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Synopsis

"Horrible Accident" in Vermont

The story opens on September 13, 1848, in Cavendish, Vermont. Phineas Gage, the affable but strong-willed foreman of a track construction gang, is preparing to blast through rock. He uses his tamping iron, a three-foot seven-inch rod that looks like an iron spear. It weighs 13.5 pounds. Phineas is twenty-six years old. This day, he carefully follows his usual strict routine to press the ropelike fuse into the gunpowder. This day, however, something goes tragically awry and the iron rod shoots straight through Phineas' brain. It enters in his cheek and shoots out above his eye. Amazingly, he is still alive and quite coherent. Blood is pouring down his face, but Phineas keeps talking about what happened.

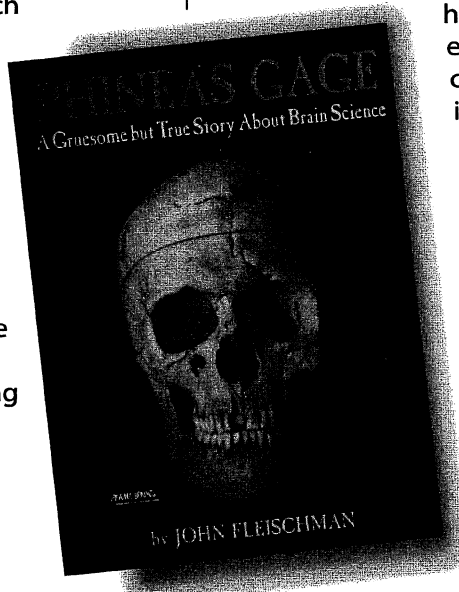
His co-workers take him to Dr. Edward Williams, who cannot believe Phineas' account of his accident. Surely, such a blow would leave him dead. Dr. John Harlow arrives and does what he can to clean the wound and make Phineas comfortable. Phineas is relatively lucky because he has an "open brain" injury. The hole in the top of his head gives his brain room to swell. Phineas appears to recover with amazing speed and insists that he wants to go to his mother's home in Lebanon, New Hampshire. Two weeks later, Phineas is declared "fully recovered" and sent on his way. But something odd happened before he left: Dr. Harlow offered Phineas \$1,000 for the pocketful of pebbles that Phineas had collected. Phineas angrily refuses the deal. Dr. Harlow realizes that Phineas may appear well, but he is not. He has lost the ability to be social.

In the spring, Phineas is back at work in Cavendish,

but it is plain that he is not his old self. He is unreliable and nasty, even spouting vulgar language. As a result, he loses his job. Dr. Bigelow from Harvard wants Phineas to address the Boston Society of Medical Improvement. Dr. Harlow makes the arrangements.

What We Thought About How We Thought

Phineas went to Boston in the winter of 1850. The doctors, dressed like gentlemen as was the practice 150 years ago, take a mold of his face and head. Despite the evidence of their own eyes, some of the doctors think that Phineas is a fraud.



Brain research was in its infancy. Doctors knew very little about cells. As a result, there are two different theories of how the brain operates. The "Whole Brainers" believe that thoughts and commands can originate anywhere in the brain jelly/cloud and flash into action. The "Localizers" think the brain is divided into specific areas that control things. They believe in phrenology, in which you

can determine brain function by the bumps on your head. Today we know that the Whole Brainers are right about the complex interaction of the brain but wrong about the brain acting as a whole. The Localizers are right about the location of function but completely wrong about phrenological organs.

Following Phineas Gage

No one is exactly sure where Phineas went after he left Boston; some think he became a circus freak show exhibit. His mother, Hannah Gage, says that Phineas returned to New Hampshire in 1851 to work for Jonathan Currier in his livery stable. He works there a year and a half. In 1852, he leaves New England for Chile to work as a stagecoach

driver. No one can verify this. In 1859, he shows up in San Francisco, where his mother has moved to be with her youngest daughter Phebe and her husband. Phineas is ill and slowly recovers until he starts having epileptic seizures. The seizures result in his death on May 21, 1860. He is 36 years old. In 1862, French surgeon Paul Broca announces that he has located a specific area of the brain that controls a specific function-- speech. As a result of this amazing discovery, brain theory becomes brain science. Meanwhile, Dr. Harlow keeps in touch with Mrs. Gage, and finally convinces her to have her son's body exhumed for an autopsy. The skull and tamping iron travel to Harvard University in Massachusetts.

Putting Phineas Together Again

Antonio and Hanna Damasio, a famous husband and wife team of brain researchers in Iowa today, study people who have frontal lobe damage like Phineas did. They have found that these patients, like Phineas, have trouble making decisions and dealing with social situations. They created dramatic computer drawings showing how the tamping iron pierced Phineas' skull.

The author concludes with praise for Phineas, who found a way to live with traumatic brain injury for eleven years.

