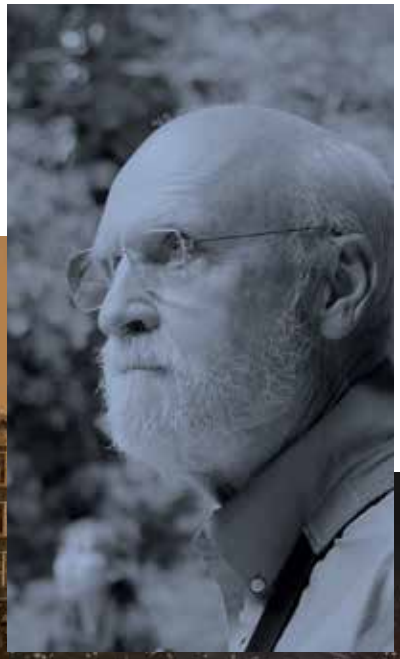
Alessandra Buonanno

HO JUNG PAIK, 1985

CHARLES MISNER, 1988



DIETER BRILL, 2016



RICHARD MATZNER, 2015

Ho Jung Paik and Charles Misner photos courtesy of the University of Maryland Archives
Merging black hole illustration by LIGO, NSF, Aurore Simonnet (Sonoma State U.)
Dieter Brill photo courtesy of same / Richard Matzner photo courtesy of same

"Weber certainly invented the field. I can't think of anyone else who had the idea that you could actually detect gravitational waves," says Richard Matzner, Ph.D. '67, physics, a professor of physics at the University of Texas at Austin. Matzner, one of Misner's students, made some of the earliest calculations of what a simplified head-on collision between two black holes would look like, including the weak gravitational waves such a merger could emit.

"Weber thought it was a tractable problem. Everyone stands on the shoulders of giants, and Weber is one of them," says Matzner.

Initially a professor of electrical engineering at UMD, Weber moved to physics in 1961. He began investing the majority of his time building resonant bar detectors—giant masses of aluminum weighing more than a ton that he expected would "ring" like a bell when struck with gravitational waves. Weber placed an array of sensors around the outer surface of the bars to catch any small change in the shape of the bars.

Weber built one such bar detector in a small, climate-controlled building on the UMD golf course, and he tended the equipment almost daily with the help of his dedicated engineering technician, Darrell Gretz. Eventually, Weber recognized the need for two identical detectors, separated by several hundred miles. Such "coincidence experiments" would help identify real gravitational wave signals amid considerable background noise from passing trucks, powerful storms and other events capable of rattling the detector. So, Weber installed a second detector at Argonne National Laboratory near Chicago.

"Weber supplied the brains and the money, and I was in charge of building, maintaining and operating the equipment," says Gretz, who worked with Weber for nearly 25 years. "At the time I never gave it a second thought, but if he was in the lab, I was always there looking over his shoulder."

John Giganti, B.S. '66, M.S. '70, electrical engineering, helped develop an efficient communications link for sharing data between the College Park and Argonne locations. Long before the advent of the internet, Weber's team shared data across hundreds of miles.

"Our system had a relatively high data rate," explains Giganti, who recently founded his second engineering and design firm. "Telephone lines today are designed for data, but back in the '60s they were designed for talking to grandma. So we digitized the data and sent it over separate communication lines."

Weber also attracted other talented experimentalists to work with him at UMD, including Jean-Paul Richard, who came to Maryland in 1965 and is now an emeritus professor of physics. For his first project, Richard designed temperature control shielding for the Lunar Surface Gravimeter that flew on the Apollo 17 mission in 1972. The instrument's intended purpose was to look for gravitational waves, but a technical issue meant that the unit was able to function best as a sensitive seismograph.

Until his retirement in 1998, Richard worked on various technological improvements to resonant bar detectors like those designed by Weber, including more efficient resonators and transducers that could expand the detectors' sensitivity. For Richard, LIGO's discovery provided some important validation.

"I worked from 1965 to 1998 without finding anything. I retired with misgivings as to whether my work would ultimately be useful," Richard says. "When I heard the LIGO news, I was shocked and stunned for a couple

(L-R) JOSEPH WEBER IN HIS LAB IN 1971; A VACUUM CHAMBER BEING LOWERED INTO THE GRAVITATIONAL RESEARCH BUILDING ON THE UMD GOLF COURSE IN 1970. (BACKGROUND) IMPORTANT CALCULATIONS FROM THE NOTEBOOK OF DARRELL GRETZ.

GRAVITATIONAL PIONEERS

Joseph Weber photo courtesy of the University of Maryland Archives
Vacuum chamber and notebook photos courtesy of Darrell Gretz

of days. It gave new value to my work and justified my efforts. That's a very big thing."

In 1978, at Richard's urging, Weber recruited a talented young postdoctoral researcher named Ho Jung Paik, who had recently finished his Ph.D. at Stanford University. Paik, now a professor emeritus of physics who continues to run an active research program at UMD, designed the first cooled, superconducting transducers to help boost the signal of resonant bar detectors like those designed by Weber. In theory, such upgrades were capable of improving the detectors' sensitivity nearly a thousandfold.

"Unfortunately, bar detectors are difficult to scale up, which meant that they would always be limited in size. Then, the laser interferometer was proposed in the 1970s," Paik explains. "Laser light overcame the size problem because it could extend the detector's baseline from a few meters to several kilometers. NSF began funding interferometer work in a major way in the 1980s. We all could see the writing on the wall."

Weber worked on some of the earliest laser interferometer designs, with help from the late Robert Forward, B.S. '54, Ph.D. '65, physics—who eventually became a well-known science fiction writer. Forward was among the first to clearly articulate the potential of laser interferometers to detect a wider range of frequencies compared with resonant bar detectors. Forward developed his own interferometer designs while working at Hughes Aircraft Company in California in the late '60s.

Despite the promise offered by laser technology, Weber remained dedicated to his resonant bar detectors until his death in 2000.

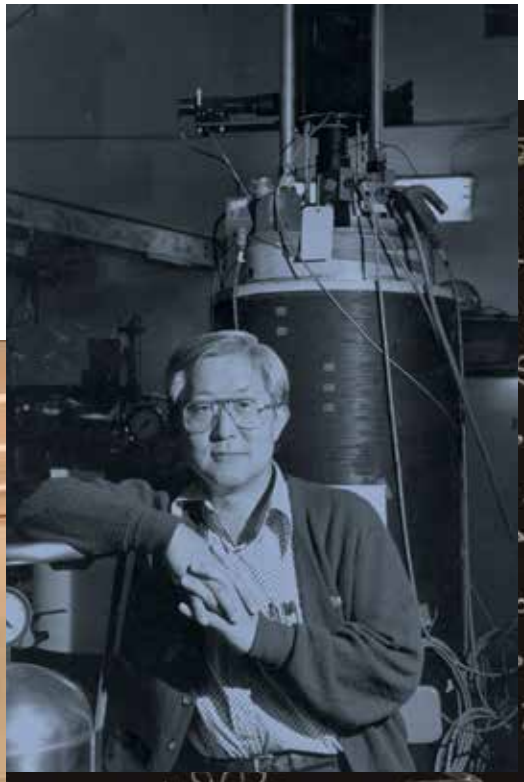
"Joe knew that you had to have two detectors and introduce a time delay between the data streams to measure the rate of accidental coincidences between the detectors. LIGO does both of these things," says Virginia Trimble, Weber's widow and a professor of physics and astronomy at the University of California, Irvine. She was a visiting professor of astronomy at UMD from 1973 to 2003. "Joe was certain his bars were detecting something and almost certain that it was gravitational radiation. If asked, he would probably have said that he always knew the waves existed and that the discovery would have occurred earlier if both technologies, bars and interferometers, had been funded and developed in parallel."

Lighting the Path

What began as sketches on paper quickly turned into proof-of-concept experiments, with a trio of scientists lighting the path that would eventually result in LIGO: Kip Thorne and Ronald Drever of Caltech and Rainer Weiss of MIT. The project gained steam throughout the 1980s, suffering some setbacks but ultimately receiving its first significant funding award from NSF in 1992.

The basic concept behind a laser interferometer is this: A single laser beam is split in two, and each half of the beam travels along one of two pathways that form the arms of the interferometer's characteristic "L" shape. A mirror at the end of each path reflects each beam back toward the original source, where the beams recombine and enter a light detector. When there is no gravitational wave present, the split beams each travel a fixed distance, and the light detector measures a constant intensity.

But when a gravitational wave sweeps by, it changes the lengths of the arms by a minuscule amount, and the recombined beam flickers ever so slightly. LIGO's light detectors record this oscillation, enabling software to reconstruct the shape and strength of the incoming gravitational wave itself. Millisecond differences in the wave's arrival time at the



(L-R) JOHN GIGANTI MAKING CALCULATIONS IN 1971; GIGANTI, JEAN-PAUL RICHARD AND ENGINEERING ALUMNUS JERRY LARSON IN 1972 POSING IN FRONT OF THE APOLLO 17 LANDING MODULE THAT CARRIED THE LUNAR SURFACE GRAVIMETER TO THE MOON; HO JUNG PAIK IN HIS LAB IN 1992.

Apollo 17 landing module photo courtesy of John Giganti
John Giganti and Ho Jung Paik photos courtesy of the University of Maryland Archives

RICHARD ISAACSON IN 2014 (TOP) AND THE UMD ID CARD HE CARRIED WHILE WORKING AS A GRADUATE STUDENT WITH HIS ADVISOR, CHARLES MISNER.

Hanford and Livingston detectors can help determine roughly where the wave came from.

Both gravitational wave events observed by LIGO lasted a second or less. But in that time, the twin LIGO detectors collected enough data to paint an astonishingly clear picture of what each stage of a black hole merger looks like.

"Laser technology provided a broadband view. Instead of being able to hear just one tone, one could hear the whole symphony. I had been selling the NSF on the fact that this was actually doable and that there would be great payoffs," says Isaacson, whose efforts at NSF were crucial to LIGO's funding and eventual construction.

"We not only had to push the technology to build instrumentation, we also knew we had to have supercomputers and good models to make the data useful," Isaacson says. "There also wasn't a large community with people ready to step into leadership roles. I don't think people understand how crazy this was. We had just the right window of opportunity."

Paik and his physics colleagues, recognizing a need for UMD to be involved in the LIGO effort, advertised a new LIGO-specific faculty position and ultimately hired Peter Shawhan in 2006. Now a LIGO principal investigator and associate professor of physics at UMD, Shawhan had been working on the project for seven years as a postdoctoral researcher at Caltech.

