

# TMC | PULSE

NEWS OF THE TEXAS MEDICAL CENTER — VOL. 5 / NO. 4 — MAY 2018

## A New Era: Launching TMC<sup>3</sup>

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**WILLIAM F. McKEON**  
President and Chief Executive Officer  
Texas Medical Center

One of the most transformative occasions in the 70-plus-year history of the Texas Medical Center took place on April 23, 2018.

State and local leaders, together with leaders of the TMC, announced the launch of TMC<sup>3</sup>, a new multi-institution research campus that will foster collaboration amid a culture of competition. The campus will be situated south of the medical center's clinical campus.

Decades from now, we will look back on this date as a historic moment for the Texas Medical Center, the city of Houston and the great state of Texas.



Greg Abbott, Governor of Texas, is seated in front at the TMC<sup>3</sup> announcement on April 23, 2018. Standing from left to right: John Sharp, chancellor of The Texas A&M University System; Edward Roski, president and chairman of the board for Majestic Realty Co.; Ed Emmett, Harris County Judge; Sylvester Turner, Mayor of Houston; William F. McKeon, president and CEO of the Texas Medical Center; Paul Klotman, M.D., president, CEO and executive dean at Baylor College of Medicine; Peter Pisters, M.D., president of The University of Texas MD Anderson Cancer Center; Michael R. Blackburn, Ph.D., executive vice president and chief academic officer at The University of Texas Health Science Center at Houston; Carrie Byington, M.D., senior vice president of The Texas A&M University Health Science Center and vice chancellor for health services at The Texas A&M University System; and Admiral William McRaven, chancellor of The University of Texas System.

## TMC | PULSE

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*President and Chief Executive Officer*  
William F. McKeon

*Vice President of Communications*  
Christen Bagley

*Pulse Editor*  
Maggie Galehouse  
mgalehouse@tmc.edu

*Assistant Editor*  
Cindy George  
cgeorge@tmc.edu

*Staff Writers*  
Alexandra Becker  
Christine Hall  
Ryan Holeywell  
Shanley Pierce  
Britni N. Riley

*Photojournalist*  
Cody Duty

*Contributing Photographers*  
Scott Dalton  
Nick de la Torre

**NEWSROOM**  
713-791-8812  
news@tmc.edu

**ADVERTISING**  
Felicia Zbranek-Zeitman  
713-791-8829  
newsads@tmc.edu

**DISTRIBUTION**  
Daniel Martinez  
713-791-6136  
distribution@tmc.edu

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## ON THE COVER:

A rendering  
of the future  
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Credit: Gensler

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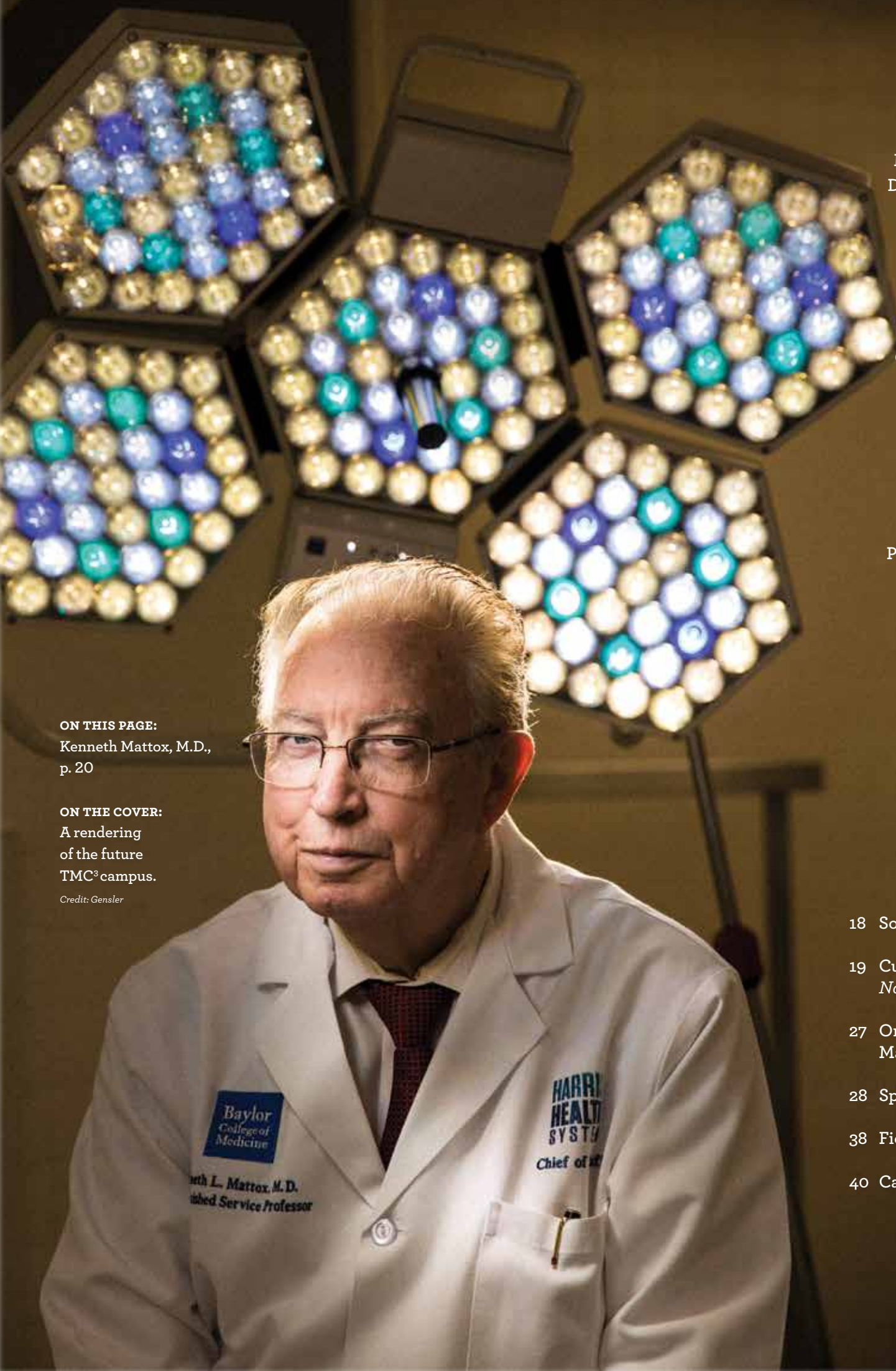
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By Alexandra Becker

## *Two years after a horrific bicycle accident, Adessa Ellis is rebuilding her body*

On Feb. 20, 2016, Adessa Ellis was cycling along Highway 90 in Fort Bend County when a drunk driver in a black Jaguar hit her from behind. She flew 25 feet into the air and landed in muddy, stagnant water. As she lay there, her major organs started to fail and a deep puncture in her lower back opened her body to infection. By the time paramedics arrived, Ellis was all but dead.

She was taken by Life Flight to the Memorial Hermann Red Duke Trauma Institute, where surgeons performed an extremely risky procedure called an open thoracotomy, making a large incision in her chest wall to gain access to her heart, lungs and other organs. It was her only shot at survival, and it worked.

But Ellis was broken. In addition to the trauma to her heart, she suffered a lacerated liver, collapsed lungs, traumatic brain injury and severe nerve damage. She shattered bones in her ribs, hip, pelvis and both legs. Her teeth had been knocked out, and infections ravaged her body. She endured surgery after surgery at Memorial Hermann, then transferred to TIRR Memorial Hermann and then Kindred Hospital Houston Medical Center for rehabilitation.

On Oct. 12, eight months after the accident, physicians amputated her left leg below the knee—a decision made, in part, because it provided a more straightforward path to recovery and would allow Ellis, a triathlete, to return

to running, swimming and cycling.

Half joking, Ellis asked her surgeons to give her the “runner’s cut.” She later learned that they had performed a specialized reconstructive surgery—known as the Ertl procedure—that left her with a stable limb that has the potential to bear the weight of a sports prosthetic.

A week after her amputation, Ellis was finally released from care. After arriving home, she promptly removed the hospital bed that had been arranged for her. That, she said, went against all of her plans.

• • •

One morning in late March, Ellis, now 40, prepared to work out in her Sugar Land, Texas, home. The furniture in her living room had been pushed aside to make room for exercise equipment—a handcycle, stationary bike, yoga mats and weights. Shelves of helmets, medals and other relics from competitions surrounded her, along with pictures of her two daughters, now 17 and 20, and statues of crosses and angels. Cheers from ‘The Price Is Right’ game show emanated from a television turned low.

Ellis wore a cycling jersey and bike shorts, her curly hair, air-dried, fell just past her shoulders. It had taken her two hours just to get out of bed that morning because of how stiff her joints and muscles had grown during the night. She compared herself to the Tin Man from *The Wizard of Oz* who needed oiling in order to move. Two hours—and yet she does it, every day.





# RECOVERY

Ellis has undergone 56 surgeries since the accident. Metal rods, screws and plates are fixed throughout her body to help keep her skeletal system intact, and she is still grappling with the effects of her traumatic brain injury and spinal cord damage, as well as a partial paralysis along the right side of her body. Two years later, and it still feels numb.

"I had hoped to be running by now," Ellis said, speaking slowly and deliberately. "But I'm still hobbling. If it was just the leg, I'd be going. But it's the brain injury, it's the right side of my body. That's what's causing all my problems."

Before the accident, Ellis, who is 5 feet 5 inches tall, weighed a fit 165 pounds. By the time she was finally discharged from the hospital, her once-muscular body had atrophied to just 85 pounds. She was not projected to live, much less walk, but she has pushed herself past all expectations.

"They told me I couldn't do certain things and I would go and do them," Ellis recalled. "I said I wanted walking crutches and they told me I wasn't ready for them. So I got online and ordered some and walked into my next therapy session. They were shocked."

That tolerance for suffering, that grit, is something Ellis has always had—and it likely saved her life.

"What has really impressed me with Adessa is this nonstop perseverance in knowing what she wants and figuring out how to get it," said Danielle H.



Melton, M.D., director of the Amputee and Orthotics and Prosthetics Program at TIRR Memorial Hermann Hospital. "She has really surprised everybody in her recovery."

At age five Ellis enrolled in taekwondo despite her mother's insistence on gymnastics—she'd always been a fighter, and although she was teased mercilessly for it, karate school was her escape. She eventually achieved second-degree black belt before she quit at 15 to move to New York to live with her dad.

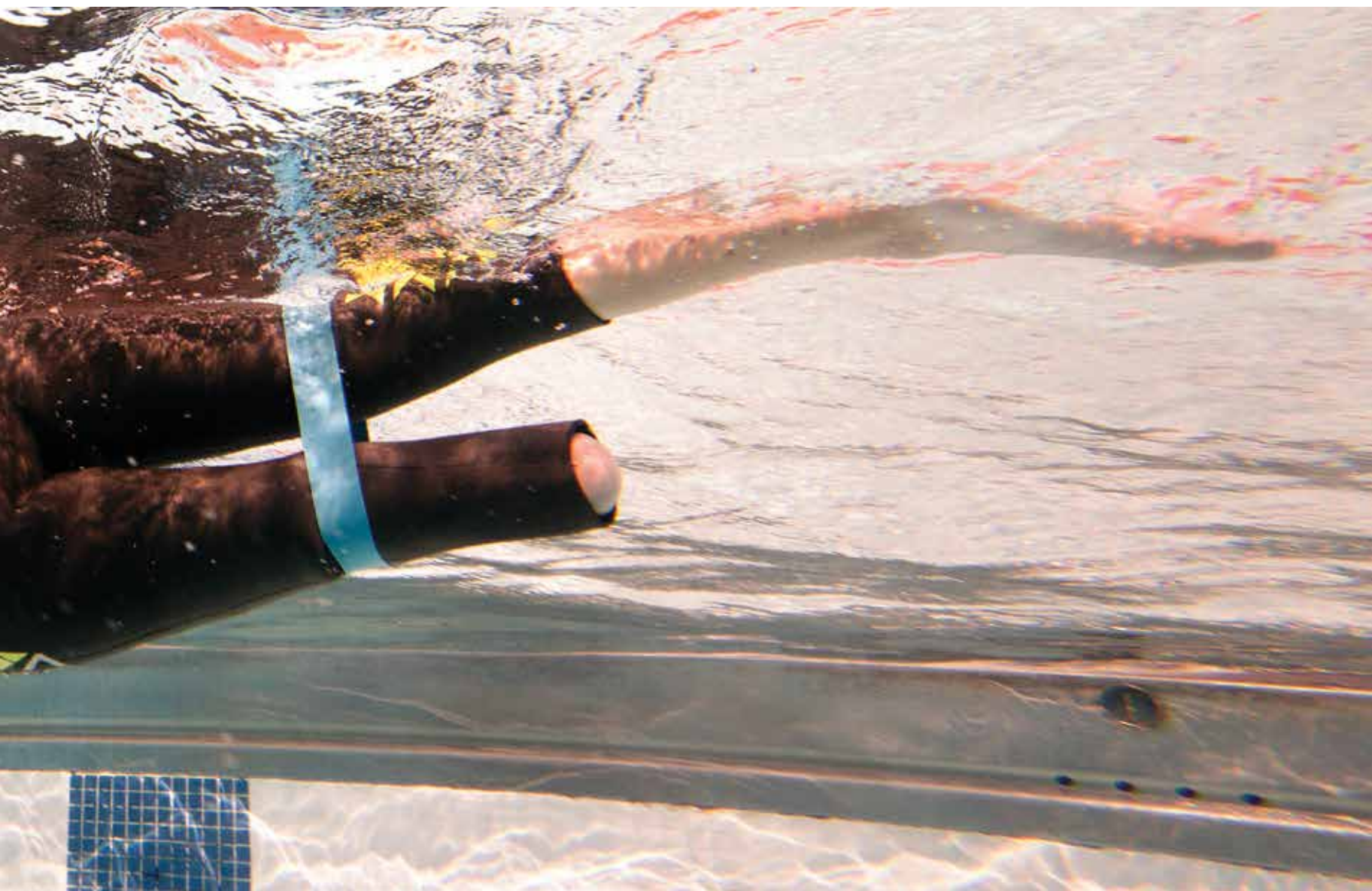
After finishing school, she got a job as a UPS driver and worked there for 22 years, hopping in and out of the truck and jogging back and forth between businesses and homes. She loved it. Her friends in the dark brown uniforms still honk when they drive by her house.

