



INSIDE

BRAIN CHANGES IN SPACE

6

NASA funds
MUSC
research.

INNOVATIONS IN NEUROSURGERY

8

Patents
ultimately help
patients.

2 Around Campus

5 Meet Lori

12 New Medical
District

THE CATALYST
ONLINE

[http://www.
musc.edu/
catalyst](http://www.musc.edu/catalyst)

Palmetto tree, steel beam mark milestone

Topping out ceremony for new children's hospital features Lowcountry twist

BY HELEN ADAMS

adamshel@musc.edu

"Hoist that beam!"

As carpenter Mekiel Mitchell said those words on stage with MUSC Health CEO Patrick Cawley, M.D., the final steel beam for the MUSC Shawn Jenkins Children's Hospital and Pearl Tourville Women's Pavilion was raised into position atop the 625,000 square-foot structure.

For Mitchell, who volunteered to speak on behalf of Robins and Morton construction workers at the topping out ceremony, it was a kind of homecoming. "This project is very dear to me, because the hospital that once stood here, I was actually born in," he told a crowd of co-workers, MUSC employees and local dignitaries. "I have a special affinity for this particular project."

Topping out ceremonies mark the placement of the last beam on top of a building during its construction. There's often a tree atop the beam, based on an old Scandinavian religious rite. Since this topping out was in Charleston, a palmetto tree rode this beam on its way to the top.

The new hospital is scheduled to open in 2019. Shawn Jenkins, the co-founder and CEO of Benefitfocus who has donated \$25 million to help build the hospital, called it surreal to see the project reach this milestone.

"It was just a year ago, October 19, that the first pile was driven, and now we're putting the top beam on the structure," Jenkins said before the ceremony, still wearing a hard hat from a lunch he shared with the construction workers.

"I come out and visit the job site a lot - every week or every other week. It's just inspiring to be around the 600-something people



photo by Sarah Pack

The blue beam, draped in an American flag and holding a Palmetto tree, rises over Charleston as workers prepare to complete the steel structure underlying the MUSC Shawn Jenkins Children's Hospital and Pearl Tourville Women's Pavilion.

building the building. You feel the energy, the excitement, to see the completion coming soon for such a mind-blowing project to help our women and children."

Later, Cawley, who also serves as vice president of health affairs, described some of the hospital's highlights while standing on a temporary stage in what will become the hospital's lobby.

"It will include an expanded neonatal intensive care unit, enhanced labor and delivery services, an entire floor dedicated to the care of the children with cancer, a world-class atrium, a world-class outdoor healing space and the most comprehensive pediatric heart center in South Carolina," Cawley told the crowd.

The project has already won awards, including the project of the year for the Southeast region from the National

Association for Minority Contractors.

Kylon Jerome Middleton, pastor of Mount Zion A.M.E. Church in Charleston, led the audience in a prayer, saying, "This is a place where anything, everything, can become possible."

New things have already become possible for Mitchell, the carpenter who spoke at the ceremony. "This is my first time in construction. You all have inspired me greatly. You guys have inspired me so much that I began school at Trident Tech for construction. I'm very grateful and proud to be part of this project."

Cawley said none of this would have been possible without the generosity of donors such as the Jenkins, Tourville and Zucker families, all of whom have donated millions toward the project.

AROUND CAMPUS

PEOPLE

Barry C. Gibney



Barry C. Gibney, DO, has joined the Division of Cardiothoracic Surgery. Gibney is an assistant professor of surgery and completed his general surgery training at Penn State Hershey and

thoracic surgery training at Brigham and Women's Hospital Harvard Medical School. His medical specialty is lung and esophageal cancer and minimally invasive thoracic surgery.

Jerry Mansfield



Jerry Mansfield, Ph.D., RN, MUSC Health executive chief nursing officer, has been elected to the board of directors of the Friends of the National Institute of Nursing

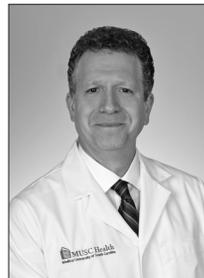
Research. Mansfield will serve a two-year term beginning Jan. 1. Mansfield joined MUSC in August 2016 where he was CNO at The Ohio State University Wexner Medical Center. The NINR's focus is improving the health and health care of Americans through the funding of nursing research and training.



photo by Anne Thompson

Present at the Oct. 12 MUSC Macaulay Museum of Dental History rededication were Susan Hoffius, curator; Drs. Staci N. Gaffos, SC Dental Association; W. Lynn Campbell, SCDA; the Hon. Alexander Macaulay, son of Dr. Neill Macaulay; Drs. Patricia Blanton, CDM former interim dean, and Theresa Gonzales, president of MUSC's Waring Library Society.

Mario Serafini



Mario Serafini, M.D., associate professor, joined the staff of the Department of Anesthesia and Perioperative Medicine in October. Originally from West

Virginia, Serafini's focus is on chronic pain management and cancer pain. He recently completed a fellowship in palliative care medicine.

Bruce Usher



Bruce Usher, M.D., professor in the Division of Cardiology, has recently been awarded a Mastership in the American College of Physicians. Usher joins a select few

bestowed with the ACP's Masters designation. Masters are selected on account of integrity, positions of honor, eminence in practice or in medical research.

EVENTS

Holiday Festival of Lights

The Holiday Festival of Lights begins on Nov. 10 and is open every evening through Jan. 1 at James Island County Park. Visit Santa's Village & Winter Wonderland. It's so much more than just a driving tour. Park your car and visit Santa, explore the sand sculptures, roast marshmallows, ride the festival train, plus other activities. Sunday through Thursday: 5:30 to 10 p.m., Friday and Saturday: 5:30 to 11 p.m., 1 to 15 guests: \$20 per vehicle, \$15 per vehicle Monday through Thursday with a canned food donation to benefit the Lowcountry Food Bank.

Women Scholars Initiative

The 4th Women Scholars Initiative (WSI) mentoring session for postdocs and staff scientists will feature MUSC's Bernadette P. Marriott, Ph.D., Tuesday, Nov. 21, from 4 to 5 p.m., Drug Discovery Building, room 312. Marriott will provide insight as a basic scientist within a medical university setting who has successfully cultivated a career in research and public policy. Space is limited so RSVP to adiseti@muscd.edu. Drinks and snacks will be provided.

