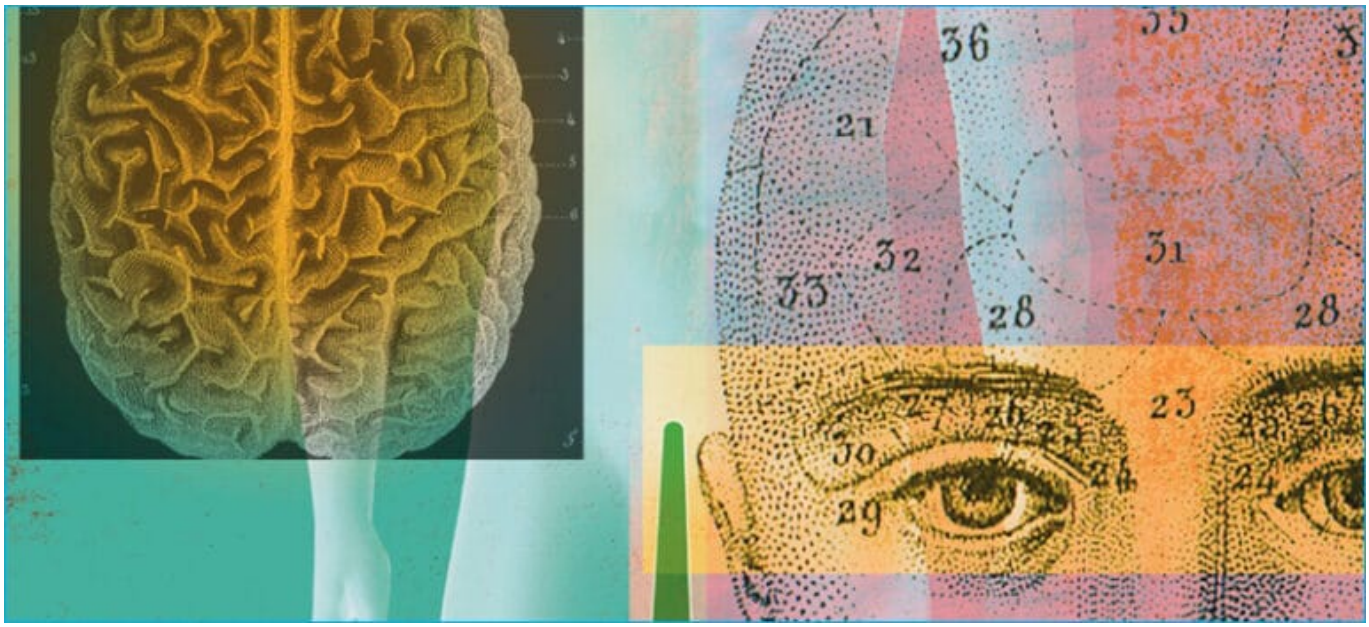
Searching for breakthroughs



Research fellows have a personal stake in their projects.

by Lori De Milto

Alessia Tassoni was just finishing high school when her mother began to have trouble seeing. Soon after, Tassoni's mother was diagnosed with multiple sclerosis. Watching her mother live with MS led to Tassoni's decision to pursue a career in research.

"It was a shock. But my mother's MS gave me an understanding of what to do next. I wanted to do science and work in MS," says Tassoni, who subsequently earned a PhD in clinical neurosciences.

Tassoni is one of four National Multiple Sclerosis Society fellows whose work was inspired by a personal connection to MS. Tassoni, along with Gregory Duncan, PhD; Kirsten Anderson, PhD; and Omar Al-Louzi, MD, are working on projects focused on halting or repairing visual loss in MS, finding differences in genes that lead to better or worse outcomes for people with MS, understanding what causes declining function in MS, and developing better imaging to distinguish damage due to MS from other damage to the brain, spinal cord and optic nerves.

The Society trains and supports researchers and physicians like Tassoni, Duncan, Anderson and Dr. Al-Louzi, who have completed their doctoral or medical degrees through nine types of research and clinical fellowships. Fellows train with seasoned MS scientists and physicians in laboratories and MS clinics. Tassoni, Anderson and Duncan have postdoctoral fellowships that support their research under the mentorship of a senior researcher. Dr. Al-Louzi has received a three-year Clinician Scientist Development Award, which provides neurologists with training

in MS clinical research.

Alessia Tassoni, PhD, is studying the optic nerve to help halt or repair vision loss in MS. Photo courtesy of Alessia Tassoni, PhD

“Fellowships supported by the National MS Society ensure that talented and passionate young researchers and clinicians are able to gain the skills and training that they need to become independent MS researchers and deliver breakthroughs to a cure for MS,” says Elisabeth R. Mari, PhD, director of biomedical research at the Society.

Halting or repairing visual loss

Tassoni left the small village in Italy where she grew up to study in Milan, where she earned a master’s degree in molecular biology at the Università Vita-Salute San Raffaele. Then she traveled to the United Kingdom, where she earned her PhD in clinical neurosciences at the University of Cambridge.

In 2015, Tassoni joined the University of California Los Angeles as a postdoctoral researcher in the UCLA MS Research Program. Since MS is different for each person, one focus of the program is looking for treatments tailored for each disability. Under her Society fellowship, Tassoni is studying vision issues. “We hope that this project will promote the discovery of treatments able to halt or repair visual loss in MS,” she says.

Tassoni is using a new technology called Ribo-tag to study specific cells in the optic nerve, which connects the eye to the brain. She’s searching for any molecule in those cells that leads to vision problems.