"I had a long ponytail and people would stare at me all the time. They acted like they'd never seen a girl driving for UPS," she said proudly. "I was just used to it, so I'm used to it

when people stare at me now."

Ellis has always pushed her body to its limits. She has competed in six Ironman triathlons—a 2.4-mile swim, 112-mile bike-ride, and 26.2-mile run—and never shied away from a physical challenge. If it's true that God doesn't give you something you can't handle, then Ellis is living, breathing proof.

*(continued)*







Ellis is now up to 127 pounds, a feat she has managed by swimming or cycling daily. In January, she completed the Chevron Houston Marathon on her handcycle—a three-wheeled cycle propelled by her arms—and she is gunning to run the 5K next year.

But it won't be easy.

Ellis still walks primarily with forearm crutches, and the paralysis throughout her right side is a daily frustration. She has no health insurance at the moment because her long-term disability and COBRA coverage have expired, so she is waiting for Medicaid to kick in. Last she heard, it would be August until she could afford to resume therapy.

She is a member of Team Catapult, a local nonprofit that supports individuals with disabilities who want to compete in endurance sports. The nonprofit has offered to fund a prosthetic running blade, but Melton and her team are concerned that Ellis' body may not be ready.

"It's a balancing act for me because I have to make sure she's safe and in the right setting, but I also want to make sure she has the equipment that's going to allow her to do what she wants to do," Melton said.

Of course, Ellis isn't taking "no" for an answer. She recently recorded a short video of herself running with a prosthetic blade—a quick, unsteady jog, her forearm crutches tossed just out of the frame.

"Now I've got evidence," Ellis said. "They say I'm not ready and to focus on how far I've come, but in my mind, I can go further."

"But," she added, "it is what it is."

It's a phrase Ellis often repeats, but don't mistake it for resignation.

"My recovery is going well—in some areas, better than expected, while in others, not fast enough," she said. "But when someone is told they'll never walk again, and within a couple of years they're learning to walk unassisted and attempting to jog, it's amazing. I could easily give up and sit in my wheelchair. I have a long way to go, but I do not intend to stop trying."

Ellis' doctors have grown accustomed to her indefatigable resolve.

"I don't know that I've ever seen somebody so motivated as she is to accomplish what she wants to accomplish," Melton said. "And I have no doubt she's going to get there."



are mad, but what are you going to do? Sit here and harp?"

That's not her style.

"The laws aren't that strict for running somebody over," Ellis added. "If I would have died, it would have been a different story."

She paused. "I did die four times, actually. I just survived."

Ellis walked to the back door of her home and gazed onto the street. She longed to be out there, her body running in a brand new way, racing forward. ■

## CYCLING ACCIDENTS

May is National Bike Month—an opportunity to highlight the benefits of bicycling and reinforce best practices for safety. According to the most recent

data from the National Highway Traffic Safety Administration, bicycle-car deaths rose 12.2 percent in 2015. More than 800 bicyclists died that year from

motor vehicle traffic crashes, and an additional 45,000 were injured. Alcohol involvement was reported in 37 percent of the fatalities.

In Texas, 65 pedalcyclist

fatalities occurred in 2016, the year of Ellis' accident. This was a 25 percent increase from 2015, according to the Texas Department of Transportation.



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# Making Music During Deep Brain Stimulation

*Surgeons at Memorial Hermann-TMC treat patient's hand tremor*

BY SHANLEY PIERCE

Anna Henry raised the flute to her mouth, took a deep breath and recalled from memory the notes of one of her favorite classical concertos. Her fingers flitted over the keys as she carefully played each note. After she finished the song, the room burst into applause.

But this wasn't a typical concert performance.

Henry, 63, was lying on her back on an operating table surrounded by doctors and nurses. Part of her scalp was peeled back to expose her skull. Surgeons had drilled two nickel-sized holes into her skull and inserted a tiny 1.3 mm-thick electrode into each side of her brain where her thalamus is located.

The surgical procedure, called deep brain stimulation, is used to treat the neurological symptoms of certain movement disorders. Surgeons implant tiny electrodes into the brain to deliver a constant electric current that significantly reduces involuntary movement and neuropsychiatric issues.

"Deep brain stimulation is a really fantastic tool in how we can modulate a perturbed, dysfunctional system in the brain and make it more normal," said Memorial Hermann-Texas Medical Center neurosurgeon Albert Fenoy, M.D., who specializes in the procedure.

Although the exact science and mechanisms behind its therapeutic benefits are unclear, deep brain stimulation has proven to be highly effective in "resetting" the brain and eliminating tremor.

"Why these patients have all these issues, like Parkinson's disease, is because a circuit is abnormally functioning. It's oscillating at a rate that, for whatever reason, which we still don't know, is wrong. It's causing the detriment that they're experiencing," Fenoy explained. "By overriding that abnormally oscillating circuit with high-frequency stimulation, you can override that dysfunction and train it to be a more normalized firing pattern."

The U.S. Food and Drug Administration has approved deep brain stimulation to treat four conditions: essential tremor, Parkinson's disease, dystonia and obsessive compulsive disorder. Because of its effectiveness, researchers are studying deep brain stimulation as a possible intervention for chronic pain, post-traumatic stress disorder, major depression and other conditions.

Deep brain stimulation has been shown to have a high success rate for patients whose conditions no longer respond to medication.

"A lot of patients, unfortunately, go into denial and say, 'I don't need brain surgery for my tremor.' Every patient who has surgery says, 'I'm so glad that I had it.' But they have to overcome that early [hesitation]," Fenoy said. "All patients have success. Our goal is to greatly reduce their tremor. Will it be 100 percent gone? I don't guarantee that for any type of surgery, but the tremor will be 70 to 80 percent better than it is now. That is a vastly significant improvement."

For Henry, deep brain stimulation was her final hope. She knew early in her childhood that she would inherit her father's shaky hands. He suffered from a disease called essential tremor, the most common movement disorder.

Henry began experiencing tremors in her dominant left hand and fingers in junior high. It started with a slight quivering in her hand, but as the years went on, her tremors intensified to the point where she could no longer perform simple everyday tasks with her hand, such as writing her name, drinking soup or sewing. The combination of beta-blockers and an epilepsy drug prescribed by her doctors—propranolol and primidone, respectively—eventually stopped working and caused muscle weakness and eye problems.

"It was frustrating to see that [control] disappear gradually and just to realize that my control wasn't what it used to be," she said.

Worst of all, Henry's tremor prevented her from doing what she loved the most: playing the flute. Henry is the principal flutist in the Big Spring Symphony in West Texas and a music teacher who has been playing the flute since she was 11 years old.

"The ability to express things through my music in a way that I'm used to isn't there anymore, no matter how hard I practiced," Henry said, before the surgery. "I've gotten to the point where I don't like practicing because I'm not getting anywhere with it. It's not making me improve like it always had."

Henry's neurologist in Lubbock, Texas, approached her four years ago about the possibility of treating her tremor with deep brain stimulation, but the idea of brain surgery frightened her.

"At that point, I didn't want anybody poking a



**“I’m a happy camper. It’s the first time I’ve been able to play a straight tone in years.”**

— ANNA HENRY

*Memorial Hermann-TMC patient who received deep brain stimulation for hand tremors*

hole in my brain,” Henry said. “As the symptoms got worse, the proposition of doing that got a little less daunting, especially when it came down to keeping the tremors for the rest of my life, letting it get worse and giving up playing—or going for it.”

She flew to Houston with her husband, Bob, on March 26. The following morning, she met with her surgical team and prepared for the operation. Henry, who arrived at the hospital with short, strawberry blonde hair, had her head shaved and was fitted with a stereotactic frame to secure her





*Anna Henry plays the flute in the operating room at Memorial Hermann-TMC, where neurosurgeons performed deep brain stimulation to treat her essential tremor.*

skull in place before she was wheeled into the operating room.

Her surgery unfolded in two parts: first, surgeons inserted the electrodes into the thalamus, which refines movement; and second, they implanted a rechargeable battery pack in her chest that will last up to nine years before it will need to be replaced.

Henry's anesthesiologist administered a local anesthesia to the scalp to numb the pain, so Henry was wide awake for the first part of the surgery. Fenoy and his surgical team made an incision across the front of her head and another on the side. They gently peeled back her scalp and used a special drill to bore through the 7.1 mm of bone in her skull. Fenoy then inserted the stimulating electrodes through the holes to her brain and applied the electric current.

The result was like flipping a switch. Prior to the surgery, Henry's neurologist, Mya Schiess, M.D.,

of the Mischer Neuroscience Institute at Memorial Hermann-Texas Medical Center and The University of Texas Health Science Center at Houston, ran a few motor control tests. Henry could barely sign her name, let alone hold a pen. When handed a cup of water, her hand shook so intensely that the water splashed over the side.

But after the electrodes were placed in her brain and the thalamus was stimulated, Henry's hand was still and stable, without a single detectable tremor. When she signed her name a second time, after that part of the surgery, each pen stroke was smooth and clean. Her handwriting was legible for the first time in decades.

"[Deep brain stimulation] works amazingly well," Schiess said. "If you have a tremor that is truly interfering with hand function, lifestyle, head or voice, honestly, there isn't a medicine out there that's going to really put you in a better state."

Deep brain stimulation helped Henry return to

playing the flute. Although her tremor had interfered with her quality of life and nearly put an end to her musical career, she refused to quit.

"My folks lived through the Depression," Henry said. "If there's anything they taught me, it was that an obstacle is not something that stops you; it's something you find a way around."

Thanks to Schiess and Fenoy, Henry has regained control of her body. Her brain stimulation device was recalibrated during a follow-up appointment in April and has eliminated, by her estimation, 99 percent of her tremor.

"I'm a happy camper. It's the first time I've been able to play a straight tone in years," she said. "It was really nice to feel like I had command of my body." ■

**WATCH HENRY PLAY THE FLUTE DURING SURGERY:**  
[tmc.edu/news/flute](http://tmc.edu/news/flute)



# MOTHER KNOWS BEST

Mothers are the “first ladies” of our lives. They’ve known us longer than anyone and dispensed a wealth of wisdom along the way. In honor of Mother’s Day,

*Pulse* asked members of the Texas Medical Center community:

*What’s the best advice your mother ever gave you?*

“My mother was incredibly supportive in anything I ever wanted to do. When this picture was taken, I was this nerdy little kid that used to run down to a brook near our house and I would bring up water and look at it under a microscope. One of the things my parents did for me was I really wanted a high-quality microscope and they were willing to make that investment. And so I wound up setting up a laboratory in my room in my home in West Hartford, Connecticut. But then when the smell started to get bad from all the pond scum, they asked me to move the lab down to the basement. My mother is now almost 90 and she lives in Bloomfield, Connecticut, and her most important words for me growing up were, ‘All you can do is your best.’ And those were always comforting words for me, to know that that is all a person can do in the end, and generally speaking, if people always try to do their best, they’ll come out ahead of the game.”

— PETER HOTEZ, M.D., PH.D.

*Dean of the National School of Tropical Medicine at Baylor College of Medicine, endowed chair in Tropical Pediatrics at Texas Children’s Hospital and director of Texas Children’s Hospital Center for Vaccine Development*



*Hotez at age 9, with his sister, Liz, and mother, Jean Hotez, in 1967.*

*Porche plans to follow in the footsteps of her mother, Vivian Porche, M.D., and become an anesthesiologist.*



“You don’t realize your mom is wise until you’re older. Through my years in medical school and looking back over my life, my mom always told me, ‘If you start something, you have to finish it. If you made a commitment, you need to honor it.’ But the best advice was, ‘You’re going to have failure in life, and you will be defined by how you handle adversity.’ I see my mom now—she’s so successful, at the top of her career as an anesthesiologist. But she remembers failing her biochem test in medical school. She took a day to cry, but afterwards she took the test over again and got an A. Most people don’t discuss their failures in life, especially when they’ve made it. But my mom is never afraid to talk about the bumps in the road.”

— BOBBI PORCHE

*May 2018 graduate of McGovern Medical School at UTHealth*

Credit: UTHealth, Maricruz Kwon



“My father’s parents started a bra company in Atlanta, Georgia, called the Lovable Company. My father graduated from high school at 10 and then went to Oglethorpe College. He rode the trolley every day, by himself, to college. He graduated at 14, then went door-to-door selling bras for his parents. He moved to New York and grew the marketing end of the business, and by the 1950s, it was the most successful bra company in the world.

In the mid-1960s, my father told my brother and me that—this being a family business—we needed to spend half of every summer doing manual labor at the company, as long as we were interested in going into the family bra business.

I learned to cut bras in Puerto Rico. In Los Angeles, I learned how to ship bras. In Atlanta, I learned quality control. I went to Princeton and, by then, I still hadn’t decided whether I planned on going into the family bra business. That summer, my mother took me out to lunch and told me, ‘You don’t want to go into business with your father.’ Basically, she said that my father was wonderful, but I didn’t want to be in a situation where I’d always have to do exactly what he said. She told me to go out and do something for myself.”

— ARTHUR “TIM” GARSON JR., M.D.

*Director of the TMC Health Policy Institute*



*Garson and his mother, Patricia Garson, in the late 1950s.*

“It’s not about what my mom said, necessarily, but it was what she showed us. I’m the oldest of three, and she was always supportive of us. We knew unconditional love from her. We saw what a hard worker she was. She worked for the same organization most of her career, so we learned loyalty from her, and we were influenced by her work ethic. There was never any pressure from our mom, as she wanted us to find our own way. If we decided to go to college or not, she would have supported either decision. One of her big rules was no lying. Honesty was a big deal to her and was something she instilled in us. Honesty and loyalty remain important to me today, and I attribute these characteristics to the way she raised us.”



