

# Carla J. Shatz, PhD of Stanford University

By Jim Keller

*Note: The IRSF Spotlight's intent is to give our lay and scientific communities an idea of who IRSF funded investigators are both as a person and a scientist working to make Research a Reality.*

Last year IRSF had the privilege to host distinguished neuroscientist, Dr. Carla J. Shatz of Stanford University as its Keynote Speaker for the Foundation's 10th Annual Rett Syndrome Symposium. At the meeting Dr. Shatz, Professor of Biology and Neurobiology who currently serves on the National Advisory Council of the National Institute of Mental Health, discussed how interactions between neural activity and newly-discovered neuronal genes shape and fine-tune brain circuit formation. In October, the Foundation announced that her Research Grant titled "MHC Class I molecules and receptors as therapy for Rett syndrome?" was selected as part of its 2010 grant funding that totals \$2.15 million. Dr. Huda Zoghbi, who discovered the gene responsible for Rett syndrome, expressed her enthusiasm, "I am thrilled to learn that Dr. Shatz will examine visual system plasticity in a mouse model of Rett syndrome. Bringing Carla into the Rett syndrome field is a huge boost to the neurobiological studies on this disorder." With this Award, made in honor of Grace Reddington, Dr. Shatz becomes one of the latest additions to a long line of distinguished IRSF funded investigators.

Dr. Shatz did her graduate training at Harvard Medical School where she was mentored by the Nobel Laureates, David Hubel and Torsten Wiesel. Drs. Hubel and Weisel were pioneers in the study of how experience influences brain development, showing how early visual experience guides development of the visual system. Dr. Shatz's studies have focused on how this influence is accomplished. Even her first studies had immediate impact resulting in her receiving the Society for Neuroscience (SFN) Young Investigator Award in 1985. Her studies have continued to define key mechanisms and shown how experience changes the relatively imprecise early connections between neurons in brain and refines them into adult precision. A recent research discovery is that a family of molecules (MHC Class I family) previously considered for their role in immune recognition were found to also play a key role in controlling the plasticity involved in experience induced changes in brain connections. This mechanism may not only contribute to regulating brain wiring during critical periods of development but also for learning and memory in the adult. This discovery establishes a potential route for immune-neuronal interactions and opens new doors for understanding how genes and environment may interact in complex neurological disorders such as Autism. MeCP2, a gene mutated in Rett syndrome, also contributes to experience mediated refinement of connections during brain development. IRSF is excited to have Dr. Shatz turn her attention to Rett syndrome and investigate if modulating the MHC class of enzymes could compensate for reduced or lost MeCP2 function in Rett syndrome.

Dr. Shatz has received countless Awards and has enjoyed membership in numerous prestigious scientific organizations including the Institute of Medicine and has held the title of President of the Society for Neuroscience. She graduated from Radcliffe College with a B.A. in Chemistry and was honored with a Marshall Scholarship to study at University College London, where she received an M.Phil. in Physiology. Dr. Shatz went on to receive her Ph.D. in Neurobiology from Harvard Medical School where she completed her postdoctoral training with Dr. Pasko Rakic in the Department of Neuroscience. In 1978, Dr. Shatz moved to Stanford University, where she became Professor of Neurobiology and ultimately moved her lab to the University of California, Berkeley, where she was Professor of Neurobiology and an Investigator of the Howard Hughes Medical Institute (HHMI). She assumed the role of Department Chair of Neurobiology at Harvard in 2000 as the Nathan Marsh Pusey Professor of Neurobiology and returned to Stanford in 2007 as Director of Bio-X.

## **What prompted you to begin a career in research?**

A dual love of science and art brought me to a synthesis of both in graduate school, where I began my studies

of the function and development of the visual system. I had no interest in going to medical school at that time- I was excited by the newly-created field of neurobiology, and I was also disappointed that neurologists had little to offer patients in the way of treatments or cures for almost all neurological disorders, including the stroke that my grandmother had just suffered.

**What is the single most rewarding aspect of conducting Rett syndrome research?**

The idea that our research may contribute key knowledge about the underlying mechanism of this devastating developmental disorder, and that this mechanistic understanding may lead not only to treatments but also to cures.

**What is a potential positive outcome of the research you are conducting that is specific to your IRSF Award?**

We hope to find molecules and mechanisms that reveal new opportunities for developing drugs or other therapeutic approaches

**If you could pick any one symptom of Rett syndrome to prevent or to provide relief for, what would it be?**

Perhaps this is a naive goal, but I would like to contribute research and understanding of mechanism that could someday result in a treatment of global symptoms.

**What other diseases does your research focus on?**

My research is focused on elucidating fundamental mechanisms of how experience and neural activity alter brain circuits, especially during early critical periods of development and learning. My lab conducts basic neuroscience research, not clinical research. Because we've discovered an unexpected role for immune molecules in brain plasticity, our research may be relevant to a broad range of disorders in which inflammation and the immune system are suspected as contributors, including not only Autism and Schizophrenia, but also possibly even neurodegenerative disorders such as Alzheimer's.

**What else would you like the RTT community to know about you?**

I have no hobbies at present and work almost all the time. This is not healthy but I am enjoying myself. In addition to research in my own lab, I am Director of Bio-X, an exciting experiment in interdisciplinary research at Stanford aimed at breaking down the ivory towers that act as barriers separating different fields and aimed at bringing together scientists, engineers and clinicians from many disciplines to tackle the challenge of understanding life's complexity and of repairing the body and brain.