Motor vehicle accidents account for more than half of the 1.5 million traumatic brain injuries (TBIs) that occur each year. Finding ways to prevent, treat, and repair TBIs is the basis for the research of Barclay Morrison, associate professor of biomedical engineering, and his Neurotrauma and Repair Laboratory team.

At the moment of injury, some brain tissue is instantaneously destroyed and can never be saved by post-injury treatment, so prevention becomes all the more important. Using an atomic force microscope, Morrison is measuring material properties of anatomical structures within the brain that can be used by the National Highway Traffic Safety Administration to set standards for automotive manufacturers.

“We’re determining the safe limits of brain deformation, which is the underlying cause of TBI, to learn what the brain can withstand, so safety systems can be designed to minimize the trauma,” says Morrison.

Morrison’s group is also working with the aftermath of TBIs. One approach investigates the brain’s own initial response, which is an attempt to repair the damaged neural connections and replace lost tissue. For reasons yet unknown, this repair process is aborted. If Morrison can find a way to short-circuit this response, it may be possible to harness and control the brain’s innate potential for repair. It may even be possible to grow replacement neural tissue from a patient’s own stem cells via neural tissue engineering.

In a scenario directly from *The Six Million Dollar Man* or *The Bionic Woman*, Morrison sees the possibility of interfacing neurons directly onto silicone circuitry to control a prosthesis. While this technology is now only imagined, he continues to investigate the factors that influence the ability of neurons to form connections with silicone circuitry, hoping for a breakthrough that can immediately impact the lives of thousands.

After receiving his PhD at the University of Pennsylvania, Morrison was a post-doctoral researcher in TBI there and later at the University of Southampton, U.K.