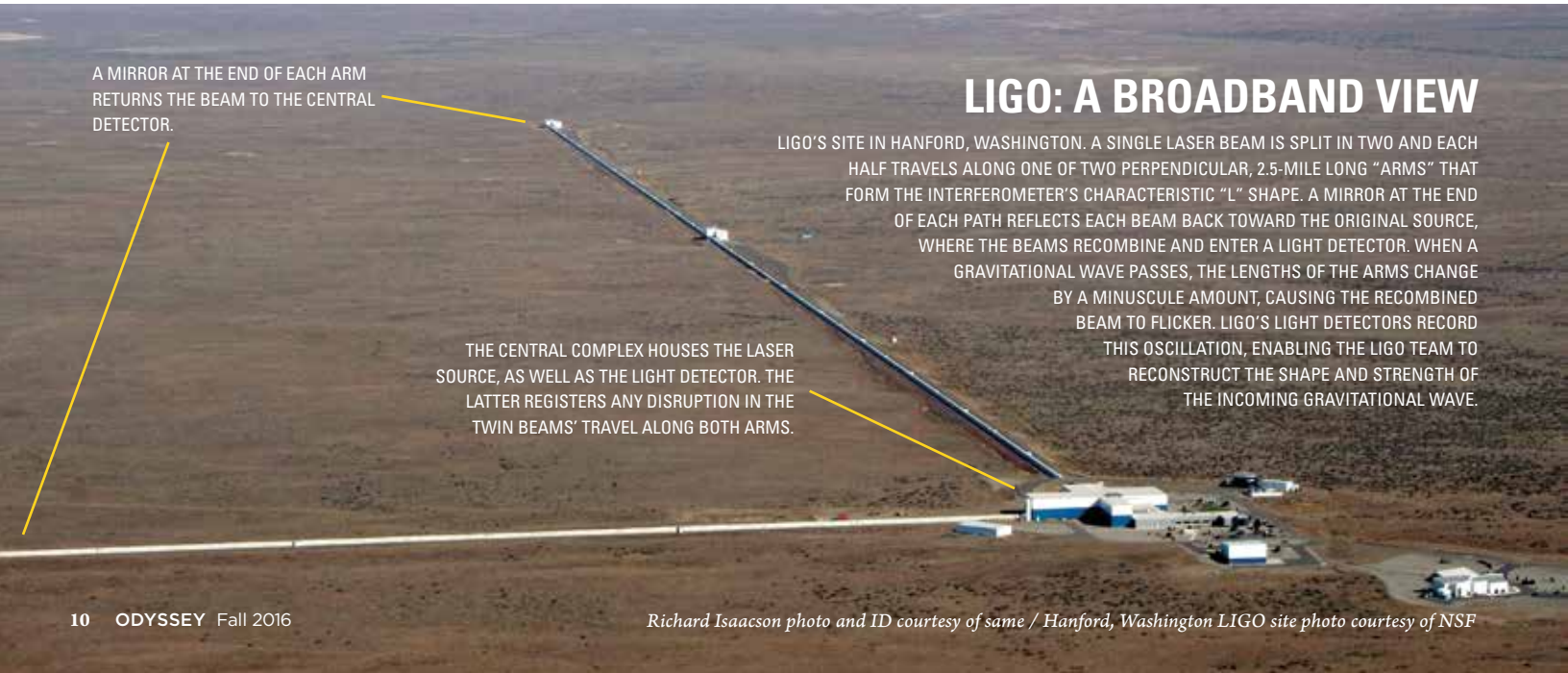
"That was still a fairly early stage. The project was funded and the observatories were built, but the instruments were not yet installed," Shawhan says. "We all had faith that we would get there someday. My role was to help figure out how we would monitor the detectors and analyze the data."

One crucial innovation the LIGO team devised, with Shawhan's help, was an elaborate "fire drill" system. Unbeknownst to other team members, a simulated signal would be randomly introduced into both detectors to test the team's response and—crucially—data analysis protocols. The entire LIGO group learned of these "blind injections" only after completing a significant number of analysis steps. Although Shawhan helped to design the blind injection system, he did not know when a test was being performed.

"In 2010, we had a blind injection test that was so convincing, it looked very much like an event candidate," Shawhan says. "We put a lot of effort into treating it as a real signal and got as far as preparing a paper for submission. We didn't know ourselves whether the signal was real or another test. We didn't want to risk letting the information leak out. This uncertainty gave us a built-in safety measure."

Once the LIGO team recognizes a candidate signal, the hard work begins. Even the strongest gravitational wave signal is still extraordinarily weak compared with those commonly received by conventional telescopes and other instruments. Buonanno and her collaborators spent nearly a decade developing models to quickly and efficiently pull promising signals out from behind the wall of noise that obfuscates them.

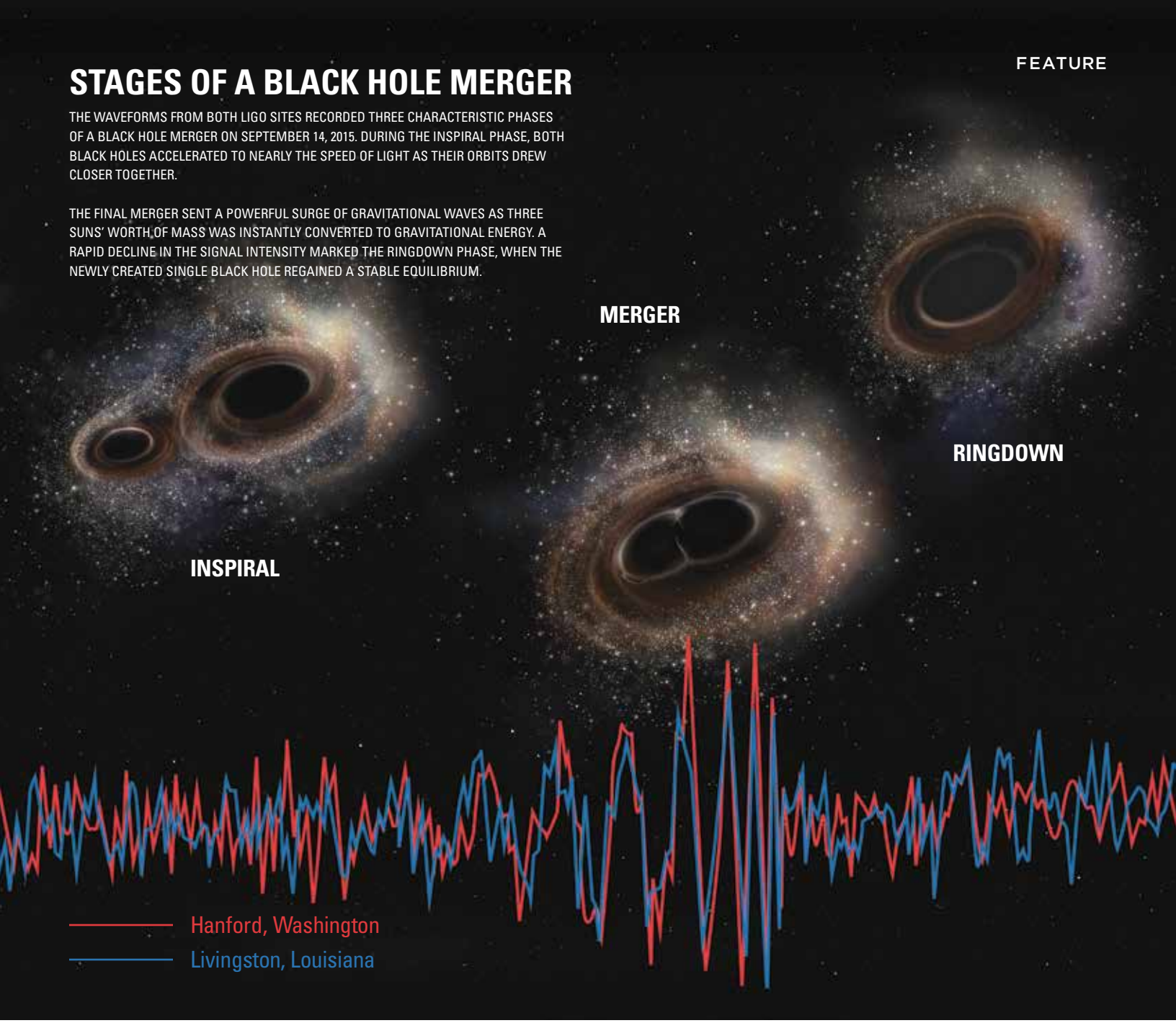
"Say you are in a room where there is a lot of ambient noise and people talking, but you want to select one of the voices," Buonanno explains. "This is what happens in the detector. The signal is buried in the detector noise, so to pull it out we need some filters. We call them templates or waveform models."



LIGO: A BROADBAND VIEW

LIGO'S SITE IN HANFORD, WASHINGTON. A SINGLE LASER BEAM IS SPLIT IN TWO AND EACH HALF TRAVELS ALONG ONE OF TWO PERPENDICULAR, 2.5-MILE LONG "ARMS" THAT FORM THE INTERFEROMETER'S CHARACTERISTIC "L" SHAPE. A MIRROR AT THE END OF EACH PATH REFLECTS EACH BEAM BACK TOWARD THE ORIGINAL SOURCE, WHERE THE BEAMS RECOMBINE AND ENTER A LIGHT DETECTOR. WHEN A GRAVITATIONAL WAVE PASSES, THE LENGTHS OF THE ARMS CHANGE BY A MINUSCULE AMOUNT, CAUSING THE RECOMBINED BEAM TO FLICKER. LIGO'S LIGHT DETECTORS RECORD THIS OSCILLATION, ENABLING THE LIGO TEAM TO RECONSTRUCT THE SHAPE AND STRENGTH OF THE INCOMING GRAVITATIONAL WAVE.

Richard Isaacson photo and ID courtesy of same / Hanford, Washington LIGO site photo courtesy of NSF



The process resembles the way a forensic scientist would compare a fingerprint found at a crime scene against a bank of known fingerprints.

"Each black hole in a binary contributes its own 'fingerprint' to the observed waveform," says Buonanno. "So, by matching the observations to one of our waveform model templates, we can infer the properties of each black hole, including mass and spin."

The problem, according to Buonanno, is that for any one given event, the LIGO team needs to check hundreds of thousands of potential templates to match the observed signal. To do this, the team must create a large bank of these waveform templates in advance, using equations based on known theory. The method developed by Buonanno and her colleagues enables the LIGO team to do exactly this, by combining the strengths of two different—but complementary—mathematical approaches.

"Alessandra has played an incredibly important role in the waveform modeling and data analysis," says Misner. "She found a way to simplify the calculations by extrapolation. This is an essential step—almost as important as the hardware."

Once an event is matched to a waveform template, physicists then have powerful clues to describe the event that created the gravitational waves. For the first two events detected by LIGO, the team discerned the masses of the black holes—both before and after the merger—and each event's approximate distance from Earth.

The second event, known as GW151226 based on the date of its discovery, resulted from the merger of two black holes that were eight and 14 times the mass of the sun. Because of the smaller masses relative to the first event, the second merger converted only

Illustration by LIGO, NSF, Aurore Simonnet (Sonoma State U.)

a single sun's worth of mass into gravitational energy. But the event lasted about one full second—roughly five times longer than the first event—allowing the LIGO team to extract much more information from the data.

"GW151226 perfectly matches our theoretical predictions for how two black holes move around each other for several tens of orbits and ultimately merge," says Buonanno. "Remarkably, we could also infer that at least one of the two black holes in the binary was spinning."

The first event, GW150914, offered a look at what is known as the "ringdown" phase—the moment that immediately follows a black hole merger and the initial spike of gravitational energy, when the two objects quickly settle into a stable form as a new, larger black hole. C.V. Vishveshwara, Ph.D. '68, physics, a theoretical physicist and director emeritus of the Jawaharlal Nehru Planetarium in Bangalore, India, who is best known for proving that nonrotating black holes are stable, first predicted the ringdown phase in the early 1970s.

"Gravitational waves and black holes both belonged to the realm of mythology," Vishveshwara told the journal *Nature* in March 2016. "At that time, I had not imagined that [the ringdown phase] would ever be verified."

"This spectacular warping of space and time happened and essentially waved hello to us. These discoveries also herald a new era in science. It's like someone who has never heard before suddenly can hear."

Ted Jacobson

A New Age of Gravitational Astronomy

It's hard to overstate the significance of observing two gravitational wave events within months of each other.

"By December, we were sure that the first event was genuine," Shawhan says. "But it was very satisfying to know, even then, that we already had a second event on our hands."

Many have pointed out that the second observation gave true meaning to the "O" in LIGO, making it an observatory and not just a one-shot tool for a single discovery. There will almost certainly be more events detected in the near future, and LIGO's initial successes will be remembered as the first of a new age of gravitational astronomy.

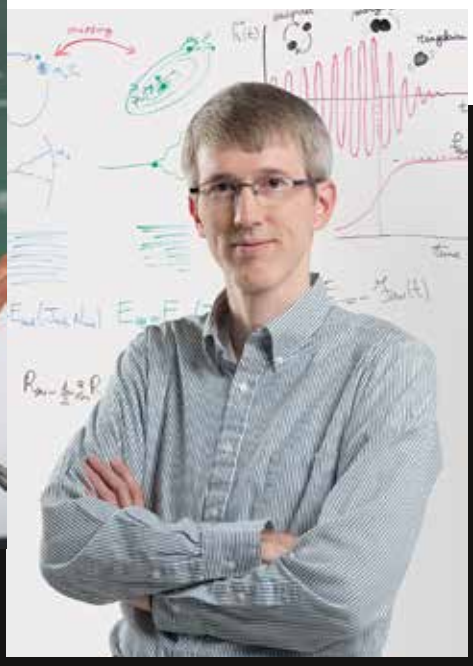
During LIGO's next data-taking run, the team expects further improvements in detector sensitivity will allow LIGO to reach as much as 1.5 to two times more of the volume of the universe compared with the first run.

