INSIDE STANFORD MEDICINE

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Dance for Parkinson's Disease at Stanford is liberating, class participants say.

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Fordyce does big science with tiny beads

By Yasemin Saplakoglu

When faculty member Polly Fordyce was 6, she liked to take a journey across 40 orders of magnitude.

Her father, who worked for NASA at the time, would take her to the National Air and Space Museum in Washington, D.C., where together they would watch a 1977 short film called *Powers of Ten*.

The film begins with a couple having a picnic at a lakeside park in Chicago. An overhead view zooms out so that every 10 seconds, the scene appears another 10 times farther away from the starting point. The viewer is swept from the park to the country, to the blues and greens of Earth seen from space, and then out beyond the galaxy. Then the scene zooms back in and travels even deeper, into cells, inside a protein and finally to an atom — a range of 40 orders of magnitude.

Fordyce, PhD, an assistant professor of genetics and of bioengineering, describes her younger self as a dorky kid who preferred staying inside during recess solving math problems to facing the indignities of being picked last for sports. She liked to think about different length scales at an early age.

Now, she delves deep into the body to help researchers understand disease. She develops new technology to accelerate the process of studying proteins. In the past, researchers were unable to predict which molecules interacted with which proteins in the body, and so they had to test the possibilities one by one. Today, Fordyce's technology allows them to predict and narrow down the number of targets they need to test.

PAUL SAKUMA

To better study how proteins recognize their binding partners, Polly Fordyce's lab creates specially designed beads that are marked with different colors. The screen to right displays an image of the beads.

"We don't study specific diseases; we try to make tools that we can apply toward understanding many different diseases," said Fordyce, who is also a member of Stanford Bio-X and Stanford ChEM-H.

'Socially awkward'

Fordyce was born and raised in Washington, D.C. "I wish I could say that as a kid I showed some particular talent for anything beyond being socially awkward," she said. "But I didn't really distinguish myself in any way until I returned to college after taking some time off and discovered physics and biology."

She double-majored in physics and biology at the University of Colorado-Boulder. Shortly after, she came to Stanford to pursue graduate studies in physics in the laboratory of Steven Block, PhD, a professor of applied physics and of biology. While in Block's lab, she worked as part of a team that developed new microscopes for applying force to molecules and understanding how it affected their movements. "The idea of coming up with new ways to visualize interactions at tiny length scales invisible to us was something I quickly became very interested in," she said.

As a postdoctoral scholar in the lab of professor Joe DeRisi, PhD, at UC-San Francisco, she worked on developing microfluidic tools for genomics, which she describes as a way to "shrink down biology."

Fordyce joined Stanford's faculty in 2014 and now has her own lab, where she and her research team delve many orders of magnitude deep into the body, looking at 1,000 reactions at once, to study how proteins recognize their binding partners. Half of her lab focuses on microfluidic devices and the other half on beads made by those devices.

"There used to be a TV show in the '80s that was called *3-2-1 Contact*," Fordyce said. "And its theme song went something like" — she started to sing — "'contact is the answer is the reason for everything that happens.'" That's the same with proteins in the body — their interaction is key to understanding a lot of different processes, she said.

Microfluidic devices drive the research in Fordyce's lab. These small devices have channels embedded in them, each the size of a human hair. Their advantage, according to Fordyce, is that they allow researchers to do biological experiments using only a small amount of material.

Tiny, colored beads

In October 2016, Fordyce received a five-year New Innovator Award from the National Institutes of Health for her team's work on See FORDYCE, page 6

Not just for 'memory athletes': Mnemonic tool boosts recall ability of noncompetitors

By Bruce Goldman

A time-honored mnemonic method used by memory athletes — people adept at feats such as quickly memorizing the sequence of all the cards in a deck or a vast string of digits — can be taught to people with no prior hint of prodigious memorization skills, according to researchers at the School of Medicine.

NORBERT VON DER GROEBEN

Michael Greicius and his colleagues found that a memory training technique helped people improve their recall skills.

This mnemonic training induces patterns of activity within new trainees' brains that closely resemble those of memory athletes, said the Stanford scientists, who helped lead a multi-institution study of memory training.

Many of the memory athletes recruited for the study, which was published March 8 in *Neuron*, attribute their prowess to their use of the "method of loci" or related mnemonic systems.

The method of loci involves pairing each item to be memorized with a visual recollection of a specific landmark along a well-traveled route, such as a round-trip walk to a local store. It was used by ancient Greek and Roman orators and is the origin of language sequences such as "in the first place," "in the second place" and so forth.

Outside the competitive arena, though, the memory athletes say they are just like the rest of us.

"If you were to ask one of them if their skill spills over into other aspects of their lives, they would say no," said Stanford medical student William Shirer, one of the study's lead co-authors. "They lose their car keys as frequently as you and I do."

The brain's operations are largely carried out by networks of multiple See MEMORY, page 7

Study: Drug combination defeats dengue, Ebola virus infections in mice

By Bruce Goldman

A combination of two cancer drugs inhibited both dengue and Ebola virus infections in mice in a study led by School of Medicine researchers, despite the fact that these two viruses are vastly different from each other.

Shirit Einav

In laboratory-dish experiments, the drug combination, which has previously shown efficacy against the hepatitis C virus, also was effective against West Nile and Zika viruses, both of which are relatives of the hepatitis C virus, and multiple other unrelated viruses.

The multi-institution study, published online Feb. 27 in the *Journal of Clinical Investigation*, also pinpointed the specific molecular mechanism by which these drugs derail a variety of RNA viruses whose genetic material consists not of DNA but of its close relative, RNA.

"We've shown that a single See VIRUS, page 7

Patient mindset matters in healing and deserves more study, experts say

By Alex Shashkevich

A growing body of research has shown that people's mindsets can measurably affect physical healing.

Social context, including patients' relationships with their doctors, and patients' expectations about healing can drive these placebo responses.

Despite this research, the benefits of these psychological and social forces still receive much less attention than drug and device treatments.

L.A. CICERO

Alia Crum's research focuses on the importance of mindsets and social context in the healing process

In a report published online Feb. 15 in *The BMJ*, researchers at Stanford University call for more health care providers to place emphasis on the importance of individual mindsets and social context in healing.

Alia Crum, PhD, an assistant professor of psychology, is the lead author of the report. The senior author is Abraham Verghese, MD, professor of medicine.

Crum and her co-authors urge researchers to develop more studies that measure the physical effects of these psychosocial elements to understand and quantify patients' subjective experiences of expectations, connection and trust.

"We have long been mystified by the placebo effect," Crum said. "But the placebo effect isn't some mysterious response to a sugar pill. It is the robust and measurable effect of three components: the body's natural ability to heal, the patient mindset and the social context. When we start to see the placebo effect for what it really is, we can stop discounting it as medically superfluous and can work to deliberately harness its underlying components to improve health care."

Power of mindset

A health care provider's bedside manner is important, and what patients think and expect about treatments can influence health outcomes, Crum said.

But the health care and education systems in the United States generally do not emphasize psychosocial training. As a result, new doctors and health care workers take few courses on how to effectively form meaningful relationships with patients and how best to help them adopt useful mindsets.

Crum and her colleagues argue that the health care and education systems need to prioritize the role of psychological and social forces in healing.

For example, medical schools should develop more training that helps students and residents use their personal strengths to connect with patients and learn the best ways to harness social context and patient mindset.

"It should be about designing a formal curriculum for medical school that weaves all of this throughout the training," said Kari Leibowitz, a graduate student and co-author of the paper. "So it's not just mentioned in one or two classes or taught for one semester and then forgotten about."

The authors also call for a reform of standard randomized trials in the health care system. When examining the effects of a new drug, researchers should include, in addition to placebos, natural conditions, which don't use placebos, alongside conditions that include altered social context and mindset. This, Crum said, will help researchers understand how beliefs, labels and context can help magnify or reduce the effects of the drug and treatment.

