

## History and Current State of Neurosurgery at the Medical University of South Carolina

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We review the development of neurosurgery at the Medical University of South Carolina (MUSC) and the emergence of MUSC as a leading academic neurosurgical center in South Carolina. Historical records from the Waring Historical Library were studied, former and current faculty members were interviewed, and the personal records of Dr Phanor J Perot were examined. Dr Frederick E Kredel was the first to perform cerebral revascularization in stroke patients using omental flaps and the first to culture glioma cells in artificial media. The MUSC Neurosurgery residency program was established in 1964 by its first formally trained neurosurgeon, Julian Youmans, MD. The first graduate of the program, Dr Russell Travis, went on to become the President of the American Association of Neurological Surgeons. In 1968, the longest serving chairman, Dr Perot, joined the department and conducted significant research in spinal cord injury, receiving a continuous, 20-year award from the National Institute of Neurological Disorders and Stroke. A major change in the neurosurgery program occurred in 2004 when Dr Sunil Patel accepted the chairmanship. He integrated neurosurgery, neurology, and basic neuroscience departments into a comprehensive Department of Neurosciences to provide integrated clinical care. This department now ranks second in the country in National Institutes of Health research funding. Recently, the Center for Global Health and Global Neurosurgery was established with a vision of caring for patients beyond national borders. Neurosurgery at MUSC has been influenced by Drs Kredel and Perot and the current leadership is moving forward with a uniquely integrated department with novel areas such as global neurosurgery.

**KEY WORDS:** History, Medical University of South Carolina, Neurosurgery

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**N**eurosurgery has witnessed a remarkable growth in its century of existence. The historical account of neurosurgery goes beyond published biographies, monographs, and articles. We have among us neurosurgeons who have witnessed this history as scholars in various stages of learning. Each US institution involved in training future neurosurgeons can trace their legacy to neurosurgical giants like Drs Harvey Cushing and Wilder Penfield, sharing common

scholarly ancestry. Documenting this history is also an effective tool for sharing the local experience with the neurosurgical community at large.

Here, we describe the development of neurosurgery at the oldest medical university in the South, the Medical University of South Carolina (MUSC). The legacy of neurosurgery in the American South and Southeast is steeped in the history of the region but parallels the development of neurosurgery in America as a whole. Understanding this history may guide the progress of future neurosurgical training, clinical care, and research in this part of the country. We also examine the current standing of this department to provide a potential model for future neurosurgical practice.

**ABBREVIATIONS:** **MNI**, Montreal Neurological Institute; **MUSC**, Medical University of South Carolina; **NIH**, National Institutes of Health; **NINDS**, National Institute of Neurological Disorders and Stroke

## MATERIALS AND METHODS

Information was collected from multiple sources including published articles, books, and reports. In-depth semistructured interviews were conducted with Drs Phanor Perot, Cristian Vera, Stephen Haines, and Sunil Patel. Personal records were obtained from Drs Julian R Youmans, Perot, and Haines. Historical records available at MUSC's Waring historical library were reviewed. Information obtained from interviews and personal records was triangulated to increase the internal validity of information.

## A BRIEF HISTORY OF CHARLESTON AND MUSC ENVIRONS

Charleston (originally Charles Towne) was founded in 1670 and became a major economic and cultural center in the pre-Civil War era. In the mid-eighteenth century, Charleston was the largest and wealthiest city south of Philadelphia because of the prospering trade at the Charleston port. Charleston played a prominent role in the American Revolution and in the American Civil War. The city has maintained its cultural richness and diversity despite enduring phases of destruction and rebuilding from wars and natural disasters. Charleston remains a major tourist attraction in North America and is often referred to as a "living museum."

MUSC is situated in historic downtown Charleston and overlooks the Ashley River. It was chartered by the South Carolina legislature on December 20, 1823, and founded as a private, proprietary institution by members of the Medical Society of South Carolina<sup>1</sup> (Figure 1). MUSC is the oldest medical school in the South and the sixth oldest continually operating medical school in the United States, with the exception of the Civil War period (1861-1865).<sup>2</sup> South Carolina assumed ownership of MUSC in 1913 and has allowed for its growth with steady public funding. MUSC's medical college achieved university status in 1950. At present, MUSC includes the medical center and 6 colleges: Medicine, Pharmacy, Nursing, Graduate Studies, Health Professions, and Dental Medicine.

The medical center is licensed for 865 inpatient beds in 4 inpatient and numerous outpatient facilities. The only comprehensive academic health care center of South Carolina, MUSC attracts patients from Georgia, Florida, and North Carolina. As the charter of MUSC describes it, the institution is committed to provide "excellence in patient care in an environment that is respectful of others, adaptive to change, accountable for outcomes, delivered by coordinated interprofessional teams, and attentive to the needs of underserved populations."<sup>2</sup>

