Will Talbot, PhD

Professor of Developmental Biology
Senior Associate Dean for Graduate Education and Postdoctoral Affairs
Stanford faculty member since 1999

Stanford | MEDICINE

Leader in Research Related to
Autism
Multiple sclerosis
Neurodegenerative diseases

Prestigious Honors Include
2014 | American Association for the Advancement of Science (AAAS) Fellow

2002 | Rita Allen Foundation Scholar (for early-career biomedical scholars)

1998 | Pew Biomedical Scholar

"Will is doing a spectacular job elucidating mechanisms that control nervous system development. He has a rare ability to solve key problems using an elegant combination of genetic and molecular methods. It's been inspiring to watch him reveal how neurons and glia interact. The pathways he is finding are fundamental, and I think will be great targets for future development of drugs and treatments to improve nervous system health and function."

David Kingsley, PhD
Professor of Developmental Biology

Brain Explorer

How do cells build and maintain a healthy brain? Will researches glial cells, which influence nervous system form and function. They do everything from creating the myelin sheath, an insulating layer around nerves, to defending the brain against infection. Despite their importance, glial cells are understudied. Will is bridging this gap by discovering the genes that govern them.

Myelin is an elaborate cellular structure that ensures speedy information flow through our brains and spinal cords. All motion—walking, standing up with good posture—depends upon it. So do cognition, learning, and memory. Disruptions can impair speech, vision, mobility, and cognition in diseases such as multiple sclerosis, peripheral neuropathies, and diabetes. "We take myelin for granted," Will emphasizes. "But it's critical for every decision we make and every movement we take."

Zooming in on zebrafish brains with a microscope helps Will investigate myelin. Within 2,600 fish tanks, he screens thousands of zebrafish to find rare mutants whose nerves don't grow properly. Because zebrafish are transparent, he can look inside their brains to see how defects arise. This research has led Will to discover more than 15 new genes critical for glial cells, such as the GPR126 receptor, which controls myelin production and is mutated in patients with a lethal nerve disease.

Will also identifies genes that regulate microglia, immune cells that protect the brain during infection. Their dysfunction occurs in a wide array of disorders, including autism and Alzheimer's disease. By screening mutant zebrafish with abnormal microglia, Will's lab found unknown genes including a receptor that suppresses inappropriate inflammation.

We can apply Will's insights from zebrafish to human patients. The genes and pathways he's defined may be disrupted in human nervous system disorders. "Zebrafish models of these diseases inform us about patient pathology and provide a way to investigate possible innovative new therapies," he says.

Q&A

What inspired you to become a biomedical scientist? What led you to your current field?

Understanding the molecular basis of life motivates me. Biology is so beautiful. And neuroscience is so fundamental to what makes us human. We've wondered how the brain works since ancient Egypt. Neuroscience is a big, important area. In recent years, many technological advances have opened new avenues to explore life's great mysteries. It's an exciting time to be a neuroscientist.

I want my work to be relevant to medicine. I love the thrill of discovering how biology works, and basic science breakthroughs are the foundation on which cures are built.

Who are you researching for?

Everyone is impacted by disease. One of my grandfathers had Alzheimer's disease. He was an educator and high school principal, and it was painful to see him decline. My wife has multiple sclerosis; fortunately, her symptoms are not severe. Much remains unknown about MS, and I hope that my work on the myelin sheath will bring us closer to a cure. My older son has autism, and that's one of the reasons I'm interested in microglia.

Stanford's unprecedented commitment to fund all bioscience graduate students for the first four years of their training is transforming the way our country educates the next generation of biomedical scientists. Tell us about your goals as Senior Associate Dean for Graduate Education and Postdoctoral Affairs.

I loved being a graduate student in Stanford Biochemistry, and the training and mentoring I received here was absolutely critical to my life in science. It was a great honor to join the faculty, and an even greater honor to become Senior Associate Dean. It's a real privilege to help shape the world's next generation of leading scientists. I want our students to have the same supportive environment I had. We recruit the best students and provide the best possible training and mentoring. Our new funding model has empowered our students—they have no financial constraints on their choice of labs or projects. Independent funding is such a great gift to a scientist—you can do the research that's most exciting for you and follow your project wherever it leads.

You just finished the Chicago marathon. How has running influenced your life?

I've run eight marathons now. Running is good exercise and very relaxing. I do some of my best, most focused thinking while I'm running. And it's fun to enjoy with my family. Both my kids run cross country, and we all run together. All four of us just ran the Stanford Race Against PH 5K. People view running as a solitary thing, but it's social. Getting outside together on a nice day is a wonderful way to spend time with my family.

Describe some of the biggest challenges you face regarding research funding.

Technology is challenging to fund. With astronomy, the public understands that engineering drives progress: for example, a new telescope or rocket or spacecraft. With biological exploration, people aren't so familiar with the technology that's needed. Technology development for biology is usually not in the news until after it's already done and producing results. Society would benefit from more appreciation for the fundamental role of technology in biological discovery.

Biologists who work on new technology often do it without much support. We can see so many ways new tools can help people, but we don't have the funds to pursue all our ideas. If we had more support, we could do much more to accelerate the pace of innovation in our own lab and in others.