These reforms, however, would require additional research that builds more scientific evidence for the importance of the effects of social context and mindsets, they said.

"Taking time and energy to develop provider-patient relationships is crucial, and we know that it makes a difference," Leibowitz said. "But you have to be able to justify why structural changes, like increasing the length of time spent with a patient to build trusting relationships and shape adaptive mindsets, actually saves all of us money."

Verghese, who is also director of the Stanford interdisciplinary center Presence, which champions the patient experience in medicine, has been teaching the value of connection and bedside manner for years.

"The wise and seasoned physician does much of this intuitively," said Verghese, who holds the Linda R. Meier and Joan F. Lane Provostial Professorship. "What is missing is the science behind it and the structure to help physicians understand these psychological and social forces so they can deliberately leverage them in health care."

The placebo effect

Over the past 30 years, neurobiological research has shown that the placebo effect, which stems in part from an individual's mindset or expectation to heal, triggers distinct brain areas associated with anxiety and pain that activate physiological effects that lead to healing outcomes.

Mindsets can also lead to negative, or "nocebo," effects. For example, patients have been shown to have a heightened pain response after being informed that an injection will hurt. Those who were told about possible negative side effects of a medication had an increased presence of those effects.

Crum has produced research suggesting that people's mindsets also influence the benefits they get from certain behaviors. For example, she co-authored a 2011 study showing that the physical effects of food depend on how caloric or indulgent it is in a person's mind. A study she co-authored two years later demonstrated that viewing stress as a helpful part of life, rather than as harmful, is associated with better health, emotional well-being and productivity at work.

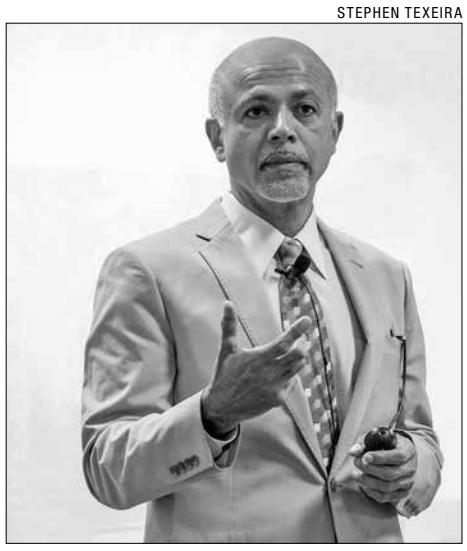
Crum said she intends to continue to contribute research on the components that make up placebo effects, such as people's mindsets. She said several studies are in progress, on which Crum's Mind and Body Lab has partnered with Presence.

But more work remains to be done, Crum said.

"We know that psychological and social forces are at work in health in healing, for better or for worse," Crum said. "But we need to develop more rigorous research to measure their physiological effects. It is time we start taking these forces more seriously in both the science and practice of medicine."

Stanford's departments of Medicine and of Psychology supported the work. **ISM**

STEPHEN TEXEIRA



Abraham Verghese is the report's senior author.

Stanford joins the University of California BRAID health-research alliance

By Kris Newby

Stanford University has joined five University of California campuses in a consortium dedicated to removing administrative barriers to sharing research resources, talent, productivity tools and bioinformatics expertise.

Leaders of the consortium say that by making it easier for research teams to leverage specialized resources and experts across member institutions, overhead costs can be reduced and health care projects can move forward at a more rapid pace, benefiting Californians and the nation at large.

This consortium, launched in 2010 by the University of California Biomedical Research Acceleration, Integration and Development program, called UC BRAID, began with five University of California campuses: Davis, Irvine, Los Angeles, San Diego and San Francisco. Since then, UC BRAID has developed several ways to streamline research processes, including UC ReX Data Explorer, a secure, online system that enables cross-institution access to clinical data from millions of de-identified patient records.

Stanford, the newest member of the consortium, will join new and ongoing efforts to develop tools that help researchers recruit study participants, improve interactions with health care industry partners and speed regulatory approvals.

Mark Cullen, MD, co-director of Spectrum (the Stanford Center for Clinical and Translational Research and Education) and director of the Stanford Center for Population Health Sciences, said he is excited about the research potential to improve care for millions of patients across the state.

"The rich diversity of California's population will enable us to develop more effective prevention programs and treatments that are precisely targeted to populations according to age, sex and race," Cullen said.

In addition, all UC BRAID members are working together to comply with the National Institutes of Health mandate that requires that all human-subject protection reviews for federally funded, multisite studies be coordinated through a single institution.

"All of our institutions want research participants to be safe, but all too often minor differences in campus policies hold up clinical trials for months. Working toward a common study review process upfront will mean faster, safer research for all," said Harry Greenberg, MD, co-director of Spectrum.

Each UC BRAID member is funded by a Clinical and Translational Science Award from the National Center for Advancing Translational Sciences at the NIH.

Leaders at UC BRAID recently weighed in on what the alliance means to their institutions.

"This type of partnership addresses the present and future needs to leverage resources and to bring knowledge and tools together to help solve the considerable challenges we face in improving the health of all Americans," Lars Berglund, MD, director of the CTSA at UC-Davis and outgoing chair of UC BRAID, said. "We strongly believe that together, the University of California and Stanford University can point to a partnership that is a powerful national model."

Steven Dubinett, MD, director of the CTSA at UCLA and incoming chair of UC BRAID, said, "Enhancing our capacity for creative team science across our campuses will afford new opportunities to translate the most important research discoveries to the benefit of all of our communities."

To read the UC BRAID announcement, go to https://www.ucbraid.org/braid-stanford-partnership. For more information on UC BRAID, visit https://www.ucbraid.org. **ISM**

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STANFORD MEDICINE

Mom saves 16-year-old son after he collapses on soccer field

By Samantha Dorman

LUCILE PACKARD CHILDREN'S HOSPITAL STANFORD

Jose Agredano Jr. takes a stress test at Lucile Packard Children's Hospital Stanford after suffering a commotio cordis during a soccer game.

Jose Agredano Jr. was released last month from Lucile Packard Children's Hospital Stanford following an unexpected and life-threatening incident. Doctors said he suffered what's known as a commotio cordis — cardiac arrest caused by a blunt impact to the chest.

Agredano, 16, a sophomore at San Benito High School, was in the middle of an intense soccer game at Watsonville High School when he was hit by the ball in the chest. "It didn't feel right," he recalled.

"After the ball hit my chest, I passed the ball, took two steps and lost my balance. My vision went, and I started spinning," he said. "I kneeled down and put my hands on the ground, and the next thing I remember, I was being put into an ambulance."

His parents were at the game. His mother, Gina Agredano, MD, said she was chatting with another parent when she heard her husband, Jose Agredano Sr., say, "There's something wrong with Jose." Both parents ran onto the field toward their son, who was on the ground and unresponsive.

Gina, a physician, immediately began assessing her son. She hadn't seen what had happened and assumed it was a head injury. She instructed her husband to hold their son's head, and they directed bystanders to call 911. Jose was still breathing, but he was unresponsive during the roughly 10 minutes that his mother continued to assess him. She was looking for eye response and breathing patterns. When his breath became labored, she knew her son needed oxygen. She sent her husband to meet the paramedics and asked the sports trainer to get the automated external defibrillator, a portable device that checks a person's heart rhythm and can send an electric shock to the heart to try to restore a normal rhythm. AEDs are used to treat sudden cardiac arrest.

Fight-or-flight response

"Right as first responders arrived and my husband left to get them over to us quickly, that's when Jose stopped breathing and his lips began turning blue," Gina said. "Up until that moment, I had this emotional connection to the situation as his mother. But at that moment, fight-or-flight kicked in, and I knew I had to begin CPR to save his life."

She recalls giving chest compressions for about three minutes. The trainer returned with the AED just as the first responders arrived on the scene. Gina quickly told them the situation and said their eyes widened and that they jumped into action, cutting off Jose's jersey and placing the AED pads on his chest.