The Virgo detector, a third interferometer located near Pisa, Italy, with a design similar to the twin LIGO detectors, is expected to come online during the next observation run. Virgo will improve the ability to locate the source of each new event by comparing the arrival times of incoming gravitational waves at each detector.

But Virgo won't be alone. The NSF recently signed a memorandum of understanding with the government of India to build a third LIGO detector, and a Japanese collaboration began constructing the Kamioka Gravitational Wave Detector (KAGRA) in central Japan. With three new detectors joining the hunt, physicists expect that they will soon be able to "hear" gravitational signals from a greater number and variety of events.

"The first detection gave us all an intimate connection to a specific event that took place 1.3 billion years ago, incredibly far away. This spectacular warping of space and time happened and essentially waved hello to us," says Ted Jacobson, a physics professor and gravitational theorist at UMD who has not worked directly on the LIGO project. "These discoveries also herald a new era in science. It's like someone who has never heard before suddenly can hear." ■

ALESSANDRA BUONANNO, 2016



PETER SHAWHAN, 2016

MOVING FORWARD

AS PRINCIPAL INVESTIGATORS FOR LIGO, ALESSANDRA BUONANNO AND PETER SHAWHAN ARE CARRYING UMD'S LEGACY FORWARD INTO A NEW AGE OF GRAVITATIONAL WAVES OBSERVATION AND RESEARCH.

Alessandra Buonanno photo courtesy of S. Döring–MPG / Peter Shawhan photo by John T. Consoli

portraits of Humanitarians

BY KIMBERLY MARSELAS

SHERITA HILL GOLDEN

Humanitarian work

is often viewed as reactionary—offered in times of crisis—or as a mission requiring one to travel the globe. But, for six University of Maryland alumni, humanitarian service begins at home, ensuring quality health care for people in their local communities day after day. Putting people first starts with one mammogram, one counseling session or one pulled tooth. And, perhaps even more importantly, it requires a health care worker willing to listen, look past stereotypes and find creative solutions.

During their years of practice, these six physicians and dentists have kept the Hippocratic oath or the American Dental Association's Code close to their hearts by building lifelines for those in need. All have given their own time to ensure that those in their local communities who can't afford the benefits of modern health care still receive the help they need.

Sherita Hill Golden photo by Keith Weller / Frame photo by Andrew C., freeimages.com

FEATURE

Anne Nucci-Sack

PRIVACY AND PROTECTION FOR AT-RISK TEENS

"WE TREAT PATIENTS. WE DON'T TREAT PROBLEMS OR DISEASES."

At the Mount Sinai Adolescent Health Center in New York City, teens and young adults know they will get outstanding care, free medicine and confidential support all in one place.

If that knowledge isn't enough to get them through the door, they can send questions via text message or sign up for a Health Squad app that reminds them to take medications.

The center's medical director and chief medical officer, Dr. Anne Nucci-Sack, B.S. '77, microbiology, makes it her job to get patients the treatment they need regardless of their ability to pay. She does so with an approach that takes into account their collective physical, mental and sexual health needs.

"We treat patients. We don't treat problems or diseases," Nucci-Sack says. "There is this burgeoning sexual and reproductive health background and a lot of depression and anxiety during adolescence—both pieces that often get missed."

Listening to the patients—many who come from low-income areas or lack strong family support—builds a bond that can translate to better care.

Though she tried private practice, Nucci-Sack says she had an epiphany long ago that helping children in communities with less access to quality health care is her calling.

She spent 18 years in the Bronx working with mentors she met during her pediatric residency. After completing a fellowship that allowed her to better understand the challenges teens and young adults face, she became chief of adolescent medicine for the Bronx-Lebanon Hospital Center and ran its school-based Taft Teen Health Center for 15 years.

In 2002, Nucci-Sack moved full-time to the Mount Sinai Adolescent Health Center. It houses a block's worth of services, targeting patients from East and Central Harlem, areas with some of New York's highest teen pregnancy rates. Patients come from all over New York City, and teens and young adults who are visiting from other states also accompany cousins or friends to get help they can't find elsewhere.

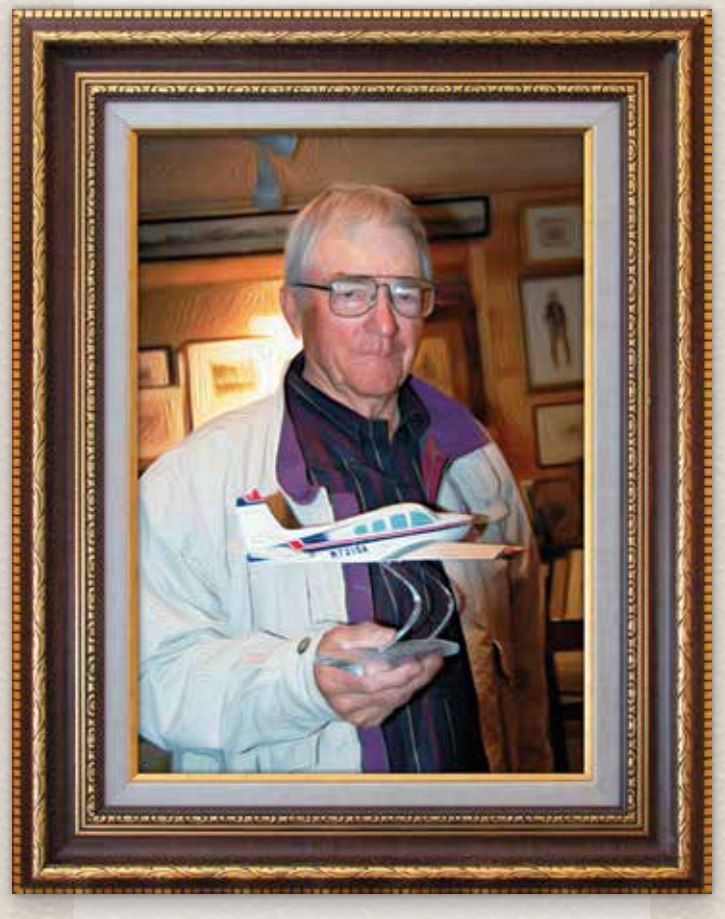
The center's reputation—particularly the fact that it only bills for services if it can do so without alerting parents to a young person's treatment—has grown with the internet. But the 10,000 patients aged 10 to 24 served each year come for the same basic reasons they always have: a sense of caring that's intentionally non-paternalistic.

Nucci-Sack spends about 50 percent of her time treating patients, but also works toward the larger goals of strengthening and expanding programming, and educating pediatric residents in adolescent health. The center depends on donors (including staff members who run the New York Marathon) to raise its $12 million annual budget.

Stories like those of former patient Jose Pacheco make soliciting support a bit easier. Being bullied and weighing nearly 400 pounds, Jose turned to center staff for help. They diagnosed a heart condition, taught him about nutrition and connected him with fitness mentors to put him on a path to wellness.

"Poverty is really a very potent entity in many of these kids' lives," Nucci-Sack says. "Many of our patients have disorganized lives. They've witnessed violence. They report physical, emotional and sexual abuse, as well as trauma. They need somebody to sit down and talk to them … someone who they know is advocating for them."

Anne Nucci-Sack photo courtesy of Mount Sinai Health System and Cathy Clarke
Frame photo by Roger Kirby, rgbstock.com



"I WAS ABLE TO PERFORM MEDICAL EXAMS THEY HADN'T BEEN DOING IN THESE PLACES."

William Ward

FLYING TO THE RESCUE OUT WEST

In the 1960s and 1970s, Dr. William Ward, B.S. '54, chemistry/pre-med, logged more than 12,000 hours in a Beechcraft Bonanza, his vehicle of choice for reaching remote hospitals too small to boast their own radiologist.

After medical school—and two semesters spent in the radiology department at the National Institutes of Health—Ward knew he wanted to practice in the rugged wilds of Colorado and Wyoming.

When he arrived in Laramie, Wyoming—a town of just 20,000 residents—in 1962, Ward was only the third radiologist. For some residents of small towns at that time, getting the right treatment required X-rays be mailed out and interpreted by a professional hundreds of miles away. Other patients made the arduous trip in person or risked a bad read by an undertrained technician or local medical examiner.

Ward wanted to bring emerging diagnostic technologies to more patients, so he began commuting by air. He spent his early days diagnosing wounds from ranching accidents, many involving horses or tractors. He also treated patients on Indian reservations and other locations with medically underserved communities. As more radiologists began to arrive in the West and new safety standards reduced the rate of some traumatic injuries, Ward added ultrasound to his arsenal and expanded to helping breast cancer patients.

"I was able to perform medical exams they hadn't been doing in these places," Ward says. "I was lucky in my practice, especially treating cancer, because the medical advancements and the equipment became so refined."

He went back to school to stay informed about new procedures and worked to convince women that they would benefit from previously unknown tests—such as mammography and ultrasounds—and sometimes-clunky machines. Within years, he had technology that could pick up masses months earlier when they were centimeters smaller.

Always eager to stay up-to-date, he spent a summer at Southern Illinois University and then went to St. Luke's Hospital in Fargo to learn about neurological MRIs. He also chaired the Wyoming Board of Medicine before retiring in 1995.

As much as Ward loves the West, he gave up a small part of it to ensure a better future for its residents. He and Carole, his wife of 40 years, sold their ranch land to fund scholarships for medical students who agree to practice in Wyoming or parts of Colorado.

William Ward photo by Andrea E. Morris / Frame photo by Serkan Kanat, freeimages.com

FEATURE

Sherita Hill Golden

ON A MISSION TO CONTROL DIABETES

Inside the Johns Hopkins Outpatient Diabetes Center on Baltimore's Caroline Street, Dr. Sherita Hill Golden, B.S. '90, biological sciences, works hard to prevent the kind of life-changing damage suffered by one of her earliest patients.

During her second year of medical school, Golden took the health history of a Type 1 diabetic patient who had experienced vision loss, kidney failure and a partial amputation—all of those complications staggering considering he was only in his mid-30s. The impact diabetes had on his life changed Golden and has been a driving force behind her life ever since.

Golden has spent her career advancing diabetes care, examining its connection to complications and other conditions, including depression and cardiovascular disease. Depression rates tend to be higher among individuals with lower socio-economic standing or less education; the same population also tends to have higher rates of diabetes because of lack of access to health care.

"Seeing patients has informed my research career all along," says Golden, who is also director of the Inpatient Diabetes Management Service at The Johns Hopkins Hospital and executive vice-chair of the Department of Medicine. "Depressive symptoms are very prevalent in the population I take care of and often they can be a barrier to treatment."

A prolific researcher, she seeks to understand both the biological and behavioral factors that make diabetes the nation's seventh leading cause of death. Much of Golden's research focuses on how hormones influence the development of diabetes. Those with chronic depression or anxiety—which elevate cortisol and adrenaline levels—have an increased risk of developing the disease. In one study, Golden found the risk emerges just three and a half years after first reporting depressive symptoms.

Because diabetes care requires daily commitment and a high level of patient engagement, Golden believes a patient's life story can be as important to success as his or her health data. Making that daily commitment easier for patients is one of the Golden's long-term goals. She's working to create collaborative care models that group different providers together to streamline care and cut down on patient costs, lost work and hassle.

Golden won Johns Hopkins' 2015 Innovations in Clinical Care Award for her role in reducing the rate of hypoglycemia—low blood sugar—in hospitalized patients with diabetes. During a three-year period, a committee Golden chaired instituted changes to create a nurse-led treatment protocol for hypoglycemia, and provide education and training for the hospital's nurses to become experts in diabetes policies and glucose management. The committee also launched a uniform electronic ordering system based on new clinical standards.