Charles Towne Landing

Volunteers are needed at the Charles Towne Landing State Historic Site. Learn to fire cannons, preserve the historic gardens, etc. Meet 10 a.m., at the Visitor Center, first Saturday of every month to complete a volunteer orientation.

THE CATALYST

Editorial Office

MUSC Office of Public Affairs & Media Relations, 135 Cannon Street, Suite 403C, Charleston, SC 29425.

843-792-4107

Fax: 843-792-6723

Editor: Cindy Abole
catalyst@muscd.edu

The Catalyst is published bi-monthly. Paid advertisements, which do not represent an endorsement by MUSC or the State of South Carolina, are handled by Island Publications Inc., Moultrie News, 134 Columbus St., Charleston, S.C., 843-958-7480 or 843-937-7489. E-mail: advertising@moultrienews.com.



Veterans Day Celebration

1:00 - 2:30 p.m. | Nov. 9, 2017 | Basic Science Auditorium

Dr. David Cole, Dr. Pat Cavley, and the Veterans Day Committee invite all MUSC employees, students, faculty and staff to its annual Veterans Day Celebration

GUEST SPEAKER
James E. Guest, USA/USN
CSM 3rd Brigade SC State Guard

MUSC Public Safety Color Guard

Video in Celebration of MUSC Veterans | Presentation of Lapel Pins to All Veterans

Role of nurse practitioners in health care celebrated Nov. 12-18

BY PAULA BROOKS, DNP

brookspa@musc.edu

National Nurse Practitioner Week will be celebrated this year Nov. 12 through 18. This special week offers a meaningful way to acknowledge and pay tribute to advanced practice registered nurses (APRN) and the important contributions they make to the health of millions of Americans. It also provides numerous opportunities to bring awareness to the NP role and the exceptional care that NPs provide.

MUSC values the expertise that APRNs bring to bear, and this celebration affords us a great opportunity to recognize them and say thank you.

ABOUT NURSE PRACTITIONERS

An NP is an advanced practice registered nurse who has completed graduate level education, such as a master's or doctoral degree. All NPs in South Carolina have been licensed by the South Carolina Board of Nursing, having completed the additional education and training. NPs have an expanded scope of practice over the traditional registered nurse role. An APRN can be a certified registered nurse anesthetist (CRNA), certified nurse midwife (CNM), a clinical nurse specialist (CNS) or a nurse practitioner (NP).

The first nurse practitioner training program was developed in 1965 by Loretta Ford and Henry Silver, a nurse and a physician, respectively. Due to a shortage of physicians, state governments sought innovative ways to meet the growing demand for primary health care services. Because the physician shortage made it difficult to meet this demand, nurses began to take on the responsibility of providing primary care. Nursing leaders believed that nurses were qualified to expand their roles and meet the need. Out of that demand, the nurse practitioner profession grew to fill an important and vital role in America's health care system.

NPs specialize in many areas, including acute care, gerontology, pediatric child health, adult health, neonatal health, psychiatric mental health, family health,

oncology, women's health and emergency services. Working hand in hand with other licensed health care professionals, NPs improve the responsiveness and efficiency of our health care system.

In the United States, the NP workforce increased by more than 75 percent from 2000 to 2011, and presently, there are approximately 234,000 NPs, with an additional 23,000 NP students graduating each year. More than 1.02 billion visits are made to NPs annually. The growth rate in the profession has also been observed in the state. According to the most recent data (May, 2016) from the United States Bureau of Labor Statistics, there were 1,920 nurse practitioners employed in the state of South Carolina.

At MUSC, the role of the advanced practitioner is also growing. Currently, there are approximately 187 NPs in a variety of APRN roles (NPs, CNM and CNS). In addition, there are 103 CRNAs.

Events held in communities around



Brooks

the country during NP week will help to acquaint local citizens with the role of NPs as providers of high-quality, cost-effective, personalized health care. It will also highlight the value of choosing an NP as your partner in health. NP practice offers a unique combination of nursing and health care treatment. Focusing not only on diagnosing and managing acute and chronic illnesses like diabetes and high blood pressure, NPs integrate health promotion, disease prevention, counseling and patient education to help patients understand their complete health picture.

Here at MUSC, we believe in our NPs and are proud of the hard work they do every day. In celebration of National Nurse Practitioner week, we are proud to recognize our NPs and again will be distributing gold ribbons for them to wear as recognition of their achievements. Inspired by similar efforts conducted by other NP organizations, the campaign has proven extremely popular and was adopted by MUSC in 2016.

Beginning Tuesday, Nov. 7, NPs can pick up a gold ribbon and wear them proudly during NP week. They are available either the director of APRNs office, located at 245A North Tower Main Hospital, or in Kristy Smith's office, located in office 1449, 1st floor

of ART. Please pass out ribbons to your fellow NPs to promote MUSC NP and National Nurse Practitioner Week and to give others an opportunity to ask what the gold ribbon means.

In addition to the gold ribbons, to celebrate National NP Week this year, there will be tables with information about NP practice in both the main hospital and lobby of ART, in collaboration with the APP Best Practice Center, APP Council and MUSC College of Nursing.

To learn more about NP Week and NP profession, visit aanp.org. To locate an NP in your community, go to npfinder.com.

Additional facts about NPs:

- ❑ 22 states and the District of Columbia have granted full practice authority to NPs, giving patients more direct access to the primary, acute and specialty care services that NPs provide.
- ❑ The federal government, through the Department of Veterans Affairs, has approved the full scope of practice to NPs nationwide.
- ❑ NPs provide a full range of services, such as ordering, performing and interpreting diagnostic tests; diagnosing and treating acute and chronic conditions; prescribing medications and treatments; and managing overall patient care.
- ❑ NPs can prescribe medication and other treatments in all 50 states and the District of Columbia.
- ❑ Patients whose primary care providers are NPs have fewer emergency room visits and shorter hospital stays, resulting in lower out-of-pocket costs.
- ❑ Two out of three patients support legislation for greater access to NP services.
- ❑ NPs emphasize the health and well-being of the whole person in their approach, including helping patients make educated health care decisions and healthy lifestyle choices.

