

# FORTUNE

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## The Brain: Diagnostics

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It's hardly a news flash that bonking your head, hard, can damage your brain. But that initial whack may not be the cause of your concussion or more severe trauma. When you're injured, your brain releases enzymes called proteases that can do further damage—well after the injury. "Think of the proteases as little Pac-Men that are asleep," says Ron Hayes. "After an injury, they become activated and start scooting around, chewing up everything in sight. Your brain tissue will continue to shrink for months after an injury. The brain ends up digesting itself."

The problem right now, Hayes says, is that doctors have no way to locate or monitor the release of the proteases. Post-whack, today's imaging tests—MRIs and CT scans—show only the physical characteristics of an injury, like swelling. There are blood tests that can discern diabetes or high cholesterol, but none exist to show chemical changes in the brain after a trauma. "We're completely blind," Hayes says.

Last year Hayes, 59, started a biotech company called Daimonion Diagnostics to develop the missing tests. He plans to have a prototype within three years. Hayes's ultimate goals are even more ambitious: to create high-tech scans that can map both the physical and biochemical structure of the brain.

If Hayes (or someone else) succeeds, doctors and paramedics in the future may have portable kits that instantaneously gauge an injury's severity. Then, by monitoring the chemical makeup of the brain at each stage of treatment, doctors will be able to conclusively determine the most effective drugs for each patient. Such tools could also be used to diagnose risk factors for diseases like Alzheimer's or Parkinson's. (One theory is that such conditions can be set off by trauma that damages the blood-brain barrier and allows destructive proteins to enter the brain.) They'd have preventive use as well, monitoring early signs of neurodegeneration and theoretically enabling doctors to prescribe drugs to prevent the onset of disease.

The fact that no such medicines are yet available doesn't daunt Hayes. If you build the tests, the drugs will follow, he predicts. "Where we are in the brain field is not in therapies, it's in diagnostics. There are drugs in the pipeline that we could use, but we don't have any way to assess how well they work. This will be the revolution."