Unpleasantness in Vermont
PHINEAS P. GAGE

IT IS THE summer of 1848. We are in New England. Phineas P. Gage, twenty-five years old, construction foreman, is about to go from riches to rags. A century and a half later his downfall will still be quite meaningful.

Gage works for the Rutland & Burlington Railroad and is in charge of a large group of men, a "gang” as it is called, whose job it is to lay down the new tracks for the railroad’s expansion across Vermont. Over the past two weeks the men have worked their way slowly toward the town of Cavendish; they are now at a bank of the Black River. The assignment is anything but easy because of the outcrops of hard rock. Rather than twist and turn the tracks around every escarpment, the strategy is to blast the stone and make way for a straighter and more level path. Gage oversees these tasks and is equal to them in every way. He is five-foot-six and athletic, and his movements are swift and precise. He looks like a young Jimmy Cagney, a Yankee Doodle dandy dancing his tap shoes over ties and tracks, moving with vigor and grace.

In the eyes of his bosses, however, Gage is more than just another able body. They say he is “the most efficient and capable” man in their employ. This is a good thing, because the job takes as much physical prowess as keen concentration, especially when it comes to preparing the detonations. Several steps have to be followed, in orderly fashion. First, a hole must be drilled in the rock. After it is filled about half-way with explosive powder, a fuse must be inserted and the powder covered with sand. Then the sand must be “tamped in,” or pounded with a careful sequence of strokes from an iron rod. Finally, the fuse must be lit. If all goes well, the powder will explode into the rock. The sand is essential, for without it the explosion would be directed away from the rock. The shape of the iron and the way that it is placed are also important. Gage, who has had an iron manufactured to his specifications, is a virtuoso of this thing.

Now for what is going to happen. It is four-thirty on this hot afternoon. Gage has just put powder and fuse in a hole and told the man who is helping him to cover it with sand. Someone calls from behind, and Gage looks away, over his right shoulder, for only an instant, Distracted, and before his man has poured the sand in, Gage begins tamping the powder directly with the iron bar. In no time he strikes fire in the rock, and the charge blows upward in his face.

The explosion is so brutal that the entire gang freezes on their feet. It takes a few seconds to piece together what is going on. The bang is unusual, and the rock is intact. Also unusual is the whistling sound, as of a rocket hurled at the sky. But this is more than fireworks. The iron enters Gage’s left cheek, pierces the base of the skull, traverses the front of his brain, and exits at high speed through the top of the head. The rod has landed more than a hundred feet away, covered in blood and brains. Phineas Gage has been thrown to the ground. He is stunned, in the afternoon glow, silent but awake. So are we all, helpless spectators.

“Horrible Accident” will be the predictable headline in the Boston Daily Courier and Daily Journal on September 20, a week later. “Wonderful Accident” will be the strange headline
in the *Vermont Mercury* on September 22. “Passage of Iron Rod Through the Head” will be the accurate headline in the *Boston Medical and Surgical Journal*. From the matter-of-factness with which they tell the story, one would think the writers were familiar with Edgar Allen Poe’s accounts of the bizarre and the horrific.

Noting how surprised people were that Gage was not killed instantly, the Boston medical article documents that “immediately after the explosion, the patient was thrown upon his back;” that shortly thereafter he exhibited “a few convulsive motions of the extremities,” and “spoke in a few minutes;” that “his men (with whom he was a great favourite) took him in their arms and carried him to the road, only a few rods distant, and sat him into an ox cart, in which he rode, sitting erect, a full three-quarters of a mile, to the hotel of Mr. Joseph Adams;” and that Gage “got out of the cart himself, with a little assistance from his men.”

Mr. Adams is the justice of the peace for Cavendish and the owner of the town’s hotel and tavern. He is taller than Gage and twice as round. He approaches Gage, and immediately has someone call for Dr. John Harlow, one of the town physicians.

