



Exploring How the Mind Arises from the Brain

Steven Jones, a doctoral candidate in neuroscience, began his fascinating journey in neurobiology with the description of an undergraduate cognitive psychology course: “The study of how the mind arises from the brain.”

“That’s how it actually started,” says the Philadelphia native of his academic and intellectual passion. Today Jones holds a prestigious fellowship and is leading innovative spinal cord research in the Drexel labs in which he once worked as a tech.

As an undergraduate at Temple University, Jones was already interested in the brain and nervous system. While he explored various sciences, such as biology, to answer his intellectual curiosity, he found the Psychology program brought him closest to his fascination with the brain. Then there was that cognitive psychology course addressing “how the mind arises from the brain.”

Eventually, Jones specialized in cognitive neuroscience within the Psychology Department. “I was fascinated by this idea that neurons start with this original cell body and then extend an axon from the cell body all the way to some separate part of the body – that was fascinating... How does the axon develop from the cell body all the way to its target? That’s exactly what I’m actually working on right now.”

Jones knew he wanted to continue his studies in neuroscience after graduation, but the “hard sciences” that comprised any prerequisites to doctoral-level studies were not part of his psychology background. “I knew what I wanted to do, but I didn’t know what it was going to take to get there.” His first application was rejected. Jones learned that to get into the College of Medicine’s Biomedical Graduate Studies program, he would need strong cellular biology and biochemistry qualifications.

Enter Peter Baas, Ph.D., director of the graduate program in neuroscience and Gianluca Gallo, Ph.D, associate professor of neurobiology and anatomy. Drs. Baas and Gallo, impressed with Jones’s professionalism and talent, suggested he enroll and take those hard science courses. Even more important, Dr. Gallo invited Jones to work as a technician in his lab. Dr. Gallo’s specialty: axon extension and regeneration.

Jones explains, “After two years of research I knew exactly what I wanted to do.... Being at Drexel Med showed me what I wanted to do and gave me all the training, and then, when it was time for me to apply to schools, I wouldn’t take anything but Drexel and the Gallo



Steven Jones

laboratory. I was really pushing to be here and to stay here. So I worked two years in the lab, and now I'm registered in the same lab."

The work to which Jones refers is on the cutting edge of neuroscience: axon regeneration. Jones and his colleagues examine the difference between younger neurons that can extend to their target cells and older neurons that, "once injured, develop an inability to grow to their target cells" and therefore cannot function normally.

By examining the cytoskeleton of neurons from chicken embryos, Jones and his colleagues investigate the means by which younger cells retain the ability to regenerate once damaged. If this method can be replicated in older cells, would that enable those injured cells to regenerate and regain their proper function?

As neurons age, they begin expressing genes at lower levels "so that they may no longer promote regeneration." Jones explains that, "Whether it be spinal cord injury or some kind of degenerative disease, you can look at those [injured] neurons in an older adult. You can find out what genes are not expressed that are expressed at younger stages and try to over-express them in that older adult to get them to regenerate."

In Jones's research, he over-expresses the protein myosin II in older neurons. "We wondered if that would help these cells to regenerate [if kept in an] environment that the younger cells were in...we learned that in some respects the over-expression of myosin II in older cells restored their function and sort of rejuvenated them, and made them just like younger cells in many respects, as far as axon extension and axon guidance."

Dr. Paul Letourneau, professor of neuroscience at the University of Minnesota, Twin Cities Campus, mentored Jones as he learned a new technology – in vivo electroporation – in their lab. He says of Jones's work, "His hypothesis suggests there is a temporal shift in the role of actin-based motility in axonal elongation as neurons mature. This idea may be significant in future strategies for promoting axonal regeneration."

Jones's work has not escaped notice. He was recently awarded a highly competitive and prestigious National Institutes of Health Fellowship. This is in addition to holding a Neuroscience Scholars Program Fellowship and authoring papers and presenting research, including platform presentations. He has also been a member of the Golden Key National Honor Society since 1999.

These achievements are all the more impressive considering Jones's background. Jones grew up in inner-city Philadelphia, where crime, drug abuse, and violence were daily realities. He is the first person in his family to attend college, let alone pursue a doctorate. He is also raising a teenage son and is very involved in community service while juggling the rigors of academia. Dr. Gallo attests that Jones is "an outstanding example" of someone "from a truly underprivileged background who has been able to achieve success at every stage of his career thus far."

Jones is in his fourth year of graduate studies, still a year or two away from defending his dissertation. He wants to continue researching neuron regeneration as a post-doc and sharing his enthusiasm and intellectual curiosity as a teacher. "Spinal cord injury research is fascinating, and there's a lot going on in terms of discovery," he says. "It may take more years, but we're making lots of advances in figuring out how to rejuvenate older neurons that undergo regeneration after injury." With this passion for teaching and innovative research, Jones is still exploring how the mind arises from the brain.