

# Casting light into darkness

By Mark Neil Levine. Photos by Dave Smith.

Long before the ravages of multiple sclerosis—a disabling disease affecting as many as 400,000 Americans—become evident, the disease is making its way deep inside the victim’s brain, destroying the protective myelin sheath that surrounds microscopic nerve fibers. When these nerve fibers, or axons, are destroyed, nerve impulses to and from the brain are disrupted, resulting in a variety of symptoms ranging from numbness in the limbs to paralysis and blindness.

If treated early, the course of the disease can be slowed. Until recently, the earliest stages of multiple sclerosis were undetectable even by the best magnetic resonance imaging technologies, and its symptoms can mimic other disorders, including depression. The cause of multiple sclerosis is unknown and there

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is no cure. However, researchers at the University of Nevada School of Medicine are making steady progress in casting light into the darkness that is multiple sclerosis. Sophisticated new magnetic resonance imaging techniques are shedding new light on this disorder.

According to Dr. William Orrison, chief of neuroradiology at Nevada Imaging Centers and adjunct clinical professor with the School of Medicine, “We can view the brain in ways not possible just a few years ago, thus leading to quicker, more definitive diagnosis and the opportunity to begin treatment months and years before the symptoms might otherwise present.”

One of the most promising new diagnostic tools used at the School of Medicine is Diffusion Tensor Imaging or DTI, which uses a technique called “fiber tracking,” in which molecules of water within nerve fibers are imaged and color-coded depending on which way they are traveling, up-and-down or side-to-side. Because the water molecules are trapped

within minute nerve fibers, their motion is restricted. The fibers become visible onscreen as slender, threadlike bands of color—similar in appearance to a sea anemone’s tendrils.

Orrison notes that the major advantage of fiber tracking and DTI imaging is the ability to actually visualize the brain’s complex cabling system. This system interconnects neurons, the brain’s nerve cells, in the intricate wiring required for brain function.

DTI reveals dramatic differences between a brain structure called the corpus callosum in healthy individuals and patients with multiple sclerosis. In multiple sclerosis patients, the nerve fibers are clearly damaged or missing. This technique has promise for early diagnosis, and thus the evaluation of new drugs once this preliminary work is confirmed.

While the exact cause of multiple sclerosis is unknown, it is clear that the immune system plays an important role in the disease. Myelin and axons—even neurons themselves—get attacked in this autoimmune disease. The disease is often characterized by episodes of improvement and deterioration generally resulting in sensory, motor and cognitive problems.

A suspected cause is a combination of genetics and environmental factors, says Dr. Steven Glyman, School of Medicine associate professor of neurology and one of the country’s leading multiple sclerosis clinicians. “There are clusters of multiple sclerosis, not in Nevada, but in the northern hemisphere,” he notes. These clusters lead researchers to speculate that sunshine, or the lack of it, and resulting lowered levels of Vitamin D could contribute to producing multiple sclerosis in those with a genetic predisposition to the disease.

Glyman has developed a strong clinical research program as he and his team investigate clinical drug trials to treat multiple sclerosis, as well as Parkinson’s disease, restless leg syndrome and other neurological diseases.



Glyman’s team includes Orrison; Phil Patton, associate professor of health physics at the University of Nevada, Las Vegas; Dr. Eric Hanson, chief of research and education at Amigenics, Inc.; and stereolithographer Timothy Mueller.

Hanson, a research scientist with a strong background in genetics, is interested in studying how the different patterns of disease correlate with the patients’ genetic make-up. This combined approach of studying imaging, clinical status, and genetic analysis will allow better care for multiple sclerosis patients.

Glyman and his colleagues in the neurology department treat nearly 1,200 multiple sclerosis patients per year, many of whom come to Las Vegas from other states. They come not only for treatment but also to enroll in clinical trials testing new therapies for multiple sclerosis patients. “Our goal is to create an open access clinical, genetic and DTI database that will enable University Nevada, Reno research-



Steven Glyman, associate professor of neurology, stands in the viewing room of the Toshiba 320 Slice Aquilion One, a \$2.7 million computed tomography (CT) machine that allows physicians to see not only a three-dimensional depiction of an organ—including heart, brain and others—but also the organ’s blood flow and dynamic function in one rotation, at high resolution.

ers to collaborate with fellow researchers studying multiple sclerosis,” Glyman says.

