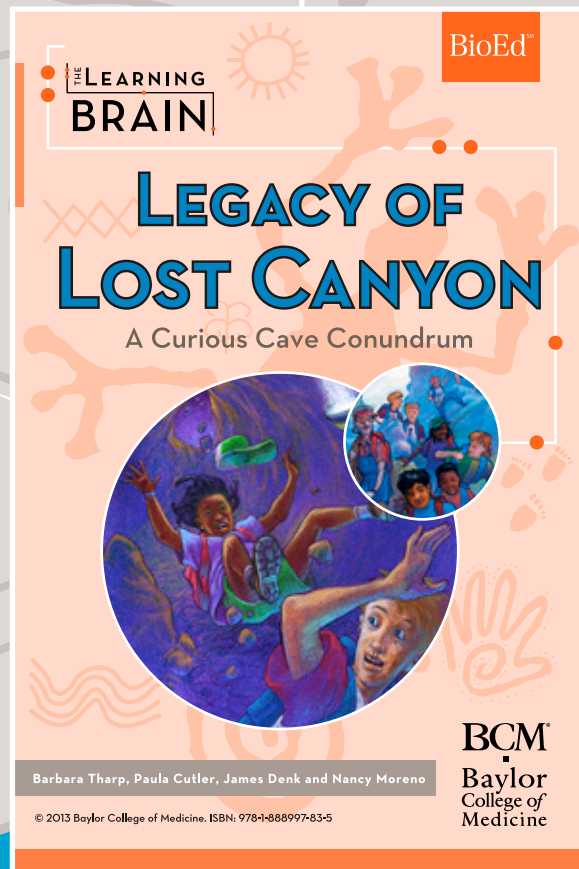


BRAIN CHEMISTRY
THE READING LINK

for use with *Legacy of Lost Canyon*



Barbara Z. Tharp, MS, Paula H. Cutler, MA, James P. Denk, MA, and Nancy P. Moreno, PhD

THE LEARNING
BRAIN

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Free, related neuroscience education resources
and online versions of these lessons are
available at www.bioedonline.org.

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ABOUT THIS SUPPLEMENT

This Reading Link has been created to provide ready-to-use reading and writing activities directly related to The Learning Brain: Brain Chemistry unit. It is not intended to represent a comprehensive reading program. The activities are related to reading objectives common to many curricula and cover a range of grade and ability levels. Teachers will wish to select the activities that are most appropriate for their own students.

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WORD MEANINGS

1. Below are words from *Legacy of Lost Canyon* that can have multiple meanings. Look at the different meanings for each word in the boxes below, and then decide which meaning works best in the sentences that follow. Write the number of the correct meaning next to each sentence.

bound

1. determined; resolved
2. a limiting line; boundary
3. to move by leaping; bounce
4. fastened by or as if by a band; confined

- _____ Josh was **bound** to arrive at the NeuroExplorers' meeting on time.
- _____ Dr. Hazelton **bound** her skis to the car's rack before driving away.
- _____ Kyle caught the football out of **bounds**.
- _____ B.J. would **bound** down the hallway whenever she got a good grade.

dig

1. to break up, turn, or remove (soil, sand, etc.) with a tool or the hands
2. a cutting remark
3. to like; admire
4. an archaeological excavation site, or the excavation itself

- _____ Dr. Hazelton said, "I **dig** your hat, B.J."
- _____ Max went outside to **dig** in the garden.
- _____ Isley I's verbal **dig** hurt Isley II's feelings.
- _____ The Brain said, "Tutankhamen's burial site in Egypt is, perhaps, the most important **dig** in history."

(continued)

WORD MEANINGS *(continued)*

2. Below are definitions of words used in *Legacy of Lost Canyon*. Write a sentence using each word. Your sentences should tell something about the story.
- a. **indigenous** - having originated in or been produced in, or growing, living, or occurring naturally in a particular location.
 - b. **cacophony** - many unpleasant sounds occurring together at one time.
 - c. **pictograph** - an ancient drawing or painting on rock.
 - d. **navigate** - to make one's way over or through; traverse.
 - e. **precipice** - a very steep or overhanging place.
 - f. **conundrum** - a question or problem having only a conjectural answer; an intricate and difficult problem; a riddle.
 - g. **spelunker** - one who explores and studies caves.