The pad read an irregular heart rhythm, and the medics began to shock his heart.

"It was surreal," Gina said. "I've seen a lot of things in my career, and I saw a lot of trauma in my residency, but when it's your child, it's a whole different thing. I just kept telling myself, 'we're not going to die today.'"

After the shocks, Jose came back. He was groggy, but he knew his name, what day it was and where he was. The whole ordeal lasted about 20 minutes, but it felt "like a year," Gina said.

Jose was taken to the emergency room at Watsonville Community Hospital, where he was stabilized and examined by a Packard Children's pediatrician, Peter Rowinsky, MD, who arranged for Jose to be transferred to the cardiovascular intensive care unit at Packard Children's Hospital. Through a partnership between the two hospitals, Packard Children's physicians can serve as hospitalists at the Watsonville hospital. Rowinsky is also a clinical assistant professor of neonatal and developmental medicine at the School of Medicine.

"Many victims of commotio cordis do not survive," said Kathleen Ryan, MD, a cardiac intensivist who admitted Jose to the cardiovascular intensive care unit. Victims are predominantly men under the age of 20, which is when the chest wall finishes developing.

"Commotio cordis causes victims to go into ventricular fibrillation. CPR is not enough because the heart is quivering about 400 to 1,200 times a minute," said Ryan, a clinical assistant professor of pediatric cardiology at the medical school. "You need to deliver an electrical shock that defibrillates the quivering heart and shocks it into a normal rhythm again, and statistically this shock needs to happen quickly, within a few minutes. In Jose's case, the quick action his mother took by performing CPR and ordering the AED to be brought over made all the difference in the world."

All of Jose's follow-up tests were normal, and doctors do not anticipate there will be any long-term damage.

Knowing CPR

Lynda Knight, MSN, RN, director of the Stanford Children's Health REVIVE Initiative for Resuscitation Excellence, said this is a reminder of the power of resuscitation education.

"Evidence shows that if a bystander performs immediate CPR, the outcome will be better. Paramedics take, on average, four to eight minutes to arrive, and each minute that someone goes without chest compressions, his or her chance of survival goes down by 10 percent."

The REVIVE Initiative has trained thousands in the community in bystander CPR and provides its CPR training program to hospital parents upon discharge.

As for the Agredanos, the event was life-changing for all of them.

"I'll never take anything for granted again," said Jose Jr. "The last thing I saw before I lost consciousness was my parents' faces. I know how lucky I am."

LUCILE PACKARD CHILDREN'S HOSPITAL STANFORD

Jose Jr. with his father, Jose, and mother, Gina, at the hospital.

"We've been at hundreds of games and have seen hundreds of hits to the head and chest. Never did we think this was possible," said Jose Sr. "My wife was the hero. She was calm and efficient. I am so thankful she was there."

For the sports community, Gina said it's a reminder of how critical it is to immediately assess an injured player. "Every second matters, and knowing what to do can make the difference between life and death," she said.

"If this happens to someone next to me on the field, now I know what to do," said Jose Jr. "But I want all my friends to know, too."

"My being a doctor, my training, that wasn't what saved him," Gina said. "Knowing the signs that call for administering CPR, which is accessible to anyone, is what saved his life." **ISM**

Formerly conjoined twins bid farewell to Lucile Packard Children's Hospital

By Erin Digitale

Formerly conjoined twins Eva and Erika Sandoval are another step closer to going home.

The 2½-year-old sisters, who were surgically separated at Lucile Packard Children's Hospital Stanford on Dec. 6, moved March 9 from Palo Alto to UC-Davis Children's Hospital in Sacramento. There, they will receive a few weeks of inpatient rehabilitation before returning to their family's home in Antelope, California.

"Erika and Eva look really great," said pediatric surgeon Gary Hartman, MD, professor of surgery at the School of Medicine. Hartman led the 50-person team that separated the twins in a 17-hour operation. He has closely monitored their recovery.

"The girls have just blossomed in terms of personality," he said. "They're very engaging and chatty."

At a March 6 hospital farewell party, parents Art and Aida Sandoval were excited. "I'm over the moon," Aida said. "It's still surreal seeing them separate, knowing that it's still them as two individual bodies. Now we're just waiting for their next chapter to begin, and the anticipation is indescribable."

At UC-Davis Children's Hospital, caregivers for the twins will focus on helping their mother and home care nurses learn to take care of them safely at home, and will keep building skills the girls still need, such as eating by mouth. As infants, Erika and Eva required tube feeding. They still receive most of their nutrition via nasogastric tubes.

The physical and occupational therapists at UC-Davis will also work to improve the girls' mobility.

Erika and Eva will continue to receive regular checkups with Hartman and other caregivers at Packard Children's after they go home to Antelope. **ISM**

LUCILE PACKARD CHILDREN'S HOSPITAL STANFORD

Eva and Erika Sandoval were given a farewell party March 6 at the children's hospital.

Dance class for Parkinson's patients nourishes body, mind

By Ruthann Richter

Sherry Brown walked gingerly into the dance class, her right elbow anchored at her side, her hand cupped in a ball. Her balance was uneven, so she took care in finding a seat among the circle of chairs in the light-filled room at the Stanford Neuroscience Health Center. As the slow, rhythmic keyboard music began, her arms, stiffened by Parkinson's disease, opened in a wide, upward arc as if embracing the sky.

"You get a sense of your body and are pushing your body to do things you don't think you can accomplish," said Brown, who was diagnosed in 2008 with the neurodegenerative disease. "There is something about the music and movement together that seems to help at a different level. … I come out of the class feeling energized and relaxed, all at the same time, and ready to move."

Brown is among some 20 students who have found a welcoming community at the Dance for Parkinson's Disease class, also known as Dance for PD. The class is not only physically therapeutic but often gives students a psychological boost. People struggling with movement and speech because of the disease say the sessions are liberating, providing a new way to express themselves.

The program, begun 15 years ago in Brooklyn, New York, and now offered in 16 countries, was introduced at Stanford last year with the opening of the new neuroscience center. It is not a traditional dance class in any sense, but rather a group artistic experience. Teachers use elements of classic and social dancing, together with imagery, poetry and live music, to inspire participants to move in creative ways. The results translate into daily life, studies show, as participants demonstrate an improvement in walking and fine-motor skills, such as tapping a finger, and feel an uplift in mood and a better sense of self that comes from gaining more physical control.

"Dancing has all the elements Parkinson's patients can benefit from: extension and flexibility and moving with intention," said Damara Ganley, a professional dancer and trained Dance for PD instructor. "Dancers are trained to be in their bodies in a conscious way, and Parkinson's patients also are learning to be in their bodies in a conscious way."

Brown, 74, gray-haired and slender, is a marriage and family therapist who maintains an active social life despite her physical challenges. She said the disease crept up on her, gradually narrowing her world. Her movements became slower, more labored, and she no longer easily stood straight. She began to feel some weakness in her right hand, which would tire after writing a few words. She would easily lose her balance and began to have debilitating falls, including one in which she broke her hip and another in which she struck her head on a rock while sweeping the walk outside her home. When she was diagnosed with Parkinson's, she said she fell into despair.

"I definitely went through a grieving period. I felt like my life was over," she said over a cup of tea at her dining room table. She now has a part-time personal assistant who helps around the house, though she is able to prepare the tea herself.

Parkinson's, which affects as many as 10 million people worldwide, can cause rigid limbs, tremors, lack of muscle control and slowed movement. Patients may have impaired walking and balance and are more prone to falls. Some also suffer from depression and may experience a cognitive decline, with slowed thinking or memory problems.

> **"I come out of the class feeling energized and relaxed, all at the same time."**

Brown said daily tasks became a challenge, as she could no longer stab a piece of lettuce with a fork, handle a pair of scissors or easily get up out of a chair. She stopped accepting new referrals to her therapy practice. She no longer drove on the freeway and began to miss out on important social occasions because of disease-related fatigue.