In addition to utilizing a team approach on the research side, Glyman also strongly believes in an integrated, supportive team approach to providing care. “Caring for multiple sclerosis patients requires a multifaceted team approach in order to ensure they receive the best treatment available. While new treatments promise as much as a 100 percent

increase in efficacy over current therapies, they will not be possible in Nevada unless we can build the medical infrastructure to administer and monitor them safely,” Glyman states.

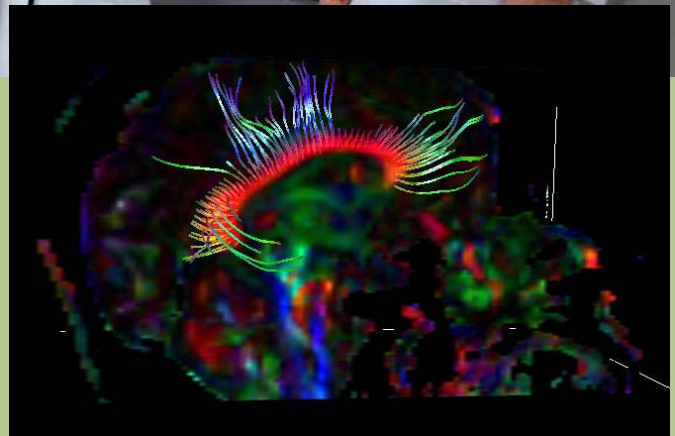
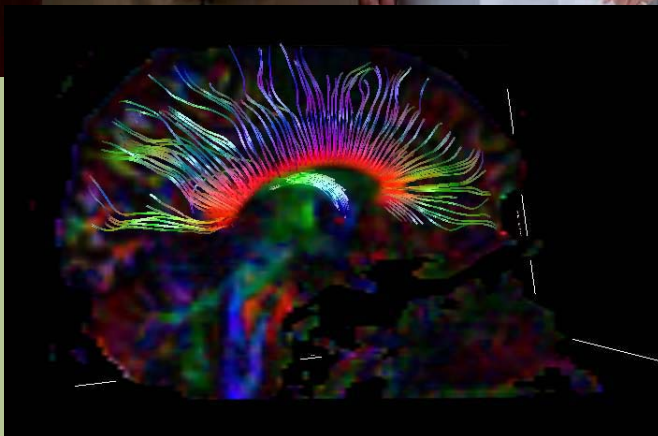
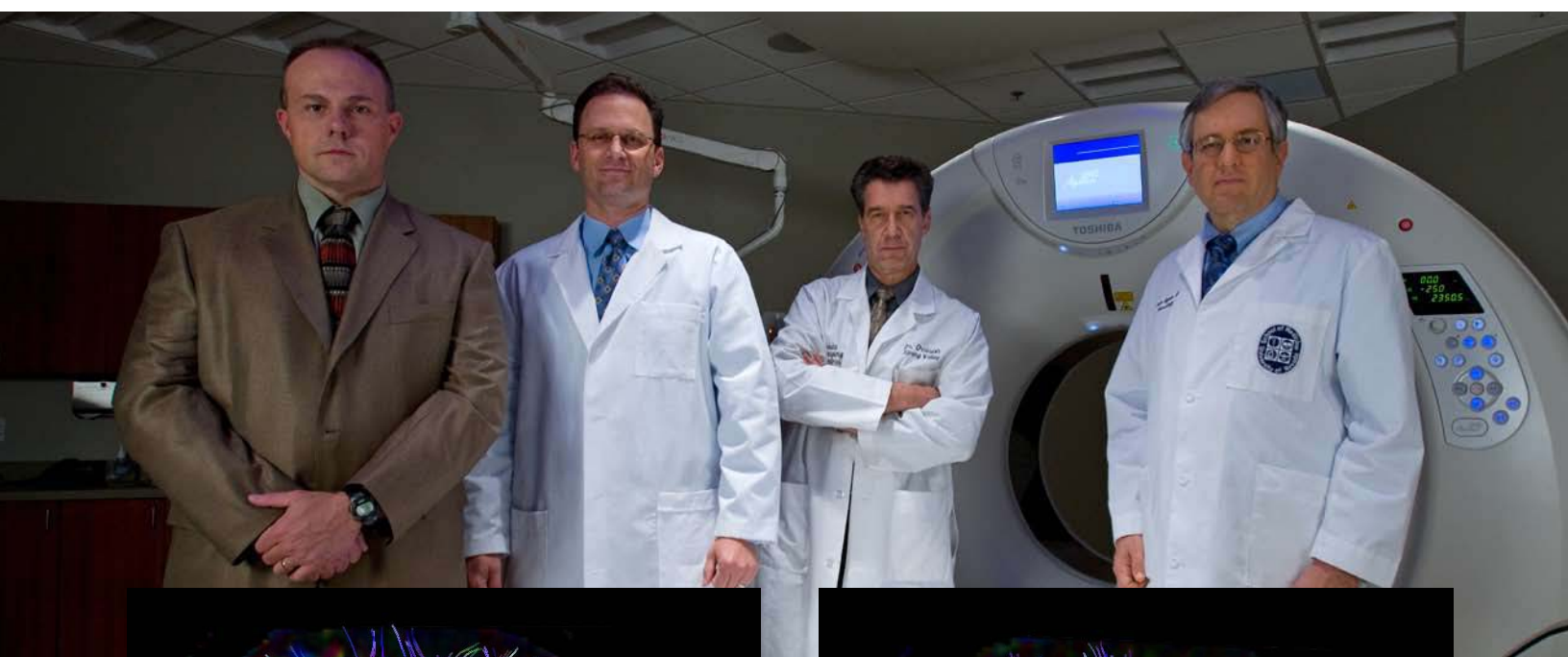
He adds that comprehensive care is more than just the professional services of physicians and nurses. Multiple sclerosis patients need psychologists and neuropsychologists to help them and their families deal with the cognitive and emotional prob-

