

# THE GENETICS OF LEARNING AND MEMORY

## Don't Try This at Home

The morning of September 13, 1848 was not anything special for Phineas Gage. But by that evening, he had gained local fame as the survivor of one of the most bizarre accidents in history. The 25 year-old railroad man was packing explosives when the charge detonated unexpectedly. Propelled by the explosion, the 3-foot iron rod he had been using flew out of his hands and blasted into his left cheek. The rod went straight through Gage's skull and came out at the crown of his head. Amazingly, he did not die! Just minutes after the accident he could walk and talk.

It wasn't until months later that people noticed a change in his personality. He became loud, unpleasant and untrustworthy. Before the accident, Gage had been a pleasant person, hard working and dependable. His doctor was the first to write a scientific report about his case, in 1848. This was more than a fantastic case to thrill morbid readers. Instead, this case inadvertently provided evidence for the connection between brain and emotional behavior. Gage's injury provided clues to normal brain function.

Gage's doctor reported what was known about the injury from external examination, but the report did not include specific details about what parts of Gage's brain was damaged. Nearly 150 years later, scientists revisited this case to see if they could use the current knowledge about brain parts and brain functions to learn what exactly happened to Phineas Gage.

Two scientists at the University of Iowa used modern technologies of imaging and computer graphics to analyze the skull of Phineas Gage, which had been preserved in a medical collection at Harvard University. The computer generated analysis showed the exact path of the rod as it passed through Gage's head.

They discovered that most of the damage occurred in the frontal lobes of the brain. The frontal lobes communicate with the thalamus. The speech and motor function areas were not damaged. The University of Iowa scientists compared their data on the Gage brain with data from other modern patients who suffered damage in similar part of the brains. From this combined evidence, they concluded that these regions are involved in processing emotions and keeping a rational view of life.

Why is it so important that the 1994 study compared the injury in Gage to other evidence of brain injury? To show the frontal lobe damage as the cause of Gage's emotional change, it is important rule out other explanations. For example, his shocking appearance after the injury could have produced mental stress and emotional change. However, the additional evidence from other patients with injuries to this part of the brain strengthens the conclusion that the frontal lobes are involved in processing emotions.

So, the moral of the story is that scientists rely on many types of experiments and observations to strengthen a scientific explanation. But don't try this one at home!

## References

Damasio, Grabowski, Frank, Galaburda and Damasio. The return of Phineas Gage: clues about brain from the skull of famous patient. *Science* 264: 1102-1105 (1994).

Sabbatini. The Amazing Case of Phineas Gage. (2001)  
<http://www.epub.org.br/cm/n02/historia/phineas.htm>.