Nurse Practitioners:
234,000
solutions to strengthening health care for America

Nurse Practitioners (NPs) are leading the charge, providing quality health care to millions of Americans. In fact, an overwhelming 64 percent of patients have seen an NP for their health care needs.

ADVANCED DEGREES
NATIONAL BOARD CERTIFICATION

PRIMARY ACUTE & SPECIALTY CARE PROVIDERS

ORDER, PERFORM & INTERPRET DIAGNOSTIC TESTS

PRESCRIBE MEDICATIONS & OTHER TREATMENTS

AANP American Association of NURSE PRACTITIONERS™

NPs: Patient-centered, accessible, high-quality health care
To locate an NP in your area, visit NPfinder.com
aanp.org

MUSC, SCSU team up to tackle health disparities

BY HELEN ADAMS

adamshel@musc.edu

Marvella Ford missed out on a fundamental part of childhood: having grandparents to spoil and take care of her. They all died before she was born. “That’s a tremendous loss that you can never overcome. I grew up not having met or seen pictures of any of my grandparents,” she said.

She couldn’t even find out how they died. “I was told that no one knew their causes of death. This lack of information about something so important made me decide to enter the field of health disparities research to try to better understand the reasons behind the racial and ethnic health disparities in this country.”

Ford is now leading the effort to establish the South Carolina Cancer Disparities Research Center, designed to do exactly that. It’s funded by a \$12.5 million grant from the National Cancer Institute. Half of the money goes to the MUSC Hollings Cancer Center and the other half to South Carolina State University.

Ford is the glue that brings the two universities together in her roles as a professor in the MUSC College of Medicine’s Department of Public Health Sciences, a senior leader at the MUSC Hollings Cancer Center and the SmartState endowed chair in prostate cancer disparities at SCSU. She’s leading the project with Judith Salley-Guydon, chairwoman of the Department of Biological and Physical Sciences at SCSU.

When it comes to cancer, “our state has glaring cancer disparities geographically, socioeconomically, and in terms of race,” Ford said. “With prostate cancer, the death rate is three times higher for black men than it is for white men. The story is the same for women in South Carolina with breast cancer. The mortality rate is much higher for black women than for white women.”

The South Carolina Cancer Disparities Research Center, also known as SC CADRE, will be guided by the belief that race and circumstances should not keep people from enjoying as long and healthy a life as possible. SC CADRE’s goals include increasing SCSU’s ability to do cancer research, conducting cutting-edge cancer disparities research, inspiring a new generation of researchers to focus on cancer disparities and getting the general public more involved in cancer research.

LAYING THE GROUNDWORK

“This grant will help us build tremendous infrastructure. The first piece is we’re developing a new biostatistics and quantitative methods shared resource at SCSU,” Ford said.

“Shared resource” is a common term in research. In this case, it means a group of people who are experts in statistics and research methods who can help cancer researchers with data and computation. MUSC already



Dr. Marvella Ford speaks with legislative aides about the need for health disparities research.

photo by Sarah Pack

has multiple shared resources at the Hollings Cancer Center, but SCSU hasn’t had one – until now.

“This is specific to cancer research center grants,” Ford said. Having the shared resource will give SCSU a much better shot at getting the federal government and other funding sources to pay for its cancer research. That, she said, benefits both SCSU and MUSC. “It really allows MUSC investigators to partner with SCSU faculty, because they have access to funding resources we don’t have, and vice versa, so multidirectional partnering can take place.”

INCREASING FOCUS ON THE HEALTH OF BLACK SOUTH CAROLINIANS

The researchers will need good material to work with, and the grant is designed to give them that. “We’re establishing a new biorepository at South Carolina State and a clinical trials office in the Regional Medical Center in Orangeburg, where 62 percent of the patients are African-American,” Ford said.

Tissue samples taken from patients in the Regional Medical Center’s Mabry Center for Cancer Care will be taken to SCSU, cataloged and made available to scientists. “We anticipate this new biorepository is going to be one of the most racially and ethnically diverse biorepositories in the country,” Ford said. “It should be in very high demand by other researchers and private industries.”

One of the SC CADRE biorepository’s most important roles will be helping researchers identify differences in the biological pathways involved in diseases such as triple negative breast cancer, which has a poorer prognosis than hormone-receptor positive breast

cancer. “We know that triple negative breast cancer is more prevalent in African-American women, but we need to understand more about why,” Ford said.

SC CADRE will also help researchers study nuances within the black community, including the health of the Gullah living on the Sea Islands of South Carolina. “We’ve done some very preliminary work with 90 breast cancer survivors in South Carolina. Our work shows that the prevalence of triple negative breast cancer seems to be lower in Sea Islanders than in blacks without Sea Island ancestry. We’re looking at biological contributors to breast cancer outcomes. That’s the kind of study we’ll be able to do.”

Finding the answers to such questions may benefit people statewide, Ford said. “This is a cancer disparities grant, but sometimes we forget disparities refer not only to racial and ethnic disparities but also to geographic and socioeconomic disparities. Our studies will include multiple racial and ethnic groups with different levels of education and income. We really want to improve cancer outcomes for everyone in South Carolina.”

LOWERING AGE LEVELS

A third piece of the SC CADRE grant focuses on lowering the levels of AGEs, or advanced glycation end products, in prostate cancer survivors. A big part of that may involve changing their diets, shifting away from cooked meat to more fruits and vegetables. Researchers will also look at whether exercise and medications can lower AGE levels and improve people’s health.

“There is a big difference in levels of AGEs between blacks and whites,” Ford said. “Blacks actually have

See **CANCER** on page 11

MEET LORI



Lori Tisdale, RN

Department; How long at MUSC
Nursing Professional Development; 8 years

How are you changing what's possible at MUSC

I love being one of the first people to meet our new hires and explaining to them why MUSC needs their fresh eyes, enthusiasm and varied experiences to continue to improve our patient outcomes.