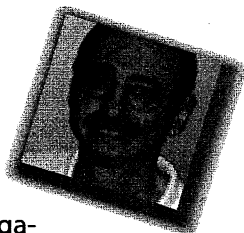
Timeline of Modern Neuroscience

- 1848** Phineas Gage has his brain pierced by an iron rod.
- 1852** Kolliker describes how motor nerves originate from the neurons in the spinal cord.
- 1853** Carpenter proposes "sensory ganglion" (thalamus) as the seat of consciousness.
- 1860** Kahlbaum describes and names "catatonia."
- 1861** Broca discovers injury to one part of the brain causes a very specific type of damage.
- 1862** Snellen invents the eyechart to test vision.
- 1863** Sechenov publishes *Reflexes of the Brain*.
- 1863** Friedreich describes a progressive hereditary degenerative disorder.
- 1869** Galton claims that intelligence is inherited.
- 1870** Von Bergmann writes the first textbook on nervous system surgery.

- 1972** Huntington describes symptoms of a hereditary chorea.
- 1874** Charcot describes amyotrophic lateral sclerosis (ALS).
- 1875** Caton is the first to record electrical activity from the brain.
- 1876** Ferrier publishes *The Functions of the Brain*.
- 1884** De la Tourette describes several movement disorders.
- 1888** Gill describes anorexia nervosa.
- 1891** Von Waldeyer coins the term neuron.
- 1891** Luciani publishes his work on the cerebellum.
- 1895** Roentgen invents the X-ray.
- 1906** Alzheimer describes presenile degeneration.
- 1909** Cushing is the first to electrically stimulate the human sensory cortex.
General Mental Illness published.
- 1911** Bleuler coins the term schizophrenia.
- 1936** Dale and Loewi share Nobel Prize for work on the chemical transmission between nerves.
First lobotomy in the U.S.
- 1938** First patients treated with electroshock therapies.
- 1951** MAO-inhibitors introduced to treat psychotics.
- 1974** First PET scanner
- 1981** Sperry awarded Nobel Prize for mapping the functions of the brain hemispheres.
- 1986** Cohen and Levi-Montalcini awarded Nobel prize for their work on the control of nerve cell growth.
- 1987** Prozac introduced as treatment for depression.
- 1990** President George H. W. Bush declares the decade starting in 1990 the "Decade of the Brain."

Author Sketch

John Fleischman was born in 1948, in New York. He earned his BA in English from Antioch College in 1970. Fleischman began his career as a reporter for various newspapers and magazines and for a public radio station. More and more, however, his interests turned to science, especially medicine. His interest grew so keen, in fact, that he completed a special class for reporters who were interested in writing about cell biology.



In 1998, Fleischman went to Cavendish, Vermont, to report on the 150th anniversary of Phineas Gage's accident. After completing his news story, Fleischman remained captivated by the story and decided to share it with children. It took him a year to write the book *Phineas Gage: A Gruesome but True Story about Brain Science*.

Fleischman has been a full-time freelance science writer since 1995 and counts among his clients Harvard Medical School and the American Society for Cell Biology. His articles also appear in *Discover*, *Muse*, and *Air & Space Smithsonian*. Today, he lives in Cincinnati, OH.

Critic's Corner

Phineas Gage: A Gruesome but True Story about Brain Science received good reviews. For example, Lolly Robinson of *Horn Book* praised Fleischman's "bold present-tense writing," adding that while the author sometimes addresses the reader directly, "the serious subject and the author's skill keep the writing from becoming jejune."

Steven Engelfried, writing for *School Library Journal*, also praised Fleischman's ability to avoid sensationalizing "the fascinating story" and to "[bring] a scientific viewpoint" to the story. *Booklist's* Randy Meyer found the text "vivid" but predicted that readers only looking for the "gruesome story" of the title will "get bogged down in heavier sections."

Deborah Stevenson noted in the *Bulletin of the Center for Children's Books* that, with his "crisp" and "lucid" text, Fleischman "deftly introduces readers to a diverse range of relevant scientific history."

In 2003, *Phineas Gage: A Gruesome but True Story*

about Brain Science was awarded an Orbis Pictus Honor Award for Outstanding Nonfiction for Children. It also received a National Council of Teachers of English award. It was named a James Madison Honor Book, a Notable Children's Book selection, American Library Association (ALA), and Best Book for Young Adults selection.

Other Books by John Fleischman

The Ohio Lands (1995)

Free and Public: One Hundred and Fifty Years at the Public Library of Cincinnati and Hamilton (2003)

Bibliography

Booklist, March 1, 2002, Randy Meyer, review of *Phineas Gage: A Gruesome but True Story about Brain Science*, p. 1101.

Book Report, November-December, 2002, Edna Boardman, review of *Phineas Gage*, p. 66.

Bulletin of the Center for Children's Books, May 1, 2002, Deborah Stevenson, review of *Phineas Gage*, p. 321.

