## Career Pathways: Dr. Tom Carmichael

There isn't just one path to success in the field of neurorehabilitation. Many researchers and clinicians have found their way to tremendously fulfilling and exciting careers by taking indirect routes and sometimes making unexpected shifts along the way. The career of American Society of Neurorehabilitation (ASNR) President S. Thomas Carmichael, MD, PhD, has spanned the realms of clinical care, biomedical research, and academic leadership and administration.



His interests in science and medicine began in middle school and high school. Tom's uncle Robert Collins was a neurologist and a research scientist who later became head of Neurology at the University of California, Los Angeles (UCLA), and he has been an important source of motivation and inspiration throughout Tom's career. Growing up, Tom was fascinated by the brain and viewed neurology as the intersection of medicine and philosophy. Our brains are what make us human and give rise to our personalities, and it was interesting for him to think about how illness or damage in the brain could change who we are.

Tom received his B.S. in biology from UCLA, and at that point, he planned to attend medical school and become a neurologist. The thought of applying his understanding of the brain to diagnose patients and provide treatments was thrilling. After enrolling in medical school at Washington University School of Medicine and beginning his coursework there, he realized that what he enjoyed most was the intellectual creativity involved in research and the excitement of discovery. Suddenly, the idea of spending the rest of his career following the algorithmic process of diagnosing patients and prescribing corresponding treatments didn't captivate him as much as it once did.

To remedy this, Tom decided to also enroll in a PhD program where he could use his creativity to improve our understanding of the brain and help develop new and better treatments for brain-related conditions. "For me, the really creative energies in biomedical research are what drive me. I really value the patient relationships that I have, but the thing that makes me tick is the discovery science and the creative process of the research lab," Dr. Carmichael noted.

He was awarded his MD in 1993 and his PhD in 1994 from Washington University School of Medicine. Next, he completed a Neurology residency there, followed by a Howard Hughes Medical Institute Postdoctoral Fellowship at UCLA. Dr. Carmichael then joined the faculty at UCLA in 2001 where he held both clinical and research appointments. Balancing patient care and making progress in the lab can be a struggle, he acknowledged, and the time demand has likely been higher than if he would have pursued just one or the other.

However, Dr. Carmichael mentioned that he chose a clinical specialty that was closely linked with his research area so that his efforts in either area could, to some extent, further both his clinical and research interests. As a neurologist, Dr. Carmichael has focused on

neurorehabilitation and treatment of individuals after a stroke or other brain injury. His research has investigated how the brain recovers following an injury. In particular, he and his team have been studying the cellular and molecular events that begin and that may limit the recovery process. These processes are key for developing new drugs and therapies to further stimulate brain repair and promote recovery.

Starting a new research lab is difficult, and Dr. Carmichael struggled during his first few years as an independent researcher. He really wanted to do discovery science to understand broadly what molecules were active as the brain began the repair process after a stroke. Rather than converge down to one really specific research question, Dr. Carmichael chose a deliberately divergent approach. The work was very challenging because the methodologies needed to address his questions were just evolving at that point. For the next three years, Dr. Carmichael had many failures and made a lot of iterative improvements in an effort to develop the new techniques and technologies required. The stakes were high because he had no guarantee that any of it would work, and he didn't have any backup projects running during that time.

Fortunately, Dr. Carmichael's efforts paid off, and his early research program yielded great results. "One of my mentors early on once told me 'Hit singles'," Dr. Carmichael explained. "Don't go for the big paper, the huge story, or the home run, especially early on in your career. Get going in what you're doing. Make solid, rigorous contributions to your field, but don't try to solve everything at once."

Since then, Dr. Carmichael has made numerous contributions to science. He and his team have published important papers on stroke recovery that have defined mechanisms of plasticity and repair, and his research has led to new directions in stroke treatments, including therapies involving stem cell and tissue engineering. Through his academic position, Dr. Carmichael has taught many students and mentored many trainees in his laboratory. This list of trainees includes 25 post-doctoral fellows, 1 clinical fellow, 12 PhD students and 6 masters students. Dr. Carmichael has had over 150 undergraduate students in his lab in volunteer and formal undergraduate course work. Concurrently, he has provided care for hundreds of patients in the neurology clinic.

As his career has progressed, Dr. Carmichael has had increasing opportunities for academic and professional leadership in the field of neurorehabilitation. From 2014 - 2020, he served as Associate Director of the Broad Stem Cell Research Center at UCLA, and he worked as the Interim Director of the Center from 2020 - 2021. This was an energizing and rewarding experience. The Broad Stem Cell Research Center is dynamic, and it was wonderful to contribute to leading a research center that brought together scientists from various disciplines to generate innovative new ideas and establish novel therapies that were overturning established dogma and leading to promising new regenerative medicine approaches.

Dr. Carmichael has also served as ASNR's President since 2020, and he has enjoyed taking an active role in shaping the organization and guiding the future of neurorehabilitation.

Currently, Dr. Carmichael is a neurologist and Professor and the Frances Stark Chair of Neurology at the David Geffen School of Medicine of UCLA. He continues to look forward to further advancing our understanding of neural repair after brain injury, and he is excited about the stem cell therapies they are investigating with the FDA and biotechnology companies. When he first started in medical school, Dr. Carmichael never would have imagined that this is the path that he would take, but looking back, he recognizes that the twists and turns of his own career path have made for a very interesting and satisfying journey. "The main thing is to utilize to your benefit both the ups and downs in science so that you move forward with both, and you can draw energy from both phases."