While her love for research started before college, with parents who "let me grow algae and all those kinds of things in the kitchen and learned along with me," her passion for research took off at UMD, in large part thanks to faculty advisor William Higgins, now associate professor emeritus of biology. Higgins pushed her to test herself in preparation for medical school.

"He almost threatened my perfect GPA," she jokes now.

In addition to anatomy and other classes that gave her new perspective on would-be patients, Golden also credits UMD with connecting her to the National Institutes of Health. She spent two summers there as a research intern before attending medical school and eventually earning a master's of health science.

THE IMPACT DIABETES HAS HAD ON HER PATIENTS' LIVES HAS BEEN A DRIVING FORCE BEHIND SHERITA HILL GOLDEN'S OWN LIFE.

Sherita Hill Golden photo by Mike Oliver / Frame photo by Andrew C., freeimages.com

ASPIRING HUMANITARIANS

BY RACHAEL ROMANO

BREANNA BOGGAN

For junior biological sciences major Breanna Boggan, the practicum required for the College Park Scholars Life Sciences program cemented her desire since the eighth grade to become a doctor and piqued her interest in surgery.

"I was able to see the daily life of a surgeon and it was an absolutely amazing experience," says Boggan. "I saw the inner workings of the operating room and had doctors show me and tell me about the procedures they were doing and the reasoning behind using certain techniques."

The scholars program also opened Boggan's eyes to new perspectives on the medical field.

"It is really interesting to be able to hear the plans of my peers and how they decided that medicine was the career path for them," says Boggan, who chose medicine because it combines her passions for science and helping others.

Currently, Boggan conducts research in the Malaria Vaccine Branch at the Walter Reed Army Institute of Research.

PRADIP RAMAMURTI

Senior biological sciences major Pradip Ramamurti, who was accepted to medical school at George Washington University as a sophomore, works as a medical scribe in the emergency services department at MedStar Montgomery Medical Center in Olney, Maryland.

"Being a medical scribe has allowed me to learn firsthand from trained physicians how to approach patient cases and the intricacies of the thought processes that go into being a physician," he says.

Ramamurti has also conducted research at the U.S. Department of Agriculture, helping to formulate a vaccine for cows with gut parasites. In 2015, he attended the Universitas 21 Undergraduate Research Conference in Auckland, New Zealand, and presented his Gemstone honors team's progress toward repurposing a known drug to decrease the virulence of tuberculosis.

"The Gemstone living-learning community allowed me to meet people with similar interests immediately upon entering college, making it easier for me to excel academically and socially," says Ramamurti.

MARQUISE SINGLETERRY

During her time at Maryland, senior biochemistry major Marquise Singleterry has pursued opportunities to empower and advocate for others by becoming a teaching assistant and volunteering at a local pregnancy aid clinic.

"As I gained firsthand experience, I saw remarkable similarities between my passions of teaching and community outreach and the role of a physician," says Singleterry, who is a member of the Gemstone Honors Program. "Pursuing a career in medicine has made my appreciation of science purposeful and my desire to impact lives in an engaging and practical manner not only attainable, but exceptionally gratifying."

In addition to being captain of Maryland Dhoom, a nationally competing South Asian fusion dance team, Singleterry conducts research in the Department of Surgery at the University of Maryland School of Medicine. There, she works to gain a better understanding of immunocompetence in cardiac allograft recipients.

continues

Photos of Breanna Boggan and Pradip Ramamurti by Faye Levine
Photo of Marquise Singleterry courtesy of same / Frame photo by eblind, freeimages.com

Aspiring Humanitarians

continued

GARSHASB SOROOSH

Senior biological sciences major Garshasb "Gary" Soroosh and two classmates will send a microbiology experiment they devised to the International Space Station next spring to test how the weightlessness of space affects microbe gene expression.

"The overwhelming support, helpful tips and guidance we received from faculty members in several departments for this project humbled me," he says.

Soroosh, who is president of the American Society of Microbiology Student Chapter at UMD and volunteers at free clinics in the College Park area, also spent the last five summers conducting research at the National Institutes of Health. He also volunteers at the Children's Developmental Clinic on campus, helping an 11-year-old nonverbal child with severe autism reduce the frequency of his seizures and outbursts.

"The thrill of the challenge is what pulls me to medicine as a field, but the intrinsic reward of committing myself to improving the lives of others is what motivates me to pursue it," says Soroosh.

SUPPORTING ASPIRING HUMANITARIANS

Tucked away inside H.J. Patterson Hall is an office just for University of Maryland students who want to pursue a medical career after college.

The Reed-Yorke Health Professions Advising Office (HPAO) offers a variety of services every year to nearly 3,500 Terps who want to become physicians, dentists, nurses and allied health professionals. The office is named for and supported by a generous gift from physician Victoria Yorke, B.S. '82, biochemistry, and her late husband, veterinarian John Reed.

"We help students understand what it takes—both academically and interpersonally—to become a successful clinician," says HPAO Director Wendy Loughlin, who recently received the Buck Hill '68 Award for outstanding service from the Northeast Association of Advisors for the Health Professions.

BREANNA BOGGAN

Loughlin's team provides one-on-one advising for every student and hosts frequent workshops on topics ranging from academic planning to navigating the application process and learning what professional schools are looking for in a candidate.

"Our role is to offer students broad ideas about how to gain the clinical, research and community service experiences necessary for admittance to a professional school," Loughlin says. "We encourage students to pursue unique activities that speak to their values and interests. Then, during the application process, we help them write and talk about these experiences in meaningful ways."

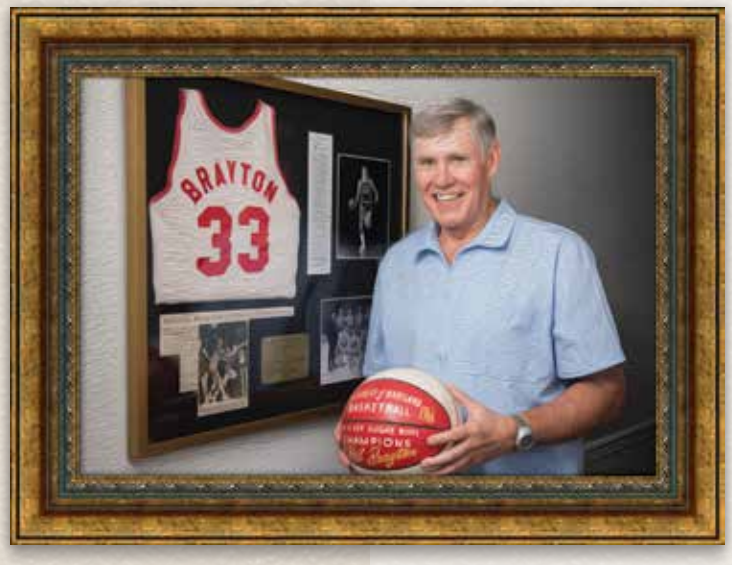
Since becoming HPAO director in 2006, Loughlin has increased the number of opportunities available to UMD students for obtaining clinical experience at local hospitals and community clinics. She also launched a clinical shadowing program with local Terp alumni physicians and dentists to expose students to different medical professions.

To encourage more information sharing among students, pre-health advisor Nick Celedón created the HPAO student advisory board three years ago. The board's members host weekly office hours where they discuss topics like course options and how to survive the application process. They also run workshops on topics such as interviewing skills and how to write personal statements for professional school applications.

As many as 500 UMD students apply to medical and dental schools every year, and Loughlin's team, along with a cadre of faculty and staff members and alumni, conduct mock interviews with the students and write a multi-page letter of support for every student.

"We have a strong record of acceptance to professional schools all over the country, though many students stay local," says Loughlin. "This fall, 51 of the 160 students at the University of Maryland School of Medicine in Baltimore will be Terps." *–ABBY ROBINSON*

Garshasb Soroosh photo by Faye Levine / Breanna Boggan photo courtesy of same



"IT'S A GREAT INHIBITOR IF YOU CAN'T OR WON'T SMILE."

Neil Brayton

BRIDGING THE GAP IN ORAL HEALTH CARE

After spending a few years unhappy with his own smile, a young Neil Brayton, B.S. '66, zoology, finally received the dental repairs that allowed him to put his best face forward.

His renewed confidence led him to consider a career in dentistry, a field where he has spent more than four decades improving patients' physical health and mental well-being.

Brayton works in private practice in Chestertown, Maryland. A self-proclaimed country dentist, he also supports Crossroads Community, a nonprofit organization providing psychosocial rehabilitation services to adults with persistent mental illness.

Each week, he treats one or two Crossroads clients—many who are transitioning from homelessness or living in poverty. The program is now supported by a grant, but Brayton began as a volunteer who appreciated the charity's efforts to help those with mental needs remain in their communities.

This population often overlooks its dental health, Brayton explains, and high smoking rates complicate threats associated with poor dental hygiene. He encounters high rates of periodontal disease and performs fillings and extractions as needed.

"It's a great inhibitor if you can't or won't smile," says Brayton, also noting that pain associated with dental issues can be limiting as well. "I can take them out of the pain they have after years of neglect. That's a nice feeling to be able to do that for someone."

Brayton was recruited to the University of Maryland as a basketball standout and played three years with friend Gary Williams, who later spent 22 years as the team's head coach.

But he might have gone to another school had coach H.A. "Bud" Millikan not reassured Brayton he would be able to complete his pre-dental requirements. During the 1964-65 season, the team went 18-8, and Brayton spent up to 30 hours a week in class, much of that time in labs.

He took summer courses to lessen his course load during fall and spring semesters and kept his eye on dental school admission policies.

In 1970, he earned his D.D.S. from the University of Maryland School of Dentistry. He was then drafted as an Army dentist during the Vietnam War, attaining the rank of major and receiving the Army Commendation Medal for meritorious service.

When he returned to the United States, Brayton went to work in Chestertown, the seat of Kent County with a population just over 5,000. Many of the staff members he started with 43 years ago still work with him today.

While the team has stayed together over the years, they have moved forward with the times, helping the practice usher in major advances in dental technology. These advances in technology and preventative care have made a huge difference. Where once Brayton might have fit two patients for dentures each week, he now fits just two pairs a month. That's a reflection of how better detection and treatment can greatly improve a person's oral health, he says.

Brayton doesn't want anyone to be denied proper dental care due to cost or lack of access. In addition to his work with Crossroads, he volunteers annually with Missions of Mercy to treat low-income, high-need patients in other Maryland cities like Salisbury and Cumberland.

One of his dental hygienists also performs exams for students in Kent and Queen Anne's county schools. She refers those who need more extensive care to the practice.

"I know firsthand what a difference dental care can make in a person's life, and I'm happy that over the years I have been able to help a lot of people who couldn't afford it," says Brayton.

Neil Brayton photos by Mike Morgan / Frame photo by Stasys Eidiejus, freeimages.com

Terp Family Dental Practice is All Smiles

(L-R) GINA McCRAY, AUDREY KIMMEL, KARA DEMER AND NATALIE PLANTAMURA (FRONT) WORKING WITH ANOTHER STAFF MEMBER AT ST. MARY'S DENTAL.

A visit to the dentist office for a cleaning can sometimes get confusing for patients at St. Mary's Dental in Mechanicsville, Maryland. That's because one of the dentists, Dr. Kara Demer, B.S. '10, biological sciences, and one of the dental hygienists, Audrey Kimmel, are twins. And they both look remarkably similar to the dentist who owns the practice—their mother, Dr. Gina McCray, B.S. '82, zoology.

While dentistry is a family affair for these ladies, their collective passion for the University of Maryland and its programs also runs deep.

"We truly are a Maryland family," says McCray, who met her husband, Milton, on campus when they were students.

McCray chose College Park for its location and reputation. She loved attending sporting events and being able to participate in a wide range of activities. Looking back, she says Maryland really prepared her for dental school at the University of Maryland, Baltimore, where she received her D.D.S. degree in 1987.

A few years later, McCray bought St. Mary's Dental, and her daughters grew up helping around the office. When the time came for the twins to attend college, both followed in their mother's footsteps to College Park with plans to pursue dental careers.