## NEUROSURGERY AT MUSC

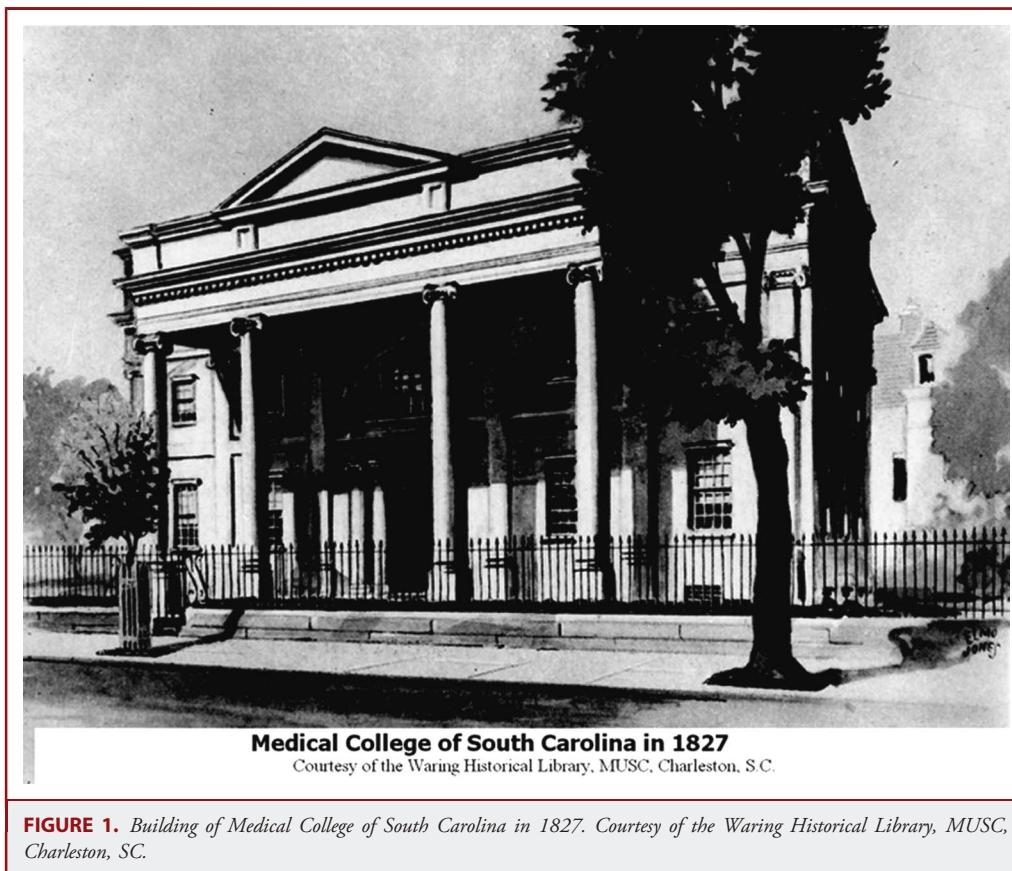
The Department of Neurosurgery at MUSC was founded in 1963 as a division of general surgery. Since its establishment, it has been transformed according to the changing needs for patient care, education, and research. The division achieved separate departmental status in 1977 and recently joined with Neurology and research Neuroscience to create a Department of Neurosciences.

During this journey, several prominent surgeons were instrumental in its development and continued progress, including Drs Frederick E Kredel, Youmans, Perot, and Patel. We, therefore, have separated this historical account into 3 different eras. The early contributions by Drs Kredel and Youmans are discussed in the "early years," whereas the time from 1968 to 1997 is distinguished as the "Perot era." The last decade, from 1997 to 2009, is included in the "recent years."

## EARLY YEARS (BEFORE 1968)

There is evidence that some neurosurgical procedures were performed at MUSC as early as the nineteenth century, even before the development of specialized neurosurgical services. The theses of the graduating students from 1834 make note of procedures performed for relief of intracranial pressure from hydrocephalus and penetrating trauma. A hand-carved wooden model of the brain was used to teach courses in neuroanatomy in the medical college from 1832. The earliest published neurosurgical work at MUSC dates back to 1881 when Dr Francis L Parker (1836-1913) published a case report on nerve repair. He sutured a severed posterior interosseous nerve with a complete motor recovery. His report is credited as the first successful repair of an injured nerve.<sup>3</sup> This is one of several "neurosurgical firsts" in the early years of MUSC. These successes were followed by Dr Kredel's pioneering work in cerebrovascular neurosurgery.

Dr Kredel (1903-1961) was a professor of surgery at MUSC from 1937 to 1961 (Figure 2). He studied sloths with Dr Samuel H Williams during his training in zoology before medical school. The scrapbooks from his research trip to Kurtabo, British Guiana, give a glimpse into Kredel's systematic approach to scientific discovery. He attended medical school at the Johns Hopkins University. Upon the request of Harvey Cushing in 1927, his name was proposed by the school to study the methods for the culture of glioma cells in artificial media. Kredel worked closely with Cushing in 1927 and 1928. This training probably inspired him to learn and perform surgical procedures on the human nervous system. Kredel was successful at culturing glioma cells in artificial media.<sup>4</sup> Cushing later recognized this scientific first in his congratulatory note to Kredel (Figure 3). Kredel completed his surgical training at the University of Chicago with Dr Dallas Phemister. From 1934 to 1935 he studied neurohistology at the University of Utrecht, The Netherlands, and Frankfurt, Germany with Professor Victor Schmieden. Kredel was invited to MUSC in 1937 to join as the first full-time teacher. He quickly rose through the ranks and became a full professor in 1938 and surgeon-in-chief in 1943. Kredel is fondly remembered as the "first brain surgeon" at MUSC. The inspiration behind some of these efforts can be traced to his initial training with the neurosurgical pioneers. The high prevalence of cerebrovascular diseases in South Carolina must have presented a need for innovative surgical treatments. In one of his hospital visits, Kredel noticed that an elevator attendant in the old hospital building was afflicted with significant hemiparesis, likely arising from a stroke. Kredel offered