*Ashworth and his mother, Irene Berrier.*

— JERRY ASHWORTH

*Senior Vice President and  
CEO of TIRR Memorial Hermann Hospital*



*Richardson  
with her  
mother, Carrie  
Richardson.*

“My mom was not a big advice-giver, but she was a very inspirational person. My mom was one of the first African-American Studies professors in the country. My mom and dad were both deans and a lot of people tell me, ‘Oh, you’re in administration; administration is so bad.’ But my mom believed administration is a good thing, especially if you think about all the things she was able to accomplish as a dean at a time when women had very little opportunity. She was able to create most of the policies about women’s rights, she created safe places for women in academics to succeed, she wrote all the date-rape policies—and I got to see that. She never gave me advice about what to do—ever—but I admired her, so it’s not surprising I’m a dean, too.”

— PAUL KLOTMAN, M.D.

*President, CEO, and Executive Dean of Baylor College of Medicine*



*Klotman with his mother, Phyllis R. Klotman, former dean for women’s affairs at Indiana University, Bloomington.*

“She has given me a lot of advice, but the one that I always remember—and I have it on my wall in my bedroom—is that happy girls are the prettiest. It just reminds me to be joyful and positive.”

— PEYTON RICHARDSON

*Texas Children’s Hospital patient who was treated for acute lymphocytic leukemia*



## MOTHER KNOWS BEST

“I was in a very major car accident. I broke my head, had brain hemorrhages and was in a coma for a long time. I had to go through rehabilitation. I was going to school, but getting paid to play basketball. That was my plan for life, but after the accident and the coma, it was difficult. A couple of weeks in a coma can really screw up your basketball career.

I was 80 percent disabled, essentially. I had been for a year in a wheelchair. I had to relearn how to use certain parts of my body. At that point, there was this notion that I could be eligible for a disability pension from the country [Italy]. It's not that we were swimming in gold and could take a risk. It was a bit of a difficult decision when my mother said, 'No, don't accept it. You'll be all right. You need to do something with your life. Don't get into this mindset that people need to provide for you. You're not going to be the person you want to be.' Especially for a mother in the situation we were in, I think it was difficult advice to give, but I'm really glad I turned the pension down. I wouldn't be here.”



*Ferrari with his mother, Flavia Ferrari, who is holding a Medaglia Mauriziana, an honor her husband received from the Italian government.*

— **MAURO FERRARI, PH.D.**

*President and CEO of Houston Methodist Research Institute*

“I went back to work within a week of having a baby. I had a bunch of stuff going on. My mother was worried that I was going to be a terrible mother. She said, 'You can't have it all at one time. It doesn't mean you can't have it all. You just have to pace yourself.'

My mother gave me that great advice when I was 32, but I gave it to my daughter in college the other day because she was trying to do too much. I told her, 'You can't do it all at one time. You can't take too many classes, run Division I, expect to be great at everything, sleep and eat. You're going to run out of time.'”

— **STEPHANIE COULTER, M.D.**

*Director of the Center for Women's Heart and Vascular Health at Texas Heart Institute*



*Coulter with her mother, Kay Coulter.*



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“My mom taught me how to live; she also taught me how to die. Both by example. In life and in death, there was always laughter and silliness, a lot of love and an abundance of physical affection.

My mom, an immigrant from Israel, was very dramatic, and her life's volume was set to loud. Her passions were her kids, grandkids, and great-grandkids; and then there was the theater. Yes, an amateur acting career was launched in her mid-50s when she became a widow. Oh, and hats. She looked amazing in all hats.

I could tell you how, at age 11, her father abandoned the family and that she had to work outside the home to help her illiterate mother pay the bills. I could go on about how she lived through wars in Jerusalem—where she was born, before the state of Israel was created—and that she told us stories about foraging for food in the hills and standing in line for hours for water.

It's probably most important that I tell you about her last two years when battling cancer for the third time. She taught me a lesson that few are lucky enough to learn: How to die with grace. She was given three to six months. She decided that wasn't long enough, so she fought back with chemo and radiation and lived well for another 30 months. During that time, she had every conversation that needed to be had, and danced—the Charleston and the tango with handsome young dance instructors, and the Yuraq with Eskimos in Alaska.

My mom was a rock—strong all on her own, but also surrounded by the rocks that she chiseled: My sister, my brother and me. I learned to carve and chisel from a master, assembling a rock garden that will stand strong even when I am gone. ”

— DORIT DONOVIEL, PH.D.

*Director of the Translational Research Institute for Space Health,  
led by Baylor College of Medicine*



*Donoviel with her mother, Zaaphia Bader.*

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# A NEW ERA: LAUNCHING TMC<sup>3</sup>

By Alexandra Becker

City, state and Texas Medical Center (TMC) leaders convened April 23 to announce the creation of TMC<sup>3</sup>, a new, multi-institutional translational research campus slated to break ground next year, with projected completion in 2022. The ambitious project will bring together the best institutions and brightest minds in clinical care, research and industry. TMC<sup>3</sup> will drive \$5.2 billion into the Houston economy and create nearly 30,000 jobs, according to a third-party impact study by Silverlode Consulting.

Named to identify Houston as the “third coast” for life sciences, the translational research campus is a collaboration between the five founding TMC<sup>3</sup> institutions: Texas Medical Center, Baylor College of Medicine, Texas A&M University Health Science Center, The University of Texas Health Science Center at Houston (UTHealth), and The University of Texas MD Anderson Cancer Center.

“The new 30-acre research campus will provide our top medical minds with the resources to remain at the forefront of the health care industry,” Gov. Greg Abbott said ahead of the announcement. “This cutting-edge facility will not only generate thousands of jobs, but it will solidify Texas’ position

as an international leader in biomedical research.”

Houston Mayor Sylvester Turner said TMC<sup>3</sup> will show everyone that Houston means business.

“This is an indication to the rest of the world that in this city, we have decided to come together and play,” Turner said at the press event. “And when we play, we play well, even in the post-Harvey era.”

## The double helix

Four years ago, for the first time since the Texas Medical Center was chartered in 1945, leaders from the TMC and its member institutions formed a strategic plan that would set the course of the world’s largest medical city for decades to come. They identified six key areas of collaboration that would add value to each individual institution while helping the medical city as a whole compete on a global scale: innovation, health policy, clinical research, regenerative medicine, genomics and a city center for translational research.

But prior to the strategic plan, TMC executives were brainstorming ways to foster collaboration in research and attract bioscience industry to Houston. William F. McKeon, President and CEO of the Texas Medical Center, recalled an early meeting he’d set with

the Houston office of Gensler, an international design and architecture firm that designed the initial concepts of the new campus.

“I remember saying, ‘Look, we have no money set aside for this, but we have this concept, and I want to create a sketch that reflects this idea of a truly innovative campus that is fostering collision and collaboration,’” McKeon said.

An intern began to sketch and McKeon looked over his shoulder, watching him draw paths between four main buildings, crisscrossing and intersecting to promote meet-ups and conversations. For McKeon’s vision to be fully realized, the design had to encourage this type of interaction.

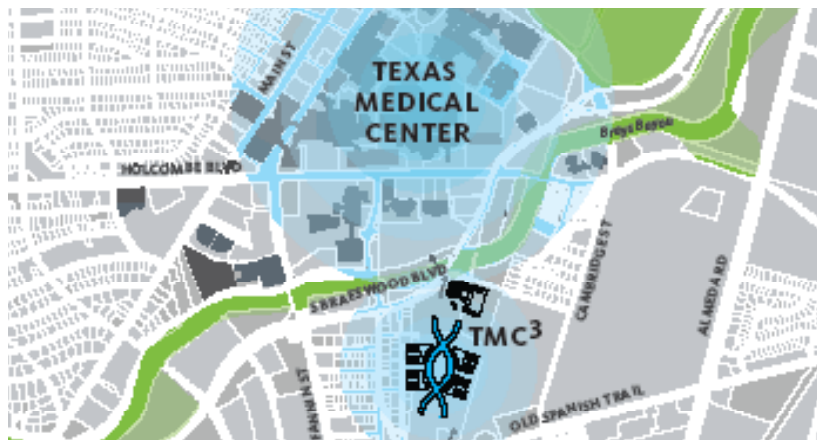
*William F. McKeon, president and CEO of the Texas Medical Center, announces plans for the TMC<sup>3</sup> campus with, left to right: Edward Roski, president and chairman of the board for Majestic Realty Co.; Ed Emmett, Harris County Judge; Sylvester Turner, Mayor of Houston; Greg Abbott, Governor of Texas; Paul Klotman, M.D., president, CEO and executive dean at Baylor College of Medicine; John Sharp, chancellor of The Texas A&M University System; Carrie Byington, M.D., senior vice president of The Texas A&M University Health Science Center and vice chancellor for health services at The Texas A&M University System; Admiral William McRaven, chancellor of The University of Texas System; Peter Pisters, M.D., president of The University of Texas MD Anderson Cancer Center; and Michael R. Blackburn, Ph.D., executive vice president and chief academic officer at The University of Texas Health Science Center at Houston.*



“Discovery often doesn’t happen in the lab,” the CEO stressed. “It happens over coffee, it happens over a drink, or while running with a friend. It’s an accidental discussion.”

The intern’s pencil continued to move in broad strokes when McKeon suddenly saw what looked like a double helix. Everything clicked. TMC<sup>3</sup> would be as big and as bold as it was groundbreaking.

Current blueprints feature four main buildings—cornerstones for the campus—connected by a three-tiered structure modeled after the shape of DNA, often compared to a twisted ladder and dubbed a double helix. TMC<sup>3</sup> will stretch across nearly 30 acres just south of the current TMC, between South Braeswood Blvd. and Old Spanish Trail. With more than 1.5 million square feet of



shared laboratory space, mixed-use permits and a focus on pedestrian traffic, the campus aims to be a true “live, work and innovate” environment, McKeon said.

The base floor of the double helix will hold three plazas saturated with trees and vegetation, as well as

restaurants and commercial, retail and entertainment space to support the community day and night. The second floor will contain shared laboratory space so that institutions can work together and alongside industry experts. In addition to the five founding members, numerous TMC institutions already have plans to be involved, including those from the academic sector.

The top level of the double helix will be a park designed by James Corner Field Operations, the landscape architecture firm famed for its work on the High Line in New York City. Situated 60 feet above ground, the green space will feature walking

and running trails, bocce courts, chef gardens, reading hammocks, children’s education gardens and more. The park will also bridge the bayou greenway systems, providing access points to the entire Houston community.

The estimated cost for the double helix is \$246 million.

“These are essential amenities if we want to attract and retain the individuals who are going to become the intellectual cornerstone of our medical city,” McKeon said. “When we look at the places we’re competing with—San Francisco, Boston, Shanghai, Singapore—they’ve all evolved from just tall buildings with labs to a more integrative environment. This whole generation of emerging scientists and leaders in research won’t accept anything less.”

The Texas Medical Center, which owns the land where TMC<sup>3</sup> will be built, will kick in \$40 million for the project. The other four founding institutions will give \$36.45 million apiece.

(continued)

“My hat has got to go off to the trustees of the Texas Medical Center. You did the brave thing, which is to completely change the covenants around two plots of land. ... That is a visionary step.”

— PAUL KLOTMAN, M.D.

*President, CEO and executive dean at Baylor College of Medicine*





“It has always been clear to me that if you want to be in the top tier of medicine, you have to be in the Texas Medical Center,” John Sharp, chancellor of The Texas A&M University System, said at the press conference. “Texas A&M—along with the other schools involved with this initiative—undoubtedly will make a huge difference in the lives and health of Texans and people all over the world.”

### Collaboration and competition

TMC<sup>3</sup> marks the first time in Texas Medical Center history when a campus is being created to support multiple institutions. The goal is to foster collaboration amid the culture of competition that is embedded within the 61 institutions that currently make up the TMC. McKeon likes to use the phrase ‘collabitation’ when referring to the ethos he hopes TMC<sup>3</sup> will inspire, where collaboration plus competition equals something beneficial to all involved. It’s time, he said, for Texas to become the “third coast” for life sciences, so that Houston can compete on a global scale.

“Our institutions have risen individually to become the best in the world, and we know that by aligning our efforts and resources, we will have the most prolific life sciences ecosystem in the world,” McKeon said. “For 70 years, the Texas Medical Center has thrived as competition spawned innovation unlike anywhere else. But just imagine what the next 70 years will hold if we maintain that competitive spirit while using our resources to work toward shared goals.”

For the five founding institutions, the chance to collaborate supported their overarching missions.

“Houston has been an education and research home to The Texas A&M University Health Science Center for more than 30 years,”

said Carrie Byington, M.D., senior vice president of The Texas A&M University Health Science Center and vice chancellor for health services at The Texas A&M University System. “I’m excited to continue working collaboratively with our peers across the Texas Medical Center and to witness firsthand the results of this novel endeavor, which will serve as a new model for biomedical innovation and collaboration. This will be especially important as we educate the nation’s future physician engineers or ‘physicianeers’ through our EnMed program, in partnership with Houston Methodist Hospital.”

McKeon noted that the trend in National Institutes of Health funding seems to be rewarding multi-

“For 70 years, the Texas Medical Center has thrived as competition spawned innovation unlike anywhere else. But just imagine what the next 70 years will hold if we maintain that competitive spirit while using our resources to work toward shared goals.”

— WILLIAM F. McKEON

President and CEO of the Texas Medical Center

*Below: A rendering of the south end of the TMC<sup>3</sup> campus shows a track that will be illuminated in the evenings.*





institution research with bigger and better grants, a recognition by the government that more minds—or in this case, more organizations—are better than one.

The TMC<sup>3</sup> campus will also encourage for-profit industry leaders to lease space, allowing for commercial partnerships and, ideally, an influx of venture capital. Alliances between institutions and commercial partners, McKeon said, will catalyze the development of new therapies, medical devices and digital health breakthroughs. It's an opportunity that has never existed before in the Texas Medical Center, primarily because of the covenants put in place during its founding, which are written to attract not-for-profits and discourage industry.