An hour has passed since the explosion. The sun is declining and the heat is more bearable. A younger colleague of Dr. Harlow’s, Dr. Edward Williams, is arriving. Years later Dr. Williams will describe the scene: He at that time was sitting in a chair upon the piazza of Mr. Adams’ hotel, in Cavendish. When I drove up, he said, ‘Doctor, here is business enough for you.’ I first noticed the wound upon the head before I alighted from my carriage, the pulsations of the brain being very distinct; there was also an appearance which, before I examined the head, I could not account for: the top of the head appeared somewhat like an inverted funnel; this was owing, I discovered, to the bone being fractured about the opening for a distance of about two inches in every direction. I ought to have mentioned above that the opening through the skull and integuments was not far from one and a half inch in diameter;... the edges of this opening were everted, and the whole wound appeared as if some wedge-shaped body had passed from below upward. Mr. Gage, during the time I was examining this wound, was relating the manner in which he was injured to the bystanders; he talked so rationally and was so willing to answer questions, that I directed my inquiries to him in preference to the men who were with him at the time of the accident, and who were standing about at this time. Mr. G then related to me some of the circumstances, as he has since done; and I can safely say that neither at that time nor on any subsequent occasion, save once, did I consider him to be other than perfectly rational. The one time to which I allude was about a fortnight after the accident, and then he persisted in calling me John Kirwin; yet he answered all my questions correctly."

The survival is made all the more amazing when one considers the shape and weight of the iron bar. Henry Bigelow, a surgery professor at Harvard, describes the iron so: “The iron which thus traversed the skull weighs thirteen and a quarter pounds. It is three feet seven inches in length, and one and a quarter inches in diameter. The end which entered first is pointed; the taper being seven inches long, and the diameter of the point one-quarter of an inch; circumstances to which the patient perhaps owes his life. The iron is unlike any other, and was made by a neighbouring blacksmith to please the fancy of the owner.” Gage is serious about his trade and its proper tools.
Surviving the explosion with so large a wound to the head, being to talk and walk and remain coherent immediately afterward – this is all surprising. But just as surprising will be Gage's surviving the inevitable infection that is about to take over his wound. Gage's physician, John Harlow, is well aware of the role of disinfection. He does not have the help of antibiotics, but using what chemicals are available, he will clean the wound vigorously and regularly, and place the patient in a semi-recumbent position so that drainage will be natural and easy. Gage will develop high fevers, and at least one abscess, which Harlow will promptly remove with his scalpel. In the end Gage's youth and strong constitution will overcome the odds against him, assisted, as Harlow will put it, by divine intervention: “I dressed him, God healed him.”

Phineas Gage will be pronounced cured in less than two months. Yet this astonishing outcome pales in comparison with the extraordinary turn that Gage's personality is about to undergo. Gage's disposition, his likes and dislikes, his dreams and aspirations are all to change. Gage's body may be alive and well, but there is anew spirit animating it.

**Gage was no longer Gage**

Just what exactly happened we can glean today from the account Dr. Harlow prepared twenty years after the accident. It is a trustworthy text, with an abundance of facts and a minimum of interpretation. It makes sense humanly and neurologically, and from it we can piece together not just Gage but his doctor as well. John Harlow had been a schoolteacher before he entered Jefferson Medical College in Philadelphia, and was only a few years into his medical career when he took care of Gage. The case became his life-consuming interest. Treating Gage successfully and reporting the results to his Boston colleagues may have been the shining hours of his career, and he must have been disturbed by the fact that a real cloud hung over Gage's cure.

Harlow's narrative describes how Gage regained his strength and how his physical recovery was complete. Gage could touch, hear, and see, and was not paralyzed of limb or tongue. He had lost vision in his left eye, but his vision was perfect in the right. He walked firmly, used his hands with dexterity, and had no noticeable difficulty with speech or language. And yet, as Harlow recounts, the "equilibrium or balance, so to speak, between his intellectual faculty and animal propensities" had been destroyed. The changes became apparent as soon as the acute phase of brain injury subsided. He was now "fitful, irreverent, indulging at times in the grossest profanity which was not previously his custom, manifesting but little deference for his fellows, impatient of restraint or advice when it conflicts with his desires, at times obstinate, yet capricious and vacillating, devising many plans of future operation, which are no sooner arranged than they are abandoned. A child in his intellectual capacity and manifestations, he has the animal passions of a strong man." The foul language was so debased that women were advised not to stay long in his presence, lest their sensibilities be offended. The strongest admonitions from Harlow himself failed to return our survivor to good behavior.

These new personality traits contrasted sharply with the "temperate habits" and "considerable energy of character," Phineas Gage was known to have possessed before the accident. He had had "a well balanced mind and was looked upon by those who knew him as a shrewd, smart businessman, very energetic and persistent in executing all his plans of
There is no doubt that in the context of his job and time, he was successful. So radical was the change in him that friends and acquaintances could hardly recognize the man. They noted sadly that "Gage was no longer Gage." So different a man was he that his employers would not take him back when he returned to work, for they considered the change in his mind so marked that they could not give him his place again." The problem was not lack of physical ability or skill; it was his new character.