to perform a revascularization procedure now known as encephalomyosynangiosis (Figure 4). Kredel had been performing this procedure since 1942, a feat recognized in the world of medicine as a first in cerebrovascular surgery.<sup>5,6</sup> Subsequently, Kredel also performed revascularization procedures by using omental flaps. Kredel also described a technique for extreme tissue conservation for myelomeningocele closure with good results.<sup>7</sup> After establishing a strong surgical program, Kredel initiated the process of providing subspecialty care.

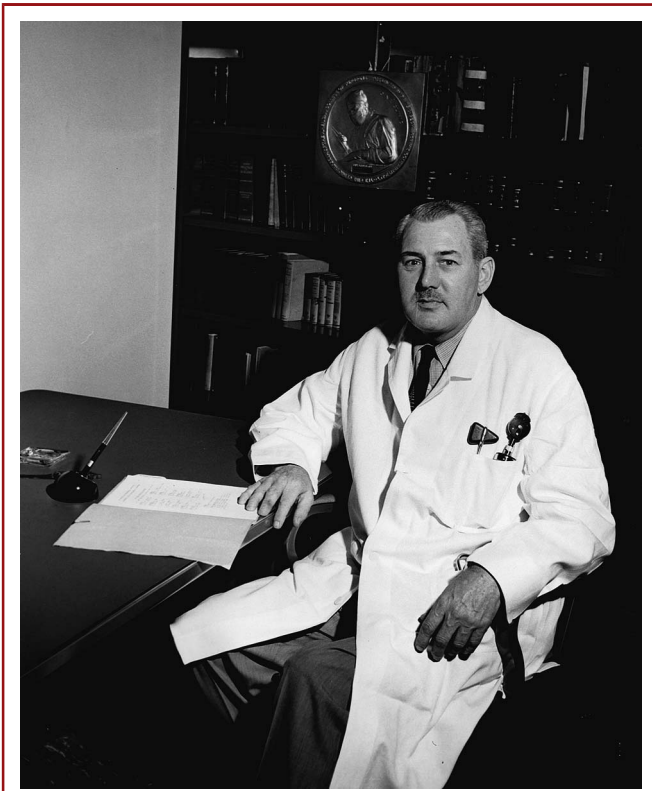
Dr Youmans (1928 to present) was the first residency-trained neurosurgeon at MUSC. He completed medical school at Emory and completed residency from the University Hospital, Ann Arbor, Michigan. When he joined MUSC in 1963 at the age of 35, he was the youngest chief of neurosurgery in America. Youmans may have known about the feats of Kredel, who was well renowned in the neurosurgical community. This may have prompted him to accept a position at MUSC. In his first year, Youmans was continuously taking calls for neurosurgery with the assistance of the general surgery residents. In 1964, he successfully obtained approval by the American Board of Neurological Surgery to implement a neurosurgery residency training program at MUSC. Dr Russell Travis was the first resident to join the department on July 1, 1964, the

same year that Drs Glenn Kindt and Charles Mitchell joined the faculty as assistant professors. Continuing in the growing tradition of excellence in cerebrovascular neurosurgery, as established by Kredel, Youmans was awarded a \$55 000 National Institutes of Health (NIH) grant to study cerebral blood flow and oxygenation. Both Drs Kindt and Mitchell received research grants of \$12 000 each from the MUSC school of medicine, which helped establish neurological research at MUSC.

These early participants laid the groundwork for neurosurgical training and research for future leaders in neurosurgery. Dr Travis completed his residency in 1968 and joined a practice in Lexington, Kentucky, later serving as the president of American Association of Neurological Surgeons in 1996 to 1997. He received the Service Award of the Congress of Neurological Surgeons. He, among others, is evidence of the contribution of MUSC neurosurgery training in the profession both in the United States and globally.

### PEROT ERA (1968-1997)

Youmans accepted the chairmanship at the University of California at San Diego, paving the way for Perot, who joined



**FIGURE 2.** Dr FE Kredel. Courtesy of the Waring Historical Library, MUSC, Charleston, SC.

MUSC in 1968 as the chief of neurosurgery. After completing his training under Drs Wilder Penfield and William Cone, Perot remained on the faculty at Montreal Neurological Institute (MNI) (Figure 4) and helped train some of the later giants of neurosurgery who emerged from MNI. Perot's decision to join MUSC was crucial in the history of the present department as a part of the Penfield legacy. Perot was attracted by the possibilities of expansion in neurosurgical clinical and research services.