But that was the past. The future, McKeon said, lies in the commercialization of research.

Texas Medical Center executives asked the TMC Board of Directors to revise the covenants for the TMC<sup>3</sup> site as well as the TMC's innovation site, the former Nabisco building on the southeast corner of Holcombe Blvd. and Almeda Rd. that houses the TMC Innovation Institute as well as the AT&T Foundry and

Johnson & Johnson's JLABS @ TMC and their Center for Device Innovation.

"My hat has got to go off to the trustees of the Texas Medical Center," Paul Klotman, M.D., president, CEO and executive dean at Baylor College of Medicine said during the press event. "You did the brave thing, which is to completely change the covenants around two plots of land. ... That is a visionary step."

McKeon said that by allowing for-profit use of that land, pharmaceutical companies would be able to work side-by-side with academic researchers and clinicians and really create a haven for accelerating discovery and moving groundbreaking therapies up to the front lines.

"It's an opportunity that does not exist anywhere else in the world," McKeon said. "If you're at MD Anderson today, you want to make sure that your clinician knows the most advanced therapies and also knows the emerging therapies that are coming out of research, because a clinical trial may be your best hope."

Peter Pisters, M.D., president of The University of Texas MD Anderson Cancer Center, said TMC<sup>3</sup> will be a boon to research and development.

"I think this really represents a monumental opportunity for great institutions to come together, for us to diversify the economy of southeast Texas, to create an even greater life sciences ecosystem here in Houston, and to really leverage a lot of the opportunity through the R&D [research and development] that exists right here in the Texas Medical Center," Pisters said at the press conference.

McKeon cited the Broad Institute in Boston as a model for researchers and industry working side-by-side.

"MIT and Harvard brought their best scientists together, and that collaborative network effect has accelerated discovery so much that it's drawn more industry around it, and suddenly it's become one of the fastest, most productive research spaces in the world."

When institutions come together, McKeon explained,



*Top: A rendering of TMC's double helix shows a three-tiered structure that will connect all the buildings on campus. Bottom: A rendering shows an aerial night view of the piazza within the double helix, which offers space for concerts, galas and other events.*

they gain the resources to invest in the most advanced technology and keep with the pace of innovation. Ultimately, he envisions industry giants like GE or Siemens adopting some of the labs as showrooms, which would simultaneously benefit researchers and their commercial interests.

## A beacon to the world

The Texas Medical Center and TMC's other founding institutions will break ground on the new campus in 2019. Flanking the area will be a 410-room hotel and conference center, which will provide 50,000 square feet of meeting space for researchers and clinicians from around the world to convene in Houston.

The Texas Medical Center is already a destination for patients seeking life-saving treatment. It is a place for students to learn and for scientists to immerse themselves in research. It is a place for discovery and innovation, and TMC<sup>3</sup> will be its beacon, a signal to the world that

Houston is the next big player in health care innovation and biomedical sciences.

"We recognize we must do more than simply represent a collection of individual institutions that happen to share proximity. We must completely change the way we operate," McKeon said. "Our institutions are aligning in new ways, leveraging our collective expertise. Our future is extremely bright and we are only limited by our imagination and willingness to work together to build upon our vision."

That confidence is shared among leaders in Houston and beyond.

"TMC<sup>3</sup> will, for a while, be competing with the best of the best around the United States and then the globe," Gov. Abbott said, at the press conference. "And then TMC<sup>3</sup> will attain its rightful position of being the No. 1 biotechnology and biosciences center in the world. And we can do that because we are Texas, and Texas always achieves the very best." ■





# Targeting T-cells

*A Houston Methodist team has identified the molecules in T-cells that control function*

BY CHRISTINE HALL

Houston Methodist Hospital researchers have discovered a way to activate certain T-cells to potentially prevent autoimmune diseases and organ transplant rejection.

T-cells are a type of white blood cell that play a central role in protecting the body from infection and transplant rejection.

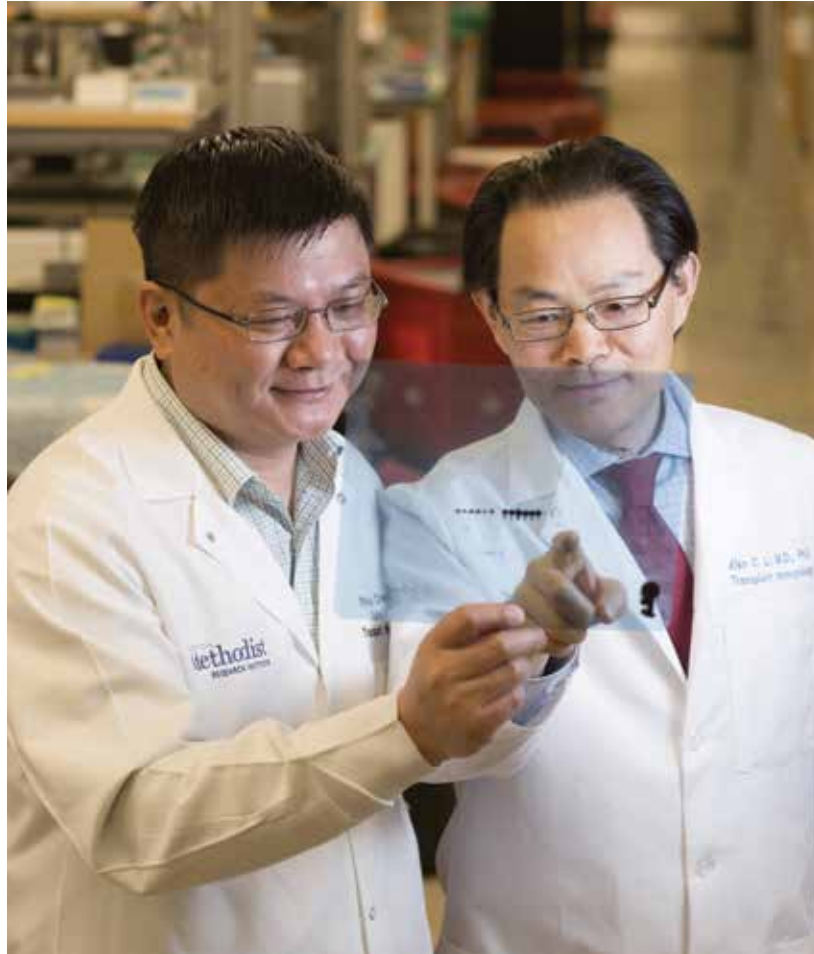
Wenhao Chen, M.D., Ph.D., a scientist in the Immunobiology and Transplant Science Center at the Houston Methodist Research Institute, has been investigating T-cell biology for the past 20 years. Recently, he and colleagues from Houston Methodist and Union Hospital at Huazhong University of Science and Technology in China identified the molecules in T-cells that control function and found a way to target them to help treat infection and disease.

“T-cells are important, so if you know the basic biology—how they are activated and how they function in different models—you can begin to solve those issues,” Chen said.

T-cells are different from other cells in that they want to protect the body, Chen explained. Because T-cells are antigen-specific, not all will respond to a particular toxic or foreign substance. Yet a very small number of T-cells will recognize a foreign substance and can be activated and expanded in just days to respond to it.

The T-cell receptor or TCR sends its activation signal to T-cells and induces the expression of hundreds of genes and molecules that allow T-cells to either attack transplants or fight infection. A positive result occurs when the T-cells get rid of infected cells; a negative result occurs when the T-cells reject transplanted tissues.

Chen and his team hypothesized that if they could identify



Wenhao Chen, M.D., Ph.D., a scientist in the Immunobiology and Transplant Science Center at the Houston Methodist Research Institute, and Xian Li, M.D., Ph.D., director of the Immunobiology and Transplant Science Center.

the molecular targets in activated T-cells, they could inhibit the function of the activated T-cells exclusively—leaving other parts of the immune system or body tissues undisturbed.

“So, we tried to hunt for molecular targets in activated T-cells downstream of the TCR signal,” Chen said. “If we can delete such targets in the activated T-cells, or make activated T-cells dysfunctional, we can solve the issue of autoimmunity and transplant rejection.”

That could provide a new treatment option for organ transplant acceptance. The current therapy is medication that targets non-selective pathways to T-cells as well as other body cells. Long-term

transplant survival is limited by the side effects of this medication.

By systematically deleting different molecules in T-cells, Chen’s team was able to determine which ones were necessary for the T-cells to function. The researchers also were able to identify what Chen called the “master regulator” of T-cell function—a critical switch that controls T-cell function and dysfunction—and a pathway to target those actions.

The function controlling gene expression in T-cells is the transcription factor or messaging system called interferon regulatory factor 4, or IRF4—which is usually only found in the immune system and not expressed in other cells.

Chen said IRF4, which is only activated with the TCR signals, is what needs to be targeted to solve the problem of transplant rejection or autoimmunity issues.

“We found, on one of the molecules, IRF4, if you deleted it after the TCR signaling, the T-cells will become dysfunctional,” Chen said. “That is important and surprising, because why is it only one of the molecules downstream of TCR signaling that connects to the whole T-cell function?”

The advantage of this new method, versus the current drug therapy, is that it targets only active T-cells that have already been exposed to antigens, leaving naïve T-cells—those that have never seen antigens and produce no or little IRF4—alone.

The team found that by inhibiting IRF4 expression for 30 days, the typical timeframe required for transplant patients to remain infection-free, the T-cells became irreversibly dysfunctional and did not try to attack the transplanted organ. In practice, this could mean prolonging a patient’s ability to tolerate a life-saving implant.

The team’s findings were published in the Dec. 19 issue of *Immunity*, a medical journal. The researchers proved the principle that inhibiting IRF4 expression is possible by identifying the signal pathways that induce the IRF4 in T-cells.

“This will be huge because it isn’t just one response that you can control,” Chen said. “I was surprised that one molecule knocked out in T-cells could, 100 percent, prevent their function. Why IRF4 is the only molecule that I have found so far that can make the functional gene switch is what we still have to figure out.” ■

# CURATED

The Intersection of ARTS and MEDICINE

By Britni N. Riley

Snakes, paint, flowers, frogs, flies. Who knew there were so many ways to die?

Displayed in a charming Victorian setting, *Death by Natural Causes*, a new exhibit at the Houston Museum of Natural Science (HMNS), examines multiple ways people can perish.

Certain animals, vegetables and minerals can be deadly—directly or indirectly.

“We focused on things that knowingly cause human death,” said Nicole Temple, vice president of Youth Education at HMNS and curator of the exhibit. “It is kind of a dark topic, but we tried to make it educational and fun by adding in some jokes and gently correcting misinformation, while adding to knowledge that visitors already have.”

One part of the exhibit traces the evolution of human knowledge surrounding deadly minerals and chemicals. Another features toxic plants, including mushrooms, poison ivy and angel trumpets.

“There are a lot of beautiful plants that are toxic and there are so many varieties of mushrooms. A lot of the really dangerous mushrooms are very similar-looking to mushrooms that are not only harmless, but also delicious,” said Spencer Greene, M.D., medical advisor to the exhibit and local toxicologist. “If you are not an expert on foraging for mushrooms, you just shouldn’t do it.”

*Death by Natural Causes* also contains several live venomous snakes and deadly bugs from the HMNS private collection.

“The things in your neighborhood are the things you need to know about—snakes come to mind, and some of the arthropods [insects, spiders and crustaceans],” said Greene, who is director of toxicology at Baylor College of Medicine. “These deaths are really rare. To die from a snake bite in the United States is exceptionally uncommon; there are fewer than 10 deaths per year.”

In the Lone Star State, the snake to watch out for is the Texas coral snake.

“There are three kinds of coral snakes in the United States—Arizona, Texas and Florida,” Greene explained. “As you go West to East, the more dangerous they get. These snakes cause a lot of pain. ... It’s kind of a neurologic and neuropathic pain when they envenomate you, but rarely do they do anything else.”

And there is an upside to these potentially deadly critters.

“Hopefully, visitors will realize all of the benefits of these venomous animals. As scary as they may be ... they serve an important role in nature and in human health. Medicines are derived from some of the venom components,” Greene said.

As visitors wander through different galleries in the exhibit, soft piano music

wafts from speakers. Throughout, interactive features keep children and adults occupied, whether by swiping through the periodic table of elements or guessing a victim’s cause of death based on a series of clues.

“We wanted each gallery to have at least one interactive exhibit to keep visitors engaged,” Temple said. “The periodic table of elements shows visitors the basic elements you need to be alive, the things that you need to stay alive and then it shows you the problematic elements that can kill you. There are a lot of overlaps in these elements; it all depends on the dosage.” ■

*Death by Natural Causes* will be on display at the Houston Museum of Natural Science, 5555 Hermann Park Dr., through September 4. Information: 713-639-4629 or [hmns.org](http://hmns.org).



Above: Poison dart frog model. Top right: Indian ornamental tarantula. Right: Angel trumpets adorn a Victorian greenhouse.



# Man on a Mission

KENNETH MATTOX, M.D.,  
HAS LED TRAUMA CARE AT  
BEN TAUB HOSPITAL FOR  
NEARLY HALF A CENTURY

By Britni N. Riley

As a child of the Depression who chased the crops with his family, Kenneth Mattox imagined he would grow up to become a missionary.

"I was from a branch of the Baptist church that said going to movies and dancing and playing cards was a sin, so a lot was expected of us," Mattox said. "I thought, 'I'll be a missionary and I'll do something to help people.'"

On a recent morning at Ben Taub Hospital, Mattox strode briskly through the halls of the trauma ICU, leading a group of patrons on a tour. Now 80, he is chief of staff and surgeon-in-chief of the safety-net hospital—Houston's largest—where he has worked for nearly half a century.

Mattox found his mission in the middle of the Texas Medical Center.

"Why do I stay here? Because medicine is pure," said Mattox, a cardiothoracic surgeon by training. "At Ben Taub, we are not going to make more money by ordering something—a drug, a test, an operation that really wasn't needed. So it's to our advantage to have a precise diagnosis and then do a precise operation and not add frills and bells and whistles that are not needed."