"I spent about a year really being aware of all the losses," she said.

Gradually, however, her life began to open up again as she came to a place of acceptance and began to improve physically with the help of new medication, physical therapy, fitness training, daily walks — and dance.

On the move

During a session last fall, Ganley, a petite woman with short-cropped hair, opens with some gentle stretching exercises in the chair, as the keyboardist plays his own rhythmic composition, which has an ethereal quality. Participants, seated in a circle, cross their feet back and forth, then move one foot to the right while gesturing to the left. The sequence is repeated on the opposite side, requiring focused concentration.

"That tickled my brain," Ganley said with a smile. Then she begins a sequence of movements to the lyrics "autumn leaves are falling, falling" as the dance students join in, rolling their hands in space like leaves being tossed in the wind, then gently falling down.

The class has many interactive moments, including one in which the instructor prods the students to "say something with the body" to a neighbor in the circle, who responds in kind. The exercise is repeated with a different partner, and the results then are displayed for the entire class. "Beautiful," Ganley said, as heads nod.

On this day, the 75-minute session included other improvisational exercises, as well as a traditional Israeli circle dance with a rather challenging series of steps. It closes with dancers individually calling out their names, then using a gesture to express what they are grateful for. Some blow kisses; others use a sweeping move of the arm to encompass everyone in the room. "Each of us is a living poem to be savored and acknowledged," Ganley said.

Brown, neatly dressed in black pants and a tailored shirt, said the class has a mindful, meditative quality. "It's totally creative and totally accepting of whatever your abilities are," she said.

With her new medication regimen and her physical activities, she is able to do many things that weren't possible before. For instance, in one class, she found she could again stand on her toes and keep her balance.

Introduced last year at Stanford, the Dance for Parkinson's Disease class is not only physically therapeutic but, participants say, often gives them a psychological boost. Sherry Brown (below right and right, facing away), who was diagnosed with Parkinson's in 2008, said the class has a mindful, meditative quality. (Below) Damara Ganley, a dance teacher and professional dancer, leads a class.

PHOTOS BY TIMOTHY ARCHIBALD

The Dance for PD at Stanford is free and open to all members of the community.

And during a flamenco dance routine, she found herself snapping her once-rigid fingers. "It just came to me," she said. The dance class "challenges you in ways you would not have thought possible."

She said the class also has helped improve the fluidity of her movements. "I think the rhythm helps keep things more even," she said. "I feel my gait is more even. In general, my body feels more in tune — more rhythmic. It's subtle.

"I think it has helped me a lot to appreciate what I can do — big and little things both," she added. "I feel that with all things I am doing — the exercise, the dance, the medications — I am definitely delaying the severe symptoms of the disease. I am pleased that I am able to have the life that I have at this point."

The program was started in 2001 by Olie Westheimer, executive director of the Brooklyn Parkinson Group, who walked into the Brooklyn studio of the Mark Morris Dance Group one day with the idea of creating a dance class for members of her group, said David Leventhal, a former Mark Morris company member who is now Dance for PD's program director. Westheimer felt patients were spending a lot of time dwelling on the disease and shuttling to doctors' and therapists' offices, and she wanted them to do something positive and beneficial together. Leventhal became one of the first instructors.

"I thought it was the most enjoyable teaching experience I had ever had because people were so focused on learning and trying to absorb as much as we had to offer," Leventhal said. "They were so engaged as students right away because for them it was not just an activity they added to their week but an essential portal for them to experience what possibilities were still available to them. It became a way of accessing their true selves — who they were as people, rather than as patients."

Helen Bronte-Stewart, MD, a professor of neurology and neurological sciences at Stanford and a former professional dancer, said she has always tried to incorporate exercise, yoga and dance as part of the standard therapy for her Parkinson's patients.

"If you improve your core strength, then the negative effects — like difficulty of getting out of chairs, getting out of a car — will be better," said Bronte-Stewart, who refers to the process of exercise and balance training as "training the machine."

"You have to keep training that motor system — training the brain — as a way of continuing movement in a disease that otherwise limits movement, counteracting the stiffness and slowness that the brain wants to impart on the musculoskeletal system," she said.

"As physicians, we stress the importance of physical activity, social interaction and mental stimulation to our patients with Parkinson's disease," she added. "Dance for PD gives them all three. But it is much more than a possible therapy or treatment; the PD dancers have told us this type of dance restores their self-image and brings them joy."

When the neuroscience building was in the planning stages, Bronte-Stewart said she was determined to include a dance studio and helped design the space with a flexible floor and glass walls on two sides. She and Ganley obtained a grant from the National Parkinson Foundation for the class, which is free and is open to all in the community.

"The worlds of dance and medicine have been far apart for a long time. That is why this is so exciting," Bronte-Stewart said. "If you have a chronic debilitating disease, you begin to get an image of yourself as someone who can't move. But you can go to this class and do something beautiful and graceful and be part of a community that accepts you. That is what we should capture, as much as whether your motor function is better."

Backed by research

Leventhal said the program initially met with some skepticism in the medical community. "There was one neurologist who told us, 'I think the program is great. But I can never recommend it because dancing is a frivolous activity and that would tarnish my reputation as a serious doctor,'" he said. "There is a lot of misconception about the amount of learning and skill and brain work and physical work that somebody has to do to execute a dance. It's the opposite of frivolous. It directly addresses what people are struggling with. Over 15 years, people have come to recognize that."

In fact, published studies have shown that Parkinson's patients who do some form of dance experience measurable physical and psychological improvements. More than a dozen studies have shown that twice-weekly dance classes improve balance, motor skills, freedom of movement and endurance. One study, published in 2011 in Frontiers in Aging Neuroscience, found that even after a single class, patients were able to move their limbs more easily, tap their fingers and change their facial expressions. (Loss of facial muscle control can lead to muted expression.) The study participants also described many improvements in the quality of their lives, with one saying, "I want to fly. It gives me a swinging feeling. I feel relaxed after the dance lesson. Before, I'm always very stiff."

> "Parkinson's patients also are learning to be in their bodies in a conscious way."

Research suggests dance has benefits beyond basic exercise for these patients because it is a rich experience involving multiple senses, creative expression and social interaction. Moreover, unlike exercise classes, participants are motivated to attend, rarely missing a class and often clamoring for more, studies show.

"People tell us, 'I always look forward to coming to class because it's so uplifting,'" Bronte-Stewart said.

She said dance is a form of mental as well as physical training. "When you think of it as a neurologist, they are planning, using their executive function and they are sequencing. These are all frontal-lobe functions that can be impaired in Parkinson's."

Bronte-Stewart said animal studies suggest there may be a biological basis for improved neurologic function among dance participants. For instance, research shows that if animals are able to do a physical activity they enjoy, they experience less inflammation, which may help counter the disease, and are able to regenerate adult stem cells, which can help build muscle and other tissues.

"It's not too much of a stretch to suggest that dance possibly may improve the brain's regeneration of its own stem cells," she said.

Dance classes may also counter some of the cognitive and mood issues that affect patients, who may withdraw and suffer social isolation and poor self-esteem. The classes provide a social setting where everyone is accepted, regardless of their limitations, and studies show participants feel their mood lighten and their anxiety decline. In a 2015 study published in the *Journal of Neural Transmission* by Westheimer and colleagues from four universities, participants reported feeling less helpless, grateful for the companionship and a general sense of improved health.

Albert Cohen, one of the Stanford dance students, said he appreciates the sense of camaraderie and caring among the students. "The attitude there is positive and receptive, which is worth a lot," said Cohen, 87. "I'm not sitting in a room doing nothing. So it's very beneficial."

A musicologist and former chair of Stanford's Department of Music, Cohen suffered a major fall in the summer that fractured his hip and pelvis. When he and his wife, Betty, returned after a two-month hiatus, class members embraced them with hugs and good wishes. Betty Cohen said the gathering is the highlight of her week.