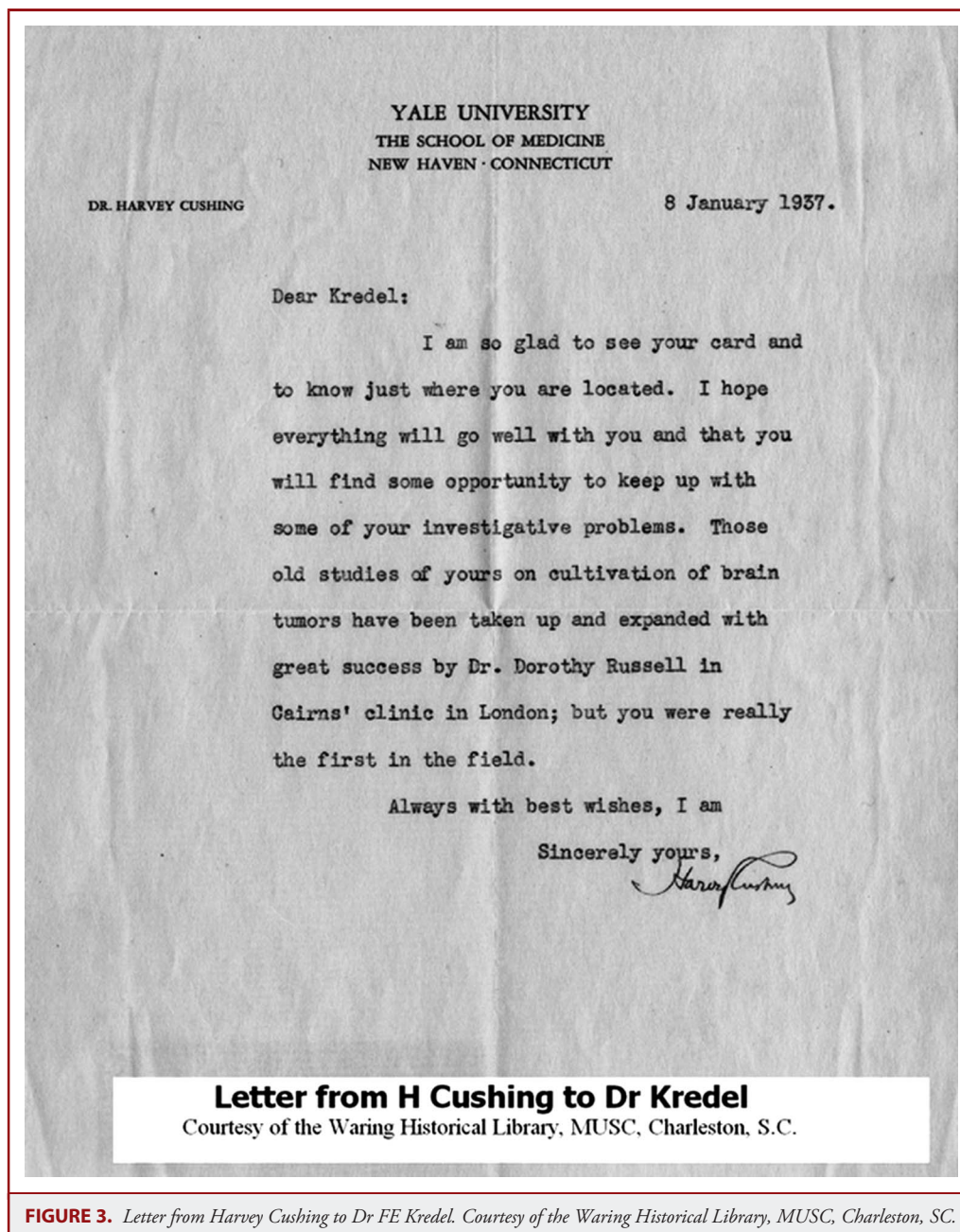
Perot focused his immediate attention on strengthening and expanding the clinical services and research. Traumatic brain and spinal cord injuries dominated the clinical spectrum during his initial practice. It is not a surprise that his initial research, both experimental and clinical, focused on central nervous system trauma. His experience at MNI led him to assemble a team of faculty and researchers with similar interests and goals. He facilitated the arrival of distinguished faculty including Drs Thomas Ducker, Ludwig Kempe, and Cristian Vera (Table 1). He launched the spinal cord injury research program with a focus on fundamental studies in acute spinal cord injury. This multidisciplinary team of clinicians and basic scientists made some of the early ground-breaking findings in pathophysiology and treatment of spinal cord injury. Dr Perot received a continuous research grant from the National Institute of Neurological Disorders and

Stroke (NINDS) from 1974 to 1993. Subsequently, a Spinal Cord Injury Research Center was established at MUSC and funded research programs were launched in the fields of neurosurgery, neurophysiology, neuropathology, pharmacology, and clinical research. During this period the Institute of Psychiatry was established at MUSC. Following in the footsteps of Perot, multidisciplinary research programs in behavioral neuroscience and addiction were launched. Although diverse initially, these concerted efforts of funded research in neuroscience were the stepping stones for a currently well-funded Department of Neurosciences.