"I chose Maryland because I knew it was one of the top schools, and it offered a physiology and neurobiology specialization that always interested me," says Demer, who followed up her bachelor's degree by earning a D.D.S. degree in 2014 from the University of Maryland, Baltimore.

Kimmel also attended UMD, but later transferred to the University of Maryland, Baltimore, where she received her bachelor's degree in dental hygiene in 2013. After graduation, she went to work at the family dental practice while she continued her academic pursuits, earning her MBA in 2015.

Today, McCray says she is "tremendously blessed and grateful" to work side-by-side with her daughters.

"My daughters do my personal dental work too, which says a lot about how much I trust them," remarks McCray.

Impressively, the family keeps a strict divide when it comes to work and family.

"When we are at work, we are truly colleagues—we're not mother and daughters," says McCray. "And we don't bring work home. We're able to separate the family aspect from the workplace."

However, that work-family separation doesn't stop them from working together to give back to their community. In fact, community outreach plays a big role in the practice. The office participates in the Crown Council, an alliance of dental teams passionately committed to protecting oral health and serving their communities through charitable work. Currently, St. Mary's Dental has teamed with the Smiles for Life Foundation on a teeth-whitening campaign to raise money for children's charities.

"Serving the community I was raised in is fulfilling and certainly makes me feel connected to the patients and their families," says Demer.

The women also welcome the chance to share their knowledge with aspiring students. McCray regularly invites pre-dental students from UMD to shadow her staff at the practice and has a dental assistant program taught at her office to students from the College of Southern Maryland.

Over the summer, she was also excited to mentor her 13-year-old niece, Natalie Plantamura. The teenager from Georgia already dreams of following in her aunt's footsteps—and already has her heart set on attending UMD when the time comes.

–RACHAEL ROMANO

Family photos courtesy of St. Mary's Dental / Frame photo by Stasys Eidiejus, freeimages.com

Margaret McCahill

TEACHING HEALTH CARE AS A HUMAN RIGHT

Arguments about the "health care crisis" aren't just politics to Dr. Margaret McCahill, B.S. '76, zoology.

As a child growing up in Los Angeles, she watched her single mom struggle to keep four young children healthy—a challenge managed mostly by volunteers at various free clinics.

Forty years later, the compassion she works to instill in others is inextricably linked to her own life experiences. As a family physician and founding director of a joint residency program combining family medicine and psychiatry, her mission is to serve medically indigent patients, particularly those in communities with less access to quality health care.

"For me, it's always been about serving people who have trouble getting access to health care," McCahill says. "It's really a terrible problem. If you don't have access to health care, nothing else really works to bridge the gap, not even other government programs."

McCahill credits her successes to her supportive husband, as well as advisor William Higgins, who encouraged her to pursue a pre-med degree instead of completing an associate's degree in nursing. Though McCahill was busy raising two young children, Higgins saw her potential and helped her arrange courses to complete her undergraduate studies quickly.

From her first residency in Cleveland, she witnessed the impact mental health had on her case load. After a move to California in the mid-1980s, McCahill decided to complete a second residency in psychiatry and merge her two passions.

Over the years, she has volunteered at a free clinic for the homeless, cared for Navajo patients who lived on nearby reservations, and tried to stop routine medical needs from exploding into health crises due to lack of health insurance.

"Small things become big things," McCahill says, recounting the story of a patient in her mid-50s who put off seeing a physician for so long that she died of diabetes and hypertension-related kidney failure within a few weeks of being diagnosed. "Even with a sliding scale, the costs add up."

As medical director of St. Vincent de Paul Village in San Diego for 10 years, McCahill had a unique opportunity to offer intervention and education. In addition to treating patients in the office—where staff resources were available for physical and mental health care—the team ran a mobile clinic stationed in church parking lots across the city.

She still remembers the single mother of four—a patient not unlike her own mom—who presented with colon cancer.

"Once you are identified with a life-threatening problem, you get access. But you have the burden of proving that life-threatening condition," McCahill says. "Without us, those four kids would have been orphaned."

The family-medicine/psychiatry residency program at UC San Diego also allowed McCahill to show young medical students, nurses and pharmacists why some patients put off care, whether because of cost or mental health issues.

"We would see so many extraordinary things," says McCahill. "It's just a crime that people go untreated. It's not only proximity. It's who's willing to see whom under which payment plans."

Though she's no longer treating patients directly, McCahill remains on the faculty at the UC San Diego School of Medicine and the University of San Diego Hahn School of Nursing and Health Science. Since earning her master's degree in theological studies this spring, she plans to teach spirituality and health—yet another way to foster mind-body connections.

As a Coast Guard wife, McCahill is also committed to serving active duty military members. She and her golden retriever, Portia, volunteer with Paws'itive Teams, an organization that helps those with post-traumatic stress, anxiety and medical issues regain comfort with real-life situations like grocery shopping.

"IT'S JUST A CRIME THAT PEOPLE GO UNTREATED."

Margaret McCahill photo courtesy of same / Frame photo by Michal Zacharzewski, freeimages.com

FEATURE

Paul Corcoran

'EUPHORIA' IN PUBLIC SERVICE

Fascinating experiences with "superstar teachers" put Dr. Paul Corcoran, B.A. '68, sociology, on the path to dental school at the University of Maryland, Baltimore.

The late A. James Haley, zoology professor, stood head-to-head at the microscopes with the students in his histology class, quizzing them about what they were seeing. James Huheey, now professor emeritus of chemistry and biochemistry, often stretched his office hours to help those who were struggling.

JEAN AND PAUL CORCORAN

Though he's now firmly past retirement age, Corcoran strives to follow the examples of these men, extending the same type of kindness as he serves Vail, Colorado's year-round residents who are the community's backbone. Among his regular clients and pro bono cases are many local carpenters and ski pros.

"My wife and I believe in treating everybody who walks through the door the same way," says Corcoran, whose wife, Jean, a former kindergarten teacher, has been the manager of his practice for the last decade. "I've been blessed far beyond what I had the right to expect in my life. We love what we do, to try and really touch people's lives."

Together, the Corcorans founded Free Day of Dentistry for the community nine years ago. The nonprofit organization offers free dental care to adults one day each October, with everyone on the office staff volunteering to help community members in need.

In a single day, Corcoran has treated as many as 65 patients in need of cleanings, fillings and extractions. Most of them would otherwise be unable to pay for the basic, but necessary, procedures.

Though he does his share of high-end procedures, Corcoran hasn't stayed in the field all these years simply to polish perfect smiles. He's on-call year-round at the 60-bed Vail Valley Medical Center to respond to traumatic injuries—many from downhill skiing accidents—and life-threatening oral health issues.

"I had a young man last summer with a toothache that blossomed into a jaw infection," recalls Corcoran. "The doctor told me he was 36 to 48 hours from death. But after a week in the hospital, he was able to return home."

In 2012, the medical center honored Corcoran for his years of dedicated service helping patients during all hours in the center's emergency department.

Corcoran also accepts referrals from local churches and other community organizations to serve at-risk patients throughout the year, including young people who have destroyed their teeth through drug or alcohol abuse.

"There's such a euphoria when you do good and help people," Corcoran says. ■

"THERE'S SUCH A EUPHORIA WHEN YOU DO GOOD AND HELP PEOPLE."

Paul and Jean Corcoran photos courtesy of same / Frame photo by Stasys Eidiejus, freeimages.com

Energy and Curiosity Drive Professor

When she first started graduate school, people told University of Maryland Chemistry and Biochemistry Professor Amy Mullin, "You're never going to finish" and "You're never going to get an academic job."

They were wrong. In 1991, Mullin earned her Ph.D. in physical chemistry from the University of Colorado, Boulder, and went on to become an assistant and then associate professor of chemistry at Boston University, where she served until coming to UMD in 2005.

"When I gave a research talk, I wanted it to be well prepared and presented well so that the audience would be as interested as I was," says Mullin, who was the youngest faculty member in her department at Boston University and the only woman. "When I taught a class, I wanted students to feel that it was worth their while to be there."

Mullin's exceptional teaching has earned her two top awards. She received a Camille Dreyfus Teacher-Scholar Award in 1999 and the Creative Educator Award from UMD's College of Computer, Mathematical, and Natural Sciences in 2011.

Since joining the faculty at UMD, Mullin has developed new graduate courses in kinetics and dynamics and created new methods for teaching physical chemistry courses.

"I develop my own lesson plans for fun and active learning. My goal is to have my students be motivated and active learners," explains Mullin. "I try to make lectures interesting by incorporating demos, videos and discussions."

Mullin says she can spot a spark of success in certain students that goes beyond getting top grades in chemistry classes.

"The kids that I see going far," she says, "are those who are genuinely curious."

One such student was Matthew Smarte, B.S. '12, chemistry, who is currently a graduate student studying atmospheric chemistry at the California Institute of Technology. Mullin mentored Smarte through the Beckman Scholars Program that she directs. Since 2007, the Arnold and Mabel Beckman Foundation has funded 18 scholars at UMD, providing financial support for undergraduates to conduct research with faculty mentors for at least 15 months.

"The Beckman Scholars Program provided me with invaluable professional development and an almost seamless transition to graduate school," says Smarte. "I thoroughly enjoyed working with Professor Mullin and learning from her tenacious approach to science. When a new experiment posed challenges, she remained confident that a solution and success were right around the corner."

Two things tie Mullin's research pursuits together: molecules and energy.

"Energy is the thing that drives all change," she says. "If we were in equilibrium, there would be no life."

A fellow of the American Association for the Advancement of Science and the American Physical Society, Mullin currently receives funding from the U.S. Department of Energy, the National Science Foundation and NASA.

For one project, Mullin studies the unusual behavior of gas-phase molecules—including carbon monoxide and nitrous oxide—which act like tiny gyroscopes when she applies strong optical fields to them. The optical fields allow Mullin to add controlled amounts of energy to the molecules and get them spinning in high rotational states to observe how they respond.

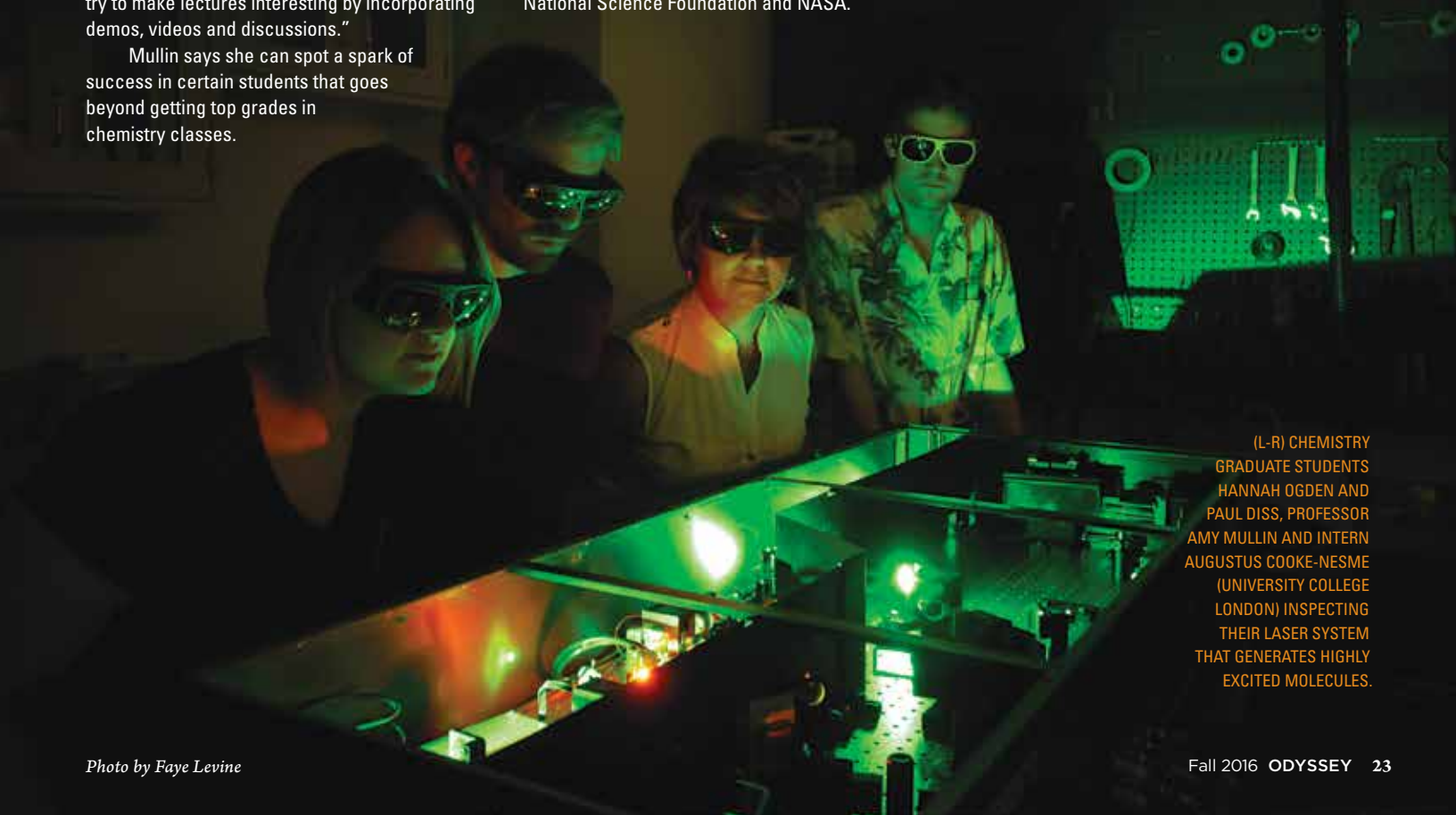
Mullin also investigates whether ultraviolet-induced bond-breaking of sulfur dioxide could explain the ratio of isotopes on the early Earth, which she hopes will help scientists identify the signals of exoplanets that are evolving, or have evolved, to be Earth-like.

