

A Joyful Way:

STEPHEN DEARMOND, PhD MCP '72, MD, MCP '75

From his youth, Stephen DeArmond, PhD, MCP '72, MD, MCP '75, wanted to become a doctor. He enrolled as a pre-med and engineering student at Santa Clara University. At the same time he also worked 20 to 30 hours a week at a local hospital to support himself. His GPA suffered from the schedule, and medical school was no longer an option. Instead, DeArmond settled on "studying the brain," as he unpretentiously describes it. The first stop on this path was the University of Utah, where he obtained a degree in experimental biology with honors.

With tenacity, humor and humility, this dual-degree alumnus of one of the college's predecessor institutions has enjoyed tremendous professional success as a neurologist, contributing to Nobel Prize-winning work. A teacher, physician, researcher and author, DeArmond continues to critically investigate and share his discoveries. He has always enjoyed the journey.

DeArmond began his PhD studies at the University of Michigan, transferring to Woman's Medical College of Pennsylvania after his thesis adviser was hired by the college. Doctoral students do not typically transfer schools mid-track, but DeArmond downplays the transition. "I didn't have any love for the really cold winters," he says. One of the responsibilities he had at Woman's Med was to teach neuroanatomy and neurophysiology to the medical students, of whom his future wife was one.

Near the completion of his doctorate at Woman's, DeArmond was approached by the dean of students, Mary Hartman, MD, who asked, "How would you like to go to medical school?" DeArmond replied, "I would like that very much." Thus, in 1969, he became one of the first three men admitted to the school for a medical degree. On July 1, 1970, the word *Woman's* was dropped, creating the Medical College of Pennsylvania, or MCP.

"I enjoyed my PhD," DeArmond reflects. "And when I got into medical school, I enjoyed that even more. I was happier than I'd ever been in my life. And my wife went along with



Bernadette, Jennifer, Stephen and Daniel DeArmond at Steve's PhD graduation in 1972



Stephen at a prion meeting in Monterey, Calif., 1998

it." (He and Bernadette Naughton DeArmond, MD, WMC '70, were married in 1968.) During his medical school years, he wrote and illustrated a neuroanatomy book, *Structure of the Human Brain*, which became a best seller. "Every step of the way was just exciting. It turned out to take a little longer to do it, but I got it all done," he says.

DeArmond completed his postdoctoral studies at Stanford University Medical Center, just down the street from his childhood home. "That was a great experience and a great time," he says. He studied under the renowned neuropathologist Lucien Rubenstein and, as junior faculty, worked with Lawrence Eng, who first isolated and characterized glial fibrillary acidic protein, which is involved in many important central nervous system processes. "Basically, I was interested in everything that had to do with neural disease," DeArmond says.

He took a position at the University of California, San Francisco, and was quickly recruited by neurologist Stanley Prusiner, MD, for research into the prion protein. Prusiner, as DeArmond recalls, "said that he needed a neuropathologist to help him figure out what's going on in the brain with prion diseases." That is a bit of an understatement.

Prusiner won the Nobel Prize in Physiology or Medicine in 1997 for the prion research: he stated that the prion protein alone is an infectious agent. "All viruses have DNA or RNA to manufacture their proteins," explains DeArmond. "Prion is a pure protein — no DNA or RNA associated with it." As an infectious agent, it causes several neurological diseases

in humans; Creutzfeldt-Jakob disease is the most common human prion disease, which typically causes death in six to nine months. Prions are also responsible for mad cow disease in bovines, scrapie in sheep, and chronic wasting disease in elk and deer.

DeArmond's contributions to that medical discovery should not be underestimated. Using antibodies developed in the Prusiner Lab, he located the prion protein in brain sections. DeArmond remembers Prusiner's incredulity: "He said, 'With just one animal, one experiment, you described the main pathology of the disease.'"

DeArmond explains that the infectivity and spread of prion disease in the brain is due to a conformational change of the normal cellular form of the prion protein (PrPC) to a pathogenic form known as PrPSc. "The abnormal form binds to the normal form, which is on the surface of neurons throughout the nervous system, and converts it to another copy of PrPSc; the process is very efficient." DeArmond's research documented this process. He and his neuropathology fellow Hans Kretzschmar, MD, also determined the amino acid sequence of the human prion protein. "We were the first to publish that sequence," DeArmond says.

While "wrapping up" the analysis of 190 human prion-related autopsies he performed, DeArmond says, "we started making all these little discoveries about how the prion protein can cause changes in the brain similar to Alzheimer's disease. As we looked at prion diseases in tissue culture," he continues, "we found PrPSc can trigger the A 1-42 formation

and hyperphosphorylation of tau protein that are characteristic of Alzheimer's disease. We keep making discoveries all the time."

DeArmond is busier than ever conducting research and writing. Yet, he also wonders if the perceived busyness is a result of slowing down: he suffered a stroke about five years ago. DeArmond recognizes how the stroke was beneficial, though. Since it occurred, his golf swing is straight, and he is no longer on night call for the hospital. So the stroke was "maybe a lose-win-win," he laughs.

An avid ice skater, DeArmond took up the sport at 47, only "because it was becoming too hard to get up to the Sierras to ski." He then proceeded to write a book about ice skating: *Steps to Success*. He initially suggested that his instructor, a former Olympian, write the book, but as a non-native English speaker, she demurred. DeArmond felt this book had to be written anyway. "I found it was real exciting," he says of the sport, "particularly the jumps and spins."

After living for 40 years in Palo Alto, DeArmond and his wife recently moved to Burlingame, which is closer to their daughter and two grandsons. Their son, Daniel DeArmond, MD, MCP '96, lives in San Antonio, Texas, and has four daughters.

Reflecting on a long career as a physician, teacher and researcher, DeArmond says, "Every bit of the way has been a joyful way." He means it. He is enthusiastic for life and, while humble about his successes, wants to share those discoveries and joys with others — whether it is the thrill of ice skating or the mysteries of the human brain.

"I really don't ever want to retire, but I guess inevitably I'll have to," he says. "I'm doing pretty good now." He's referring specifically to his research linking prion and Alzheimer's diseases, but the sentiment could speak for his life as a whole.