Perot established a busy clinical practice over the years and was well known locally. The neurosurgical service cared for a variety of patients with epilepsy, tumors, intracranial hematomas, neurotrauma, and vascular malformations. Perot realized that autonomy of the neurosurgery division is imperative for excellence in academics and patient care. He therefore worked toward an independent department of neurosurgery. In August 1977, departmental status was awarded to neurosurgery and Perot was appointed as the founding chairman. This went a long way to successfully achieving the academic goals and establishing high standards of clinical care. Perot organized the clinical services to meet the needs for neurosurgical patients. Perot and Ducker established a dedicated neurosurgery intensive care unit in 1972 to care for traumatic brain and spinal cord injury patients.

Despite his busy clinical practice, Perot devoted significant time to his research. He is credited with describing the trans-thoracic approach for discectomy.<sup>8</sup> This technique has become a standard of care in the armamentarium of modern day neurosurgeons. Continuing his interests in neurophysiology, Dr Perot collaborated with researchers from the Neuroscience and the Institute of Psychiatry and studied the behavioral effects of direct electrical stimulation on the cortex in patients with epilepsy.<sup>9,10</sup> Dr Vera, continuing from his earlier work at MNI, carried out extensive studies in the fundamentals of neurophysiology both in animals and humans. These studies contributed significantly to our understanding and interpretation of somatosensory evoked potentials.<sup>12</sup> These collaborations later paved the way toward a creation of a unified Department of Neurosciences, as described later. The academic productivity flourished under his leadership. Among other faculty accomplishments, Kempe and Blaylock described the transcallosal technique for ventricular tumors during their stay at MUSC.<sup>11</sup>

Resident education received focused and dedicated attention during almost 3 decades of Perot's leadership (Table 2). The residency program was fully accredited during his tenure. The resident retention was more than 90%. Perot considers that the excellent neurosurgical training at MUSC was his greatest achievement. Drs Cristian Vera, Fraser Hendersen, Byron Bailey, Sunil Patel, and Brian Cuddy are among other trainees at MUSC who took various leadership positions after completing training with Perot. Perot's residents fondly remember their training at MUSC and admire him for instilling in them the qualities of a good doctor.



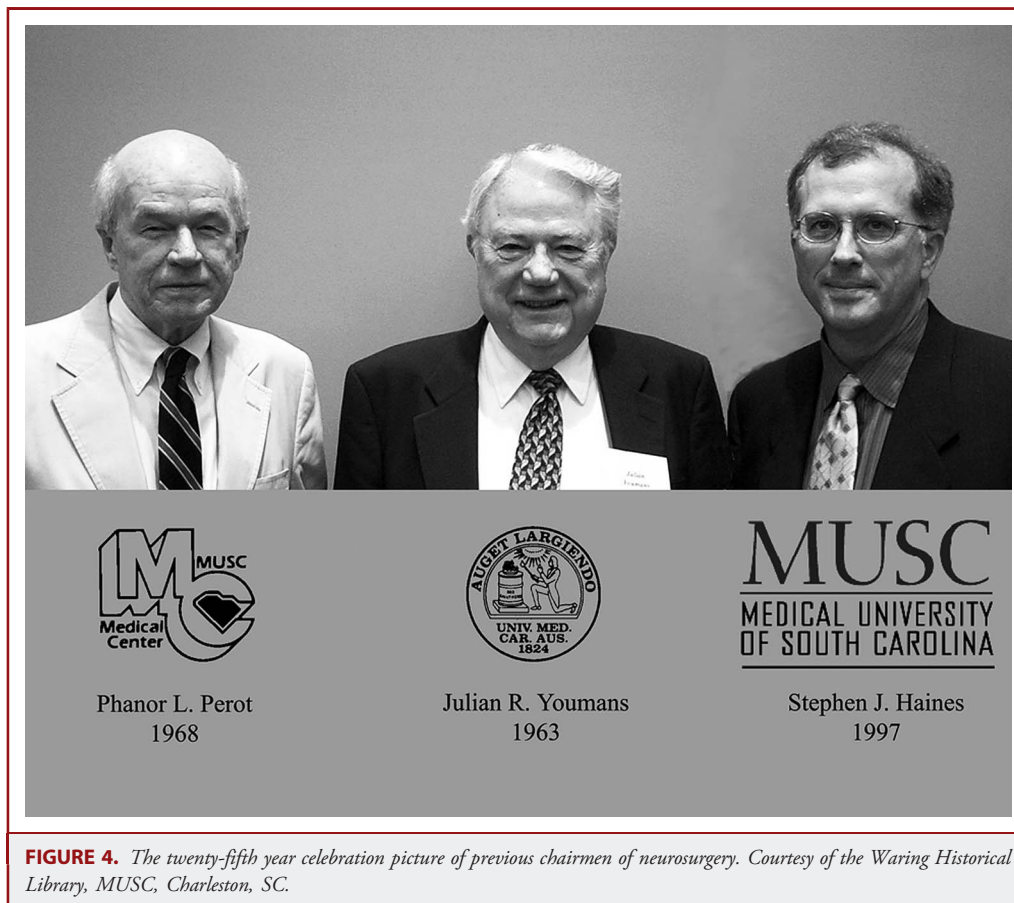
**FIGURE 3.** Letter from Harvey Cushing to Dr FE Kredel. Courtesy of the Waring Historical Library, MUSC, Charleston, SC.