Family and pets

Husband, Charlie (17 years); daughter, Bella; and two Labrador retriever mixes, Nala and Hershey

Branch of the military you served

U.S. Air Force — six years active duty

Who is your military hero and why

I have more than one: my brother (active duty Air Force), my sister-in-law (Air Force Reserves), my brother-in-law (retired U.S. Navy), my grandfather (retired Air Force), another grandfather (Navy veteran), and my great uncle (who went MIA during WW II). They've all served our country during war, with deployments, while raising families.

Please join us...
**Angel Tree
 Kick Off &
 Holiday Tree
 Lighting Ceremony**
 November 8th at 5:30PM
 MUSC Horseshoe
 Salvation Army
 Coastal Belle Singers
 Dr. David Cole & Dr. Patrick Cawley
 Complimentary
 Cookies & Hot Chocolate

Mobile On-site Mammography



LOOKING FOR A CONVENIENT WAY TO
 GET YOUR MAMMOGRAM?

The Hollings Cancer Center Mobile Health Unit is coming to

Parkshore Center

November 07, 2017

from 8:45am – 2:45pm

APPOINTMENTS ARE REQUIRED

To schedule an appointment, please call Outreach Services
 at (843) 792-0878



Study unveils changes in the brain during extended missions in space

NASA funds neuroradiologist, team in groundbreaking science studying the brain

BY CINDY ABOLE

aboleca@musc.edu

It's been 55 years since NASA astronaut John Glenn successfully launched into space to complete three orbits aboard the Friendship 7 Mercury spacecraft, becoming the first American to orbit the Earth. The evolution of spaceflight, advancements in science and technologies and the progress of public-private commercial partnerships with companies such as Space X and Blue Horizons have strengthened NASA's goals and the public's confidence to move forward in discovery and human exploration.

More people today are poised to explore space than ever before; those who do will experience the effects of microgravity on the human body. Recognizing the need for data related to those effects, MUSC neuroradiologist Donna Roberts, M.D., conducted a study titled "Effects of Spaceflight on Astronaut Brain Structure as Indicated on MRI," the results of which were featured in the Nov. 2 issue of the *New England Journal of Medicine*.

"Exposure to the space environment has permanent effects on humans that we simply do not understand. What astronauts experience in space must be mitigated to produce safer space travel for the public," said Roberts.

While living and working in space can be exciting, space is a hostile environment and presents many physiological and psychological challenges for the men and women of America's space program. For example, NASA astronauts have experienced altered vision and increased pressure inside their heads during spaceflight aboard the International Space Station. These conditions can be serious problems for astronauts, particularly if they occur in low-earth orbit aboard the International Space Station or far from Earth, such as on an exploration mission to Mars.

To describe these symptoms, NASA coined the term visual impairment intracranial pressure syndrome, or VIIP syndrome for short. The cause of VIIP syndrome is thought to be related to the redistribution of body fluid toward the head during long-term microgravity exposure; however, the exact cause is unknown. Given safety concerns and the potential impact to human exploration goals, NASA has made determining the cause of VIIP syndrome and how to resolve its effects a top priority.

Roberts is an associate professor of radiology in the Department of Radiology and Radiological Sciences at MUSC. Before attending medical school at MUSC, she worked at NASA Headquarters in Washington, D.C. Working with NASA's Space Life Sciences Division in the early 1990s, she was already aware of the challenges astronauts faced during long-duration spaceflights. She was concerned about the lack of data describing the adaptation of the human brain to microgravity and proposed to NASA that magnetic resonance imaging (MRI) be used to investigate the anatomy of the brain following spaceflight.

Roberts suspected subtle anatomical changes in the brains of astronauts during spaceflight might be contributing to the development of VIIP syndrome, based on her earlier work. From 2001 to 2004, Roberts led a three-year NASA-funded bed-rest study, collaborating with other life sciences researchers at the University of Texas Medical Branch in Galveston. A South Carolina native, Roberts had just completed a two-year neuroradiology fellowship at the University of California, San Francisco.

For this study, she examined the brains and muscular responses of participants who stayed in bed for 90 days, during which time, they were required to keep their heads continuously tilted in a downward position to simulate the effects of microgravity.

Using functional MRI, Roberts



photo by Sarah Pack

Dr. Donna Roberts, third from left, joins her MUSC research team: Dr. Marc Chimowitz, left to right, Davud Asemanni, Dr. Michael Antonucci, Dr. Maria Vittoria Spampinato, Dr. Arindam Rano Chatterjee, Corie Lynn and Judith Yost. Not pictured: Elizabeth O' Quinn.

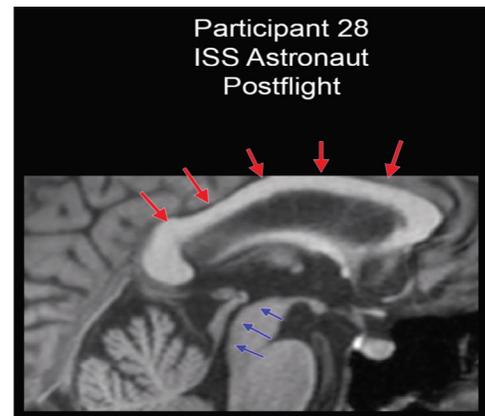
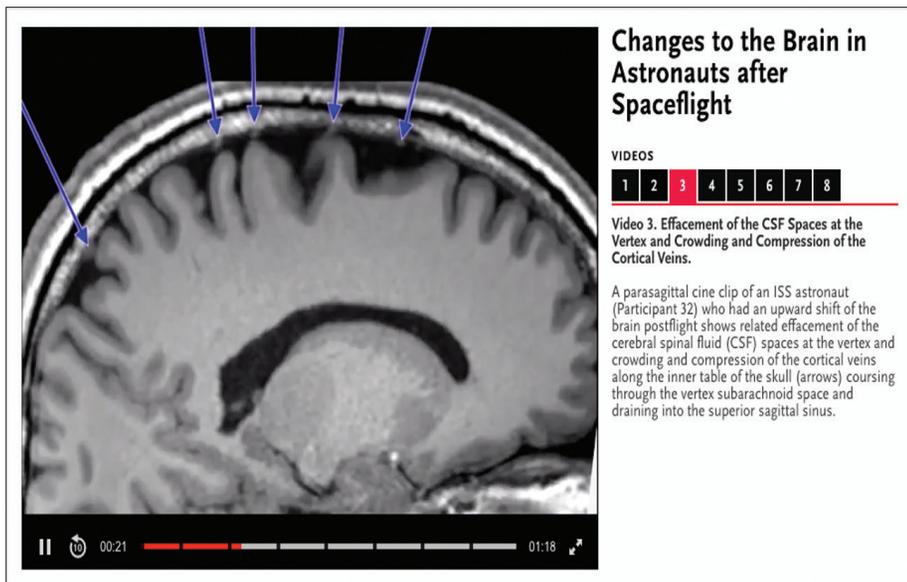
evaluated brain neuroplasticity, studying the brain's motor cortex before, during and after long-term bed rest. Results confirmed neuroplasticity in the brain occurred during bed rest, which correlated with functional outcomes of the subjects.