A molecule is a very small part of a substance. If Tassoni finds a molecule and other studies

confirm this, therapies that target these molecules can be developed and tested in clinical trials to prevent or reverse vision problems. Fortunately, Tassoni says her mother's MS is now stable.

Finding gene "flavors" that affect outcomes

After studying biochemisty at the University of Colorado, Anderson stayed on to earn a PhD in immunology. Several of her colleagues in graduate school had MS, and Anderson saw how they struggled to complete their degrees and live their lives. This led to her decision to study MS.

Kirsten Anderson, PhD, is examining data to determine factors that contribute to a faster MS onset. Photo courtesy of Kirsten Anderson, PhD

Then, in 2018, Anderson's connection to MS got more personal. "I got a phone call from my aunt, but I didn't know she was my aunt because I was adopted," Anderson says. Her aunt had tracked her down to tell her about her biological father's health problems. During their conversations, they talked about Anderson's work, and her aunt mentioned that she and her twin daughters have MS.

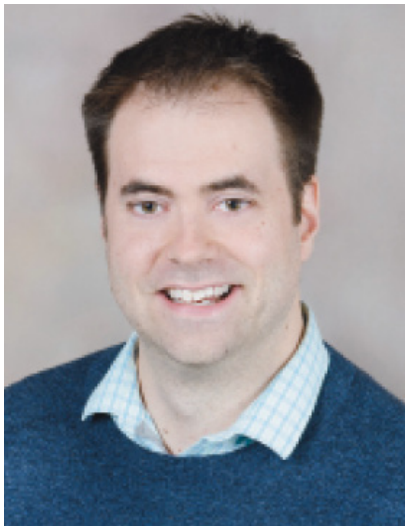
At the time, Anderson was preparing to move to California, where her aunt lived, to join the University of California San Francisco's Multiple Sclerosis Center as a post-doctoral researcher.

Anderson learned that her aunt and cousins were part of the study she would be working on at the university: the Multiple Sclerosis Expression, Proteomics, Imaging Clinical study.

Now, Anderson is using information from her relatives and about 600 other people with MS in

her Society fellowship project. She's using next-generation sequencing, which generates large amounts of genetic data very quickly, to study a specific cell type with alleles, or specific gene "flavors." These alleles vary among people and may contribute to relapses and disability in MS. Anderson is comparing sequencing results to MRIs and clinical test results to see if there's an association between the allele and a faster disease onset.

"If we can identify an allele associated with faster disease onset, people with this allele when first diagnosed can consider more aggressive treatment earlier to prevent progression," Anderson says. A blood test would enable doctors to identify whethera person has the allele.



Gregory Duncan, PhD, uses genetic profiling and editing to find a different approach to treating MS. Photo courtesy of Gregory Duncan, PhD

Studying damage that leads to disability

Like Tassoni, Duncan was in high school when his mother, who has rheumatoid arthritis, was diagnosed with MS. "I think for a lot of years, they wrote off the MS as the arthritis," Duncan says. Although his mother's MS had been mild, her diagnosis changed Duncan's career plans.

Duncan always planned to be a scientist, but after his mother's diagnosis, he switched from chemistry to neuroscience. After earning a bachelor of science degree in cell biology and genetics and a doctorate in zoology, both at the University of British Columbia in Canada, Duncan joined the Oregon Health and Science University as a postdoctoral fellow in 2018.

Under his Society fellowship, Duncan is using genetic profiling and editing to better understand damage to neurons and axons within the brain and spinal cord. Neurons are tiny

cells with fibers (like cables) that allow the neurons to send information from the brain to the body and back. Damage to neurons causes progressive disability in MS.

Duncan hopes he'll learn enough to start using a different approach to treating MS. "Anti-inflammatory therapies can be effective, but the disease still progresses. We think a more direct approach might be to understand how damage to neurons occurs and then, ideally, develop drugs to reduce the damage," he says. Duncan expects the results of this project to serve as a roadmap for future studies that could eventually lead to new MS treatments focused on reducing damage to neurons.

Omar Al-Louzi, MD, uses MRI imaging to study the central vein sign, a blood vessel common in MS lesions. Photo courtesy of Omar Al-Louzi, MD

Developing better imaging for earlier diagnosis

Dr. Al-Louzi's mother was diagnosed with MS when he was 16 years old. After earning his medical degree at the University of Jordan, Dr. Al-Louzi moved to the U.S. to continue his training.

Dr. Al-Louzi completed his internship at North Shore Medical Center and his residency in neurology at Brigham and Women's Hospital, Massachusetts General Hospital and Harvard Medical School. He completed a Research Fellowship in neuroimmunology and MS at Johns Hopkins Hospital.

In 2018, Dr. Al-Louzi joined the National Institutes of Health as a clinical fellow in the neuroimmunology branch, which focuses on MS research. Under his Society fellowship, Dr. Al-Louzi is working on developing imaging methods that can better distinguish MS-related from

non-MS-related lesions. These lesions look similar on MRIs, making it difficult to diagnose MS.

Dr. Al-Louzi is using advanced MRI imaging to study the central vein sign, a blood vessel that's seen more often in MS lesions than in other lesions. He is studying the central vein sign in people with different types of MS and will look for the best way to capture this on MRI.

Lori De Milto is a Sicklerville, New Jersey-based freelance writer.

Learn more about research the National MS Society supports.

Find out more about clinical fellowships.