Discover, June, 2002, Deborah Hudson, review of *Phineas Gage*, p. 79.

Horn Book, May-June, 2002, Lolly Robinson, review of *Phineas Gage*, pp. 343-344.

Kirkus Reviews, February 15, 2002, review of *Phineas Gage*, p. 254.

Publishers Weekly, April 15, 2002, review of *Phineas Gage*, p. 66.

School Library Journal, March, 2002, Steven Engelfried, review of *Phineas Gage*, pp. 247-248; May, 2003, John Peters, review of *Phineas Gage*, p. 102.

Science News, March 23, 2002, Cait Goldberg, review of *Phineas Gage*, p. 191.

General Objectives

1. To understand how the brain works
2. To understand brain injuries
3. To see how Phineas' injury was treated
4. To trace the sequence of events
5. To describe the causes and effects of Phineas' brain injury
6. To integrate the art and text
7. To trace the development of brain science
8. To evaluate the effectiveness of original art and other visuals

9. To recognize the significance of setting
10. To analyze life in late 19th century

Specific Objectives

1. To understand exactly how Phineas was injured
2. To explore the effect of Phineas' treatment on his recovery
3. To assess the change in Phineas' personality as a result of his accident
4. To grasp a basic understanding of modern neuroscience
5. To describe how and why doctors studied Phineas
6. To appreciate Phineas' spirit and coping abilities
7. To understand the philosophy of the "Whole Brainers"
8. To understand phrenology
9. To understand how scientists learned more about the brain
10. To analyze why Phineas was so important to modern science

Literary Terms and Applications

For a better understanding of John Fleischman's style, present the following terms and applications to the novel:

description a word picture of what something or someone is like. Description is made up of sensory details that help readers form pictures in their minds. John Fleischman uses a high descriptive style in *Phineas Gage* to help readers visualize the time and place. This is evident from page 3: "It's a tapering iron rod that is three feet, seven inches long and weighs thirteen and a half pounds. It looks like an iron spear. At the base, it's fat and round, an inch and three quarters in diameter. The fat end is for tamping—packing down—powder." Notice how this description appeals to our sense of touch as well as sight.

author's purpose the author's goal in writing a selection. Common purposes include to entertain, instruct, persuade, or describe. A selection may have more than one author's purpose, but one purpose is often the most important. Fleischman's primary purpose in *Phineas Gage* is to describe a landmark case in brain injury. His secondary purpose is to entertain.

style an author's distinctive way of writing. Style is made up of elements such as word choice, sentence length and structure, figures of speech, and tone. An author may change his or her style for different kinds of writing and to suit different audiences. In poetry, for example, an author might use more imagery than he or she would use in prose. Fleischman uses a direct style in this book, as a newspaper reporter uses. He gives us the facts in clear prose, each sentence carefully crafted for economy yet completeness.

The Importance of Setting

Setting is comprised of time and place. The place is not the crucial element in *Phineas Gage*; rather, it is the time. In 1848, when the tamping iron pierced Phineas' skull, knowledge of the workings of the brain was virtually nonexistent. No one had a clue how the brain actually operated. Some scientists thought you could determine a person's intelligence from the bumps on their head, a pseudo-science called "phrenology." Others thought the brain was a mass of undifferentiated jelly.

Knowledge of germs and basic hygiene was equally nonexistent. No one had the slightest idea that bacteria cause infection. With a hole in his skull, Phineas' brain was wide open. This makes him a prime candidate for a fatal infection. In 1848, Louis Pasteur has not yet figured out fermentation, decay, and infection. All three processes are caused by microorganisms, which Pasteur named "germs." Pasteur's discoveries would inspire the English surgeon Joseph Lister to perform surgery in sterile conditions. Its success was nothing short of astounding—the number of deaths after surgery plummeted by 90 percent. But Lister's experiment was still 20 years away.

In 1848, science was still twenty years away from figuring out that infections come from bacteria. It would take close to 100 years for scientists to create the first effective substances—antibiotics—to fight off infection. That specific antibiotic, penicillin, will save countless lives.

As a result, it was a rare stroke of luck that the doctor who attended Phineas immediately after his injury, Dr. Harlow, cleaned the skin around the hole and washed away most of the germs. Harlow also kept the wound clean but covered and watched

for infection. Two weeks after the accident, Phineas did suffer an infection. Again, he was lucky to recover, given the period.