Perot was a dynamic and enthusiastic neurosurgeon who revolutionized the way neurosurgery was practiced in South Carolina. He served as the President of the Society of Neurological Surgeons from 1988 to 1989 and was founding vice president of the World Federation of Neurosurgical Societies from 1989 to 1993. Perot was a chairman of the NINDS Program Project Review Committee at NIH (1979-1981) and a member of the NINDS National Advisory Council

(1983-1988). MUSC recently announced an endowed chair in his name for professorship in spinal cord injury.

## RECENT YEARS

Dr Stephen Haines, who was trained at the University of Pittsburgh, accepted the chairmanship of neurosurgery in 1997 (Figure 4). He focused on initiating a subspecialty neurosurgical



**FIGURE 4.** The twenty-fifth year celebration picture of previous chairmen of neurosurgery. Courtesy of the Waring Historical Library, MUSC, Charleston, SC.

practice at MUSC. Haines recruited faculty in spine, functional, and pediatric neurosurgery and strengthened the technological infrastructure by obtaining equipment for image guidance, radiosurgery, and an ultrasonic aspirator. He proposed a dedicated neuroscience intensive care unit for patients with neurological ailments. While at MUSC, he authored “Evidence-based Neurosurgery” and initiated educational programs to teach the principles of evidence-based medicine to neurosurgical residents.<sup>13</sup> These sessions involved critical appraisal of a researchable question in everyday patient care. Haines encouraged the paradigm shift toward the application of rigorous scientific principles in the practice of clinical neuroscience. The residency program transitioned from 5 to 7 years, with 1 year dedicated to research. Upon Haines’s departure to assume the chairmanship of the University of Minnesota, Dr Patel accepted the position of interim chairman of the Department of Neurosurgery in 2003. Patel finished his residency with Perot in 1991 and subsequently trained in skull base at the University of Pittsburgh with Dr Peter Jannetta and specialized in microneurosurgery with Dr Kenichiro Sugita. His vision for neurosurgery at MUSC has been to achieve the highest standards of patient care, training, and research. Recruitment of faculty in all subspecialties of neurosurgery, increased

collaboration with clinical and research departments to promote multidisciplinary translational research and resident training through mentoring and innovations in education have been the main focus of his chairmanship for the past 6 years. The creation of the Department of Neurosciences in November 2004 by merging neurosurgery, neurology, and basic physiology/neuroscience has been a vital step in this journey of excellence. Patel along with the Dean of the College of Medicine, Dr Jerry Reeves, initiated efforts toward formation of the Department of Neurosciences. This innovative structure was intended to address the need of training research clinicians and translating discoveries for patient care. The already productive multidisciplinary teams of researchers in basic neuroscience, behavioral neuroscience, and clinical neuroscience were unified within this department. This process has further increased the productivity by enhancing collaborations. The department has consistently grown in funding since its inception in 2004 and currently is the second largest in the country with respect to NIH funding (fiscal year 2009).<sup>14</sup>

The first step toward the creation of a unified department was choosing leadership. The Department of Neurosciences is led by dual chairmen: Patel is serving as the clinical chairman and Dr Peter Kalivas serves as research chairman. Kalivas is a well-respected

**TABLE 1. Former and Current Faculty Members<sup>a</sup>**

Faculty	Neurosurgery Training	Years at MUSC
Julian Youmans	University of Michigan, Ann Arbor	1963–1967
Glenn Kindt	University of Michigan, Ann Arbor	1964–1967
Charles Mitchell	Wake Forest University	1964–1969
Shokei Yamada	University of Toronto	1964–1973
Phanor Perot	Montreal Neuroscience Institute	1968–present
Thomas Ducker	University of Michigan, Ann Arbor	1970–1975
Ludwig Kempe	Walter Reed General Hospital, Washington, DC	1973–1983
Stephen Rawe	Yale University School of Medicine	1976–1980
Cristian Vera	Montreal Neuroscience Institute	1981–present
Stephen Gudeman	Medical College of Virginia, Richmond	1982–1988
Alfred Nelson	Medical College of Virginia, Richmond	1985–1990
Fraser Henderson	MUSC	1989–1990
Byron Bailey	MUSC	1990–2009
Bruce Storrs	University of Utah	1990–1995
Sunil Patel	MUSC	1991–present
Brian Cuddy	MUSC	1994–1999
Stephen Haines	University Of Pittsburg	1997–2000
Richard Osenbach	University of Iowa Hospitals and Clinics	1998–2000
Ehud Mendel	Lousiana State University School of Medicine	2000–2003
Jeffrey Campbell	University of Pittsburg	2000–2005
Istivan Takacs	Karolinska Institute	2000–present
Abhay Varma	All India Institute of Medical Sciences	2002–present
Gerald Tuite	University of Michigan, Ann Arbor	2005–2007
Bruce Frankel	SUNY, Syracuse	2006–present
Ian Johnson	Harvard Medical School	2007–2010
Steven Glazier	University of Pennsylvania	2007–present
Dilantha Ellegala	University of Virginia, Richmond	2008–present
Raymond Turner	Cleveland Clinic	2008–present
William Vandergrift	Medical University of South Carolina	2008–present

<sup>a</sup>MUSC, Medical University of South Carolina; SUNY, State University of New York.

neuroscientist who specializes in elucidating neuronal circuitry and biochemical aspects and behavioral modeling underlying drug addiction. The Division of Neurosurgery currently has 8 full-time and 2 part-time neurosurgery faculty (Table 3).