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

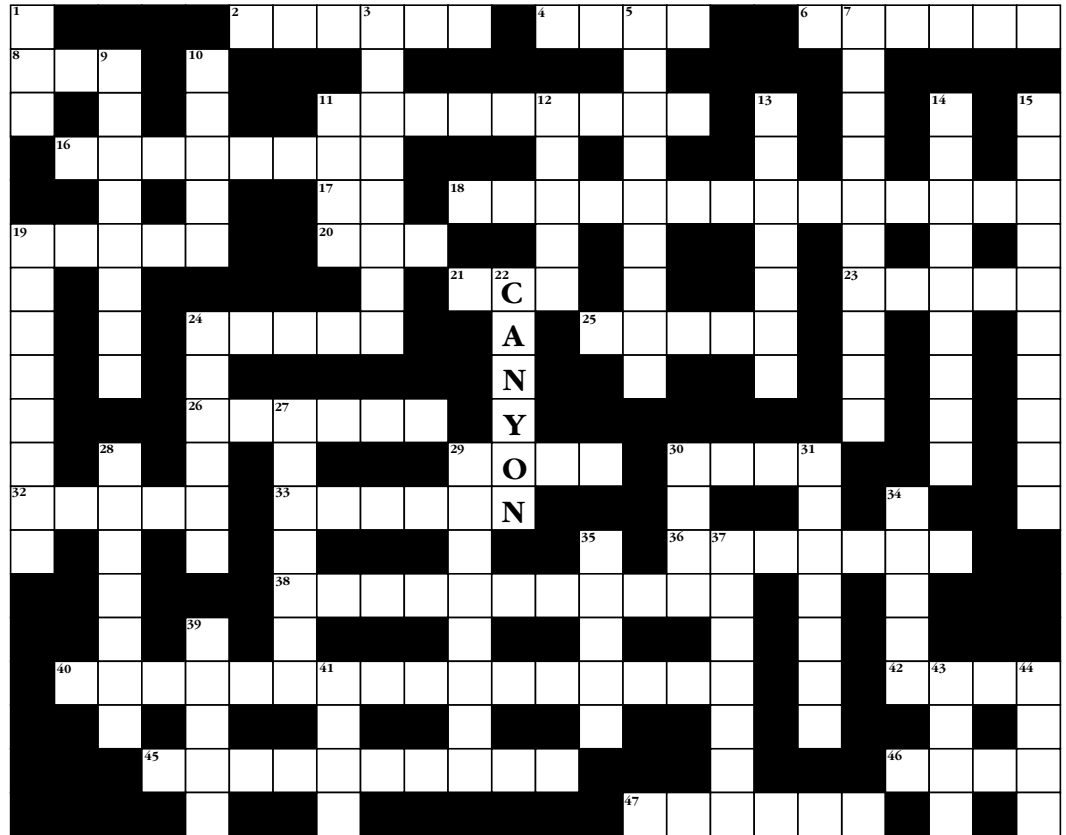
(continued)

WORD MEANINGS (continued)

Complete the *Legacy of Lost Canyon* crossword puzzle below.

Across

2. Isley II takes medicines every day to treat what condition?
4. The NeuroExplorer who grabbed Kyle and saved him from falling off the canyon ledge.
6. Garbage heap for ancient communities.
8. Rodent with a hairless tail that might be found in a cave.
11. Part of the brain responsible for automatic functions like breathing and heart beat.
16. An outer room connected to a main room.
17. Opposite of "yes."
18. Type of drugs taken by a healer to cause visions.
19. How the NeuroExplorers first contacted Dr. Hazelton.
20. The opposite of "to begin" is "to _____."
21. The kind of stare Jeb gives Dr. H. when he is captured.
23. They heard a strange banging _____ from another part of the cave.
24. Lakeisha's favorite game.
25. The purpose of the holes in the ceiling of the healers' cave.
26. Type of tool Dr. Hazelton found in the cave.
29. No longer known or visible; also the name of the canyon.
30. A healer's hallucinations often were caused by use of a _____.
32. The brain has _____ main parts.
33. Tribal spiritual leader.
36. First name of the NeuroExplorer nicknamed "The Brain."
38. Another word for the hormone, adrenaline.



40. Special chemical that passes messages from one neuron to the next.
42. Early people often made utensils and tools from this material.
45. Ancient or prehistoric drawing or painting on a rock wall.
46. To reach the cave, the group had to climb high along the steep, rock canyon _____.
47. Name for a healer's supernatural trip: _____ Quest.