"You're getting out. You're with other people. You are exposed to music, which helps the brain. There is rhythm and movement. I think all of this is helpful," she said. "It really is more than the dance and the music. It's greater than the sum of its parts. Something emanates from the heart and soul. It helps me emotionally accept everything that I'm finding hard to accept."

Caregivers are encouraged to attend the classes to support their partners and to share a positive experience. "I think the class allows care partners to see their loved ones and companions in a different light and enjoy an hour together when they are not dealing with the struggle of daily life but see each other as dance partners and as co-learners. That's very important," Leventhal said. Stanford medical students and undergraduates also participate in the class through specially designed coursework.

Juan Bulnes, a 74-year-old computer scientist who was diagnosed with Parkinson's in 2008, regularly attends class with his wife, Margaret. He often does the movements in his chair, as he is shaky on his feet and afraid he will fall, he said.

"There is joy in the dancing class," Bulnes said. "We do some of the same movements as in other classes, like tai chi or physical therapy, and here we do them with an added, special flair that comes from conscious dance movements, such as gracefully waving your hands to imitate falling leaves, rain, wind or reaching for the stars. Integrating physical exercise, rhythm, music and imagination makes dancing a very liberating experience."

Making it more accessible

Leventhal, who gave up performing five years ago to devote all of his time to the project, has been making the program more widely available and providing opportunities for practice between classes. The flagship Dance for PD program in New York has developed three DVDs, which have been distributed to 4,000 people worldwide, and last year began live streaming classes from Brooklyn and Toronto.

Mark Morris Dance Group, together with the New York creative agency SS+K, has also created Moving Through Glass, custom software for use on the Google Glass platform to help Parkinson's patients navigate the world outside the dance studio. The application enables users wearing the device — a head-mounted display that resembles a pair of glasses without frames — to play modules in which Mark Morris dancers give prompts, taking them through home exercises to help with specific problems, like regaining balance or unfreezing the limbs. The app is being evaluated at three locations around the country, including Stanford, where Bronte-Stewart has recruited dance class participants to try it out.

Dance for PD, meanwhile, is becoming a widely accepted form of Parkinson's therapy. Stanford recently added a second class that meets on Monday afternoons.

Sherry Brown attends both the Monday and Friday sessions; she is determined to do what she can to forestall any further physical decline. "I do have fears about the future, and there's nothing I can do about that. I like to stay in the present as much as I can," she said.

The dance class helps her to set aside her fears, at least for the moment. "It has helped me adjust to the future. It becomes a little less scary about the unknown, seeing other people go through it," she said. "It focuses you on the present, and the rest of your worries fade into the distance. You are focused on the here and now."

ISM

A version of this article first appeared in the winter 2017 issue of Stanford Medicine *magazine.*

Fordyce

continued from page 1

a unique project. Using microfluidic devices, her lab develops tiny, specially designed beads made of polyethylene glycol diacrylate, a polymer, with luminescent nanoparticles inside them. The beads are 40 to 50 microns in diameter — smaller than the thickness of a sheet of paper. The researchers mark the beads with different colors — over 1,000 in total — and glue diverse peptides, the building blocks of proteins, onto their surfaces. Then they mix them in a test tube with a protein they want to learn about.

The point is to observe which peptides the protein of interest binds to the strongest and which ones it just isn't attracted to — information that is necessary to develop therapeutics for a variety of diseases, according to Fordyce.

"The only way we can test 1,000 peptides is if we encode the beads in some way to tell which peptide is on which bead," Fordyce said. "The colors are the codes."

There's just one problem: The protein is microscopic, so once it binds, it's impossible to tell which peptides it has bound to.

So, the team throws in labeled antibodies — fluorescent proteins that bind specifically to the protein of interest. "The labeled antibody is like a reporter that allows us to understand what is happening on the microscale," Fordyce said. First, they image the mixture with ultraviolet light to excite the luminescent nanoparticles and figure out which peptide sequences each bead has. Next, they shine visible light onto the mixture to observe how much antibody is bound to the beads. The combination of these two imaging techniques allow them to deduce which peptides the protein binds to and at what intensity.

What they end up with is a bunch of pictures that show which colored bead is bound to the protein of interest.

"In the same time it takes somebody to measure one thing, now we measure 1,000 things, and that drives science forward 1,000 times faster," Fordyce said. "If we were to do these experiments with traditional biochemistry techniques, it would take years and armies of postdocs."

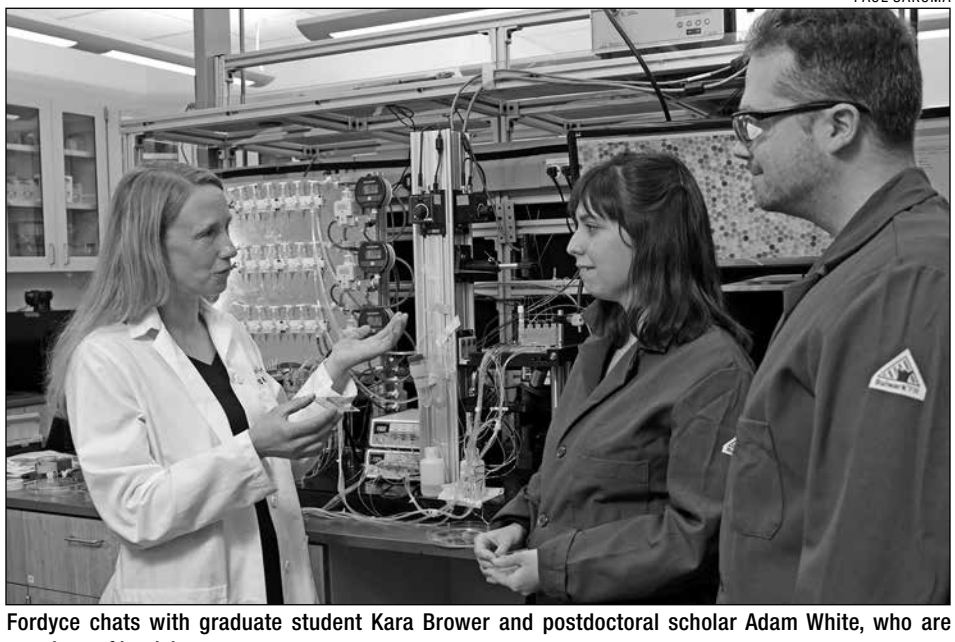
Custom microscopes

"It's really hard to make 1,000 different colors and then be able to tell 1,000 different colors apart," Fordyce said. To do that, her team built custom microscopes, microfluidic devices and software to run all the instruments.

Fordyce and her team made much of their lab equipment from scratch. They took apart certain parts of commercial microscopes and 3-D-printed other parts to create a custom microscope capable of imaging the colored beads with deep UV light.

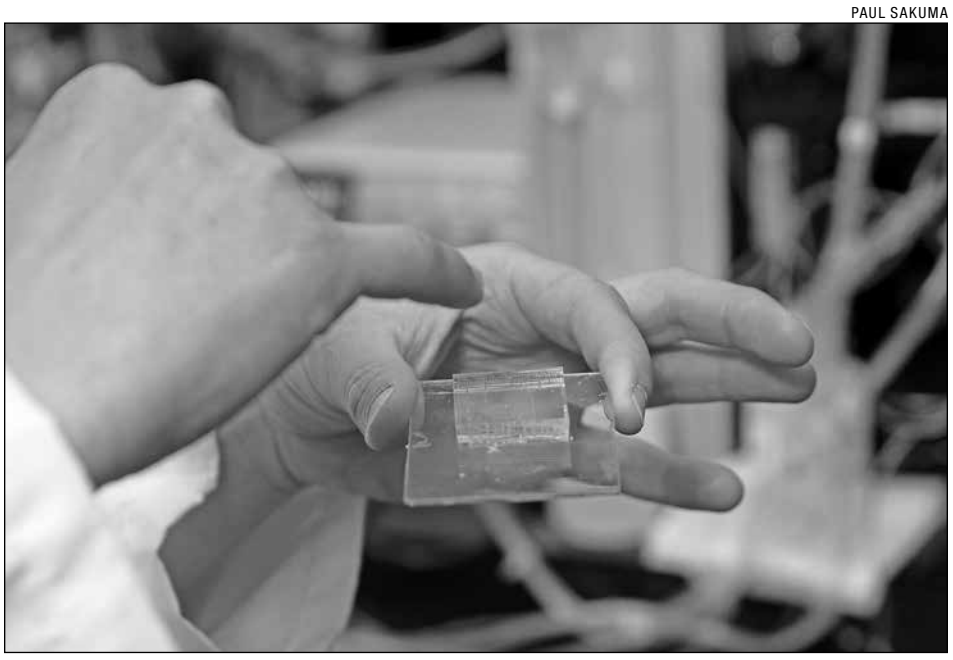
As a first application of this technology, Fordyce is collaborating with Martha Cyert, PhD, a professor of biology at Stanford whose lab focuses on understanding calcineurin, a protein known to activate the immune system.