Dr Steven Glazier was recruited to the department by Dr Patel to help oversee the restructuring of clinical neurosciences into

**TABLE 2. List of Residents Graduated from MUSC<sup>a</sup>**

Graduation Year	Resident	Current Position
1969	Russell Travis	Lexington, KY
1970	Otmar W Albrand	Denison, TX
1971	Ben N Estes	North Augusta, SC
1972	Darwin W Keller	Spartanburg, SC
1973	Otis M Ballenger	Greenville, SC
1974	Randhir Sinha	Webster, TX
1975	Cristian Vera	Charleston, SC
1976	Michael G Hughes	Battle Creek, MI
1977	Russel Blaylock	—
1978	—	—
1979	Michael J Marzluff	Charleston, SC
1980	Fred Andrew Brindle	Sandusky, OH
1981	Mike O Tyler	Charleston, SC
1982	David Changaris	Louisville, KY
1983	John Ledlie	Tyler, TX
1984	—	—
1985	Robert Allen	Raleigh, NC
1986	George H Khoury	Charleston, SC
1987	James E Hansen	Austin, TX
1988	Artur Pacult	Charleston, SC
1989	Fraser C Henderson	Washington, DC
1990	Byron Bailey	Charleston, SC
1991	Sunil J Patel	Charleston, SC
1992	Steven Sinderman	Philadephia, PA
1993	Brian Cuddy	Charleston, SC
1994	Larry S Davidson	Concord, NC
1995	Eugene Giddens	Columbia, SC
1996	William Naso	Florence, SC
1997	Henry Poole	Greensboro, NC
1998	Troy Vaughn	Alexandria, LA
1999	John C Mace	Springfield, MO
2000	Mark Gerber	Naples, FL
2001	—	—
2002	Philip G Esce	Spartanburg, SC
2002	Vrijesh Tantuwaya	San Diego, CA
2003	Steven Bailey	Crestview Hills, KY
2004	Timothy Hopkins	San Angelo, TX
2005	Frank Castillon	Dallas, TX
2006	Christopher Chittum	Spartanburg, SC
2007	Suhas Pai	Gastonia, NC
2008	William A Vandergrift	Charleston, SC
2009	Sabino D'Agostino	San Angelo, TX
2010	Tanya M Quinn	St. Louis, MO

<sup>a</sup>MUSC, Medical University of South Carolina.

specialized subdivisions comprising comprehensive teams of neurosurgeons, neurologists, and neurointerventionalists to complete the transition from 3 independent departments into the unified Department of Neurosciences. He served as the Chief of the Division of Neurosurgery in the Department of Neurosciences from 2007 to 2010, and more recently as the Medical Director of the Neuroscience Service Line, the strategic planning and management entity of the Medical University of South Carolina Hospital Authority. Several other faculty members

**TABLE 3. Current MUSC Division of Neurosurgery Faculty<sup>a</sup>**

Faculty	Training	Neurosurgery Subspecialty
S Patel	MUSC	Neuro-oncology, base of skull
S Glazier	University of Pennsylvania	Pediatrics, epilepsy
I Takacs	Lund University, Sweden	Functional, radiosurgery
A Varma	All India Institute of Medical Sciences	Spine, peripheral nerve
B Frankel	SUNY, Syracuse	Neuro-oncology, spine
D Ellegala	University of Virginia	Cerebrovascular
R Turner	Cleveland Clinic	Endovascular surgery
A Vandergrift	MUSC	Endoscopic neurosurgery
W Warmath <sup>b</sup>	University of Michigan	Spine
J Mcgillcuddy <sup>b</sup>	Medical College of Virginia	Peripheral nerve

<sup>a</sup>MUSC, Medical University of South Carolina; SUNY, State University of New York.

<sup>b</sup>Part-time faculty.

joined the department both in the clinical and research divisions. The Department of Neurosciences currently has more than 80 full-time faculty including 40 clinicians. The comprehensive cerebrovascular, movement disorder, neuro-oncology, epilepsy, neurosurgical pain management, and spine health programs provide cutting edge care to patients with neurological diseases. The vision of a seamless transition of care from nonsurgical to surgical neuroscience care is being realized through these comprehensive teams at MUSC.