Cross-Curricular Sources

Novels

Alyssa Brugman, *Finding Grace*
Betsy Byers, *The Summer of the Swans*
Carol Carrick, *Stay Away Simon!*
David Melton, *A Boy Called Hopeless*
Sam Teague, *The King of Heart's Heart*
Nancy Hope Wilson, *Bringing Nettie Back*

DVDs and Videos

Brain Damage (1988)
I Am Sam (2002)
NFL Players: Head Concussion, Brain Injury Seminar
(1995)

Nonfiction

Karen Brennan, *Being with Rachel: A Personal Story of Memory and Survival*
Cathy Crimmins, *Where is the Mango Princess?*
Malcolm Macmillan, *An Odd Kind of Fame: Stories of Phineas Gage*
Claudia Osborne, *Over My Head*
Deborah Quinn, *Conquering the Darkness: One Woman's Story of Recovering from Brain Injury*
Richard Edward Schmelzkopf, *Brain Damage: A Book About Overcoming Cognitive Deficit and Creating the New You*
Diane Roberts Stoler, *Coping with Mild Traumatic Brain Injury*
Kara L. Swanson, *I'll Carry the Fork: Recovering a Life After Brain Injury*

Internet

Interview with John Fleischman
<http://books.scholastic.com/teachers/>

The Strange Tale of Phineas Gage
www.brainconnection.com/topics?main=fa/phineas-gage

Themes and Motifs

A study of the central issues and situations in John Fleischman's *Phineas Gage* should include these aspects:

Themes

- courage
- history
- tragedy
- fate
- personality changes
- injury
- research
- determination
- coping skills
- original documents

Motifs

- adapting to diminished mental capabilities
- showing courage after a traumatic brain injury
- learning about the brain
- understanding the effects of a specific brain injury
- tracing the unfolding story of modern neuro science
- learning about germs and bacteria
- using science to find the truth
- exploring historical theories of the human body
- understanding the importance of Phineas Gage's case
- reading about modern brain researchers

Meaning Study

Below are words, phrases, sentences, or thought units that have particular meaning in the book. Explain the meaning of each. Page numbers indicate the context from which the item is taken.

1. But something goes wrong this time. (p. 5)
(Phineas is the skilled and respected foreman of railroad track construction gang. No one is ever sure exactly what goes wrong, but on this fateful day, Phineas' 13.5 pound tamping iron shoots straight through his head, in his cheek and out the top of his skull. This is the "horrible accident" in Vermont that sets the plot into motion.)
2. No one in Cavendish in 1848, no scientist in America or Europe, has the slightest notion that bacteria cause infection. (p. 11)
(Phineas survives by pure luck. Virtually nothing is known about the brain and just as little about sterile conditions. By pure chance, the doctor who treated him had washed his hands and the wound. Phineas did suffer an infection, but it was slight and he recovered.)
3. Yet there is something odd about the "recovered" Phineas. (p. 19)
(On the surface, except for the hole in his head, Phineas looks completely recovered. Nonetheless, he is not. He can count, feed, and dress himself. He can even sing. However, he has suffered serve personality changes. He has lost his ability to get along with people. He is no longer social or fit to be with people.)
4. Yet their wrong theories—and Phineas himself—will steer our knowledge of the brain in the right direction. (p. 26)
(Phineas' dramatic and unbelievable wound sparks the interest of doctors across America and accelerates brain research. As a result, Phineas Gage has become one of the most famous modern medical cases.)
5. The family physician comes and "bleeds" him. (p. 52)
("Bleeding" is the practice of applying leeches to the patient's body to remove blood and thus restore the correct balance of bodily fluids. This ancient practice, not completely discredited as medically sound, goes back to the beliefs of the ancient Greeks. By the end of Phineas' life in 1860, bleeding was dying out. Nonetheless, that it was done at all shows the primitive state of medicine in America at that time. This makes Phineas' recovery all the more remarkable.)
6. They finally kill him on May 21, 1860 (p. 52)
(Phineas dies from epileptic seizures, the cumulative effect of his traumatic brain injury.)
7. Half the world away from San Francisco in 1862, French surgeon Paul Broca in Paris announces a discovery that finally turns brain theory into brain science. (p. 53)
(Broca discovers how injury to a very small part of the brain causes one specific kind of damage. This explodes the theories of the Phrenologists and Whole Brainers and paves the way for modern brain science.)
8. If there are exact locations in the brain that allow for the ability to hear or to breathe, is there a place that generates human social behavior? If that place is damaged, do you stop acting human? (p. 64)
(This is the central question of the book, and the answer has yet to be found. The author builds up to this question because it defines what makes us human.)
9. We are "hard wired" to be sociable. When we lose that ability, we end up like Phineas. (p. 70)
(After his brain injury, Phineas changed from an affable, sociable person to a crude and anti-social one. His closest companion became his iron tamping rod. It appears from Phineas' experience that humans do indeed come with the built-in ability to be able to get along with others—and to need people.)
10. His accident was terrible. It changed him into someone else, and yet Phineas figured out how to live as a new person for eleven years. (p. 75)
(From these straight-forward lines, readers can infer that the author admires Phineas very much. Robbed of his full emotional abilities by a tragic accident, Phineas nonetheless managed to make his way in the world, to support himself

and survive on his own until the very end. He adapted by working with animals—horses—when he could no longer work with people. Phineas took care of himself and even managed to travel.)