Down

1. Nickname the NeuroExplorers give Professor Hazelton (no spaces or punctuation).
3. Chemicals that circulate in the bloodstream and act as messengers to the nervous system and to other parts of the body.
5. Someone who explores and study caves.

(continued)

WORD MEANINGS (*continued*)

7. Someone or something originating in, or native to a particular region or environment.
9. One country where pictographs have been found.
10. Another name for "house" is " _____ing."
11. Fragments of _____, or skeletal remains, often are found at archaeological digs.
12. Dr. Hazelton's first name.
13. Place where electronic messages pass from one neuron to another.
14. Last name of person who was stealing the pictographs.
15. The science Dr. Hazelton studied in college.
19. To dig out and remove; to uncover something by digging.
22. Deep narrow valley with steep sides and often with a stream flowing through it.
24. Mode of transportation the group uses to get off the mountain: heli_____.
27. Name of the dam that blocked up Rocky River.
28. B.J. is this kind of musician.
29. The first NeuroExplorer to have an interest in pictographs.
30. High level school administrator.
31. The type of science Jeb used to study.
34. The NeuroExplorers live in _____ City.
35. Dr. Hazelton's excavations in Rocky River's canyons prompted her to _____ articles for archaeology magazines.
37. Specialized cells in the nervous system that send messages in one direction.
39. The most complex organ in the body.
41. There was a vent hole in the ceiling, or _____ of the healers' cave.
43. Synonym for "all right."
44. _____ almost slipped off the ledge as the group hiked along the canyon wall.

DETAILS AND SUPPORTING IDEAS

1. Using correct paragraph construction, describe the canyon trek that took Dr. Hazelton and the NeuroExplorers to the caves. Keep in mind that a complete paragraph includes sentences stating a main idea, supporting ideas and a conclusion.

2. Do you remember the healers' cave that Isley I and Lakeisha found accidentally? From your memory, write a paragraph that describes what Dr. Hazelton and the NeuroExplorers saw there.

(continued)

DETAILS AND SUPPORTING IDEAS (*continued*)

3. Imagine that you have been asked to speak to a group of younger students about the dangers of drug abuse. Based on what you learned while reading *Legacy of Lost Canyon*, write out your speech below, explaining some of the ways that different drugs can affect the brain and nervous system.

SEQUENCE OF EVENTS AND MAIN IDEA

SEQUENCE OF EVENTS

Which of the following events happened last? Write “4” next to it. Then number the other events (1–3) to show the order in which they occurred.

- _____ Kyle slips off the canyon path.
- _____ Jeb Hunnicutt finds himself all tied up.
- _____ The NeuroExplorers meet Ms. Ching.
- _____ Professor Hazelton explains the healer’s ritual to the NeuroExplorers.

MAIN IDEA

1. Read the Science Box on page 12. Fill in the circle next to the sentence below that best expresses the main idea of that paragraph.
 - Hormones are chemicals that circulate in the bloodstream.
 - In times of danger, hormones can shut down a number of nonessential bodily functions, like digestion.
 - Hormones act as messengers to various parts of the body and can have a variety of effects on many parts at once.
 - Epinephrine is another name for the hormone adrenaline.
2. Read the Science Box on page 22. Fill in the circle next to the sentence below that best expresses the main idea of that paragraph.
 - Despite the highly addictive nature of nicotine, the greatest health risk of tobacco comes from the other chemicals it contains, which are linked to several types of cancers.
 - Abuse of mind-altering drugs can lead to permanent changes in the brain and other parts of the body.
 - Marijuana can damage memory regions of the brain and affect coordination and the senses.
 - Heroin changes the way nerve cells in the brain receive and process messages.
3. Read Chapter 3, “Overload.” Fill in the circle next to the sentence below that best expresses the main idea of that chapter.
 - Dr. Hazelton had made several important discoveries at the ancient site but had to stop the excavation before she and her team were able to study it thoroughly.
 - A midden is a garbage dump, where people living in caves would have placed their refuse.
 - Dr. Hazelton grew up in the Rocky River area and always was interested in the various artifacts she found there.
 - The North American Heritage Society gives money to scientists who wish to study ancient civilizations.