Ben Taub Hospital is owned and operated by Harris Health System and staffed by faculty, residents and students from Baylor College of Medicine, where Mattox is a distinguished service professor.

Over the course of his career, Mattox has revolutionized trauma surgery and care, worked with United States presidents and Middle Eastern royalty, and trained thousands of health care workers in the region.

As Mattox guided the patrons past the trauma ICU to the emergency room check-in, a line of patients suddenly became visible—a seemingly endless throng of people in need.

The Ginni and Richard Mithoff Trauma Center, a level I trauma center within Ben Taub Hospital, cares for 100,000 emergency patients annually.

"Ken Mattox really is the heart and soul of the Mithoff Trauma Center and Ben Taub Hospital," said Richard Mithoff, a Houston attorney,

philanthropist and Mattox's close friend. "It is his reputation that has grown the reputation of the hospital. I can't tell you how many trauma surgeons have told me that the very best training they ever received was at Ben Taub."

The two men met more than 20 years ago after Mithoff was retained by a family in a high-profile case involving a police officer shooting. Mithoff raised the question of whether or not paramedics had gotten the officer to Ben Taub's trauma center in a timely manner.

"It was memorable because when I met him, the first thing he said to me was, 'Mr. Mithoff, I'm so glad to finally meet you. You're going to lose this lawsuit,'" Mithoff recalled. "And he proceeded to tell me the problems with the case, which became an education for me and allowed me to educate the family and, frankly, allowed me to bring some closure to the family."

In 2006, Ben Taub's trauma center was renamed in honor of Mithoff and his wife, Ginni, who had donated millions to what was then called the Harris County Hospital District. The public hospital sees the city's toughest trauma cases, from injuries sustained in car accidents to gunshot wounds. The beds and waiting rooms are always full.

"I serve here," Mattox said, "because these people have no other option."

## Picking, singing, falling in love

Kenneth Mattox was born at the height of the Great Depression in White Oak, Arkansas—population 15—in the Ozark Mountains. His father chopped cotton for 50 cents a day. When Mattox

was six months old, his family piled into a two-seater car with another family and headed west to find work. They ended up in the central valley of San Joaquin, California. For six years, Mattox and his family picked fruit and chopped and picked cotton.

In the fourth grade, Mattox moved with his family to El Paso, Texas, and then to Clovis, New Mexico, when Mattox was in junior high.

In high school, Mattox was in a band and jammed with other musicians at a recording studio affiliated with a local radio station. Occasionally, a kid from Lubbock, Texas, would come by to play. His name was Buddy Holly. One day, Holly brought along a friend from Tupelo, Mississippi. His name was Elvis Presley.

Because he was uprooted so much as a child, Mattox found solace in the church and considered becoming a minister or the next religious singing sensation. In 1956, he graduated from Clovis High School and accepted two scholarships to Wayland Baptist University in Plainview, Texas—a ministerial scholarship and a music scholarship to sing in the school's a cappella choir.

"I've always known him to have a strong command in the operating room and a reputation among interns and residents as being someone you needed to pay attention to," Mithoff said. "What I learned for the first time the other night is that he sang in the choir at Wayland Baptist and that his choir director absolutely demanded attention and attention to detail. ... He credits a lot of his diligence and training in surgery to that teacher."

Mattox also met his future wife, June, at Wayland Baptist. During his sophomore year, the Asian flu outbreak of 1957 was causing panic on campus.

"I was the school nurse at Wayland, and they had never had a school nurse before," June recalls. "It was the days of the Asiatic flu so there were a lot of sick kids on campus."

(continued)

Facing page: Mattox checks out a renovation project at Ben Taub Hospital.

“I wanted the toughest, hardest, highest road, the most complex training program I could find. That’s the way I’m wired.”







*Mattox relaxes in his office at Ben Taub Hospital.*

June had been asked by the school doctor to pass out medication to students in their dorms and that is how she met her future husband. They were married in the fall of 1959.

In 1960, the newlyweds made their way to Houston after Mattox was accepted to Baylor College of Medicine. To help her husband through medical school, June took a job as the head nurse on the pediatric oncology unit of what is now The University of Texas MD Anderson Cancer Center.

"It was a busy time, the first few years," June recalled. "We lived close by in a garage apartment and I was usually working on weekends and he would be studying all the time."

### DeBakey days

While Mattox was making rounds as a Baylor student at Jefferson Davis Hospital on Allen

Parkway, history was in the making at the Texas Medical Center. Cardiac and vascular surgery were still somewhat primitive, but Mattox has a saying about things like that: "Go to the heart of danger and there you find safety."

At that time, Michael E. DeBakey, M.D., was doing cardiothoracic surgery like nobody else and creating a training program that was the most disciplined in the country. That's just what Mattox was looking for.

"The biggest challenge was what was emerging—cardiac transplantation, development of cardiac pulmonary bypass, sewing of vessels together. It required knowledge, judgment, technique," Mattox recalled. "I wanted the toughest, hardest, highest road, the most complex training program I could find. That's the way I'm wired."

In 1965, Mattox was drafted into the Army to

serve in the Vietnam War. When he returned in 1967, the race was on for the artificial heart. That year, a South African surgeon successfully completed the first human heart transplant.

"DeBakey was working on the artificial heart in his laboratories at Baylor when Christiaan Barnard transplanted the heart and the world went crazy and everybody started playing the 'me too' game," Mattox said. "The laboratories, limited in size, were switched from doing artificial hearts to doing transplants. Dr. Domingo Liotta, who was doing the work with the artificial heart, was kicked out of his lab—not fired, but he didn't have a place to work."

As Mattox recalled, Denton Cooley, M.D., acclaimed heart surgeon and former protégé of DeBakey, bumped into Liotta one day and asked, "Why do you have such a long face?" Liotta, who had been working closely with DeBakey, answered, "Because they kicked me out of my lab." Cooley responded: "Well, you know I am a member of the department of surgery. I have extra space over at St. Luke's Hospital. Why don't you come work with me and bring your equipment?"

On April 4, 1969, Mattox was still a resident training in general surgery when he was called in by Cooley to observe one of history's most groundbreaking surgeries.

Cooley had found a patient who needed an artificial heart: Haskell Karp, a 47-year-old man dying of heart failure. DeBakey and Liotta had been developing an artificial heart through funding from the National Heart Institute. They had tested the heart in four calves, but all of them died within hours of their surgeries.

Nonetheless, Cooley was determined. DeBakey was out of town, and Liotta went to the lab and procured the artificial heart for Cooley's patient. Cooley and Liotta became the first surgeons to implant a total artificial heart in a human body.

"I'm probably the only one left who was in the room that day," Mattox said.

Mattox said he was one of the first people to see DeBakey after he got back to Houston and discovered, from a newspaper article, that Cooley had



put his artificial heart in a patient. And thus began the famous feud between Cooley and DeBakey that lasted for half a century.

Surgeons—especially surgeons in Houston—are the world's largest concentration of mass, raw ego, Mattox said. They are fiercely competitive and they often try to outflank each another, just like athletes.

"It was wonderful training with Dr. DeBakey," Mattox said. "He was a tremendous taskmaster, but he expected nothing of anyone else that he didn't expect of himself. He considered sleep a bad habit. He would run up nine flights of stairs. He was totally dedicated to his patients and he was always looking for a better way. In essence, that is what medicine is all about."

### Shock and awe

In 1973, Mattox began his career at Ben Taub as deputy surgeon-in-chief, director of emergency surgical services and chief of thoracic surgery service. With so many new responsibilities, he began recruiting a strong support staff—beginning with his assistant, Mary Allen.

"Mary has been with me since the first day I started—almost 50 years," Mattox recalled. "She knows things I have long since forgotten."

Today, the two work in side-by-side offices lined with books written by Mattox and edited by

“It was wonderful training with Dr. DeBakey. He was a tremendous taskmaster, but he expected nothing of anyone else that he didn't expect of himself. He considered sleep a bad habit.”

Allen, photographs of Mattox with world leaders, and a jumble of awards, honors and plaques. Throughout the work day, Mattox frequently calls Allen into his office to discuss ongoing and upcoming projects.

"He always impresses me with his enthusiasm for his job and what he does for the patients. His dedication never wanes," Allen said. "A lot of people get burned out and frustrated, but he never does. Anything that other people would consider frustrating or challenging, he considers an opportunity."

Mattox took over as chief of staff and surgeon-in-chief at Ben Taub Hospital in 1990. His training and resourcefulness in the military, as well as years of experience in cardiac and

general surgery, elevated the hospital's reputation for trauma care. Among his notable practices: Maintaining low blood pressure in trauma victims to keep their bodies in a state of shock.

"Shock is actually beneficial, and that idea was started by me. During the Gulf Wars, we had hypotensive resuscitation," Mattox said, referring to the practice of maintaining blood pressure in the lower than normal range when a patient experiences continuous bleeding during an injury. "We did not take blood pressure cuffs to war, we only talked to the person and asked for their name, rank and serial number and felt for a pulse. If they had either of those, we didn't operate on them immediately. If they were losing those, we'd cut them and took care of what was bleeding."

Mattox's name has become synonymous with trauma care. His textbook, *Trauma*, co-written with Ernest E. Moore, M.D., and David V. Feliciano, M.D., is the definitive guide to trauma surgery. Mattox has made significant breakthroughs in trauma resuscitation—specifically regarding shock, trauma systems, thoracic trauma, vascular trauma, auto transfusion, complex abdominal trauma and multi-system trauma. One trauma technique even bears his name: The "Mattox Maneuver" refers to the mobilization of the descending colon to the midline to expose the abdominal aorta.

(continued)



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Mattox is so well known in trauma circles that *Vanity Fair* magazine asked him to weigh in on what really killed Princess Diana. His conclusion: heart herniation.

"In cases of extreme lateral shocks," Mattox told the magazine in October 2004, "the heart can burst through the pericardium and lodge in the left or right side of the chest. We know [from the medical report] that Diana was sitting sideways, facing the other rear passenger, so her heart would have herniated to the right. That would have stretched the left pulmonary vein so far that it tore at the point of attachment."

Mattox said it was probably pericardial strangulation, rather than internal bleeding, that caused Diana's sudden cardiac arrest in the Paris tunnel.

"Informing the world of the total truth puts this thing to closure," he told *Vanity Fair*. "We never reached it on J.F.K., but maybe now we can on Diana."

### Katrina, Clinton and Obama

Part of Mattox's mission at Ben Taub is to keep costs affordable for patients.

For example, a CT scan sets providers back about \$75 in incremental cost, Mattox said. However, some private hospitals may charge what it costs to buy the machine—\$2,225. At Ben Taub,

Mattox said, the patient is billed \$75 for a CT scan because that's what it actually costs.

"Part of it is me," Mattox said. "I'm the only person on either side of my family, with maybe one exception, who ever went to college. A bunch of dirt farmers. For six years of my life we were migrant farm workers. I had no house, no tent, slept on the ground in California. ... I realized if I have someone who comes in the emergency room, they may not need all of those tests and scans."

Mattox estimates 60 percent of what is done in medicine today is unfounded in scientific fact and done simply because it is what has always been done.

"All of the dogma of you've got to get blood pressure, start an IV..." Mattox began. "In the Texas Medical Center, 95 percent of the CT scans

that we obtain do not alter decision making. They make the hospital rich, but you really don't need them. [They're] unnecessary and we are exposing people to radiation."



Mattox and his wife, June, walk outside their Afton Oaks home.

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When Hurricane Katrina hit the Gulf Coast in 2005, Mattox was among the medical professionals and city leaders who ran operations at the Astrodome, where 25,000 evacuees from the New Orleans area had landed. Mattox leaped into action to build a clinic in the stadium and provide care to a traumatized population—the same way he does at Ben Taub.

“During Katrina, Hillary and Bill Clinton were in Houston. I was in the same room with Nancy Pelosi, Hillary and Bill Clinton, George and Laura Bush, and Barack Obama,”

Mattox said. “I found myself beside Obama—he was not running for president yet. ... I said, ‘Thank you for coming to Houston. I’m glad you see the way we do things here. If you are looking for a cost-effective way

to provide public health care, look no further than the contract and the partnership between Baylor College of Medicine, Harris County Health Department and the Houston business community. We have done it right.”

But Mattox doesn’t feel like any of the politicians heard him, and he points to the failure of the Affordable Care Act as proof. He believes the legislation does not help patients or hospitals. Washington should have listened, he said.

Mattox still shares his thoughts with politicians, even on Twitter. He said he has been asked by presidents on both sides of the aisle to serve on their respective staffs, but never accepted.

“Nothing about a political party drives me,” Mattox said. “It’s about doing the right thing with the resources that we have. If I have a political philosophy, it is that our family expressions, our educational experiences, our disaster response, our churches that we go to, our health care delivery is always local. Always local.”

### An orchestra, a team

Mattox and his wife evacuated their home in Meyerland last August when floodwaters from Hurricane Harvey forced them out. They raised their daughter in that house, and had to say goodbye to half a century’s worth of memories.

Late last year, the couple moved into a new

home in Houston’s Afton Oaks neighborhood. Mattox called in the family troops—his daughter and three grandchildren—to help unpack.

“I made them all come down here during Christmas,” Mattox said. “We had just found our replacement house after the flood from Harvey. We were living in a house that had a bed that we could sleep on and a table we could eat on. Everything else was a jungle of boxes. So I said, ‘You all come down here for Christmas,’ and I put them to work unpacking.”

Mattox also took his entire family to New York City, where they saw the musical, *Hamilton*, on Broadway. These days, he has more time for family trips.

Although he no longer practices medicine, Mattox remains deeply involved with day-to-day life at Ben Taub and looks after Baylor’s interest in the hospital.