Comprehension Study

Answer the following questions in your own words. There is not always a right answer. Your judgment is important and you should be ready to defend your answers by referring to passages in the book.

Questions 1-5 (Literal Level)

1. How is Phineas injured?
(He is injured while blasting rock on a railroad building site. He uses his iron rod to tamp down the gunpowder. Something goes tragically wrong and the iron rod shoots out of the hole like a projectile, straight in and out of his head.)
2. When and where is the story set? Why is the setting important?
(The story begins in Cavendish, Vermont, in 1848 and ends in San Francisco eleven years later, in 1860. The setting is important because virtually nothing was known about germs, infections, and the brain at that time. As a result, nothing could be done to treat Phineas, other than basic wound care.)
3. What is so unusual about Phineas' injury?
(We would expect that having a tamping iron that is more than 3 feet long and weighs more than 13 pounds pass through your brain would kill you instantly, or at least leave you in a complete vegetative state. Yet Phineas lives. On the surface, Phineas appears fully functional and he manages to work and support himself for eleven years.)
4. How does Phineas change as a result of his injury?
(He loses the ability to get along with people.)
5. How long did Phineas live with his injury?
(He lived eleven years.)

Questions 6-8 (Interpretative Level)

6. How do you think Phineas' injury would have been treated today?
(First, he would have access to sophisticated tools such as MRIs and CAT scans. These would have helped doctors pinpoint the region of the injury. After his injury was repaired in a sterile operating room and he completed his recovery in a hospital, he would likely have been given various kinds of therapy to help him retrain his brain. None of these measures was available to him in 1848, because they had not been invented yet.)
7. Why is Phineas' case so important?
(It sparked deep interest in brain research and pointed scientists in intriguing directions. In many ways, it opened up the entire field of brain surgery.)
8. Why do you think the author chose this topic and wrote this book?
(The author finds the topic fascinating and wants to educate people about the brain and how it functions.)

Questions 9 and 10 (Critical Level)

9. Why do you think the author included original illustrations, diagrams, photographs, and other materials?
(The visuals help readers immerse themselves in the time and place. This gives readers the flavor of the era. The pictures from the mid- to late 1800s convey the lack of knowledge about the brain and germs at that time. The more modern pictures serve to educate us about the brain's composition and workings.)
10. What is the author's attitude toward Phineas?
(Fleischman admires Phineas for coping so well with his handicap. Readers can infer that he sees Phineas as heroic in his fortitude.)

Questions 11-12 (Creative Level)

11. Hold a roundtable discussion in which participants explain what they learned about the brain from this book.
12. Read one of the works in the "Resources" section at the back of the book and explain what it adds to your understanding of the events described in this book.

Across the Curriculum

Art/Music

1. Draw Phineas' spear or make a scale model of it. Use the description on page 3 and the photograph on page 73 as your guide.
2. Look under a microscope at a drop of pond water or other slide that contains living organisms. Draw what you see and add a caption.
3. Imagine you are creating a movie of *Phineas Gage*. Choose background music for an especially dramatic scene.
4. Using scenes from the book, create a mural of the main events.
5. Make a large drawing of the brain and label each part.

Language Arts

1. Write directions for setting off a gunpowder charge in 1848 as described on page 3. Frame your directions as a booklet.
2. The accident happened so fast and was so dramatic that no one was really sure what happened. Imagine that you were present that fateful day. Write your first-hand account of Phineas' accident.
3. Write a news story for the Cavendish, Vermont, newspaper in 1848 about Phineas' injury. Be sure to include a lot of details to help readers visualize the action.
4. Pretend you are Dr. Harlow. Write the letter to Mrs. Gage, asking for permission to exhume her son's body for examination.
5. Write Phineas Gage's eulogy. Be sure to include a description of his life before and after his accident.
6. No one is sure that happens to Phineas for a few years after his accident. Some people say that he exhibited himself in the circus. Write an essay in which you fill in the missing years with information about Phineas' life.

History/Social Studies

1. Before his accident, Phineas worked as the foreman of a railroad. There, he blasted rock by hand. Find out how rocky land is cleared today to make way for roads and tracks.
2. Demonstrate phrenology, using a model of the skull or volunteers.
3. In an essay, describe what San Francisco was like in the 1850s-to 1860s.

Science

1. Find out more about the invention of dynamite. Report your findings to the class in an essay or poster.
2. A closed brain injury is often called a concussion. Research the treatment of a concussion and share your findings with your classmates.
3. In 1848, no one knew that bacteria (or "germs") cause infection. Make a guidebook for kids to use to reduce the number of infections caused by bacteria. Hints include washing your hands often, covering your mouth when you cough and sneeze, and not sharing cups, for instance.
4. Explain the theory behind "bloodletting." Then discover what diseases are treated by bloodletting today.