PAUL SAKUMA



Fordyce chats with graduate student Kara Brower and postdoctoral scholar Adam White, who are members of her lab.

PAUL SAKUMA



Fordyce holds a microfluidic device that is used for developing the tiny beads, which are 40 to 50 microns in diameter — smaller than the thickness of a sheet of paper.

"Polly goes beyond being energetic," Cyert said. "She is a force of nature."

Common post-transplant drug therapies target calcineurin to dampen the immune response. However, the protein has many roles throughout the body, so patients receiving these drugs also experience many unwanted consequences. Now, Cyert is working with Fordyce's lab on a project aimed to identify all the proteins calcineurin binds to — not just those in the immune system — by tagging every colored bead with a different human peptide.

"The new peptide-bead technology that Polly developed will revolutionize how we study protein-based information networks within cells," Cyert said.

Investigating protease interactions

About two months ago, Fordyce also began collaborating with Matthew Bogyo, PhD, a Stanford professor of pathology. Proteases are enzymes that function by cleaving other proteins and are prominent players in many human diseases, most notably cancer; in cancerous tissue, there is an increase in protease levels. Bogyo's lab is developing fluorescent probes that light up when interacting with proteases so that when a patient is imaged, it is possible to see where diseased tissues, like cancer, are located. The lab is using Fordyce's bead technology to help rapidly screen large pools of peptides to find those that produce a fluorescent signal when cleaved by proteases.

"Polly's technology has huge potential for us to search for new protease substrates at 'powers of 10' greater diversity than we would be able to do if we had to test each substrate individually," Bogyo said. "It could be a game changer for our work."

The other half of her lab also uses microfluidic devices, but without the portability of the beads. These devices each have 1,000 different chambers that can run 1,000 different reactions at once. Although the point is again to accelerate the speed of experimentation, these devices can also reveal information about reactions that the beads would miss. Whereas experiments with the beads look at single mechanical interactions between proteins, these devices can look at entire chemical reactions without missing weak ones or products that diffuse away.

Fordyce was also recently named an investigator at the Chan Zuckerberg Biohub, a nonprofit medical research organization aimed at developing the tools to cure, prevent or manage all disease. As an investigator, she will receive up to $1.5 million over five years to support her work.

When she's not in the lab, Fordyce likes to get outside. She loves to rock climb and explore the outdoors with her husband and their 4-year-old twin daughters.

When she's in the lab, she gets sucked into the wonder of different scales. "We use tools on the micron scale to understand molecular interactions on the nanometer scale which actually explain behavior on the organismal scale," Fordyce said. "It's pretty amazing." **ISM**

Lloyd Minor appointed to second term as dean of the School of Medicine

Lloyd Minor, MD, has been appointed to a second five-year term as dean of the School of Medicine. He began serving as dean on Dec. 1, 2012.

"As I look back on my first term, I am filled with gratitude for the role that each of you has played in the many successes we have achieved and the challenges we have overcome," Minor said in a statement. "Thank you for your support, your advice and the work you do every day to push our mission forward. I couldn't ask for better colleagues and collaborators."

Lloyd Minor

During the past four years, Minor worked with faculty, students, staff and hospital leaders to establish a strategic vision for precision health, the goal of which is to anticipate and prevent disease in the healthy and precisely diagnose and treat disease in the ill. He appointed a multidisciplinary committee that has identified priorities and initiatives to ensure that precision health is a part of everything from equipping medical students with skills in bioinformatics and determinants of wellness, to developing cutting-edge diagnostics, to delivering personalized strategies aimed at keeping patients well. All of these endeavors will be tied together through a hub of data science that informs medical research, practice and teaching.

The dean has also worked with the leaders of the two hospitals to ensure that priorities are aligned across Stanford Medicine, laying the foundation for creating an integrated strategic plan. In addition, he led the development and implementation of an innovative model for cancer research and patient care delivery, and has collaborated with faculty and hospital leaders in developing strategies to enhance the quality of care delivered in Stanford Medicine's expanding clinical networks.

Increasing diversity, raising funds

A few of Minor's other accomplishments include:

• Increasing diversity among students by expanding programming, outreach and scholarships. Underrepresented minorities accounted for 28 percent of the incoming graduate students and 25 percent of the incoming medical students in 2016, compared with 10 and 14 percent, respectively for 2012. He has also worked with school leaders to increase accountability and transparency in their efforts to enhance diversity among the faculty ranks, and has taken a variety of steps to create an atmosphere at the school that is inclusive and welcoming.

• Improving support for graduate and medical students, including an innovative program that provides support to graduate students so that they no longer have to rely on funding through faculty grants from the National Institutes of Health.

• Working to enhance fundamental and translational research support. For instance, by leveraging $4 million distributed thus far as seed grants through the school's Discovery Innovation Fund, researchers have received an additional $20 million in grants. NIH funding to the school has increased from $295 million in fiscal 2013 to $382 million in the current fiscal year.

• Building philanthropic pipelines as part of the Campaign for Stanford Medicine, which ended in August 2016 after raising $1.7 billion for a variety of initiatives including support for biomedical innovation and the building of the new Stanford Hospital, and through the Lucile Packard Foundation for Children's Health for pediatric and obstetric programs. Among the major philanthropic gifts were $24 million to establish the Sean N. Parker Center for Allergy Research and $50 million from the Bill & Melinda Gates Foundation for the Stanford Human Systems Immunology Center.

"As I look to the next five years, I am excited and grateful for the opportunity to continue our work together. The future holds so much promise and, with our precision health vision and our culture of collaboration, we are poised to lead," Minor said. **ISM**

Memory

continued from page 1

discrete brain regions. These regions, anatomically connected to one another via white-matter tracts or through intermediary nodes, share "functional connectivity," meaning their activity is tightly coupled. Around two dozen separate networks mediating memory, language, vision, executive planning and other functions have been identified with the use of functional magnetic resonance imaging.

"Training normal humans to be memory athletes bulks up the brain's memory networks," said the study's senior author, Michael Greicius, MD, MPH, associate professor of neurology and neurological sciences at Stanford.

The other lead authors of the study are assistant professor of neuroscience Martin Dresler, PhD; postdoctoral scholar Boris Konrad, PhD; and graduate student Nils Muller, all at the Donders Institute for Brain, Cognition and Behavior in the Netherlands.

Memory competitions

In 2013, Dresler, who was then a visiting scholar at Stanford, alerted Greicius, an imaging expert, to data Dresler and Konrad had acquired on 23 of the 50 top-scoring memory athletes in an annual contest called the World Memory Championships. (Konrad is a memory athlete.) In these tournaments, contestants compete in timed events in which they must memorize torrents of unrelated words, blizzards of fictional historic dates, lengthy digital series, sequences of playing cards and so forth.

"Why do people engage in such things? Probably, as in any other sport, because they can, and they have fun," said Dresler. "I admit, that's hard to believe when you see them staring at their digit columns or piles of card decks from morning to evening."