“Ken Mattox is a terrific ambassador for Baylor College of Medicine,” said Paul Klotman, M.D., Baylor’s president, CEO and executive dean. “Not only is he a highly skilled trauma surgeon, but he has been a steadfast leader for both Baylor and Ben Taub Hospital. His focus continues to be on assuring that patients receive the highest quality of care and that the next generation of physicians are provided outstanding educational experiences. We are fortunate to have him.”

(continued)



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Mattox peers into an observation dome overlooking Ben Taub Hospital's trauma OR.

Ben Taub Hospital is currently in the middle of a \$250 million renovation that encompasses multiple projects.

"We are almost going to be doubling our capacity in the operating rooms, which will be a great thing for our patients and medical staff," said Mike Staley, vice president of operations at Ben Taub and Harris Health System.

"When the hospital was built, the code

requirement was 400 square feet. Now the smallest a room can be is 600 square feet."

During regular rounds this spring, Mattox led a group to an observation dome overlooking the trauma operating room—the same room where *RoboCop 2* was filmed in 1989.

On this particular day, one of Mattox's many trainees, Matt Wall, M.D.,

was performing a coronary bypass.

"What you see here is an orchestra, a team. Everyone has their particular job to do and everyone knows what part of the operation is next," Mattox said, gazing down on the surgery in progress. "Any teacher ... you have to reach the point that you realize you have sired another brain that is another person and your job is to teach the fundamentals, the skills to make judgment, and to

move forward and to trust them with your life."

Mattox trusted Wall with his life.

"In 2001, after being up for about 48 hours, I went to a conference at 7 a.m. and I didn't feel so good," Mattox said. "I thought, 'This may be heart,' so ... I decided to go up six flights of stairs to cardiology at Ben Taub."

Within 20 minutes, Mattox had a coronary arteriogram that showed a blocked artery. Wall was part of a team of doctors that opened him up and performed emergency heart surgery.

That teacher-student cycle is as reliable as the steady stream of patients who come to Ben Taub Hospital for care.

"The patient population has gotten bigger since I started, but patients a thousand years ago and patients now are the same," Mattox said. "They hurt, they broke something, they drank something they didn't need to drink, they developed an infectious disease ..."

Patients don't really change, Mattox said, and neither do the people who care for them.

"People become doctors because they want to relieve suffering," he said. "And, quite honestly, this kind of practice, this kind of hospital and this kind of community has a mission feel." ■



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## HOW TMC EMPLOYEES SPEND THEIR SPARE TIME

Born and raised in a small village outside of Bangalore, India, cardiologist Madaiah Revana, M.D., cultivated an early appreciation for horticulture. He spent his childhood helping his family grow rice, vegetables and coconuts on their farm. As a young man, after his friends introduced him to fine wines, he quickly became enthralled by the nectar of the gods.

Revana began collecting world-class Bordeaux wines—including vintages from Château Mouton Rothschild and Château Lafite Rothschild. But his passion for collecting wine soon evolved into a love for making wine.

In 1996, the cardiologist visited a friend in Tuscany, Italy, where the sweeping landscapes and bucolic views instantly captivated him.

“I went there and absolutely fell in love with the vineyards,” Revana said. “I thought, ‘It’s so beautiful! Maybe I should have a little vineyard. It would be fun for when I retire from cardiology.’”

As luck would have it, Revana turned his daydream into a reality sooner than expected. While attending a Mayo Clinic conference in Napa Valley in 1997, he found a 9-acre plot of vineyard land just off the main highway in St. Helena. Nothing had been planted, but Revana saw the potential. Wasting no time, he sent a soil sample to the University of California, Davis for composition analysis and discovered that the land was one of the last remaining pieces of property in Napa Valley that could grow premium Bordeaux varieties.

“I bought the property without knowing a whole lot about the vineyard or winemaking, but I knew that I really wanted to make one of the best wines. That was my focus,” he said. “I surrounded myself with the best people to accomplish that.”

In 1998, he hired Jim Barbour, a leading viticulturist in Napa Valley, to plant and manage his estate vineyard. Revana and his team installed extensive drain tile systems throughout the property to ensure that it remained dry year round, and planted specific grapes that matched the soil.

Naturally, the doctor was meticulous and careful in his approach, making sure that “everything was done precisely, surgically,” he said.

“My philosophy has always been excellence. When I operate, I always want to do the best job for my patients,” Revana said. “When I’m assembling a wine, I want to make the wine the best I can. When I taste the wine and I don’t like it, we don’t



Credit: ©kopol bonick studio

NAME: **Madaiah Revana, M.D.**

OCCUPATION: **Cardiologist at Humble Cardiology Associates and Memorial Hermann**

INTEREST: **Winemaking**

release it. It really has to be good quality.”

Revana’s attention to detail and drive to produce beautiful wines paid off. *Wine Spectator* gave his Cabernet Sauvignon a 91-point score in 2001 and ranked his 2007 vintage No. 4 on its Top 100 Wines list of 2010, with a score of 97.

In 2005, Revana decided to expand his wine enterprise and began to search for the perfect terroir to create Pinot Noirs comparable to those from Burgundy, France. He purchased an 80-acre property in the Dundee Hills of Willamette Valley, Oregon, and named it Alexana Winery after his daughter, Alexandra. Currently, 56 acres of the property are planted to grow 10 different clones of Pinot Noir, as well as Riesling, Pinot Gris and Chardonnay.

In 2008, Revana added his third

vineyard in Argentina’s Uco Valley, located at the base of the Andes Mountains. He named the 17-acre vineyard Corazon Del Sol, or “heart of the sun,” as a nod to his son, Arun, whose name translates to “sun” in Sanskrit. There, he produces three types of Bourdeaux (Malbec, Cabernet Sauvignon and Cabernet Franc) and southern varietals (Grenache, Syrah and Mourvèdre).

In recent years, Revana proved that his initial success was not a fluke. In 2013, his 2010 Alexana Pinot Noir Dundee Hills scored 94 points and landed on *Wine Spectator*’s Top 100 list at No. 17.

In 2017, he debuted his latest wine from Corazon Del Sol, a Grenache Rosé. As an homage to his heritage, he named the Rosé Padma, which is a pink lotus flower that not only resembles the playful blush hues of the Rosé, but is native to India.

“It’s always about going back to your roots,” Revana said.

Revana Family Vineyard distributes wine in 47 states and in top restaurants around the country. Internationally, Revana wine is sold in England, Denmark, China, Thailand, India and Canada. ■

*The Alexana Winery sits in the Dundee Hills of Willamette Valley, Oregon.*



Credit: Andrea Johnson Photography

ON THE SIDE

BY SHANLEY PIERCE



For nearly two years, **CHARLES SMITH** has overseen the Texas Health and Human Services Commission, the newest organization to become a member of the Texas Medical Center (TMC). This budding partnership coincides with a TMC land gift for the first public psychiatric hospital to be built in Harris County in more than 30 years. Smith, a native Texan raised in the Panhandle town of Childress, spoke with *Pulse* about teamwork, treating people with dignity and presiding over a massive reorganization of the commission, which is responsible for the state's Medicaid programs, food subsidy payments and child care licensing.

**Q** | *You've earned a reputation as a state agency transformation specialist. How did your rural upbringing influence your leadership style?*

**A** | My father was a preacher. My mother was a stay-at-home mom and there were eight children. I am No. 5. Growing up, we went fishing and played with friends. We had the proverbial 'when the street lights came on, we came back home.' I didn't realize we were poor until I went to college. ... My grandmother worked as a house cleaner for many of the families in Childress and had a farming background. One of the things she would say was: 'Make a hand'—like a hired hand—'and whatever you do, do your best.' That was really ingrained in me. My dad would help people and he instilled in us the value of helping people who are less fortunate. ... My dad always told me that your name and your reputation should be protected. If you do anything, do it to the best of your ability—the first time.

**Q** | *You graduated from Texas Tech University in 1988 with a bachelor's degree in psychology, but didn't start your college education there. Why did you transfer?*

**A** | When I left high school, I went to East Texas State University [now Texas A&M University-Commerce] and played college football for a couple of years. I met a girl between my freshman and sophomore years living in Childress. We struck up a relationship. I went back to college, played one more year of football, dropped football and transferred to Texas Tech [in Lubbock] because she graduated from high school and went to Lubbock Christian University. It worked out. We've been married for almost 29 years.

**Q** | *You previously ran the child support division at the Texas Attorney General's Office. How did you get your first opportunity to work in state government?*

**A** | I started at the child support division because I was planning to go to law school. I had an uncle who said if I really wanted to go to law school, I should do a volunteer stint at the Attorney General's office. He knew some people in Lubbock who could make that happen. I started to volunteer 20 hours a week, which was kind of surprising to them. I was working in the legal area typing pleadings and doing interviews for paternity affidavits. They asked me if I would like to work there. After about six months of being with the agency, people were coming to me asking questions about the job. The manager asked me what I was doing that made people come to me and I said: 'I took the manuals home and read them.'

**Q** | *Did your own socio-economic background inform your work at the Attorney General's office?*

**A** | Growing up, I had friends who were in single-parent homes. Once I started dealing with paternity situations, I began to realize how their families struggled. We were all living in the projects—in subsidized housing. My family was eventually able to move out into a home my father bought. He was a disabled veteran. I stayed connected to my friends because they were a couple of blocks away. Through the job, I began to realize how difficult things were for them with their mothers trying to make ends meet. This became an opportunity to explain to staff why it was important for us to do a tremendously good job. It's about collecting money and helping families so that children can have a brighter tomorrow.

**Q** | *After managing child support offices in Midland, Abilene and the Dallas-Fort Worth region, you went to work in Austin. How did you make the leap from the Attorney General's office to the Health and Human Services Commission?*

**A** | After Greg Abbott became Attorney General in 2002, I was asked in October 2003 to come to state headquarters to become the assistant director of field operations. In May 2004, they created the position of deputy director of the child support division and put me there. I stayed in that role until the deputy attorney general retired in September 2013 and that was when Attorney General Abbott appointed me to executive deputy of the child support division. I initially came over to the commission in July 2015 as the chief deputy executive commissioner. Commissioner Chris Traylor retired in May 2016 and I was appointed by now-Governor Abbott.

**Q** | *What professional challenges have you faced since you were appointed Executive Commissioner of the Health and Human Services Commission (HHSC) in June 2016, particularly regarding the agency's reorganization?*

**A** | The transformation of HHSC really was my sweet spot. At the Attorney General's office, that was my reputation: Turning things around and fixing problems. I'm bringing a sense of clarity to HHSC so that people understand the mission. Health and Human Services has really been focusing on outcomes. We have almost 700 programs and more than 35,000 employees. I have changed the human resources policy to make it more aligned with a high-performing agency. We had employees who hadn't had evaluations for years.

Coming to work and doing your job and doing it without mistakes is what you're paid to do. It's not meritorious; it's what we expect. For those who go above and beyond expectations, we can look to reward them with merit increases. The more effective and efficient we can be as a team ... the more people we're going to help.

**Q | How are you prepared to be effective without a health background?**

**A |** People say, 'You don't really understand. You're not a medical doctor. You're not a lawyer. How do you know health?' I know that if our job is to improve people's health, then we have to begin to monitor and understand health outcomes. Let's make sure our contracts are leading to better health outcomes. We spend billions of dollars every year with our managed care organizations taking care of 4.5 million lives through Medicaid, CHIP and our waiver programs. How can I incentivize a person diagnosed with diabetes who is headed toward blindness, amputations and dialysis—all of those things that, in the Medicaid program, drive up costs for taxpayers? If I can get you to make diet and lifestyle changes and I can get the managed care organizations focused

on that, then those are better outcomes for the patients and their families.

**Q | How would a Texan receiving services through your agency identify the changes you are implementing?**

**A |** We're going to treat everyone who comes through the door with dignity and respect. We have terminated people for rude and discourteous behavior to internal customers as well as external customers because we are going to have civility. People come to us for help and they don't need to be judged. That's going to be one easily seen aspect. We are working with our managed care organizations and holding them accountable. I expect the health care that is prescribed by health professionals to be delivered. I believe that will be easily seen by those who are a part of our health care system.

**Q | Both of your children have followed your footsteps to college and to state government, is that correct?**

**A |** My son Chris is 27. He graduated from the Texas Tech business school. Alyssa graduated from Texas Tech. They both work for the Office

of the Governor. Our son is a budget analyst in the budget shop. My daughter is in the criminal justice division as a grants coordinator. She turns 26 in May.

**Q | The HHSC will build a new, 200-bed psychiatric hospital next to the UTHealth Harris County Psychiatric Center, augmenting the state's mental health services. What is the value of the commission's new partnership with UTHealth and the Texas Medical Center?**

**A |** We have an opportunity, by increasing the number of beds, to look at the full continuum of care. We'll have inpatient and respite and step-down care on one campus, which is something that we don't have. It's an opportunity for Houston to be a model for the rest of the state—and even for the country—as we begin to attack the growing mental health needs in our state. We can also help drive down costs and improve the lives of individuals and families because we are going to be able to provide services to people before they enter the criminal justice system. ■

*Charles Smith was interviewed by Pulse assistant editor Cindy George. The conversation was edited for clarity and length.*





# Gaming Tech and 3-D Reach the OR

*State-of-the-art technology can streamline surgical procedures*

BY SHANLEY PIERCE



Rhinologists at Memorial Hermann-TMC perform endoscopic sinus surgery on a patient with the assistance of augmented reality technology.

A 72-year-old man suffering from nasal polyps and chronic sinus inflammation lay unconscious on the operating table. Blue surgical towels veiled nearly every inch of his body, but his face was exposed—his head tilted back and nose pointed toward the ceiling.

Martin Citardi, M.D., inserted a long endoscope through the patient's nasal passage. The glow of a monitor illuminated the darkened room. Everyone's eyes were glued to the video camera feed on the screen, which looked more like a video game than a real-time view of the winding journey through the patient's sinus cavity.

Citardi and his team at Memorial Hermann-Texas Medical Center are the first in the country to use augmented reality (AR) technology for minimally invasive sinus procedures.

AR technology, which overlays computer-generated images onto a user's view of the real world, gained mainstream popularity after Pokémon Go first launched two years ago. At its peak, 45 million users were hooked on the gaming app.