Speech/Drama

1. Working with a partner, model the social skills that people need to be successful. Include at least five key interpersonal skills.
2. Put on a skit showing Phineas' behavior before and after his accident.
3. Give a lecture on the history of neuroscience, as explained in this book. Summarize the main points that Fleischman makes to use as your main points.
4. Fleischman argues that humans are "hard-wired" to be sociable. With some classmates, debate both sides of this issue. Is being sociable an inborn or an acquired skill?

5. Fleischman concludes that Phineas Gage was lucky. Even though his accident was terrible and changed him into a different person, he had a good life. Agree or disagree in a speech.

Math

1. Phineas was 5'6" tall, short for our time but average for his. Make a chart showing the average heights of kids in grades 4-7.
2. Find out how much the average human brain weighs.
3. Research the number of people living with a traumatic brain injury today. Show your results on a chart.
4. Find out how much it costs to treat a person with a traumatic brain injury per one year of medical care.

Alternate Assessment

1. Discuss how the life of a teenager in America in 1850 was the same and different from your life today.
2. Make a list of actions that show that Phineas Gage was heroic.
3. Re-enact the scene in which Phineas goes to Boston in 1850 so the doctors can assess his condition for themselves.

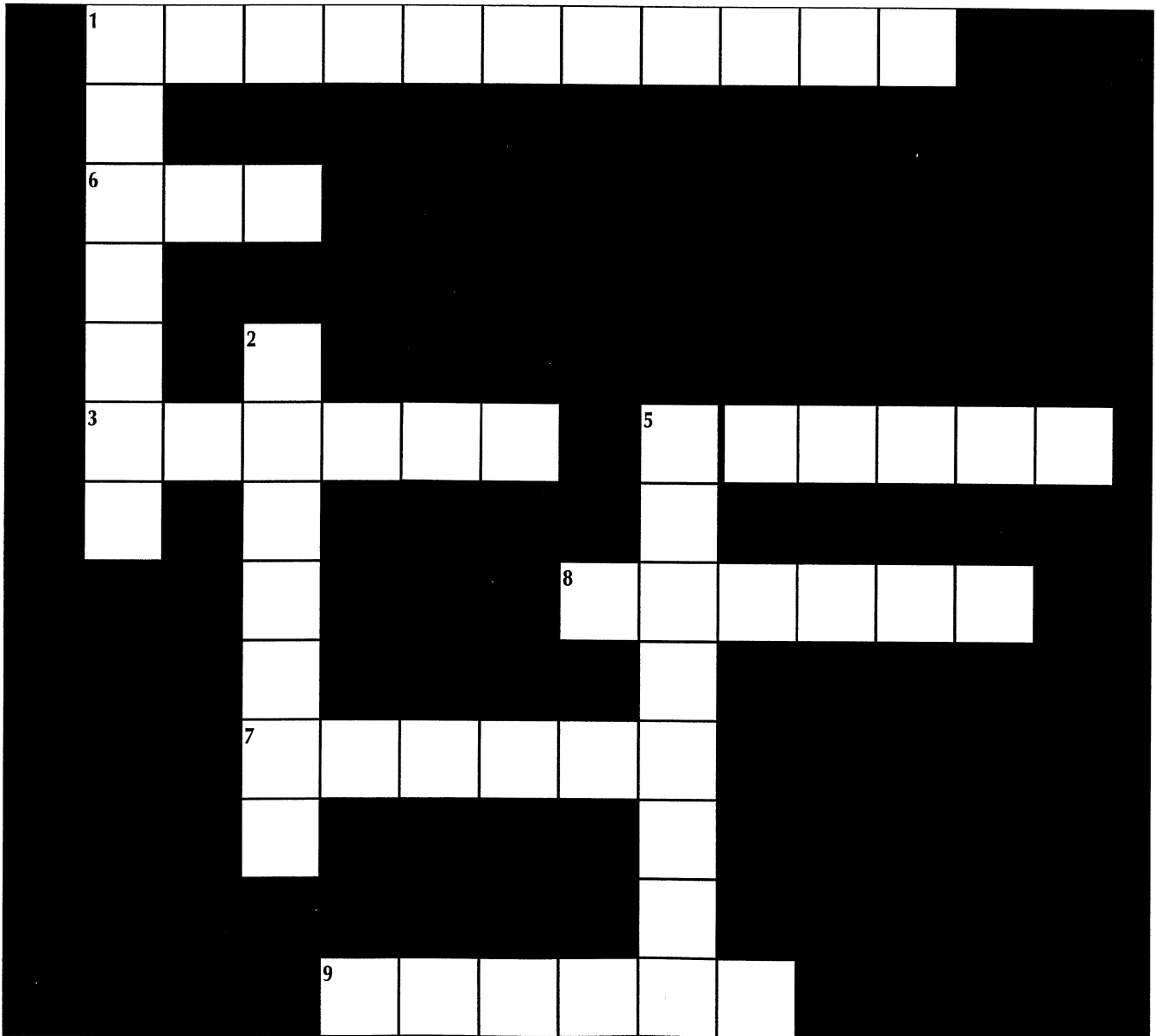
Vocabulary

Complete the crossword puzzle with the following clues and words from *Phineas Gage*.