In another project, which could lead to more efficient car engines, Mullin examines how collisions induce energy flow between molecules that contain large amounts of vibration.

She also studies how light can control a technique called nanolithography to pack memory features closer together and create devices with more digital memory.

Mullin has built a thriving research program at Maryland—thanks in part to her own energy and curiosity—and has been able to push the prejudice and resistance she experienced early in her career into her rearview mirror. ■

–RACHEL CROWELL



(L-R) CHEMISTRY GRADUATE STUDENTS HANNAH OGDEN AND PAUL DISS, PROFESSOR AMY MULLIN AND INTERN AUGUSTUS COOKE-NESME (UNIVERSITY COLLEGE LONDON) INSPECTING THEIR LASER SYSTEM THAT GENERATES HIGHLY EXCITED MOLECULES.

Photo by Faye Levine

PHILANTHROPY

UNPLANNED PATHS
LEAD BACK TO MARYLAND

They have never met in person, but Andrew Balo, B.S. '70, microbiology, and Nicholas Simon, B.S. '76, microbiology, have more in common than their University of Maryland degrees. After successfully helping biotech startups take new health care technology and treatments to market, both decided they wanted to give back to their alma mater in a big way.

About a year ago, after several phone conversations, Balo and Simon agreed to team up to make a joint $1 million gift to establish the college's first endowed life sciences chair. In September, their gift received a $1 million match through the Maryland E-Nnovation Initiative Fund. The program, launched last year, adds to private funds raised in support of endowed professorships and chairs in scientific and technical fields at Maryland's higher education institutions.

The newly created Andrew and Mary Balo and Nicholas and Susan Simon Endowed Chair will strengthen the college's ability to retain or recruit an outstanding life sciences faculty member with a focus on human health and/or disease.

"We both wanted to make contributions to the University of Maryland, primarily to recognize the impact the university had on our lives," explains Simon. "And we wanted the funds to go toward enhancing human health."

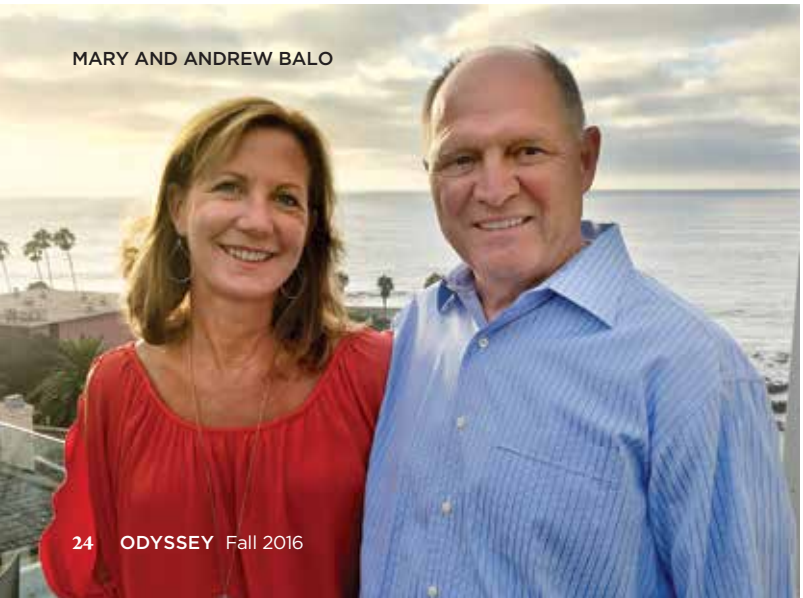
"The future of identifying and treating diseases is going to take place at the cellular level and through application of translational medicine, so I wanted to help Maryland bring in more expertise in this area," says Balo.

Balo and Simon both started their undergraduate years at Maryland with life plans that would change completely after taking a couple of introductory life science courses.

Balo came to College Park from Pittsburgh, with plans of becoming an engineer. Three years into his engineering major, he took some elective science courses.

"Right then, the light bulb went on in my mind," Balo says. "These courses changed my path and my life. I really wanted to get into health science and learn about different diseases. Courses in virology, immunology and biochemistry just heightened my interested in the health-related sciences."

Over the next 40 years, Balo applied the science he learned at Maryland to the business of health care, with established and startup companies. Today, he works at Dexcom, a startup that developed a continuous glucose monitoring device that can dramatically improve the daily lives of people with diabetes. As executive vice president of clinical, regulatory and quality, Balo oversees



MARY AND ANDREW BALO

(Left) Mary and Andrew Balo photo by Cheri Meadows

Highway photo by Steve Vidler, Alamy

Andrew Balo and Nicholas Simon's original plans to each give $500,000 to the College of Computer, Mathematical, and Natural Sciences took a different turn, just like their career paths.

NICHOLAS AND SUSAN SIMON

all of Dexcom's clinical trials, statistical analyses, worldwide regulatory affairs and quality operations, and is widely regarded as an industry expert in regulatory and clinical strategies. He has also participated on many Food and Drug Administration advisory panels.

Balo has also been instrumental in bringing other new medical devices to the market, including a neurological cooling device, mechanical and tissue-based heart valves, pacemakers, pacing leads and a 3-D electrophysiology mapping device. But he also admits that he failed twice at his first two startups.

"I'd encourage students to be persistent, to challenge current thinking and to think outside the box when it comes to their ideas and research," says Balo. "Look for new ways to apply what they're learning to solve real-life problems."

A native of Timonium, Maryland, Simon also ended up in a place he didn't imagine when he came to Maryland with plans to go to medical school.

"I hadn't heard of microbiology, but when I took the 'Introduction to Microbiology' course, I fell in love with it and it became my lifelong career," says Simon, who followed up his microbiology degree with an MBA from Loyola University when the field of biotechnology was emerging.

"I started with a biotech company in the D.C. area and then went out to the Bay Area where the biotech boom was beginning in the early '80s," recalls Simon. "All the companies that were raw startups had this great vision of applying newly discovered techniques to all kinds of things, from medicine to industrial chemicals to agriculture. Everybody was trying to figure out what niche their little company could pursue."

Simon has since acquired more than 30 years of operating and investment experience in the biopharmaceutical industry, including at Genentech, where he was vice president of business and corporate development. There, he played an integral role in the acquisition, development and approval of the company's blockbuster cancer products Rituxan, Avastin and Herceptin. Today, he is managing director of Clarus, a health care investment firm he co-founded in 2005.

"We invest in startup companies and even established companies to fund the advancement of science to produce drugs to treat significant unmet medical needs," Simon explains. "Probably the latest one that's proven to be transformative is a drug called Imbruvica that's been shown to dramatically extend the lives of leukemia and lymphoma patients."

Just like their careers, Balo and Simon's original plans to give to the college separately took a different turn. Balo had already donated the money for a professorship when he got a call from Jayanth Banavar, dean of the College of Computer, Mathematical, and Natural Sciences at UMD, who was with Simon in San Francisco. Simon said he was willing to match Balo's donation to give their gifts more clout and impact. All that was needed was a green light from Balo.

"The thought behind it was that we needed a bigger commitment if we really wanted to bring on a top-notch faculty member and really enhance the life sciences at the University of Maryland," says Simon. "We decided to come together and pool our resources to enable the dean to bring on a professor of even higher stature than he had envisioned."

Balo agreed, and the two families joined forces.

"We embraced the opportunity to give back to the university that enabled us to get to where we are today in our careers," Balo says. "We hope our gifts will enable future life science students at Maryland to have even more opportunities than we did and to become leaders in the health sciences." ■ *–ELLEN TERNES*

(Top right) Nicholas and Susan Simon photo courtesy of Nicholas Simon

Steve Rolston Named Chair of Physics

University of Maryland Physics Professor Steve Rolston became chair of the Department of Physics in July.

"I am excited and delighted to continue the department's upward trajectory and strengthen its commitment to excellent research and to excellent education," says Rolston.

Rolston, who joined UMD in 2003, is also co-director and a fellow of the Joint Quantum Institute (JQI), a research partnership between UMD, the National Institute of Standards and Technology (NIST), and the Laboratory for Physical Sciences. As JQI co-director since 2008, Rolston oversaw the institute's growth into a leader in the fields of quantum physics and information, and the addition of 10 new faculty members. Home to a National Science Foundation-funded Physics Frontier Center, JQI is internationally renowned in the areas of quantum information, atomic physics and condensed matter physics.

In his research, Rolston uses ultracold atoms created through laser cooling to study a variety of quantum phenomena. He develops simulators of disordered solid-state systems, works to understand how dissipation can be useful in quantum systems, creates strong quantum connections between atoms and photons, and generates the building blocks for a network of quantum devices.

Rolston earned his Ph.D. in nuclear physics from the State University of New York at Stony Brook and a bachelor's degree from Wesleyan University. After completing postdoctoral fellowships in atomic physics at the University of Washington and Harvard University, he spent 15 years as a staff scientist in the lab of Nobel Laureate Bill Phillips at NIST. He is a fellow of the American Association for the Advancement of Science, the American Physical Society and The Optical Society. In addition, Rolston received the university's Kirwan Undergraduate Education Award in 2014 in recognition of his outstanding achievement in engaging undergraduates in science education.

STEVE ROLSTON

Rolston succeeds Drew Baden who completed a 10-year term as physics chair.

New Home for Md. State Insect in College Park

Last year, a dedicated group of University of Maryland entomologists and arborists embarked on a mission to establish a new population of Baltimore checkerspot butterflies in College Park. Once fairly common, Maryland's state insect is now considered imperiled in the state and can be found only in small, isolated areas primarily in the state's western and central counties.

Experts worry the checkerspot may disappear from Maryland forever due to a decline of wetlands and marshes, home of a perennial flowering plant that Baltimore checkerspots feed on exclusively as young caterpillars—the white turtlehead. White-tailed deer also love eating this plant and compete with the checkerspot for this food source.

In May 2015, researchers in Entomology Assistant Professor Dennis vanEngelsdorp's laboratory; members of PollinaTerps, a group working to build a pollinator-friendly community on campus; and University of Maryland Arboretum staff members led a Launch UMD crowdfunding campaign that raised over $5,000 to help bring the state insect back to College Park.