In one experiment, 17 memory athletes who took a word-memorization test could correctly recall, on average, nearly 71 of 72 words 20 minutes after a timed memorization session. In contrast, a group of control participants, devoid of special memorization skills and without any prior training, averaged about 40 correctly recalled words.

Prior to their memorization tasks, all participants received eight-minute fMRI scans under instructions to simply relax and let their minds wander, so that the scientists could monitor goings-on in a brain network that's most active when a person's brain is at rest. This collection of closely cooperating brain structures, called the resting-state network, has been found to be involved in memory.

> "Training normal humans to be memory athletes bulks up the brain's memory networks."

In a subsequent analysis of these fMRI scans, the Stanford scientists zeroed in on 71 brain regions previously implicated in memory or in visuospatial processing, a brain function one might expect to be activated during use of the method of loci. They calculated, for each participant, the extent to which activity in any two of these 71 regions — nearly 5,000 pairwise measurements per fMRI scan for each participant — was correlated.

After the initial round of memorization tests, Dresler and Konrad gave fMRI scans and memorization tests to 51 untrained non-athletes, then divided them into three groups. The first group underwent a six-week course of daily online-training sessions in the method of loci. The second group received six weeks of training to improve a different facet of memory called working memory: the ability to juggle several pieces of data in your head at the same time for a short period. The third group got no training at all.

Putting the training to the test

Afterward, the three groups underwent resting-state fMRI scans and then took the 72-word memorization test. Recall was checked at 20 minutes and 24 hours afterward. Four months later they came back for another test session, with a different set of 72 words.

The memorization skills of control participants trained in the method of loci improved dramatically. They could recall almost as many words as the memory athletes could, and they achieved similar results four months after completing training. Not only that, but their resting-state functional connectivity patterns now more closely resembled those of the memory athletes than they had been prior to training.

No such memory gains and brain-connectivity changes were seen among participants who received working-memory training or no training at all.

"The degree to which someone's resting-network organization changed to resemble that of the memory athletes' predicted how much that person's memory performance would improve," Shirer said.

"The strength of functional connectivity within this distributed memory network was correlated with performance outside the scanner," said Greicius, who is medical director of the Stanford Center for Memory Disorders and a member of Stanford Bio-X and the Stanford Neurosciences Institute. "This suggests that a six- or eight-minute snapshot of a person's functional connectivity has some value in predicting how they perform in the world."

Investigators from the Max Planck Institute of Psychiatry in Munich, Germany, also contributed to the study.

Funding for the study was provided by the National Institutes of Health, the Feldman Family Foundation, the Netherlands Organization for Scientific Research, the Volkswagen Foundation, and the German Academic Exchange Program.

Stanford's Department of Neurology and Neurological Sciences also supported the work. ISM

Virus

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combination of drugs can be effective across a broad range of viruses — even when those viruses hail from widely separated branches of the evolutionary tree," said the study's senior author, Shirit Einav, MD, assistant professor of infectious diseases and of microbiology and immunology.

The study's lead authors are former Stanford postdoctoral scholars Elena Bekerman, PhD, now at Gilead Sciences Inc., and Gregory Neveu, PhD, now at the University of Lyon and French National Institute of Health and Medical Research.

The reason the drugs used in the study are able to combat infections by such different viruses is that their disabling action is directed not at the virus but at proteins of the host cell it's trying to infect, Einav said.

Challenges posed by RNA viruses

Einav and her team are investigating strategies for combatting RNA viruses, such as dengue and Ebola. These viruses have a faulty replication process that results in frequent errors as their genetic material is copied, rendering them especially prone to mutations. Consequently, they swiftly acquire resistance to a typical antiviral drug that targets a specific viral enzyme, Einav said.

"The 'one drug, one bug' approach can be quite successful, as in the case of hepatitis C virus," for which a concerted effort has generated several approved antiviral treatments, she said. But it took more than 10 years of research, she noted, and drug development costs typically exceed $2 billion. Making matters worse, Einav added, is the impossibility of predicting what the next emerging viral threat will look like.

"We're always getting blindsided," she said.

The deadly Ebola epidemic of a few years ago has subsided but could return at any time. Dengue infects an estimated 390 million people annually in over 100 countries. Four distinct strains of the dengue virus exist, hampering the development of a vaccine and boosting the chances of a once-infected person's re-infection by a different strain against which that person hasn't achieved sufficient immunity. Secondary infections can become life-threatening.

Picking a different target

While an Ebola vaccine has shown promise, it's not yet approved. A recently approved dengue vaccine has only limited efficacy. No viable antiviral drugs are currently available for either virus.

Viruses are cut-rate brigands: They produce nothing on their own, but rather hijack the machinery of our cells. Hepatitis C, dengue, Ebola and other viruses hop onto molecular "buses" that whisk cargo between cell compartments. These buses shuttle the viruses around the inside of cells. The buses' routes and fares are regulated by numerous cellular enzymes. Two such enzymes, which go by the acronyms AAK1 and GAK, essentially lower the fares charged by the molecular buses by tweaking them so they bind more strongly to their cargo.

The standard antiviral approach aims to disable a specific viral enzyme. Einav and her associates' alternative approach took advantage of viruses' total dependence on infected cells' molecular machinery.

The two-drug combination Einav's team put to work against dengue and Ebola impedes AAK1's and GAK's activity, effectively pricing bus fares beyond the viral budget. Erlotinib and sunitinib, each approved by the Food and Drug Administration more than a decade ago, are prescribed for various cancer indications. Neither AAK1 nor GAK are the primary targets of these drugs in their cancer-fighting roles. But Einav's group discovered, by accessing publicly available databases, that the two drugs impair AAK1 and GAK activity, too.

Einav and her colleagues previously demonstrated that erlotinib and sunitinib inhibit hepatitis C virus infection in cells. In the new study, the investigators conducted experiments in lab dishes to show that both drugs inhibit viral infection by impeding the activity of AAK1 and GAK.

Next, they tested the combination in lab dishes against the dengue and Ebola viruses, and observed that viral activity was strongly inhibited. While the dengue virus is a relatively close cousin of hepatitis C, it is quite different from the Ebola virus. The same drug combination also showed efficacy against a variety of other RNA viruses related to hepatitis C, including the Zika and West Nile viruses, and even against several unrelated viruses.

Testing the combination in mice

In a prevention experiment in mice, the investigators administered the erlotinib-sunitinib combination once daily starting on the day of dengue-virus infection, employing the two drugs for five days at doses comparable to those approved for use against cancer in humans. All the control mice died between days four and eight. But of those treated with the drug combination, 65 to 100 percent, depending on the individual experiment, survived and regained their pre-infection weight and mobility. Given individually, the drugs provided substantially less protection, Einav said.

In another experiment designed to test the drugs as a therapy, the combination retained substantial antiviral efficacy as long as it was given less than 48 hours after infection.

In a similar prevention experiment with the Ebola virus, the scientists administered the drug daily for 10 days starting at six hours before infection. Some 90 percent of the control mice died within a week or two. But half the mice receiving the drug combination survived. Again, the drugs were substantially less effective when given individually.

Additional lab experiments showed that the combination profoundly inhibited the dengue virus's ability to develop drug resistance. There's no possible way for viral mutations to alter the proteins of the cells it infects, Einav said, and no easy way for the virus to mutate around its dependence on those proteins.

Stanford's Office of Technology Licensing has filed for patents on intellectual property associated with the findings.

Other Stanford study co-authors are Claude Nagamine, DVM, PhD, assistant professor of comparative medicine; and research scientist Robert Mateo, PhD.

The study was carried out in collaboration with researchers from the University of Chicago, the U.S. Army Medical Research Institute of Infectious Diseases in Maryland, the Washington University School of Medicine in St. Louis and the University of Leuven in Belgium.