As Roberts evaluated the brain scans, she saw something unusual. She noted a "crowding" occurrence at the vertex, or top of the brain, with narrowing of the gyri and sulci, the bumps and depressions in the brain that give it its folded appearance. This crowding was worse for participants who were on longer bed rest in the study.

Roberts also saw evidence of brain shifting and a narrowing of the space between the top of the brain and the inner table of the skull. She questioned if the same thing might be happening to the astronauts during spaceflight.

In further studies, Roberts acquired brain MRI scans and related data from NASA's Lifetime Surveillance of Astronaut Health program for two groups of astronauts: 18 astronauts who had been in space for short periods of time aboard the space shuttle and 16 astronauts who had been in space for longer periods of time, typically three

See **BRAIN** on page 7



images provided

Cine clip stills show a crowding of the cortical veins and upward shift of the brain postflight in astronauts from the International Space Station.

BRAIN *Continued from Page Six*

months, aboard the International Space Station. Roberts and her team then compared the brain images of the two groups of astronauts.

Roberts and study investigators evaluated the cerebrospinal fluid (CSF) spaces at the top of the brain and CSF-filled structures, called ventricles, located at the center of the brain. In addition, the team paired the preflight and postflight MRI cine clips from high-resolution 3-D imaging of 12 astronauts from long-duration flights and six astronauts from short-duration flights and looked for any displacement in brain structure.

Study results confirmed a narrowing of the brain's central sulcus, a groove in the cortex near the top of the brain that separates the parietal and frontal lobes, in 94 percent of the astronauts who participated in long-duration flights and 18.8 percent of the astronauts on short-duration flights. Cine clips also showed an upward shift of the brain and narrowing of the CSF spaces at the top of the brain among the long-duration flight astronauts but not in the short-duration flight astronauts.

Her findings concluded that significant changes in brain structure occur during long-duration space flight. More importantly, the parts of the brain that are most affected — the frontal and parietal lobes — control movement of the body and higher executive function. The longer an astronaut stayed in space, the worse the symptoms of VIIP syndrome

would be.

Roberts compared these findings with a similar medical syndrome experienced by women called idiopathic intracranial hypertension (IIH), which affects young, overweight women who present with symptoms similar to VIIP syndrome: blurry vision and high intracranial pressure with no known cause. A common treatment for IIH is to perform a lumbar puncture, whereby CSF is drained using a needle placed in the lower back — a procedure performed by a neuroradiologist such as Roberts. Presently, there is no protocol to perform a lumbar puncture in a microgravity environment.

To further understand the results of the study, Roberts and the team plan to compare repeated postflight imaging of the brains of astronauts to determine if the changes are permanent or if they will return to baseline following some time back on Earth. With NASA's Mars expedition mission set to launch in 2033, there's an urgency for researchers such as Roberts to collect more data about astronauts and understand the basics of human space physiology.

A journey to Mars can take three to six months, at least. In order to reduce travel time between the Earth and Mars, the two planets need to be aligned favorably, which occurs approximately every two years.

During this two-year time period, crew members would remain on Mars, carrying out exploration activities. The gravity on Mars is approximately one-third that of Earth. Considering

do to the human body? Could a human even survive that long in a reduced-gravity environment?

NASA astronaut Scott Kelly spent 340 days living and working aboard the International Space Station, and astronaut Peggy Whitson recently completed a 288-day mission in space. To date, the longest continuous time in space was 438 days, a record held by Russian cosmonaut Valery Polyakov.

"We know these long-duration flights take a big toll on the astronauts and cosmonauts; however, we don't know if the adverse effects on the body continue to progress or if they stabilize after some time in space," Roberts said. "These are the questions that we are interested in addressing, especially what happens to the human brain and brain function?"

Study co-author and Department of Radiology and Radiological Science colleague Michael Antonucci, M.D., agreed. "This study is exciting in many ways, particularly as it lies at the intersection of two fascinating frontiers of human exploration — space and the brain."

"We have known for years that microgravity affects the body in numerous ways," he continued.

"However, this study represents the most comprehensive assessment of the impact of prolonged space travel on the brain. The changes we have seen may explain unusual symptoms experienced by returning space station astronauts and help identify key issues in the planning of longer-duration space exploration,

"The changes we have seen may explain unusual symptoms experienced by returning space station astronauts and help identify key issues in the planning of longer-duration space exploration, including missions to Mars."

Michael Antonucci, M.D.

travel to and from Mars, along with the time spent on the surface, the Martian expedition crew would be exposed to reduced gravity for at least three years, according to Roberts. What would that

See **BRAIN** on page 11

Neurosurgeon proves necessity is the mother of invention

BY MIKIE HAYES

hayesmi@musc.edu

Kitty Hawk had the Wright brothers. Apple had Steve Jobs.

MUSC has Bruce Frankel.

Neurosurgeon, researcher, blacksmith, speaker, inventor. A Renaissance man with a keen power of observation and a lightning quick wit that could have just as easily landed him on late-night TV, his domain is the operating room — where not only does he use his skill to serve patients, he channels his boundless mental energy into innovation.

Whether he is placing screws in a spine, forging 160 layers of steel into a Bowie knife or creating a way to see beneath a tumor, his brand of curiosity doesn't end with simply wondering how something might work better. He, like many inventors, is compelled to fix problems by creating unique solutions.

