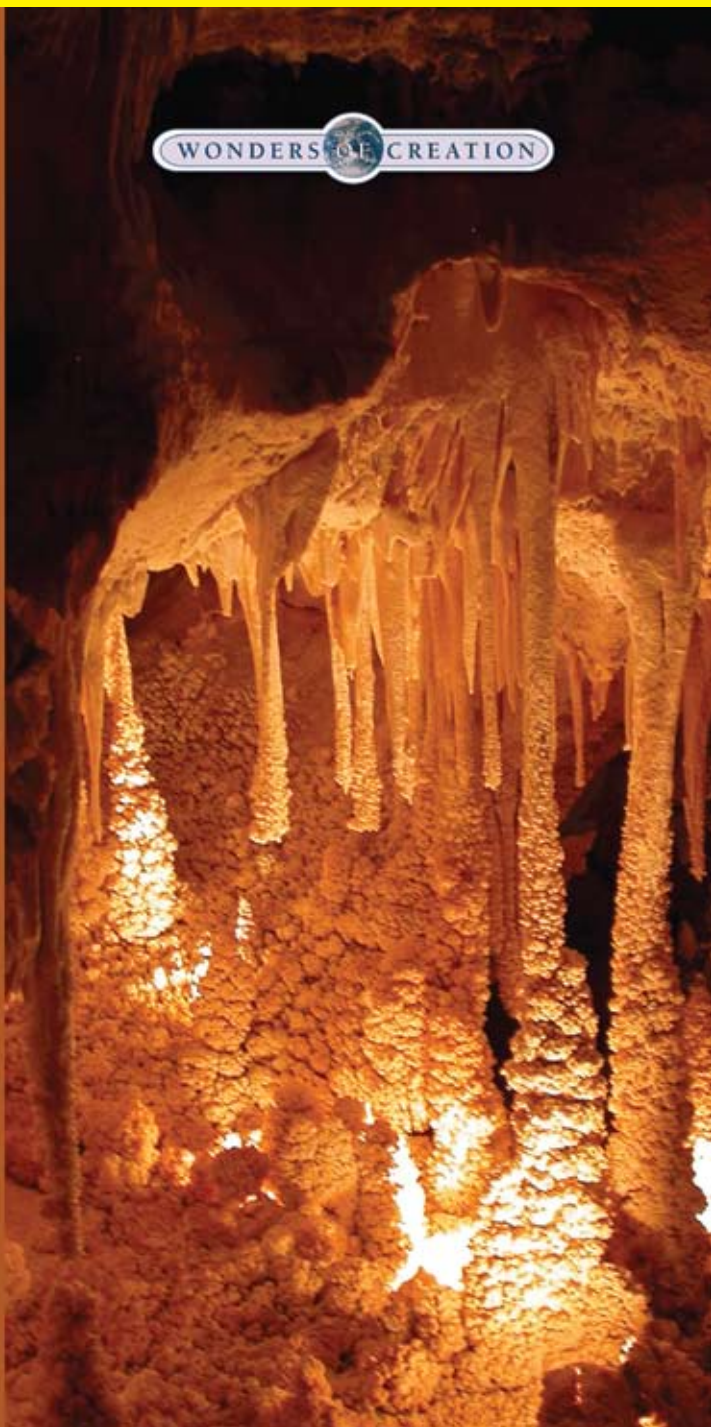


# STUDY GUIDE & WORKBOOK

# THE CAVE BOOK





**THE  
CAVE  
BOOK**

**STUDY GUIDE  
& WORKBOOK**

First printing: March 2009

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# CONTENTS

Introduction.....	4
1. Humans and Caves.....	6
2. Caves and Mythology.....	9
3. Caves and Karst .....	12
4. Classifying Caves.....	15
5. Exploring Caves .....	18
6. Studying Caves .....	20
Answer Key .....	22

# INTRODUCTION

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**Text:** Pages 6–7

## **Terms to Know and Spell**

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karst

karst aquifers

## **Short Answer**

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1. What is the probable reason some of our ancestors may have entered the “underland” of cave systems?
2. The strange event near the \_\_\_\_\_ not only split the once unified population, but scattered those with different skills and abilities.
3. How much of the world’s drinking water comes from limestone (karst) terrains?
4. How much is it estimated to be by 2025?

## Discussion Questions

---

1. What role did caves play for our ancestors?
2. How did the events surrounding the Tower of Babel affect the ancient groups of people who disbursed from that area?

## Activity

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1. Read through the account of the Tower of Babel (Genesis 11:1–9), and discuss issues that would have affected the various people groups when this event occurred.
2. Utilize the *Adams' Chart of History* to trace the lineage of various people groups from the time of the Tower of Babel to the early 1900s.