The study was funded by the National Institutes of Health; the American Cancer Society; the Doris Duke Charitable Foundation; the Department of Defense; Stanford Bio-X; the Stanford Spark program; the Stanford Translational Research and Applied Medicine program; Spectrum, which administers Stanford's Clinical and Translational Science Award from the NIH; the Stanford Child Health Research Institute; and the Taiwan Ministry of Science and Technology.

Stanford's departments of Medicine and of Microbiology and Immunology also supported the work. ISM

Judith Ned appointed assistant dean of medical degree admissions

By Tracie White

Judith Ned, EdD, has been appointed assistant dean and director of the Office of MD Admissions, effective March 1.

Ned will supervise all operational aspects of medical student admissions and will help to transform the outreach and recruitment efforts of the office by supporting and developing new programs.

"In this new position, I hope to continue making positive strides toward increasing diversity in the medical and health professions, fostering community partnerships and supporting academic innovation that aligns with the mission of the office of medical degree admissions and the Stanford School of Medicine," Ned said.

During her 15-year career at Stanford, Ned has administered university and community-based academic science, technology, engineering and mathematics enrichment programs. For 13 of those years, she directed the Stanford Medical Youth Science Program, a five-week summer residential program held on the Stanford campus to encourage low-income and underrepresented minority California high school students to aim for careers in medicine. During those years, she worked with more than 450 young people, many of whom are now on academic paths toward careers in health, science and medicine.

Judith Ned

"Dr. Ned brings expertise in programmatic admissions, leadership development and academic counseling to the Office of MD Admissions," said Iris Gibbs, MD, associate dean of MD admissions. "We are excited and fortunate to have her on our team."

Ned also serves as an instructor in the School of Medicine, where she teaches a course on leadership and multicultural health, and as an instructor in the university's Program on Urban Studies, where she teaches a course on approaches to community-based research.

She holds a doctoral degree in educational leadership from Mills College in Oakland.

"Throughout my career in education, I have attempted to model the words of chef Leah Chase, proprietor of Dooky Chase Restaurant in New Orleans," Ned said. "'Make other people feel their worth.' Her words have been central to my strong desire to create pathways of success for young people." ISM

OF NOTE

reports on significant honors and awards for faculty, staff and students

ROBSON CAPASSO, MD, was appointed associate professor of otolaryngology-head and neck surgery, effective Feb. 1. He is the chief of sleep surgery and an adviser for Stanford Biodesign. His interests include the use of smartphone applications for sleep-disordered breathing, biomarkers for obstructive sleep apnea, presurgical evaluation of sleep-apnea patients and post-surgery upper-airway changes in those patients, and the development and validation of new medical devices and digital health concepts.

KARA DAVIS, DO, was appointed assistant professor of pediatrics, effective Jan. 1. Her research uses single-cell studies in primary patient samples to identify features of leukemia populations associated with patient outcomes.

MANISHA DESAI, PhD, was promoted to professor of medicine and of biomedical data science, effective Feb. 1. She is the founder and director of the Quantitative Sciences Unit, which supports researchers by providing expertise in biostatistics and informatics. She is developing team-based approaches to collaborate with clinical and translational investigators. Her research interests include the treatment of missing data, the processing and analysis of accelerometer data and the analysis of longitudinal studies. *(Editor's note: This item ran in the Feb. 27 issue with an incorrect photo. The item is republished here accompanied by the correct photo.)*

ADAM FRYMOYER, MD, clinical assistant professor of pediatrics, was named an Early Career Investigator by *Pediatric Research*. His paper "High-dose erythropoietin population pharmacokinetics in neonates with hypoxic-ischemic encephalopathy receiving hypothermia" will appear in the May issue. His research focuses on understanding sources of variation in drug pharmacokinetics and pharmacodynamics in children and applying this understanding to guide therapeutic decision-making.

DAVID GABA, MD, professor of anesthesiology, perioperative and pain medicine, will receive the 2017 Dr. Larry Zaroff Man of Good Conscience Award from the American Medical Women's Association. The honor, which will be presented at the association's annual meeting in April, is given to a man who is a champion and supporter of women in medicine. In addition, Gaba received the Pioneer in Simulation Award from the Society for Simulation in Healthcare in January. He was recognized for developing the technology for one of the first human patient simulators, for using simulation to support teamwork in health care and for serving as the founding editor-in-chief of the journal *Simulation in Healthcare*.

AIDA HABTEZION, MD, assistant professor of medicine; **SIDHARTHA SINHA**, MD, instructor of medicine; and **JUSTIN SONNENBURG**, PhD, associate professor of microbiology and immunology, have received a $200,000 Synergy Award from the Kenneth Rainin Foundation for their project investigating how secondary bile acids modulate intestinal inflammation. The funding is given to support collaborative research projects on inflammatory bowel disease that have the potential to yield transformative discoveries and major insights.

POONAM HOSAMANI, MD, clinical assistant professor of medicine, has received the 2017 Clinician Educator Award from the California-Hawaii Region of the Society of General Internal Medicine. The award recognizes early- or mid-career clinicians who focus on medical education. Hosamani's interests include hospital medicine and undergraduate and graduate medical education.

HADI HOSSEINI, PhD, was appointed assistant professor (research) of psychiatry and behavioral sciences, effective Feb. 1. His research focuses on investigating structural and functional brain networks, known as connectomics, in several neurological and neuropsychiatric disorders using neuroimaging and graph theoretical and multivariate pattern analysis techniques. He is also developing neurofeedback interventions to enhance executive functions in children and older adults with neurocognitive deficits.

YUHEI KOBAYASHI, MD, a postdoctoral scholar in cardiovascular medicine, has received a Young Author Achievement Award from the American College of Cardiology. The honor recognizes the publication of outstanding research. Kobayashi's paper "The influence of lesion location on the diagnostic accuracy of adenosine-free coronary pressure wire measurements" appeared in the *Journal of the American College of Cardiology: Cardiovascular Interventions*. His mentor is William Fearon, MD, professor of medicine.

SCOTT LAMBERT, MD, professor of ophthalmology, has been named the co-chief of pediatric ophthalmology at Lucile Packard Children's Hospital Stanford, effective Feb. 1. His clinical focus is treating children and adults with strabismus, and his research interests include improving care for children with congenital cataracts.

NATALIE LUI, MD, was appointed assistant professor of cardiothoracic surgery, effective Feb. 1. She is a thoracic surgeon who specializes in minimally invasive thoracic and foregut operations, tracheal surgery and thoracic outlet syndrome. Her research focuses on thoracic oncology.

KOEN NIEMAN, MD, PhD, was appointed associate professor of medicine and of radiology, effective April 1. His research focus is on cardiac imaging.

KATHLEEN POSTON, MD, was promoted to associate professor of neurology and neurological sciences, effective Feb. 1. Her research focuses on developing neuroimaging biomarkers to understand cognitive impairment and dementia in people with Parkinson's disease.

KRISTAN STAUDENMAYER, MD, was promoted to associate professor of surgery, effective Feb. 1. Her interests include trauma surgery, general surgery and determining the extent of injuries in older adults.

KRISTEN YEOM, MD, was promoted to associate professor of radiology, effective Jan. 1. Her research focuses on the development and validation of MRI-based techniques for the pediatric and neonatal brain, as well as clinical translation of MRI methods to improve the understanding of normal childhood brain development and neuropathology, including brain tumors, injury and the neurotoxic effects of some treatments. ISM

Robson Capasso

Kara Davis

Manisha Desai

Adam Frymoyer

David Gaba

Aida Habtezion

Justin Sonnenburg

Poonam Hosamani

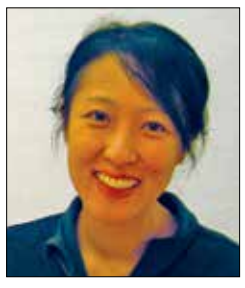
Hadi Hosseini

Scott Lambert

Natalie Lui

Kathleen Poston

Kristan Staudenmayer



Kristen Yeom