And he has 12 patents and 10 licenses to show for it.

Since the fifth grade, Frankel has been figuring out better ways. When he runs into a problem, his mind immediately goes into high gear.

"I get the idea to try something a different way, usually because there's an unmet need. So I'm always asking myself, 'Why are you doing it that way?' 'Can this be done better?'"

Approaching things differently started early for Frankel. As a boy of about 10, he decided to make his own skateboard. From scratch. He cut the platform out of wood, stained it, got the individual parts and put it together. "I guess it was I was in the fifth grade," he recalled, "when I went through a major bicycle- and skateboard-making phase.

"Frankly," he laughed, "they weren't very good. But I liked seeing how they held up under certain conditions. If I could skate around and the board didn't crack in half, I was like, 'Wow, I made something robust enough that it could withstand so and so,' and I enjoyed being able to fix it when it broke."

Plus, he learned he could bring a project to fruition.

"There was something, and there still is, about making something myself. I'm a blacksmith now. I like making things myself and seeing how far I can push it. There's just something very intriguing about it."

Not surprisingly, that driving curiosity made its way into his work.

His first medical invention was a cement tap. When he was a young surgeon, he had a patient in Memphis with a fracture in a bone that was very osteoarthritic. He realized the screws he was going to insert into it weren't going to stay put.

"This is terrible,' I thought to myself. 'She's going to get up, and the screws are going to rip out of her back.' I would take a needle and inject the cement in the bone, but the bone was like Swiss cheese — it would squirt backward along the needle and out another hole. So I thought, 'Why don't I make a disposable tap that would prevent backflow of cement that could be followed by screw placement?'"

There was, in fact, a whole body of knowledge on how to cement them, but none of it worked very well, so he set out to remedy that. And he came up with an idea that allowed him and other surgeons to better cement them, giving patients a more robust and satisfying quality of life. This concept skirted other existing patents and regulatory hurdles, had a number of patents issued and is still commercially available for use today.

It's not just how something can be done better that he grapples with but also how to improve on something that's inferior or possibly even dangerous.

Such was the case when he devised a way to use a hand-held ultrasound-containing instrument to see within and around a tumor.

"I was doing surgery and couldn't see blood vessels behind the tumor no matter what I used, and that posed serious risks. So I thought, 'I have to find a better way of doing this.'"

Thinking outside the box paid off. He improved on an existing technology, taking it to a new and innovative place.



photo by Sarah Pack

Dr. Bruce Frankel displays two of the patented surgical devices he invented: the Everest Fenestrated Tap and the UST-5311.

"I didn't invent ultrasound," he explained, "but I made a device that is an instrument that has ultrasound built into it so that I could use it as a probe, a curette or a scraper, but also so I could look at what I was doing simultaneously

with that instrument and almost see into the future. I could tell where important blood vessels are before I saw them by eye."

See **INVENTOR** on page 9

INVENTOR *Continued from Page Eight*

The device was unique enough that it is used in a number of different surgical applications. For that invention, he received two patents, with others still pending.

Not long after, he recognized there was still a need for a safer way to locate pilot holes in bone prior to performing a pedicle screw implantation — a type of bone screw that is implanted. He crafted a small ultrasound device with a probe attached to the tip that could be used to detect even the smallest bone breaches prior to the screw being inserted with the potential to greatly decrease the risk of injuring spinal nerves traveling millimeters away.

Interestingly, what is most exciting for him is not just how many other surgeons are using his invention, but how they are taking it to the next level — beyond what Frankel had originally imagined.

“The ultrasound-based instrument — it’s a very versatile thing. The pedicle screw system is only used in spine. But I also use this ultrasound tool for pituitary surgery, as do other surgeons. They use it at quite a few famous institutions around the country. Many places are seeing the value in it and making it safer for patients. Now, people are developing operations for patients with cancer to more safely resect metastases that are growing in the spine. So people are developing new operations around it and building on it. It’s nice. I’m really thrilled by the versatility of that particular device and how you use it with different instruments you attach it to.”

Building on his invention. For him,

that’s important validation.

“I’m very mindful of the fact that if I come up with an idea, I understand that I may see the utility, but when you see the market accept them, and you see other surgeons accept them, there’s a pride. It’s thrilling to see that you really were onto something.”

That possibility keeps his wheels turning, always asking, “What if?” Still, he doesn’t see how that makes him particularly unique.

People have been asking that question for a very long time, he said.

“You look back in history at the surgeon-inventor type; there have always been users and inventors,” he explained, pointing to London surgeon John Bradmore, who saved the day in the early 1400s when Henry V was shot in the head with an arrow, the tip of which lodged itself six inches into his face.

Surgeons at that time would break the shaft of the arrow off wherever it was, so it didn’t show. If the person survived, the surgeon then would try to pull it out.

“Accounts of the surgeon who devised the technique to be able to get the arrow out of the skull of the future king of England shows that people have been doing this forever. It’s just part of being a human. You’re working with instruments and creating things that didn’t exist — and seeing that you’re no different than any other human being. Whether it was 500 years ago or 2,000 years ago, you’re just doing what a human does.”

And earlier this year, his did it again. Frankel received notice that the FDA had approved another device he invented, a curved titanium rod he invented for use in minimally invasive



Dr. Bruce Frankel is co-director of the MUSC Spine Center.

lumbar spinal fusion surgeries where degenerative spinal conditions, fractures, dislocations or tumors are present. According to Frankel, who worked with MUSC’s Zucker Institute for Applied Neurosciences to develop this device, it’s a huge improvement over the standard rod that surgeons typically use in these

surgeries.

Frankel noticed during his surgical procedures, when he would tighten the construct down, the curvature of the rod would cause the top part of the tall screws he was inserting to touch or overlap. When the screws are not placed properly, it puts stress on the components. After the procedure, that could lead to loosening or other complications. But because of the device’s wave shape, several concave dips in the rod allow screws to stay put and not touch when tightened.

He has also worked with ZIAN on several other devices, like an expandable cage, which is used to reconstruct vertebral bodies in complex spinal surgery. This device has been issued two patents and is being actively licensed to industry.