# CHAPTER 1

## HUMANS AND CAVES

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**Text:** Pages 8–21

### **Terms to Know and Spell**

---

acoustics

Archeulean industry

bas-reliefs

cave paintings

engravings

Kyr

Myr

Neanderthals

spleothems

taphonomists



## Short Answer

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1. Were there caves present before the Flood?
2. When does the Bible mention caves for the first time?
3. How many times is the word “cave” mentioned in the Bible?
4. What large creatures have used caves to live in?
5. In what country is Longgupo Cave which is believed to host the oldest stone artifacts?
6. What is the Twin River Cave in Zambia known for: (a) oldest human remains, (b) oldest burial site, or (c) art associated with burial rituals?
7. What are the three kinds of cave art that have been found?
8. Were Neanderthals a different species from us?

## Discussion Questions

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1. Why did humans move to caves after having lived in cities?

2. Why did humans worship inside caves?
3. Where is the largest number of cave paintings located? Why?
4. What is the main criterion to separate various human cultures?
5. Who were the Neanderthals?
6. What did the human remains from Shanidar Cave reveal about Neanderthal social life?

## **Activities**

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1. Do a keyword search for the word “cave(s)” in the Bible using a Bible concordance or online search. Examine the various reasons people used caves during the biblical period.
2. Use a plastic knife to carve a bar of soap into a stone axe head. Examine the different uses for an axe in a book or online resource.
3. With a large sheet of paper and paints (or chalk), recreate the look of cave paintings. You might consider using a dark room or garage with candles (under parental supervision), to sense the dark cave atmosphere.

## CHAPTER 2

### CAVES AND MYTHOLOGY

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**Text:** Pages 22–29

#### **Terms to Know and Spell**

---

arthropods

bidirectional air circulation

cul-de-sac

echolocation

troglobites

troglophiles

trogloxenes

unidirectional air circulation

## Short Answer

---

1. Name a few civilizations that have caves present in their mythology.
2. Which is the largest troglobite alive today?
3. Are bats: (a) troglaxenes, (b) troglaphiles, or (c) troglobites?
4. What is the Movile Cave in Romania famous for?
5. How much does temperature vary (fluctuate) inside most rocks at 22.44 inches below surface?
6. What is the normal humidity inside most caves?

## Discussion Questions

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1. What happens when female bats give birth?
2. What is the longest period of cave habitation in modern times? Why did those humans choose to live inside a cave?

3. How can ice accumulate inside caves in a temperate climate?
4. What are the health benefits of caves?

## Activities

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1. The Dead Sea Scrolls contained fragments from the Old Testament books of Genesis, Exodus, Leviticus, Numbers, Deuteronomy, 1 and 2 Samuel, Psalms, Job, Isaiah, Daniel, Jeremiah, Ezekiel, and parts of the Minor Prophets. Pick a passage and write it out on a piece of paper. Roll it up to reconstruct the look of a scroll fragment that would have been discovered in the Qumran cave system.
2. Build a cave model with clay. Try to include forms that represent bidirectional airflow, cold air traps, and unidirectional airflow passages.
3. Do further research on cave creatures (fauna) and list the various types of creatures one might expect to find in a cave system.

# CHAPTER 3

## CAVES AND KARST

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**Text:** Pages 30–37

### **Terms to Know and Spell**

---

cave

emergences

endogenetic

exogenetic

karsted

orthokarst

parakarst

pseudokarst

resurgences

sinkholes

## Short Answer

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1. What are karstic rocks?
2. What percentage of the dry, ice-free landmass is covered by karstic rocks?
3. Which is the main agent that dissolves limestone?
4. Besides limestone, what other sedimentary rocks host many caves?
5. What is a resurgence in karst terrains?
6. What is an emergence in karst terrains?
7. What is the highest average flow of a karst river? Compare that to the daily water consumption of New York.
8. What is a rhythmic spring? Name one.

## Discussion Questions

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1. What are characteristics of caves found in igneous rocks?

2. Where does the name “karst” come from?
3. Name a few specific forms of the karst relief.
4. Where in South America has a surprising parakarst been discovered? What rock is it developed in?
5. What is unusual for the karst terrain in the Guadalupe Mountains in New Mexico?

## **Activities**

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1. Complete online research on cave systems around the world. Compile information on at least one system per continent, print off photos of each one, and use a world map to pinpoint their locations.



# CHAPTER 4

## CLASSIFYING CAVES

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**Text:** Pages 38–47

### **Terms to Know and Spell**

---

active caves

compoundrelict caves

detrital formations

dripping speleothems

phreatic caves

relict caves

speleothems

vadose caves

## Short Answer

---

1. What is an active cave?
2. How many types of active caves are there?
3. What is a shield?
4. How many kinds of eccentric speleothems are there? What is the criterion to classify them?
5. What are cave rafts?
6. Name a case of recorded rapid speleothem growth.

## Discussion Questions

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1. Name several non-calcite speleothems.
2. How does ice accumulate in caves in a temperate climate?

3. Outline in very simple terms how speleothems are dated.
4. What is the most obvious and logical argument against a very old age of speleothems?

## **Activities**

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1. Build a three-dimensional cave model utilizing a cardboard box (shoebox). Draw small pictures of the various cave formations (including stalagmites, stalactites, columns, flowstones, cave coral, etc.), then glue or tape the various drawings into the cardboard shell, labeling each structure.
2. Find old or broken items (with a parent's permission) and have someone bury them in your backyard. Set up a specific perimeter with strings staked in the ground (as they would in an archeological excavation site). Carefully dig up the "artifacts" and catalog where they were found and what use they may have served.