- Across**
1. fake
 3. rare
 5. stared
 6. not bright
 7. lessens
 8. nonsense!
 9. poor person

- Down**
1. dead body
 2. warm and friendly
 5. horrifying

- | | | | |
|-------------|---------|---------|----------|
| humbug | cadaver | cordial | gawked |
| abates | pauper | exotic | gruesome |
| counterfeit | dim | | |



Comprehension Test A

Part I: Matching (20 points)

Match each description with a name from the list. Place the letter of your answer in the blank provided at left.

- | | |
|---------------------|------------------------------|
| A. Jonathan Currier | F. Phineas Gage |
| B. John Fleischman | G. Dr. Edward Williams |
| C. Dr. Paul Broca | H. Dr. Harlow |
| D. Vermont | I. Massachusetts |
| E. California | J. Antonio and Hanna Damasio |

- ___ 1. The first doctor who treats Phineas
- ___ 2. The state where Phineas' skull is on display
- ___ 3. The husband-and-wife team of contemporary brain researchers
- ___ 4. The foreman who had an iron rod shoot through his skull
- ___ 5. The state where Phineas is injured
- ___ 6. The livery owner for whom Phineas works
- ___ 7. The doctor who offers Phineas \$1,000 for a handful of pebbles
- ___ 8. The state where Phineas dies
- ___ 9. A famous 19th century French brain researcher
- ___ 10. The author of *Phineas Gage*

Part II: Sentence Completion (20 points)

Circle the term that best completes each of the following statements.

- 1. The story opens on September 13, (**1848, 1948**).
- 2. The story of Phineas Gage is set in (**Middlebury, Cavendish**).
- 3. When the story opens, Phineas is (**sixteen, twenty-six**) years old.
- 4. Phineas' tamping iron weighs about (**two, thirteen**) pounds.
- 5. As a result of his accident, Phineas has lost the ability to (**speak, be social**).
- 6. Phineas went to speak to the doctors at (**Harvard, Yale**) University.
- 7. According to the theory of the ("**Big Heads," "Whole Brainers"**), thoughts and commands can originate anywhere in the brain jelly/cloud and flash into action.
- 8. According to the theory of the ("**Localizers," "Unifiers"**), the brain is divided into specific areas that control movements and speech.
- 9. Phineas dies as a result of a series of (**falls, seizures**).
- 10. Phineas lived with traumatic brain injury for (**eleven, thirty**) years.

Comprehension Test A (Page 2)

Part III: True/False (20 points)

Mark the following statements either T for true or F if a part is false.

- ___ 1. Phineas' accident occurs because he is very careless when he presses the ropelike fuse into the gunpowder.
- ___ 2. After the accident, Phineas is amazingly alert and even talks coherently to people.
- ___ 3. Phineas is relatively lucky because he has an "open brain" injury. The hole in the top of his head gives his brain room to swell.
- ___ 4. When Phineas was injured, doctors actually knew quite a bit about germs and the brain. Their knowledge was almost equal to ours today.
- ___ 5. After Phineas left Boston, we're sure that he became a circus freak show exhibit for ten years.
- ___ 6. Phineas also worked in Chile as a stagecoach driver.
- ___ 7. Mrs. Gage refuses to allow the doctors to dig up her son's body and clean off the skull, so they do it without her permission.
- ___ 8. People with the same brain injury as Phineas have trouble making decisions and dealing with social situations.
- ___ 9. The author concludes with praise for Phineas, who found a way to live with traumatic brain injury and still be productive.
- ___ 10. Phineas' case is important because it helped scientists learn about the brain.

Part IV: Essay (40 points)

Choose two and answer in complete sentences.

- 1. Explain how the brain works, using the information you read in *Phineas Gage*.
- 2. Summarize Phineas' life before and after the accident.
- 3. Explain why Phineas Gage is an admirable person.
- 4. *Phineas Gage* contains many black-and-white reproductions of period art, diagrams, and photographs. Explain what you learned from the visuals in this book. How do they add to your appreciation and understanding of the story?

Comprehension Test B

Part I: Sentence Completion (20 points)

Write in the term that best completes each of the following statements.

1. Before his accident, Phineas Gage is best described as surly and (**quiet, affable**) but strong-willed.
2. Phineas was the foreman on a (**railroad, lumber yard**) when his accident occurred.
3. The accident took place on September 13, (**1848, 1948**).
4. Phineas was using (**guns, gunpowder**) when the accident took place.
5. The tamping iron entered in his (**neck, cheek**) and shot out above his eye.
6. Phineas is relatively lucky because he has a(n) ("**closed brain, "open brain"**") injury.
7. Dr. Harlow offered Phineas \$1,000 for the pocketful of (**money, pebbles**) that Phineas had collected.
8. Phineas has lost the ability to (**smell and taste, be social**).
9. A few years after the accident, Phineas left New England for (**Chile, France**) to work as a stagecoach driver.
10. Phineas dies as a result of a series of (**seizures, infections**).