While revolutionary inventions such as these might conjure up images of state-of-the-art equipment lining the walls of an engineering lab, in reality, Frankel’s process is quite a bit less intimidating. At night and on weekends, he can be

See INVENTOR on page 11

Nature's medicine: Part of process for greening MUSC

In 2012, the MUSC Annual Report, titled "The Greening of MUSC," described the recent trend at MUSC, which focused on sustainability, green spaces and environmental conservation. Stories highlighted people and projects dedicated to making MUSC a healthier place to work and included the MUSC Arboretum, Porcher Medicinal Garden, MUSC Urban Farm and MUSC Sustainability, to name a few. A year later, in tribute to then-MUSC President Ray Greenberg, the Greenberg Greenway was dedicated, showcasing a series of greenscapes that connect people with places that support the environment and ecology of our campus, provide opportunities for hands-on learning and create an inviting space for exercise and

other health-promoting activities.

Fast forward to November 2017, and as we prepare to celebrate the first phase of the Charleston Medical District Greenway, it is evident that greening MUSC is an institutional priority that is having an impact far beyond the boundaries of our campus. Imagine MUSC 2020's goal of Building Healthy Communities demonstrates our commitment to creating a culture of well-being on and off our campus, which focuses on policies, systems and an environment that makes healthy living accessible for all.

The process of greening MUSC has created not only a more visually appealing campus, but it also provides an extension to the healing work that

happens within our walls. Ecotherapy is a term that describes healing through interaction with nature. Research has found that patients in hospitals with a view of nature, a living plant in their rooms or interaction with hospital gardens, heal faster. One study reports that 95 percent of people who walk through hospital gardens report a therapeutic benefit from simply being in them. Contact with nature not only speeds patient healing, it also helps family members and hospital staff more effectively deal with the stress of providing care. And that enables them to serve their recovering loved ones and patients better.

Benefits of a green campus extend beyond patients and visitors. Employees and students are no different than the average American, which means we are all suffering from nature-deficit disorder, spending an estimated 93 percent of our time either indoors or in an enclosed vehicle. Negative effects can include diminished use of the senses, attention difficulties, higher rates of physical and emotional illnesses, a rising rate of myopia, child and adult obesity, vitamin D deficiency and many others. The good news is that just five minutes of activity in natural areas resulted in improvements in self-esteem and mood, as well as increased focus and creativity. Health care workers and students often work long hours and late shifts; getting outdoors can improve circadian rhythms and provide a much-needed energy

MUSC Health & Well-Being

By Susan L. Johnson, Ph.D., MUSC Office of Health Promotion



boost.

Spending time in nature also:

- Boosts the immune system
- Lowers blood pressure
- Reduces stress
- Improves mood
- Increases ability to focus, even in children with ADHD
- Accelerates recovery from surgery or illness
- Increases energy levels
- Improves sleep

No matter why nature influences our well-being, the research shows that spending time in nature impacts our health in a positive manner. So take advantage of the wonderful green spaces, and think about taking your next lunch break at the Urban Farm or Medical District Greenway or by simply strolling through the arboretum that is the MUSC campus. And don't forget to come out and celebrate the Medical District Greenway on Nov. 20 at 11 a.m.

For more information on greening at MUSC, visit www.musc.edu/ohp or email Susan Johnson, Ph.D., at johnsusa@musc.edu.



Save the date

Going green through 2019 *It's only the beginning...*

Please plan to join the City of Charleston, MUSC, Roper Hospital, and the Ralph H. Johnson VA Medical Center to celebrate a kickoff event for the Charleston Medical District Greenway – Phase 1. More details to follow soon!

November 20, 2017 11:00 a.m. – 1:00 p.m.

If you are interested in supporting the Charleston Medical District Greenway, please contact the MUSC Office of Development at 843-792-4281.



U.S. Department
of Veterans Affairs
Veterans Health
Administration
Ralph H. Johnson
VA Medical Center



INVENTOR *Continued from Page Nine*

found in his garage, tinkering with the supplies he's bought at Lowe's, designing prototypes.

Between his inventing, a busy surgical schedule and responsibilities that at any time can include teaching, grant writing and research, it might seem like he's on the job 24/7. Colleagues wonder if it's not actually a bit more, especially when you add in the fact that Frankel and his wife, a neurophysiologist at MUSC, are so incredibly active in the lives and activities of their five kids.

Sometimes, in fact, it takes hitting the friendly skies for Frankel to find time to take a mental break.

"Airplanes are great times for that. I'll take whatever time is available," he said with a laugh. "We're always getting pinballed from one place to another with our jobs, so if there's some downtime, it's a wonderful thing. I find it very soothing. Also, the blacksmithing is invaluable when my mind is rushing, and

I need to just focus on something else and not try to fix something. Sometimes it can be very taxing to have your mind continuously racing."

He genuinely enjoys the artistic process of making pattern-welded steel knives, which he gives away to friends. It allows him to decompress. He welds the high-carbon and stainless steel – all 160 layers – and forges it together. From the bolster to the tip, he handcrafts every single part of the knife. And the etched artwork? His. Even the leather pocket sheath to place it in – he sews it himself.

And while he's fortunate to have been granted so many patents, licenses and relicenses, he also said he's had lots of failures. That just keeps him going back to the drawing board. And not for the prestige – for the people who benefit from his work.

Patents, he said, are just a necessary evil.

"The business side of this, I am lousy at it. I only have an interest in them in order to get these ideas to market. I

don't care about patents. I care about my patients. But in order to use a device on a patient or get it into the clinic, I need to interest companies in it. One of the ways to interest companies is to build value in it. You build value by having patents."

For him, that makes all the politics and red tape worthwhile, because being in the operating room and inventing, he said, are the biggest thrills of his professional life.

"I love my patients. My greatest love is being a neurosurgeon. Using these instruments to help patients in the operating room is one of the most thrilling things that I've experienced. And writing about them, if I've used it to reduce blood loss or increase the strength of what I'm doing – that, to me, is thrilling."

He has a couple of new things coming down the pike soon. But for now, he said, he's in a quiet period.

Will that last?

"No," he admitted.

"I do look back and think, 'That was a fun ride.' I learned this and that, which gives me perspective. But it seems like it's the next thing that really holds that excitement for me."