But AR isn't just for gamers anymore. Medical device companies are beginning to use AR technology to superimpose preoperative medical imaging over real-time video of a patient's anatomy, creating a composite view for surgeons.

Typically, Citardi would simultaneously analyze a 2-D CT scan on a light box prior to surgery and mentally visualize the patient's 3-D anatomy, going back and forth between the two. But when Citardi uses Stryker's Scopis Target Guided Surgery (TGS), an AR navigation system, all the relevant imaging is combined into a single field.

“Surgeons are visual creatures. Putting everything together on one screen is appealing. A big part of minimally invasive surgery is getting directly to the target and avoiding collateral damage.”

— MARTIN CITARDI, M.D.,  
Memorial Hermann-TMC physician,  
chair of the Department of Otorhinolaryngology-  
Head and Neck surgery at UTHealth

He marks up preoperative images to identify which areas to dissect and which critical structures to avoid, then overlays the annotated scans directly on top of the endoscopic view of the surgical area to create a clear, video game-like image of the pathway to follow.

The Scopis TGS is analogous to a 3-D GPS navigation system: Doctors can track the surgical instrument's position relative to the "map" of a patient's preoperative imaging.

"Surgeons are visual creatures. Putting everything together on one screen is appealing," Citardi said. "A big part of minimally invasive surgery is getting directly to the target and avoiding collateral damage. The ability to have those overlays facilitates that process. It takes even more of the mental gymnastics out of it."

Since X-rays were first discovered in 1895 by German mechanical engineer and physicist Wilhelm Conrad Röntgen, medical imaging technology has made great strides. Positron emission tomography (PET) scans and nuclear medicine imaging were introduced in the 1950s. In the early 1960s, Ralph Meyerdirk and Bill Wright developed the first commercial ultrasound scanner, specifically designed for medical use. In 1979, G.N. Hounsfield and A.M. Cormack won the Nobel Prize for their invention of computed tomography (CT) scans that captured cross-sectional images

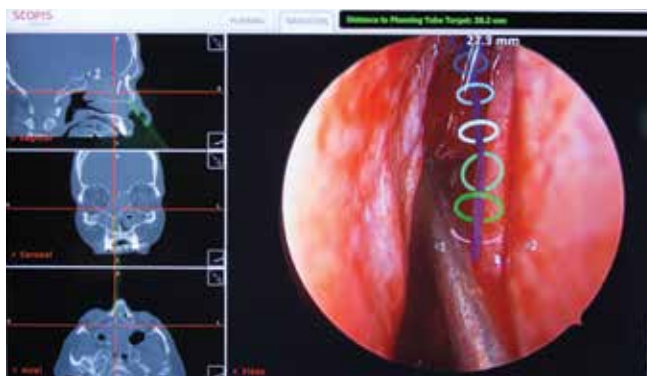
of the body. Also in the 1970s, American physician Raymond Damadian invented the magnetic resonance imaging (MRI) scanner.

These breakthroughs in medical imaging have become mainstays in medicine, helping doctors to accurately diagnose patients and surgeons to meticulously plan complicated operations. Yet the visualization of that information remained archaic.

"It sounds intuitive to have all the relative information on one screen, but we're long overdue," Citardi said. "Scopis is an important step on that path to image convergence."

### Orbeye

Scopis' AR-assisted surgical navigation isn't the only trending technology in the operating room. Surgeons in the Texas Medical Center recently used 3-D technology to perform intricate



*Stryker's Scopis Target Guided Surgery technology allows surgeons to overlay preoperative imaging scans onto the endoscopic view for safer, more accurate surgical navigation.*

procedures. In March, pediatric surgical specialists at Texas Children's Hospital used the Orbeye for pediatric plastic, pediatric urology and pediatric congenital heart surgeries.

Developed by SOMED, a joint venture between

major imaging powerhouses Olympus and Sony, Orbeye is a new freestanding videomicroscope that displays high-resolution 3-D imaging of surgical procedures on an expansive 55-inch 4K monitor with stunning clarity. It's like bringing the IMAX movie theater experience into the operating theater.

"You put the glasses on and it literally almost comes out at you on the screen. It was like watching [a movie] in 3-D," said Chris Pederson, M.D., a pediatric plastic surgeon at Texas Children's who has used the Orbeye to perform reconstructive microsurgery on babies.

*(continued)*

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— CHESTER KOH, M.D.

*Pediatric urologist and director of the Pediatric Robotic Surgery Program at Texas Children's Hospital*

Pederson called the device a “game-changer,” especially for microsurgery and specifically for pediatric and reconstructive surgery.

“We’re able to see better and do better. We take care of kids with smaller spaces and smaller anatomy, so we need this technology,” said Chester Koh, M.D., pediatric urologist and director of the Pediatric Robotic Surgery Program at Texas Children’s, who spearheaded the effort to bring the Orbeye to Houston. “This is not just another piece of technology. It’s a needed tool that we’re using that will help us take care of kids better.”

Typically, microsurgeons perform the initial part of the procedure using standard magnifying loupes to help them see tiny tissue and blood vessels, then roll in a cumbersome microscope to

complete the next step of the surgery. Surgeons often spend hours with their heads slumped over, straining their necks and looking down at the operating table through either loupes or a microscope lens. But the Orbeye is designed to eliminate that discomfort. By combining both the optical capabilities of the loupes and microscope into a single camera and screen, surgeons can swap out their traditional lens for 3-D glasses that allow them to stand upright.

“The original microscopes were invented much like a microscope you’d find in a lab. You’re hunched over and you have to get the eyepieces just right. They’re fine, but you have a very narrow field of view,” Pederson said. “With the Orbeye, you don’t have to lean over to look in the

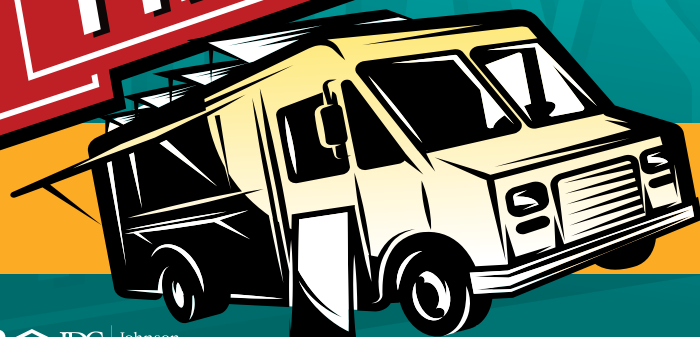
microscope. You suddenly have this giant field of view [on] this whole wall behind everyone. Hopefully, the next generation of surgeons won’t have neck and back problems like I do.”

Because the Orbeye is so compact, it doesn’t occupy as much space in the operating room and requires less time to set up. The camera—the size of a soda can—is attached to a flexible arm that can be easily maneuvered and angled in different positions based on what surgeons need to see. The large monitor allows everyone in the room to view the surgical procedure and coordinate more effectively.

“We move body parts around from one place to another ... and are often operating in places that are difficult to get both surgeons to see at the same time,” said plastic and reconstructive surgeon Jesse Selber, M.D., director of clinical research and associate professor in the department of plastic surgery at The University of Texas MD Anderson Cancer Center, who trialed the Orbeye in April. “With the microscope, you have two people connected [on opposite sides] to it. The Orbeye would allow both surgeons to be on the same side of the bed or people to be in different body positions that the microscope might not allow you to do due to physical constrictions.”

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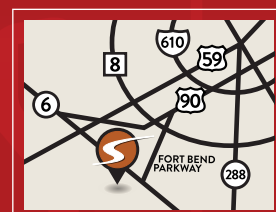
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## 'Be there in the planning'

AR technology and 3-D visualization are transforming the operating experience for surgeons. Medical device companies are paying attention to this growing trend.

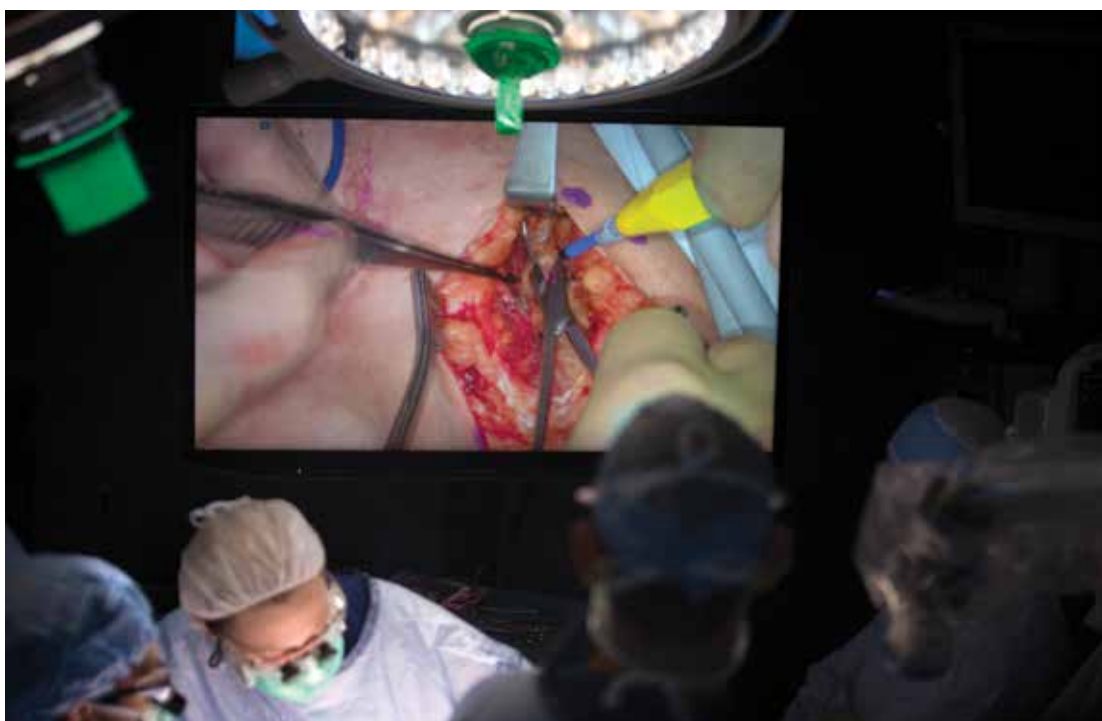
According to market research agency Arizton, the global market for such technologies in health care is projected to surge from \$0.6 billion in 2017 to nearly \$3.04 billion in 2023—a compound annual growth rate of more than 31 percent.

"Technology just gets better and better in terms of new generations of robots and new generations of microscopes," Koh said. "The key is to be at the forefront—not wait for someone to build it, but be there in the planning, in the testing, to benefit our patients as soon as possible."

Of course, any emerging technology draws skeptics.

"Any time you introduce new technology, there's a million people who will line up to say there's no reason to do anything any differently than the way we either do now or have always done," Selber said. "It's the reason why people used horses and buggies for 10 years after automobiles were invented and available."

As medical technology continues to evolve and hospitals race to gain competitive advantage



Jesse Selber, M.D., and his team at MD Anderson use the Orbeye during a recent surgery.

over one another, Citardi said, patient care must continue to be what drives innovation forward.

"We always have to find ways to do better by our patients. It's as simple as that," Citardi said.

"If everyone thought good enough was good enough, we'd still be doing the same things the same way as we did decades ago. There's always room to make things better." ■

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# Postpartum Depression Prior to Giving Birth

*Some patients are affected while pregnant*

BY BRITNI N. RILEY

When Christine Sherman learned she was pregnant with her first child, she and her husband were over the moon with excitement.

But her joy didn't last long. A crushing sadness hit the expectant mother, then 36, just seven weeks into her first trimester.

"I went from feeling normal and fine to almost an instant depression," Sherman said. "I was very scared and anxious. I had a hard time getting out of bed and I was very worried about what was happening to me. I had no appetite and began losing weight like crazy."

Friends and medical professionals told Sherman it was way too early in her pregnancy to be having these issues.

"I kept thinking, 'I can't be the only woman this has ever happened to,'" Sherman said. "I literally could not find a doctor that would treat me. ... I had been to multiple doctors. Multiple psychiatrists. I even had two tell me to terminate my pregnancy to save my life."

After five weeks of discouraging appointments with specialists, Sherman and her husband finally met with Lucy J. Puryear, M.D., medical director of The Women's Place—Center for Reproductive Psychiatry at Texas Children's Hospital.

That's when her symptoms were diagnosed as postpartum depression.

Postpartum depression, as its name suggests, is typically experienced by mothers after the birth of a child. But the condition can manifest during pregnancy.

"One of the reasons we start screening during pregnancy is that some of the data shows postpartum depression can start in the third trimester of pregnancy," Puryear said. "If women are starting to have symptoms before they deliver—if we

**“I literally could not find a doctor that would treat me. ... I had been to multiple doctors. Multiple psychiatrists. I even had two tell me to terminate my pregnancy to save my life.”**

— CHRISTINE SHERMAN

can intervene before the baby gets here—then maybe we can stop it from occurring or being as bad."

That's exactly how Puryear helped Sherman.

"She didn't look at me like I was crazy or say that I was making it up in my head," Sherman recalled. "We sat on her couch and I remember she looked at me and said: 'I'm going to get you better and you're going to be OK.'"

According to the U.S. Centers for Disease Control and Prevention, as many as 1 in 5 new mothers experience postpartum depression.

"We call it postpartum depression, but really, it can be many different types of mental health symptoms, like anxiety—women feeling overly anxious, not able to sleep, because they are checking on the baby every 10 minutes," Puryear said. "They are worried that something awful is about to happen to them or the baby, up to the point of having panic attacks."

Sleep deprivation, a common situation for new parents, can trigger depression and anxiety. With the physical and lifestyle changes a new mother experiences, in addition to the steep drop in hormone levels after delivery, nearly 80 percent of women with infants experience



Christine Sherman spends time at home with her children, Dylan, 5, and Zachary 3.

"baby blues"—a very different phenomenon than postpartum depression.