SUMMARY OF A SELECTION

1. Write a short summary of Chapter 2, "Walking in Footsteps."

2. Read Chapter 8, "Hallucinogens" and Chapter 9, "Vision Quest." Then, write a detailed paragraph below that describes what pictographs are, who made them, how pictographs were made, and what they might mean.

CAUSE AND EFFECT

1. Why did Mr. Lopez caution the NeuroExplorers and suggest they get more information before going off to explore the old excavation site? What were the results of this suggestion?

2. What caused Dr. Hazelton to be so upset after she investigated the first cave?

(continued)

CAUSE AND EFFECT (*continued*)

3. What are three outcomes of Jeb Hunnicutt's theft of the pictographs?

4. What caused Isley I to fall down into the hidden cave? What happened because of Isley's fall?

FACT OR OPINION

Facts are true. Opinions sometimes are stated as facts, but they might not be true. Decide whether each of the following statements related to the story is a fact or an opinion.

Write F (Fact) or O (Opinion) in each space.

- _____ There are pictographs in Tanzania. (page 1)
- _____ The state water commission doesn't care about the early people who lived near Rocky River. (page 3)
- _____ Dr. Hazelton studied archaeology in college. (page 7)
- _____ Isley I has a pea-brain. (page 7)
- _____ Neurons receive messages on branches called dendrites. (page 11)
- _____ Much rock art was inspired by religious beliefs. (page 21)
- _____ One must enter a trancelike state to commune with the spirit world. (page 21)
- _____ LSD contributes to chronic mental disorders. (page 22)
- _____ Some healers' visions were thought to represent an entry into the supernatural world. (page 24)

GENERALIZATIONS / DRAWING CONCLUSIONS

1. Which of the following generalizations or conclusions can be made from the information given in the story, *Legacy of Lost Canyon*? Fill in the circle next to each correct statement.

- It is safe to climb up the side of a canyon wall.
- Libraries are great sources of hard-to-find information.
- All caves have pictographs.
- Remains from lost civilizations usually are very valuable.
- Someone who abuses drugs can permanently damage his brain and nervous system.
- Scientists are boring “brainiacs” and can’t relate to students very well.
- With proper training, equipment and supervision, spelunking can be exciting.
- Early people had complex and developed cultures.

2. What does Dr. Hazelton think of Jeb Hunnicutt? Does she understand his motivation for stealing the pictographs? Would she really leave him tied up in the cave? Is it important to protect ancient artifacts, like the pictographs? Tell what you think, and explain why.

PAINTING PICTURES WITH WORDS

Sometimes words are used in an unusual way to “paint” a verbal picture and help us “see” what is being described. For example, someone might say, “He’s as graceful as a three-legged rhinoceros.” This form of speech, using “like” or “as” to compare two unlike things, is called a simile (SIHM-uh-lee). Similes can help us to understand the writer’s meaning more clearly.

Look at the following “word picture” sentences from *Legacy of Lost Canyon*. Then try to write three sentences of your own, using similes. You might describe a cave scene, a canyon above a rushing river, the actions or feelings of one of the characters in the story, etc.

SENTENCES FROM *LEGACY OF LOST CANYON*

The rocky terrain looked like a strange world. (page 9)

“Did it occur to anyone else that we’re just like a string of neurons working together here?” Josh asked as he followed Kyle. (page 9)

“There’s water coming from somewhere above and the ledge is as slippery as slime.” (page 11)

MY WORD PICTURE SENTENCES

1. _____

2. _____

3. _____

MY PICTURE

Now draw one of the “pictures” you have just “painted” with words.

CROSSWORD ANSWER KEY

Across

2. Asthma
4. Josh
6. Midden
8. Rat
11. Brainstem
16. Anteroom
17. No
18. Hallucinogenic
19. Email
20. End
21. Icy
23. Noise
24. Chess
25. Vents
26. Pickax
29. Lost
30. Drug
32. Three
33. Shaman
36. Antonio
38. Epinephrine
40. Neurotransmitter
42. Rock
45. Pictograph
46. Wall
47. Vision

Down

1. Drh
3. Hormones
5. Spelunker
7. Indigenous
9. Tanzania
10. Dwell
11. Bone
12. Sally
13. Synapse
14. Hunnicutt
15. Archeology
19. Excavate
22. Canyon
24. Copter
27. Coslett
28. Drummer
29. Lakeisha
30. Dean
31. Geology
34. River
35. Write
37. Neurons
39. Brain
41. Roof
43. Okay
44. Kyle