With the funding, students built deer-proof enclosures and protected meadows on the UMD golf course and on campus near the Xfinity Center. They also prepared and planted plots of white turtlehead in the meadows, which they plan to more than double the size of in 2017.

The researchers will collaborate with the Smithsonian Institution and the Maryland Department of Natural Resources to rear and release Baltimore checkerspot caterpillars into the white turtlehead enclosures in the next few years.

(LEFT) A BALTIMORE CHECKERSPOT BUTTERFLY. (ABOVE) UNDERGRADUATE STUDENTS PLANTING WHITE TURTLEHEADS. (BACK ROW, L-R) LAURA TIFFANY (BIOLOGICAL SCIENCES), EMILY STAROBIN (ENVIRONMENTAL SCIENCE AND POLICY AND SPANISH), JUDY JOKLIK (B.A. '16, ANTHROPOLOGY), GRACE TIETZ (LETTERS AND SCIENCES), AUTUMN DORSEY (LANDSCAPE ARCHITECTURE). (FRONT CENTER) BRANDON MCINTYRE (SUSTAINABLE AGRICULTURE).

Checkerspot photo by Andy Reago & Chrissy McClarren (CC BY 2.0)
Group photo courtesy of Emily Starobin


REISSE PARK


BRENDAN IRIBE CENTER FOR COMPUTER SCIENCE AND INNOVATION


MICHAEL ANTONOV AUDITORIUM


VIRTUAL GROUNDBREAKING
USING OCULUS RIFT TECHNOLOGY

(L-R) UMD PRESIDENT WALLACE D. LOH, MARYLAND GOVERNOR LARRY HOGAN, BRENDAN IRIBE, MARYLAND SENATE PRESIDENT THOMAS V. MIKE MILLER JR., MICHAEL ANTONOV

UMD Breaks Ground on Iribe Center

The University of Maryland broke ground in April on the Brendan Iribe Center for Computer Science and Innovation, a new building designed for future-focused developments in computer vision, robotics, artificial intelligence, virtual and augmented reality, and new computing platforms.

"This remarkable building will transform inspiration into new knowledge and innovation," said UMD President Wallace D. Loh. "We have tremendous faculty and student talent in these fields—Brendan Iribe is a great example—and now they will have the ideal collaborative space to enable success."

Offering unprecedented opportunities for students and faculty to create bold new applications of computer science, the building is fueled by a $31 million gift from Oculus Co-founder and CEO Brendan Iribe; a $4 million gift from Oculus Co-founder and Chief Software Architect Michael Antonov, B.S. '03, computer science; and a $1 million gift from Quantumscape Co-founder and CEO Jagdeep Singh, B.S. '86, computer science, and his wife Roshni.


LOBBY/CAFÉ

"Students will be able to walk into the center and have access to everything they need to build the next great company or breakthrough technology," said Iribe. "I'm excited to see what future engineers, entrepreneurs and CEOs come out of UMD and these new facilities."

A striking presence at the university's front door, the Iribe Center's 215,000 square feet will facilitate previously unimaginable creation and discovery on campus. The center will include dynamic makerspaces, virtual and augmented reality labs to give students a high-tech environment to build immersive multimedia experiences, and a motion-capture lab giving dancers and athletes the ability to record and perfect movement.

Eight classrooms will feature interactive technology and enable collaborative group work, and the 300-seat Michael Antonov Auditorium will bring innovation out of the labs through conferences, hacking competitions and lectures.

To honor the memory of Oculus Co-founder Andrew Reisse, B.S. '01, computer science, the rooftop garden will be named Reisse Park. Plans for the park include a peaceful sanctuary with natural water features and native plant life. Reisse, a friend of Iribe and Antonov, was an avid photographer and hiker, as well as a talented computer graphics engineer.

The Brendan Iribe Center for Computer Science and Innovation is expected to open in 2018. For more information, visit **iribe.cs.umd.edu**.

Steve Rolston photo by Faye Levine
Groundbreaking photo by Mike Morgan / Illustrations by HDR

STUDENT PROFILE

Building Bridges

University of Maryland astronomy graduate student Ashlee Wilkins looked down at her phone. Staring back at her was a young man smiling in a lab at Harvard University. Only weeks before, Raphael Outlaw, who had just received his associate's degree from Baltimore City Community College, told Wilkins he was intimidated by an offer to conduct research at such a prestigious university. Looking at the picture, Wilkins felt a swell of pride. Not only had Outlaw accepted the offer, but the letters GRAD-MAP now peeked out from under his lab coat in the photo.

GRAD-MAP, which stands for Graduate Resources Advancing Diversity with Maryland Astronomy and Physics, is a program close to Wilkins' heart. A founding member of the UMD student organization, Wilkins says she and fellow graduate students noticed a lack of diversity within the fields of astronomy and physics and wanted to change that.

"We wanted to bring together faculty members and students at Maryland and local historically black colleges and universities to start thinking about climate and student experiences," says Wilkins. "We also wanted to learn more about admissions practices and examine whether the metrics being used measured an undergraduate's true ability to become a competent scientist."

Since its start in 2013, the GRAD-MAP program has helped dozens of students from groups traditionally underrepresented in the sciences who attend minority-serving institutions gain the research experience and skills required for graduate school.

The program mentors approximately 10 students a year through its winter workshop and reaches out to additional students with its seminar series and summer events. Through these opportunities, students visit university and federal laboratories, learn about UMD faculty member research projects and receive specialized training in skills such as programming languages.

Three years since the program's inception, Wilkins considers it a success. Twenty-seven students have completed the winter workshop, and four of them returned to College Park this summer to work in the Department of Astronomy as part of the first cohort of GRAD-MAP Summer Scholars.

GRAD-MAP SUMMER SCHOLARS AND MENTORS MEET WEEKLY FOR PROFESSIONAL DEVELOPMENT. (L-R) HUNTER COLLEGE ASTROPHYSICS MAJOR BETSY HERNANDEZ, UMD ELECTRICAL ENGINEERING MAJOR IAN STRINGER, MONTGOMERY COLLEGE PHYSICS STUDENT MADISON RAE SMITH, UMD ASTRONOMY GRADUATE STUDENT AND GRAD-MAP FOUNDING LEADER ASHLEE WILKINS, UMD PHYSICS GRADUATE STUDENT AND GRAD-MAP CO-LEADER PETER MEGSON.

"It's about supporting the development of a student's 'science identity' in multiple ways and spaces, which requires them to experience situations where they have to prove themselves as scientists and be positively affirmed of their abilities," says Wilkins.

In addition to her GRAD-MAP leadership, Wilkins has collaborated with Stuart Vogel, chair of the Department of Astronomy, to modify the department's BANG (Better Astronomy for a New Generation) career seminar to include speakers and discussions on diversity and equity, as well as career paths and professional development.

"A lot of people think the terms diversity and excellence are at odds with one another or that it means you're lowering the standards," says Wilkins. "However, that's not true—it actually makes for better science when you have a diverse group of scientists."

Wilkins isn't content to impact equity and inclusion at the departmental level only. Eager to explore these issues throughout UMD and apply lessons she has learned through GRAD-MAP, she was elected Graduate Student Government vice president of academic affairs and became a member of the University Senate's Equity, Diversity, and Inclusion Committee.

This past year, the senate committee proposed changes to the university's nondiscrimination and accessibility policies. Wilkins also helped write a new policy to support students who want to designate a pronoun or noun in their student record that is different than the gender identity recorded on their birth certificate.

"We addressed concerns of communities that are not often addressed," says Wilkins. "They don't have as loud of a voice, and we were able to learn from all sorts of different entities on campus."

Wilkins' efforts to improve equity and equality go beyond her work in her department, her university and her community. She hopes that her career will help to generate diversity within science, ultimately creating better science. ■ *–RACHAEL ROMANO*

Student photo by Faye Levine
Andromeda Galaxy background courtesy of NASA, ESA, J. Dalcanton, B.F. Williams, L.C. Johnson (University of Washington), the PHAT team and R. Gendler

Two faculty members were elected to the American Academy of Arts and Sciences.

- **CHRISTOPHER JARZYNSKI**, chemistry and biochemistry
- **MARY ANN RANKIN**, biology

Four faculty members received Faculty Early Career Development Program (CAREER) awards from the National Science Foundation.

- **JACOB BEDROSSIAN**, mathematics
- **MARIA CAMERON**, mathematics
- **EFRAIN RODRIGUEZ**, chemistry and biochemistry
- **JAY DEEP SAU**, physics

Sau also received a Sloan Research Fellowship.

Two faculty members were named 2016-2017 Jefferson Science Fellows by the U.S. Department of State and the U.S. Agency for International Development.

- **KAREN LIPS**, biology
- **SUMANT NIGAM**, atmospheric and oceanic science

Lips was also elected fellow of the Ecological Society of America.

Two researchers were included on Thomson Reuter's 2015 list of Highly Cited Researchers, a compilation of influential names in science.

- **SANKAR DAS SARMA**, physics
- **JEREMY SELENGUT**, Center for Bioinformatics and Computational Biology

Two assistant research scientists received exceptional scientific achievement medals from NASA.

- **FRANCESCO TOMBESI**, astronomy
- **HIROYA YAMAGUCHI**, astronomy

THOMAS ANTONSEN JR., physics, received the 2016 John R. Pierce Award for Excellence in Vacuum Electronics.

JOHN BENEDETTO, mathematics, was elected fellow of the Society for Industrial and Applied Mathematics.

CATHERINE CARR, biology, was elected chair of the Grass Foundation for 2018-2020.

S. JAMES GATES JR., physics, was selected to serve on the steering committee for the American Academy of Arts and Sciences' "The Public Face of Science."

DANIEL GERSHMAN, astronomy, won an early career public achievement medal from NASA.

EUGENIA KALNAY, atmospheric and oceanic science, was named to the National Oceanic and Atmospheric Administration's Scientific Advisory Board.

SAMIR KHULLER, computer science, received the inaugural Test of Time Award from the European Symposium on Algorithms.

WENDY LOUGHLIN, health professions advising office, received the Buck Hill '68 Award from the Northeast Association of Advisors for the Health Professions.

ATIF MEMON, computer science, received the Fraunhofer-Bessel Research Award from the Humboldt Foundation and the Fraunhofer Society for the Advancement of Applied Research.

CHRISTOPHER MONROE, physics, was elected to the National Academy of Sciences.

MARGARET PALMER, entomology, received the Sustainability Science Award from the Ecological Society of America.

DON PERLIS, computer science, received the Blue Sky Award for Innovative Work in Artificial Intelligence from the Association for the Advancement of Artificial Intelligence.

LESLIE PICK, entomology, was elected fellow of the Entomological Society of America.

ROALD SAGDEEV, physics, was named to the Breakthrough Starshot management and advisory committee.

ELLEN WILLIAMS, physics, was elected foreign member of the Royal Society.

JAMES YORKE, mathematics, made *The Washington Post*'s list of notable mathematicians with local ties.

CARROLL ALLEY, physics, died February 24. Alley retired in 2008 after 45 years on the UMD faculty. He was principal investigator for the lunar laser ranging retroreflector experiment that was placed on the moon in 1969 by NASA's Apollo 11 crew. He actively studied gravitation until his death.

A. KADIR AZIZ, Ph.D. '58, applied mathematics, died March 25. Aziz was a professor in the Department of Mathematics and Statistics at the University of Maryland, Baltimore County, from 1967-1989. In 1999, he established the Aziz Lecture Series at UMD.

LAWRENCE BRANDT, B.S. '50, zoology, died February 22. Brandt was a D.C.-based real estate developer.

KATHARINE GEBBIE, physics, died August 17. Gebbie became a visiting senior research scholar at UMD in 2013, following a 45-year career at the National Institute of Standards and Technology where she retired as director of its Physical Measurement Laboratory.

CAMILLE HILL, B.S. '78, chemistry, died May 20. Hill was an Orange County assistant district attorney in California.

DENNIS KIM, biological sciences major, died March 10.

FRANK SCOTTI, B.S. '60, chemistry, died July 20. Scotti worked as a research chemist for American Cyanamid and then started his own business developing environmentally safe painting and caulking supplies. He held several U.S. patents.