The unraveling continued unabated. No longer able to work as a foreman, Gage took jobs on horse farms. One gathers that he was prone to quit in a capricious fit or be let go because of poor discipline. As Harlow notes, he was good at "always finding something which did not suit him." Then came his career as a circus attraction. Gage was featured at Barnum's Museum in New York City, vaingloriously showing his wounds and the tamping iron. Harlow states that the iron was a constant companion, and points out Gage's strong attachment to objects and animals, which was new and somewhat out of the ordinary. (This trait, what we might call "collector's behaviour," is something I have seen in patients who have suffered injuries like Gage's, as well as in autistic individuals.)

Four years after the accident, there was another theatrical coup. He left for South America. He may have worked on horse farms, and was a sometime stagecoach driver in Santiago and Valparaiso. Little else is known about his expatriate life except that in 1859 his health was deteriorating.

In 1860, Gage returned to the United States to live with his mother and sister, who had since moved to San Francisco. At first he was employed on a farm in Santa Clara, but he did not stay long. In fact, he moved around, occasionally finding work as a laborer. It is clear that he was not an independent person and that could not secure the type of steady, remunerative job that he once held. The end of the fall was nearing.

In my mind is a picture of 1860s San Francisco as a bustling place, full of adventurous entrepreneurs engaged in mining, farming, and shipping. That is where the Old Phineas Gage might have belonged. But that is not where we would find him if we could travel back in time. He had joined the tableau of dispirited people who had come to California to die.

The meager documents available suggest that Gage developed epileptic seizures. The end came on May 21, 1861, after an illness that lasted little more than a day. Gage had a major convulsion which made him lose consciousness. A series of subsequent convulsions, one coming soon on the heels of another, followed. He never regained consciousness. He was thirty-eight years old. There was no death notice in the San Francisco newspapers.

**Why Phineas Gage?**

Why is this sad story worth telling? What is the possible significance of such a bizarre tale? The answer is simple. While other cases of neurological damage that occurred at about the same time revealed that the brain was the foundation of language, perceptions, and motor function, and generally provided more conclusive details, Gage's story hinted at an amazing fact: Somehow, there were systems in the human brain dedicated more to reasoning than to anything else, and in particular to the personal and social dimensions of reasoning. The observance of previously acquired social convention and ethical rules could be lost as a
result of brain damage, even when neither basic intellect nor language seemed compromised. Unwittingly, Gage’s example indicated that something in the brain was concerned specifically with unique human properties, among them the ability to anticipate the future and plan accordingly within a complex social environment; the sense of responsibility toward the self and others; the ability to orchestrate one’s survival deliberately, at the command of one’s free will.

The most striking aspect of this unpleasant story is the discrepancy between the normal personality structure that preceded the accident and the nefarious personality traits that surfaced thereafter and seemed to have remained for the rest of Gage’s life. Gage had once known all he needed to know about making choices conducive to his betterment. After the accident, he no longer showed respect for social convention; ethics in the broad sense were violated; the decisions he made did not take into account his best interest, and he was given to invent tales without any foundation except in fantasy. There was no evidence of concern about his future; no sign of forethought.

The alterations of Gage’s personality were not subtle. He could not make good choices and the choices he made were not simply neutral. They were not the reserved or slight decisions of someone whose mind is diminished and who is afraid to act, but were instead actively disadvantageous. One might venture that either his value system was now different, or, if it was still the same, there was no way in which the old values could influence his decisions. No evidence exists to tell us which is true, yet my investigation of patients with brain damage similar to Phineas Gage’s convinces me that neither explanation captures what happens in those circumstances. Some part of the value system remains can be utilized in abstract terms, but it is unconnected to real-life situations. When the Phineas Gages of this world need to operate in reality, the decision making process is minimally influenced by old knowledge.

There is no question that Gage’s personality change was caused by a circumscribed brain legion in a specific site. But that explanation would not be apparent until two decades after the accident. For a long time, everybody believed that “the portion of the brain traversed, was, for several reasons, the best fitted of any part of the cerebral substance to sustain the injury.” In other words – a part of the brain that did nothing much was thus expendable. Yet Gage’s case raised more questions than answers.