Part II: Identification (20 points)

Briefly describe each person, place, or thing and explain why it is important in the story.

1. the tamping iron
2. phrenology
3. the "Whole Brainers"
4. the "Localizers"
5. the brain

Comprehension Test B (Page 2)

Part III: Matching (20 points)

Match each description with a name from the list. Place the letter of your answer in the blank provided at left.

- | | |
|------------------|------------------------|
| A. Phineas Gage | F. Professor Macmillan |
| B. Hannah Gage | G. Dr. Bigelow |
| C. Vermont | H. Dr. Harlow |
| D. San Francisco | I. Dr. Edward Williams |
| E. Valparaiso | J. Dr. Paul Broca |

- ___ 1. The place where Phineas' accident occurred
- ___ 2. The place where Phineas traveled and worked for a while after the accident
- ___ 3. The town physician who treats Phineas' wound
- ___ 4. Phineas' mother
- ___ 5. The first doctor to examine Phineas
- ___ 6. The famous French brain researcher
- ___ 7. A professor of surgery at Harvard Medical College
- ___ 8. The young man who suffers a traumatic brain injury
- ___ 9. A modern scholar and expert on Phineas Gage
- ___ 10. The place where Phineas died

Part IV: Essay (40 points)

Choose two and answer in complete sentences.

- 1. Describe Phineas' life before and after his accident.
- 2. Explain what measures people can take today to protect themselves from traumatic brain injury.
- 3. Analyze how Phineas' experiences would be different if they took place today.
- 4. Describe at least two things that you learned about science from this book.

Answer Key

Vocabulary

- | Down | Across |
|-------------|----------------|
| 1. cadaver | 3. exotic |
| 2. cordial | 4. counterfeit |
| 5. gruesome | 5. gawked |
| | 6. dim |
| | 7. abates |
| | 8. humbug |
| | 9. pauper |

Comprehension Test A

Part I: Matching (20 points)

- | | |
|------|-------|
| 1. G | 6. A |
| 2. I | 7. H |
| 3. J | 8. E |
| 4. F | 9. C |
| 5. D | 10. B |

Part II: Sentence Completion (20 points)

- | | |
|---------------|---------------------|
| 1. 1848 | 6. Harvard |
| 2. Cavendish | 7. "Whole Brainers" |
| 3. twenty-six | 8. "Localizers" |
| 4. thirteen | 9. seizures |
| 5. be social | 10. eleven |

Part III: True/False (20 points)

- | | |
|------|-------|
| 1. F | 6. T |
| 2. T | 7. F |
| 3. T | 8. T |
| 4. F | 9. T |
| 5. F | 10. T |

Part IV: Essay (40 points)

Answers will vary.

Comprehension Test B

Part I: Sentence Completion (20 points)

- | | |
|------------------------------|-----------------|
| 1. affable but strong-willed | 6. "open brain" |
| 2. railroad | 7. pebbles |
| 3. 1848 | 8. be social |
| 4. gunpowder | 9. Chile |
| 5. cheek | 10. seizures |

Part II: Identification (20 points)

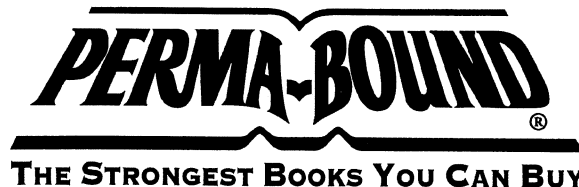
1. The tamping iron is the 13.5 pound iron rod that shoots through Phineas' skull. It is important because of its sheer size; how could something that big and heavy pass through a person's skull and still leave the person relatively intact? It is also important because after the accident, the tamping iron becomes Phineas' closest companion.
2. Phrenology was the pseudo-science that claimed a person's intelligence and other character traits could be determined by the bumps on their skull. It shows the nearly total ignorance about brain science in the 19th century.
3. The "Whole Brainers" were one school of brain theorists in the 19th century. They believed that thoughts and commands can originate anywhere in the brain jelly/cloud and flash into action.
4. The "Localizers" were the other school of brain theorists in the 19th century. They believed that the brain is divided into specific areas that control things.
5. The brain is the focus of the book, as the author traces the development of brain science and the amazing strides we have made in our knowledge of the brain in the last 150 years.

Part III: Matching (20 points)

- | | | | | |
|------|------|------|------|-------|
| 1. C | 2. E | 3. H | 4. B | 5. I |
| 6. J | 7. G | 8. A | 9. F | 10. D |

Part IV: Essay (40 points)

Answers will vary.



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