JOHN TOSSELL, chemistry and biochemistry, died April 25. He joined the UMD faculty in 1973 and retired in 2009 as professor emeritus. Tossell authored 250 scientific papers and in 2011 won the American Chemical Society's geochemistry division medal.

HORST ELMAR WINKELNKEMPER, mathematics, died on April 10. Having joined the UMD faculty in 1973, Winkelnkemper's most cited publication is a short proof, joint with Fields Medalist Bill Thurston.

Eleven alumni received National Science Foundation Graduate Research Fellowships.

- **ABIGAIL AHLERT**, B.S. '15, atmospheric and oceanic science, graduate institution: University of Colorado Boulder
- **BRENNA HODGES**, B.S. '15, chemistry, graduate institution: Yale
- **GEOFFREY JI**, B.S. '15, physics, mathematics and computer science with an additional major in economics, graduate institution: Harvard University. Ji also received a 2016 National Defense Science and Engineering Graduate Fellowship.
- **CHRISTINE MOOMAU**, B.S. '14, biological sciences, graduate institution: Massachusetts Institute of Technology
- **LAMONT NELSON**, B.S. '06, computer science, graduate institution: New York University
- **ALISON POST**, B.S. '14, biological sciences, graduate institution: Colorado State University
- **TALIA RINGER**, B.S. '12, mathematics and computer science, graduate institution: University of Washington
- **MARY SAME**, B.S. '14, mathematics and biological sciences, graduate institution: University of Southern California
- **APRIL SIMMONS**, B.S. '97, computer science, graduate institution: Georgia Tech
- **KEVIN STUBBS**, B.S. '15, mathematics and computer engineering, graduate institution: Duke University
- **JONATHON ZYTNICK**, B.S. '08, mathematics; B.A. '08, economics, graduate institution: Columbia University

Two alumni were named Sloan Research Fellows.

- **ABHINAV GUPTA**, M.S. '07, Ph.D. '09, computer science, is an assistant professor of computer science at Carnegie Mellon University.
- **MATTHEW HIRN**, Ph.D. '09, mathematics, is an assistant professor of mathematics at Michigan State University.

ELLIOTT ALPHER, B.S. '61, zoology, was initiated into the American Sleep and Breathing Academy's Hall of Fame. Alpher founded and directs the Alpher Center for Sleep Disorders & Jaw Pain, P.C. in Washington, D.C.

CHARLES BENNETT, B.S. '78, astronomy, was named a Bloomberg Distinguished Professor at Johns Hopkins University. Bennett will be the first distinguished professor to hold a joint appointment with the Applied Physics Laboratory, as a senior scientist.

ARIJIT BISWAS, M.S. '11, Ph.D. '14, computer science, was named one of India's top innovators under 35 by *Mint* and *MIT Technology Review.*

ALAN BRAUN, B.S. '01, computer science, was named chief technology officer and executive vice president of product at the software company ScrollMotion.

DEANA CAIRO, B.S. '95, biological science, joined Tucker Ellis as a partner in its Denver office and will work in the firm's antitrust and competition law group.

JOHN CALLAHAN, B.S. '85, M.S. '87, Ph.D. '93, computer science, was named chief technology officer of Hoyos Labs.

ROBERT DIXON, Ph.D. '77, physics, became interim provost and vice president of academic affairs at Cheyney University of Pennsylvania.

RAIMUNDO ESPINOZA, M.S. '08, sustainable development & conservation biology, was named an advisor to the National Oceanic and Atmospheric Administration's Marine Fisheries Advisory Committee. Espinoza is an environmental consultant in Puerto Rico, Cuba and the wider Caribbean.

FRANCIS FERDINAND, B.S. '84, zoology, became chief of cardiothoracic surgery at Albany Medical Center.

PATRICIA HENNING, M.S. '86, Ph.D. '90, astronomy, was named interim associate vice president for research at the University of New Mexico. Henning is a professor in the Department of Physics and Astronomy.

THOMAS J. HENRY, Ph.D. '95, entomology, received the Thomas Say Award from the Entomological Society of America. Henry is a research scientist with the U.S. Department of Agriculture.

CARMEN HUFFMAN, Ph.D. '05, chemistry, received a 2016 UNC Board of Governors Award for Excellence in Teaching. Huffman is an associate professor of chemistry at Western Carolina University.

MANHER JARIWALA, Ph.D. '04, physics, received the 2016 Metcalf Award for Excellence in Teaching from Boston University. Jariwala is a lecturer in the university's Department of Physics.

KENNY JOHNSON, B.S. '99, biological sciences, became associate head coach of men's basketball at the University of Louisville.

BENJAMIN LANGMEAD, M.S. '09, Ph.D. '12, computer science, received the Benjamin Franklin Award from Bioinformatics.org for his development of open source and cloud-based bioinformatics software. Langmead is an assistant professor of computer science at Johns Hopkins University.

TOBIN MARKS, B.S. '66, chemistry, received the Priestley Medal, the American Chemical Society's highest honor. Marks is the Charles E. and Emma H. Morrison Professor of Chemistry, Professor of Materials Science & Engineering, and the Vladimir N. Ipatieff Professor of Catalytic Chemistry at Northwestern University.

DIANNE MARTIN, M.S. '71, computer science, retired in August as vice provost for faculty affairs at George Washington University.

JEFFREY MECHANICK, B.S. '81, zoology, was named president of the American College of Endocrinology. Mechanick is director of metabolic support and clinical professor of medicine at the Mount Sinai Icahn School of Medicine in Manhattan.

STEVE MESCHER, B.S. '76, chemistry, was appointed adjunct professor in the Department of Oral Medicine at Nova Southeastern University's College of Dental Medicine in Florida.

MARTIN O'NEILL, B.S. '82, computer science, published a book titled "Next Generation Leaders: Getting Tomorrow's Leaders Ready Today." O'Neill is the founding principal at Corsum Consulting.

PATRICK O'SHEA, M.S. '82, Ph.D. '86, physics, was named president of University College Cork. O'Shea was vice president and chief research officer at UMD.

DHEERAJ PASHAM, M.S. '10, Ph.D. '14, astronomy, received a NASA Einstein Fellowship. His host institution is the Massachusetts Institute of Technology.

RICK PERLEY, Ph.D. '77, astronomy, received the George Van Biesbroeck Prize from the American Astronomical Society. Perley works at the National Radio Astronomy Observatory in New Mexico.

ROBERT ROSENTHAL, B.S. '78, chemistry, was elected chairman of the board of Safeguard Scientifics and was appointed to the board of directors for Bruker Corp. Rosenthal is CEO of Taconic Biosciences.

MICHAEL SCHATZ, M.S. '08, Ph.D. '10, computer science, was named a Bloomberg Distinguished Associate Professor of Computational Biology at Johns Hopkins University, with appointments in computer science and biology.

EMILY SELDOMRIDGE, M.S. '09, marine estuarine environmental sciences; Ph.D. '12, geology, was appointed watershed coordinator for the Delaware Center for the Inland Bays.

GERARDO SIMARI, M.S. '07, Ph.D. '10, computer science, was named to IEEE Intelligent Systems' Artificial Intelligence "10 to Watch" list for 2016.

JANET STANDEVEN, M.CLFS '13, chemical and life sciences, received the 2016 Georgia Bio Biotechnology Teacher of the Year award. Standeven teaches at Lambert High School in Georgia.

SHAWN WALKER, M.S. '07, applied mathematics & statistics, and scientific computation, received a Faculty Early Career Development (CAREER) award from the National Science Foundation. Walker is an assistant professor of mathematics at Louisiana State University.

MICHAEL WITTMANN, M.S. '96, Ph.D. '98, physics, was named to the Knowles Science Teaching Foundation Board of Trustees. Wittmann is a professor in the Department of Physics and Astronomy at the University of Maine.

MARY ZINK, B.S. '88, biological science, became the first full-time, on-site shelter veterinarian at the Humane Society of Harford County in Maryland.

STUDENT HIGHLIGHTS

Three undergraduates were named 2016 Goldwater Scholars.

- **KATHERINE CORDWELL**, mathematics and computer science major
- **YOUSUF KHAN**, biological sciences major
- **MARK MORETTO**, astronomy and aerospace engineering major

Three graduate students received NASA Earth and Space Science Fellowships.

- **J. DREW HOGG**, astronomy
- **DANA LOUIE**, astronomy
- **ZEEVE ROGOSZINSKI**, astronomy

Two undergraduates received U.S. Department of State Critical Language Scholarships.

- **AMANDA LEE**, biological sciences major, studied Korean in Gwangju, South Korea.
- **SYDNEY ROBINSON**, physics and French double major, traveled to Lucknow, India, to study Urdu.

Three undergraduates received Fulbright Scholarships.

- **AMIRA COLLISON**, biological sciences major
- **PRIYA KAREDDY**, biological sciences and government and politics major
- **SARAHANN YEH**, biological sciences major

Two graduate students and one undergraduate received National Science Foundation Graduate Research Fellowships.

- **ANDREA BAJCSY**, computer science major
- **KAYLA DAVIE**, applied mathematics
- **ALTERRA SANCHEZ**, marine estuarine environmental sciences

ELLIOT FRANK, mathematics and English language and literature double major, participated in the Fulbright Summer Institute for Young American Student Leaders at the University of Bristol in the United Kingdom.

Mathematics major **TIM MARTIN** was named to the Hogan Commission on Service and Volunteerism.

Biological sciences graduate student **CALANDRA STANLEY** received a Big Ten Academic Alliance/Smithsonian Institution Fellowship.

LEANNE YOUNG, biological sciences and computer science double major, received a full-tuition scholarship to medical school from the Cleveland Clinic Lerner College of Medicine, a partnership between the Cleveland Clinic and Case Western Reserve University.

IOWIS ZHU, biochemistry and biological sciences major, was named University Medalist during the spring 2016 commencement ceremony.

ALUMNI NOTES ARE WELCOME.

Please send them to Odyssey, CMNS Dean's Office, University of Maryland, 2300 Symons Hall, College Park, MD 20742.

Send information to abbyr@umd.edu.

COLLEGE OF
COMPUTER, MATHEMATICAL,
& NATURAL SCIENCES

University of Maryland
2300 Symons Hall
College Park, MD 20742

You're Invited!

COLLEGE OF COMPUTER, MATHEMATICAL, AND NATURAL SCIENCES FALL 2016 EVENTS

OCTOBER

Monday, Oct. 24
"Data, Predictions & Decisions in Support of People & Society"
Speaker: Eric Horvitz
Technical Fellow and Director at Microsoft
5 – 6 p.m.
Stamp Student Union, Grand Ballroom Lounge
go.umd.edu/horvitz

Tuesday, Oct. 25
Bioscience Day
Keynote Speaker: Carol Greider
2009 Nobel Laureate in Physiology or Medicine
8:30 a.m. – 5 p.m.
Stamp Student Union
bioscienceday.umd.edu

NOVEMBER

Tuesday, Nov. 1
Gravitational Waves Celebration
4:30 – 7:30 p.m.
Stamp Student Union
go.umd.edu/gravwavesevent

Sunday, Nov. 6
Technica All-women Hackathon Expo
Bring your family to the expo to see students' creations from the weekend-long event.
gotechnica.org

Monday, Nov. 7
Diversity in Computing Summit
8:30 a.m. – 5:30 p.m.
College Park Marriott Hotel & Conference Center
go.umd.edu/dicsummit2016

Thursday, Nov. 10
"Digital Disruptors"
CMNS Speaker: DJ Patil, U.S. Chief Data Scientist
TED-style event featuring UMD alumni sharing insights on how emerging technologies will impact our future.
6 – 9 p.m.
AFI Silver Theater and Cultural Center
big4.splashthat.com

DECEMBER

Tuesday, Dec. 20
Campuswide Commencement
10 a.m.
Xfinity Center
commencement.umd.edu

Wednesday, Dec. 21
CMNS Commencement
Speaker: Rita Colwell
Distinguished University Professor Emerita
University of Maryland Institute for Advanced Computer Studies
3:30 p.m.
Xfinity Center
go.umd.edu/cmnsgradinfo