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The human brain may be the last frontier for science. It is in complexity and its hunger for knowledge and self-understanding is insatiable. Explanations for this complex organ have always come from the brightest and best thinkers of the time, but what does this mean in a world of liberalization and growing gender equality? For centuries, males have dominated the field of neuroscience, with little to no remarks from the surrounding community. But female contributions to the study of the human brain have been no less influential than those by their male counterparts. One such woman, Carla Shatz, has broken boundaries in her role as a female neuroscientist regardless of societal pressures or expectations. For decades, Shatz has been at the forefront of neuroscientific research by exploring the processes of the brains' visual centers and its early development. Her advances in both these realms not only show the amazing capacity of science to comprehend the incomprehensible, but also the infinite potential of women neuroscientists. It is the role of scientists like Shatz to support the involvement of women in the neuroscience community, and to endure as a role model for female scientists of the future.

Like so many scientists before her, Carla Shatz had an inept talent for understanding and questioning the world of scientific discovery. After receiving her B.A. in chemistry from Radcliffe College in 1969, Shatz's expansion into the neuroscience community was unstoppable (1). A Marshall scholarship to the University College London, followed by her Ph.D. in neurobiology from Harvard Medical School and she began studying among some of the nation's greatest thinkers and progressive researchers. Twenty years after receiving her undergraduate degree, Shatz became professor of neurobiology at Stanford University, where she continues to teach today. Shatz's involvement in the neuroscience community has involved attendance on multiple councils, presidential oversight of the Society for Neuroscience, and management of the Bio-X program at the Stanford University School of Medicine. Along with these duties, Shatz continues to conduct her own research and produce cutting-edge publications.

Shatz's exploration of the brain's processes has mainly focused on visual centers and their development. Her groundbreaking discovery in 1991 of retinal synapses occurring spontaneously in vivo led to further research and established that spontaneous synapses, before visual input, are necessary to strengthen the connections in these centers (2). In fact this discovery early in her career set the stage for much of her future research. Just five years after this initial experiment, Shatz's understanding of this developmental process had increased exponentially. An article she published in 1996 explained that the current understanding of the brain assumed that "sensory experience [was] viewed as the strongest force guiding circuit formation."(3) What she argued was that this was not the case. Her own research, as well as the cumulative studies of others in the field, provided evidence for spontaneous neural activity being crucial to, if not the leading factor in neuronal construction. This argument was refined more by Shatz throughout her career and led to her being honored with numerous awards and prizes.

More recent research by this phenomenal scientist has yielded results at the molecular level for neural traits. Her paper on the regulation of CaMKII activity in single visual cortexes has shown that the boundary between immunologically oriented cells and neurons is not as distinct as was previously thought (4). In this experiment, Shatz was able to show that the relationship between developing neurons and MHC1 expressing cells was of significant importance. Her research has serious implications in the diagnosis and understanding of neurological disorders like dyslexia and autism. Not only did this research yield exciting results with regard to the inner workings of neural plasticity, it also overcame past barriers in the methods for obtaining this type of data.

It is apparent then that female neuroscientists like Carla Shatz have contributed more than their fair share to the world of neuroscience. Yet the issue still remains: why are there so few female neuroscientists?

Current statistics show that the number of PhD's prescribed to males outnumbers those to females by two and a half to one (5). In the year 2006, only one in five papers had a female author, and the numbers are similar among the rest of the hard science domains. These statistics are not surprising. Gender inequality has penetrated every realm of civil and scientific society for all of human history. The factors that determine this are mostly societal. Traditional values

among religion, culture, and ethnicity have driven female representation down according to historical trends. The neuroscience community has not escaped these effects. In 2003, only 25% of the nation's tenure tracks were for females, a number that falls well below the ratios observed in social sciences and political science (5).

But the numbers are finally changing. Female neuroscientists are becoming leaders in their field, and young students are expanding their interest in neuroscience as a whole. What remains to be seen is whether this current expansion will sustain itself long enough to equalize centuries of male overrepresentation. Scientists like Shatz establish a precedent that young women can follow and idolize, but it may require more than role models to upset the status quo.

Regardless of the causes for female underrepresentation in the neuroscience community, there is a hopeful future. Science as an ideology welcomes universal involvement in its quest for knowledge. In an ever-expanding world of thinkers and inventors, gender roles can only decrease in importance beneath the shadow of this goal. For women, this means a greater voice and a more powerful presence. Scientists like Carla Shatz embody the collective spirit of the scientific method, and provide an admirable example to young thinkers of every sect of life. The wonderful instrument we call the brain does not discriminate in its quest for ultimate knowledge, it merely encourages its own self-awareness through the innovators of the present, both male and female.

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