"Baby blues" usually subside within a couple of weeks after giving birth, but some new mothers do not recover from the emotional slump and experience postpartum depression.

"It's supposed to be fun—and a lot of it is fun—but it's also overwhelming," Puryear said of welcoming a new baby. "As each week goes by, it's supposed to get easier because you kind of figure out what is going on, you develop a little rhythm and the baby starts to make a little more sense. But for moms with postpartum depression, it just continues to feel overwhelming."

Once a woman comes to Puryear for help, treatment can begin.

"By the time they end up seeing someone, they are feeling pretty

badly," Puryear said. "I think the desire to not have something wrong—you've just had a baby and you're supposed to be excited and everyone else is excited—you just keep hoping that it is going to get better."

At The Women's Place, a patient visits with a psychiatrist who will determine if medication is needed. A new mother also is referred to a therapist for support.

Puryear explained that lots of different therapies work well for postpartum depression symptoms. Sometimes, talking to someone about how to get the baby to sleep better or how to manage the relationship with a spouse yields positive results.

"For moms with anxiety disorders, there is cognitive behavioral therapy that teaches you how to do what a mom without anxiety

can do," Puryear said.

Sherman said taking medication during pregnancy made her nervous at first because she didn't want to hurt the baby, but she was reassured by Puryear's prediction that the postpartum depression symptoms would improve.

"That was hard for me because that is a long time to be feeling bad or like I can't do this," Sherman said. "It took a while for the medicine to turn me around."

By her second pregnancy two years later, Sherman was fully prepared for another bout of depression if the symptoms returned.

"I had been off the medication for years at that point, but when it happened it was almost the same," Sherman said. "It just wasn't as scary because I knew what it was and I knew Dr. Puryear would help."

Today, Sherman's daughter, Dylan, is 5, and her son, Zachary, is 3. Sherman's postpartum depression is safely in the past, though she still wonders what caused it.

Researchers are trying to find the answer. Although Puryear and others have been able to treat postpartum depression successfully and track its progression, its cause remains elusive.

"When you are pregnant, right from the beginning, your hormones just start rising and they keep rising throughout the entire pregnancy. They are at their highest of any time during a woman's life," Puryear said. "What happens immediately postpartum is all of those really high hormone levels fall. They don't fall gradually. They rise gradually, but postpartum, they just fall off a cliff. There is something about that rapid drop in hormones that for some women triggers symptoms and nobody yet has quite figured out what is going on there."

To help solve that mystery, Puryear has made it her mission to expand screening services throughout the Texas Children's system by administering the Edinburgh Postnatal Depression Scale questionnaire to women at various stages of pregnancy and after delivery in multiple care settings.

"One of my goals was to make sure that all women who were seen

by the obstetrics and gynecology practices in this hospital were screened for postpartum depression and then my second goal was to have the pediatrics practices screen," Puryear said. "As of now, if you are seeing one of the OBs who practices in this hospital, you are screened at the first prenatal visit, again at 34 to 36 weeks, before delivery and then at six weeks postpartum. All of the pediatric clinics are screening at the first well child visit, usually around two weeks, and then again at two, four and six months."

Although any pregnant woman can get postpartum depression, some women are at a higher risk than others.

"What is so surprising about it for women and their families is that in lots of instances it is just totally unexpected," Puryear said. "If you have had any history of mental health issues, any previous episode of depression at any time in your life, if you have any stressors in your life, a difficult support system or come from a lower socioeconomic status, you are at a higher risk."

Knowing your risk of postpartum depression and creating a plan for support after the birth of your child can help pregnant women and new mothers reduce its likelihood, Puryear explained.

"Our culture is so transient, so a lot of moms I see in Houston have no family here at all. They are isolated and I think that increases the risk for postpartum problems," Puryear said. "Who is going to help and who is going to bring meals? Who is going to do laundry? Who will help with the other kids? It is called a postpartum plan."

Just as expectant mothers should develop a birth plan that details who they want in the delivery room and whether or not they want an epidural, they should also devise a blueprint for postpartum depression—whether it hits during pregnancy or after.

"As soon as you leave the hospital and they put a baby in your arms and you go home, there is not a lot of support or help or reaching out going on unless you've set something up ahead of time," Puryear said. ■

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# That Puzzling 7 Percent

*A portion of astronaut Scott Kelly's gene expression has not returned to normal*

BY ALEXANDRA BECKER

Two years after returning from his record-breaking year on the International Space Station, parts of Scott Kelly's DNA remain altered. The revelation, which came from NASA in March, prompted Scott's twin, Mark, also a retired astronaut, to tweet: "I used to have an identical twin brother. Then this happened...."

The research surrounding Scott Kelly's DNA is part of NASA's ongoing Twins Study, which analyzes Scott's genome, as well as other molecular profiles, against his twin brother and also against Scott himself, pre-flight. This multi-omic approach—which compares data sets related to the numerous layers that contribute to DNA function and includes genomics, epigenomics, and several other "omic" disciplines—will allow scientists to understand the genetic and health-related effects of space travel as they work to answer a question critical for a mission to Mars: What happens to the human body in space?

"Understanding how zero gravity and radiation exposure affect the multi-omic signature of the human body is critical because it tells us about both life on Earth and in space," said Brendan Lee, M.D., Ph.D., chair of the department of molecular and human genetics at Baylor College of Medicine. "If we are to go to Mars, these issues will be very important, because when you get to Mars, there's not going to be a Texas Medical Center to take care of you. At the same time, I think by understanding how the body responds to a completely different environment, we will learn about whether there are applications on Earth that may benefit from those observations."

NASA's press release about Scott Kelly's DNA revealed that 7 percent of his gene expression



Twin brothers and former NASA astronauts Mark (left) and Scott Kelly, are part of NASA's ongoing Twins Study.

“I think it's sometimes difficult to convey the concept that there are actually two genomes; that there's the part of the genome that's made up of our DNA, and then the part of what we call the epigenome, which is the programming, the software that makes the genome work.”

— CHERYL WALKER, PH.D.

Director of the Center for Precision Environmental Health at Baylor College of Medicine

still has not returned to normal since he landed back on Earth. This finding might point to long-term modifications in genes related to his immune system, DNA repair, bone formation networks, hypoxia (lack of oxygen within tissues) and hypercapnia, which is a condition associated with too much carbon dioxide in the bloodstream.

NASA stressed that these

variances are associated with gene expression and do not indicate an alteration of the genetic code itself. Changes in the actual DNA code, known as genetic mutations, do occur, and can contribute to harmful conditions or diseases, including cancer. But the study of changes in gene expression and of how this may relate to chemical modifications of DNA and of the proteins

that bind DNA—a field called epigenetics—is more complex.

"I think it's sometimes difficult to convey the concept that there are actually two genomes; that there's the part of the genome that's made up of our DNA, and then the part of what we call the epigenome, which is the programming, the software, that makes the genome work," explained Cheryl Walker, Ph.D.,

director of the Center for Precision Environmental Health at Baylor College of Medicine. “When you think about the human body, all the cells and tissues in the body have the exact same DNA, and yet they function completely differently, and that’s because they have different epigenomes. The software that’s programming your liver cell is telling your liver cell to turn on all the liver genes and don’t turn on the brain genes, and the brain is saying turn on the brain genes but forget about the liver genes.”

That same software is also skilled at reacting to external, environmental forces. Scientists are beginning to understand that the epigenome can be modified as a result of exposure to chemicals, toxins, stress or any variation of the cell’s ecosystem, including changes in a person’s nutrition or climate.

“It is one of the interesting things about our biology that we are designed to protect our genome from change—we have so many mechanisms to repair damage to DNA and to make sure that mutations don’t occur—but our epigenome is actually the exact opposite. Our epigenome is designed to respond to our environment,” Walker said.

Lee noted that the epigenome is important because it allows the human body to adapt quickly to a new environment. Whereas changing the DNA code is a matter of slow-moving natural selection over generations, substantial changes in the epigenome can occur in just one generation.

Perhaps, then, it’s not surprising that changes have occurred in Scott Kelly’s epigenome as a result of the environment in space. But, Walker pointed out, based on the information NASA has released thus far, “we don’t know whether those changes in the epigenome are good and are helping the human body adapt to space, or whether they are reflecting an adverse effect of space.”

Baylor, which created the Center for Precision Environmental Health with Walker’s recruitment, is analyzing how Earth’s environment affects the genome and epigenome, as well.

“Precision environmental health is the idea that we’re going to understand the effects of the environment on each individual person by looking very carefully at their genome and epigenome, looking at their environmental exposures, and doing that in a very holistic way using data science and big data—the ‘omics’ approach,” Walker said. “In terms of environmental exposures, this is a really important, active area of study because of the emerging appreciation that the epigenome is a major target for environmental exposures that can influence our health.”

Walker explained that the epigenome’s plasticity carries with it a vulnerability.

“We are beginning to understand that there are periods in our life when our epigenome is especially vulnerable to environmental exposures,” Walker said. “For example, the period of development is a time when all of this epigenetic software is being installed, when you go from two separate cells, from the sperm and the egg, to this complex, multicellular organism, and changes due to an environmental exposure can be carried with an individual for their entire life and can change their risk for disease.”

Researchers are actively working to understand which periods of time may be most vulnerable to environmental exposures, or which environmental exposures may be capable of disrupting the epigenetic programming in a way that could have a permanent effect.

Walker hopes more details from the Twins Study will potentially shed light on these areas. NASA said an integrated summary publication should be released later this year—something the research community anxiously awaits.

“The important aspects will be revealed in the in-depth analysis,” Lee said. “It’s not always *how much* is different or the same, it’s *what* is different or the same. It may be that very important genes haven’t returned to baseline, which could have a critical impact on health. I think the detailed analysis will be very important and exciting.” ■



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[1] Actors Mark McManus and Kathleen Brown brought *The Lion, the Witch, and the Wardrobe* to life in the 14th floor waiting room of **TEXAS CHILDREN'S CANCER AND HEMATOLOGY CENTERS**.

[2] Houston City Hall was lit in green and blue lights April 8 – 10 to support organ, eye and tissue donation and honor Donate Life Month and **LifeGift**, a local nonprofit that helps individuals needing transplants in Southeast, North and West Texas.

[3] **BIJAN NAJAFI, PH.D.**, left, professor of surgery, director of iCAMP and of clinical research in vascular surgery and endovascular therapy at Baylor College of Medicine, was honored in Qatar with the Best Research Project Award from the Qatar Foundation for Education, Science and Community Development, for his diabetic foot research.

[4] **RICHARD A. BOND, PH.D.**, professor of pharmacology at the University of Houston College of Pharmacy, was appointed an honorary fellow of the British Pharmacological Society.

[5] **CATHERINE L. TROISI, PH.D.**, associate professor in the department of management, policy and community health at The University of Texas Health Science Center at Houston (UTHealth) School of Public Health, was awarded the 2018 Academic Public Health Practice Excellence Award by the Association of Schools and Programs of Public Health.

[6] **JAMES "JIM" DIGAN** was named senior vice president for institutional advancement at Baylor College of Medicine.

[7] **XIANG ZHANG, PH.D.**, associate professor and McNair Scholar in the Lester and Sue Smith Breast Center at Baylor College of Medicine, is the 2018 recipient of the Sue Eccles Young Investigator Award from the Metastasis Research Society.

[8] Thousands of Katy and West Houston-area residents participated in the sixth Texas Children's Hospital and Houston Marathon Foundation Family Fun Run at **TEXAS CHILDREN'S HOSPITAL WEST CAMPUS**.



Credit: Nos. 3, 4, 5, 6, 7, 11, 12, 14, 15 courtesy photos; No. 2, Troy Fields; No. 8, Paul Vincent Kuntz, Texas Children's Hospital; No. 10, Phil Steffek; No. 13, Paul Vincent Kuntz, Texas Children's Hospital





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[9] **K. LANCE GOULD, M.D.**, professor of cardiovascular medicine at McGovern Medical School at UTHealth, was awarded the 2018 Distinguished Scientist Award-Translational Domain by The American College of Cardiology.

[10] **BARBARA ELIAS, RN**, the ventricular assist device coordinator for Texas Children's Heart Center at Texas Children's Hospital, was honored with the Daisy Award, which recognizes clinical nurses for their extraordinary work with patients and families.

[11] **LARRY EASTERLING, M.D.**, has joined LifeGift as its associate medical director.

[12] **WESLEY LEE, M.D.**, co-director of Texas Children's Fetal Center and section chief of women's and fetal imaging and the director of fetal imaging research at Baylor College of Medicine, was presented with the Joseph H. Holmes Pioneer Award at the American Institute of Ultrasound in Medicine's 2018 convention.

[13] NBA legend **SHAQUILLE O'NEAL** visited **TEXAS CHILDREN'S CANCER CENTER** on April 9. Later that day he was honored at the annual Evening with a Legend event benefiting Texas Children's.

[14] **WILLIAM F. McKEON**, TMC President and CEO, poses in Washington D.C. with HeartCoR Solutions founder and CEO **LARRY LAWSON**, who received a 2018 Horatio Alger Award, bestowed upon leaders who have succeeded despite facing adversities and who have remained committed to higher education and charitable efforts in their local communities.

[15] Three **RICE UNIVERSITY** students, including **GIGI RILL**, drew inspiration from Spider-Man and built a replica of Peter Parker's bedroom for Willy Week, when each residential college participates in themed activities leading up to Beer Bike, an annual intramural bicycle competition.



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5/25

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**William G. Kaelin, Jr., M.D.**

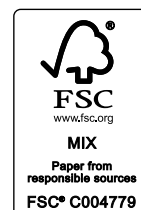
Howard Hughes Medical  
Institute Investigator

Professor of Medicine,  
Dana-Farber Cancer Institute  
and the Brigham and  
Women's Hospital,  
Harvard Medical School

Contact: Amy Craft  
[amy.craft@bcm.edu](mailto:amy.craft@bcm.edu)

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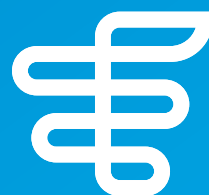




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