CANCER *Continued from Page Four*

higher levels of AGEs even before cancer diagnosis. They're linked with poorer prognosis and worse outcomes in prostate cancer. The idea is, if we can drive down the level of AGEs, we can make more equitable health outcomes for blacks and whites, and it may help reduce disparity in prostate cancer survival rates."

BUY-IN FROM THE PUBLIC

Ford said all of her team's work is guided by input from the public. "We have community input at every step. Even in putting the grant together we went to our advisory board at the cancer center to get their input in how to proceed with developing the grant."

The SC CADRE researchers created a community engagement panel. "It's important to have the input of the public, especially when we're designing clinical trials. They can tell us about how the trial might be perceived in the community. And when it comes to the end points that we think are most important, they may have other ideas we can learn from."

Part of getting that community input involves letting people know that the researchers understand where they're coming from, in terms of the burden of cancer in local communities. "We hear the pain. We feel the pain," Ford said. "I want people to know we are doing everything we can to conduct research to reduce disparities in South Carolina."

BRAIN *Continued from Page Seven*

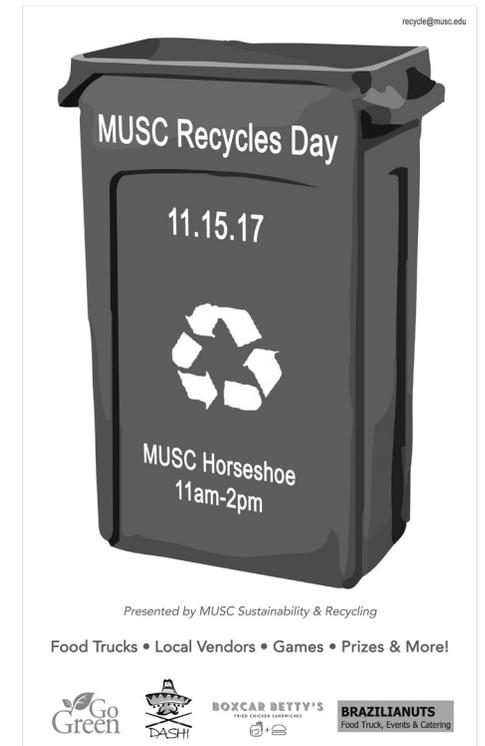
including missions to Mars.

Roberts hopes to continue to collect long-term follow-up data on the astronauts already being studied. In addition, she is participating in a new bed-rest study in Cologne, Germany, collaborating with Racheal Seidler, Ph.D., of the University of Florida and the German Space Agency. The study simulates astronauts living aboard the International Space Station, while being exposed to higher levels of carbon dioxide. CO2 scrubbers aboard the International Space Station clean and filter the air systems throughout the spacecraft, but some CO2 remains. Roberts will evaluate the blood flow to the brain, brain structure and other changes among study subjects.

With her team's hard work and dedication, Roberts hopes to establish MUSC as the go-to institution for further studies in clinical neuroimaging related to space exploration.

Study authors:

Donna R. Roberts, M.D.; Moritz H. Albrecht, M.D.; Heather R. Collins, Ph.D.; Davud Asemani, Ph.D.; A. Rano Chatterjee, M.D.; M. Vittoria Spampinato, M.D.; Xun Zhu, Ph.D.; Marc I. Chimowitz, MBChB; and Michael U. Antonucci, M.D.



Tactical Urbanism: Reclaiming Doughty Street for new Medical District Greenway

Staff Report

With the Charleston Medical District Greenway kickoff event quickly approaching, employees will start to see some major changes to Doughty Street, beginning this week. These changes will affect the stretch of road that runs from Doughty at Ehrhardt Street to the intersection of Doughty, President and Jonathan Lucas streets, which meet in front of the Public Safety building.

As of Monday, Nov. 6, this section of Doughty Street will close forever to vehicular traffic, thus launching a new era of use for this space in the heart of the Charleston Medical District. As a result, it is important to be mindful of changing pedestrian patterns, especially

while the road is being painted green, electric signage indicating new travel routes for vehicles is being placed near the space (Nov. 3) and trees and furniture are being delivered and positioned (beginning Nov. 10).

Many exciting changes and new additions are expected in the area over the next several weeks. The street will be painted green to denote the long-term intention to remove the asphalt. Mature and hearty oak and bald cypress trees will find new homes in large planters along the greenway, beautifying the area. With the hope that people will begin to utilize the space, new outdoor furniture will offer numerous spots for respite and fellowship. Food trucks will be able to park at one end of the greenway regularly



images provided

Artist renderings of the new Charleston Medical District Greenway will feature a variety of trees, outdoor furniture and areas for relaxation.

to offer fun and unique fare.

As the greenway is gradually brought to life, new landscaping promises to mirror the wonderful esthetic improvements that are already evident around MUSC campus. It's been said that Doughty Street is "going green through 2019," and it's only the beginning. Before long, the area will be completely transformed.

"Tactical urbanism" is a relatively new term that might be most familiar to people who live in large metro areas such as New York City, Chicago or Boston. It refers to reclaiming a road or abandoned property quickly and inexpensively and creating a temporary public space that can be used in a new way for a variety of activities. The idea is to reclaim urban spaces swiftly, with more permanent changes coming in the future. Perhaps the best known example is NYC's Times Square, when literally overnight, it became home to hundreds of folding

lawn chairs and inaccessible to cars.

As time moves on and more permanent projects are implemented to take the greenway to its final phases, hopefully families looking for a nice place to walk and relax at MUSC, Roper or the VA, will come to consider this space a place of healing, community and sustainability.

For more information about the long-term planning efforts involving this part of campus and the entire Charleston Medical District, please watch this video: <https://vimeo.com/239653080/e67f58e2d5>.

Please plan to join MUSC, the city of Charleston, Roper Hospital and the Ralph H. Johnson VA Medical Center at the kickoff event to celebrate the launch of Phase I of the Charleston Medical District Greenway. The event will take place on Monday, Nov. 20, from 11 a.m. to 1 p.m., at the intersection of Doughty, President and Jonathan Lucas streets.