The Cushing and Penfield philosophy of research, training, and clinical service at the institutes of excellence all over the world influenced the founding fathers of neurosurgery at MUSC. Members of the current neurosurgical faculty at MUSC also have specialized training from different parts of the world. They recognize that neurosurgical disease is a global problem. As a part of their vision for the future, the department has taken a lead in promoting Global Neurosurgery and Neuroscience. A founding member of Madaktari Africa, a consortium of University Neurosurgical Centers with active training overseas, the department has taken a step further by promoting one of its faculty to head a newly designated Center for Global Health with a section of Global neurosurgery. This center will impart specialized training to physicians for taking care of the global patient population beyond national borders.

## CONCLUSION

The Division of Neurosurgery in the Department of Neurosciences has been an important component of MUSC, the oldest medical school in the South. This Division has been a pioneering center of patient care, teaching, and research. The dedication and

hard work by the founding faculty has geared it toward the growth it has seen over the years. The leadership of this program is committed for continued growth and development through multidisciplinary patient care and research. The unique structure of this program aims to produce clinicians trained in research to meet the growing need for translating discoveries for improvements in patient care.

## Disclosure

The authors have no personal financial or institutional interest in any of the drugs, materials, or devices described in the article.

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## COMMENTS

This is a nice overview of the history and the current state of neurosurgery at the Medical University of South Carolina and how it has developed from and is embedded in the busy town of Charleston. The department of neurosurgery was founded in 1963 as a division of general surgery and it received separate departmental status in 1977 so, historically, it can be considered as being rather young. But before that Dr Kredel, the first full-time professor of surgery at the Medical College of the State of South Carolina, was also very much interested in neurosurgery.



The authors have nicely described the transition, with change in leadership, over time in clinical services, education, and research and the vision and thought process leading to the integration of the neurosciences and the making of subdivisions in recent times and how the residency training program has developed as a linkage and a legacy of these developments.

The thing we can learn from such a historical overview is how successful it can be to unify productive multidisciplinary teams of researchers in basic neuroscience, behavioral neuroscience, and clinical neuroscience as this process has further increased the productivity by enhancing collaborations. The department has consistently grown in funding since its inception in 2004 and currently is the second largest in the USA with respect to NIH funding. This philosophy of strongly combining research, training, and clinical service is seen in other successful institutes of excellence around the world. Rather unique is their effort in taking a lead in promoting Global Neurosurgery and Neuroscience by the newly designated Center for Global Health with a section of Global neurosurgery, a center that will impart specialized training to physicians for taking care of the global patient population beyond national borders.

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This interesting article provides a multiperspective, not only historical overview, of the legacy of neurosurgery at the medical university of South Carolina. Credit should be given to the authors for having identified the spirit that moved the development of such historical path that results already lighted by extraordinary names. The fascinating

amount of information provides the reader with the opportunity to take a thoughtful ride along the developmental process of the neurosurgery department at MUSC and, above all, of the whole of neurosurgery itself. It does not go only through on hints, tricks, pros and cons or drawbacks, it involves the process of teaching and learning, the passion for one's work, the compassionate care and the ability of training a method. Definitely, it was not easy to keep the balance along and to give adequate attention and importance to each period to praise the stature of different leaders, with their topics and concepts. The authors accomplished such a task with harmony and surgical insight of every crucial aspect, without ever losing the thread.

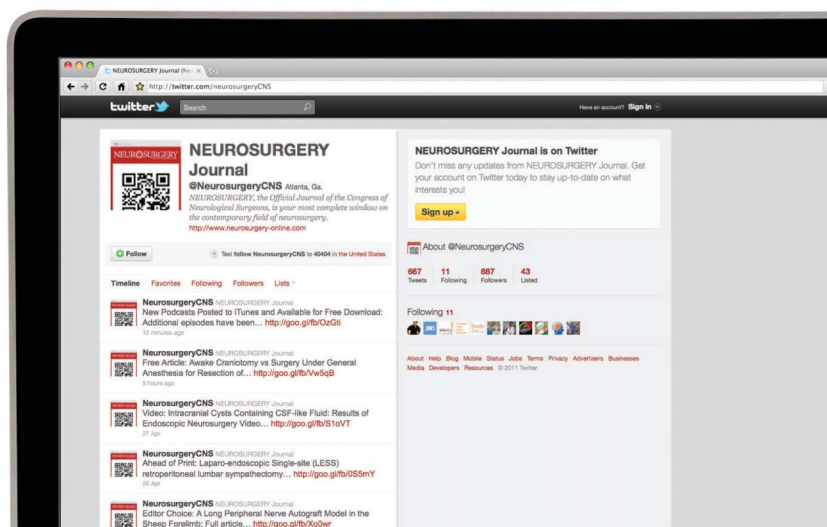
**Paolo Cappabianca**  
*Napoli, Italy*

This article chronicles the development of neurosurgery at the Medical University of South Carolina (MUSC). The recent founding of the neurosurgery department in 1963 belies the iconic status of some of its faculty members and trainees through its short lifespan. The authors detail the ancestry and legacy of these figures, placing them in the context of this dynamic program.

Embedded within this story are key themes that are replicated at other great institutions. Chief among these are interconnectedness and the importance of collaboration with other fields of neuroscience. Such lessons should inspire other programs aspiring to a trajectory similar to that enjoyed by MUSC.

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