lems associated with this devastating disease. Social workers are needed to help patients with complex insurance issues, financial problems, patient advocacy, and home health care. Physical, occupational and speech therapists play a vital role in the rehabilitation of patients with multiple sclerosis. Advanced practice nurses and other nurse specialists are important team members, who assist in the delivery of increasingly complex care.

“Nurse educators need to be part of the team, teaching patients, families and community members about the complexities of multiple sclerosis. Only by coordinating all of these individuals and services into a comprehensive care facility can we provide optimal care,” Glyman says. The neurology faculty has established a close working relationship with

*“Whether adversity be a stumbling block, discipline, or blessing depends altogether on the use made of it.”*


—Anonymous multiple sclerosis patient



Images courtesy of Timothy Mueller.

TOP: Phil Patton, Eric Hanson, William Orrison and Steven Glyman showcase the new Toshiba 320 Aquilon One CT scanner. BOTTOM: On the left is an image of a normal, 21-year-old brain made with a 3.0 Tesla MRI Diffusion Tensor Imaging scanner. The image shows water molecules within normal corpus callosum nerve fibers, which appear as colored tendrils. The brain on the right, from a different patient, shows nerve fibers that have been destroyed by multiple sclerosis.

neuroradiologists, fellow researchers and physicians with significant expertise in multiple sclerosis treatment.

“If we can establish an endowed chair in multiple sclerosis, it would greatly accelerate the progress in research and treatment coordination, by allowing us to gather all the required staff and technical resources to partner within our multiple sclerosis practice,” Glyman notes. “A research chair will help us attract and educate the next generation of medical professionals who want to specialize in treating multiple sclerosis patients. Establishing the multiple sclerosis chair would go a long way in laying the foundation for developing a comprehensive treatment and research facility to expand and improve upon the treatment options for our multiple sclerosis patients and in the process help establish Nevada as a pioneer in the fight against this disease.” 

## NUMBERS:

Multiple sclerosis affects **400,000** Americans, generally between the ages of **20-40**. There are about **2.5** million people worldwide with multiple sclerosis. Multiple sclerosis is the leading cause of disability of young adults. Multiple sclerosis was **first** identified and described by a French neurologist, Dr. Jean-Martin Charcot, in **1868**. Sclerosis means scars—plaques or lesions in the brain and spinal cord. Women are affected almost **twice** as often as men. Multiple sclerosis is **five** times more prevalent in temperate climates than in tropical regions.