# CHAPTER 5

## EXPLORING CAVES

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**Text:** Pages 48–55

### **Terms to Know and Spell**

---

desiccation cracks

master joints

scallops

### **Short Answer**

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1. Who was the first to build and use a diving device?
2. Who was the one who co-invented the Aqualung and was the first to SCUBA dive inside a cave?
3. What family spent the most time in a cave during World War II?
4. What is the name of the cave system this family used?

## Discussion Questions

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1. Describe the gear needed for cave exploration.
2. Discuss some of the concerns, problems, and challenges faced by modern cave explorers as they study a cave.
3. What concerns are there for those trying to take photographs in a cave?

## Activities

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1. Utilizing the chart on page 53, mark out the various length and depth records on graph paper (or lined paper). Use this to evaluate the caves side-by-side. Consider finding other typical measurements for comparison (length of a football field or height of a specific building).

# CHAPTER 6

## STUDYING CAVES

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**Text:** Pages 56–72

### **Terms to Know and Spell**

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cenote

concavities

convexities

diagenesis

karstlands

Xibalba

### **Short Answer**

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1. What is the only measurement of the karsting processes generally accepted?
2. What are the two basic types of waters that reach karstic rocks?
3. Extremely valuable information is yielded by continuous measurements of the discharge or flow rates (\_\_\_\_\_) and chemical composition

(\_\_\_\_\_) of waters emerging through karst springs.

4. How are karst aquifers evaluated today?
5. Within what amount of time after the Flood did the Ice Age set in?

## **Discussion Questions**

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1. Describe the various areas of science covered in the study of caves.
2. Why do karstologists never recommend any significant mining activities below the karst water table?
3. Describe why karstlands are one of the most sensitive types of environments.
4. List the three stages of the creationary model for cave formation with each of the sub-points listed.

## **Activities**

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1. After completing a study of caves, consider taking a tour of a local cave system. Use this opportunity to discuss the various topics you have learned about karsts, including formation, history, and the life contained inside.

# ANSWER KEY

## INTRODUCTION

### Terms to Know and Spell

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karst — the term scientists use for caves

karst aquifers — 25 percent of top-quality drinking water comes from caves

### Short Answer

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1. Their immediate need to find shelter from the rapidly cooling climate.
2. Tower of Babel
3. 25 percent
4. Over 50 percent

### Discussion Questions

---

1. It was deep inside the caves that some found shelter, mystical ritual hunting grounds, and a burial place for their dead.
2. The once-global knowledge and craftsmanship was split between many groups that could no longer truly communicate. Very quickly, various groups found themselves with the monopoly over one or several crafts/technologies, while other crafts were more or less lost for them. They were soon isolated from the other groups and many lost much of their knowledge of God.

## CHAPTER 1

### Terms to Know and Spell

---

acoustics — points of resonance (locations where if certain musical notes are emitted, they will bounce back, amplified, from the walls)



Archeulean industry — from the town of Saint-Acheul, whose most characteristic tool was the stone hand axe

bas-reliefs — artwork usually made of soft, pliable clay attached to walls or even to large blocks

cave paintings — either simple outlines of charcoal or mineral pigment, or true paintings with outlines, shading, and vivid pigment fills

engravings — usually made on soft limestone surfaces

Kyr — abbreviation for thousand years

Myr — abbreviation for million years

Neanderthals — believed by some to be an early human, found in the Neander Valley (“Neader Thal” in German)

spleothems — dripstones; especially stalagmites and stalactites

taphonomists — from the Greek word *taphos* meaning “death”; it refers to all complex transformations that artifacts in the archaeological record have undergone

## Short Answer

---

1. Though we do not know for sure because there is no mention in Scripture, it is possible that there were caves prior to the Flood. They would have been formed differently than those caves that exist today.
2. It is first mentioned in Genesis 19:30 concerning Lot and his daughters.
3. The word “cave” appears some 40 times in the Bible.

4. Cave bears, cave lions, and cave hyenas
5. China
6. Art associated with burial rituals
7. Paintings, engravings, and bas-reliefs
8. No, they were descended from the family of Noah.

## **Discussion Questions**

---

1. Discussion might include their role as shelters or religious sanctuaries.
2. These early people carried their deep beliefs from their ancestor Noah. They also took on new beliefs as they separated from each other. Some may have come to see caves as an entrance into the earth. These were places of deep mystery to them.
3. The largest number of cave paintings are located in places of resonance (locations where if certain musical notes are emitted, they will bounce back, amplified, from the walls). It seems probable that chanting, dancing, and other types of ritual musical activities were associated with cave paintings.
4. Civilization; individual and unique. Man was created by God in His own image and was very intelligent and skilled from the beginning.
5. First representative of this human type was discovered in 1856 in a cave in the Neander Valley in Germany. Some have seen the remains as those belonging to an idiot, a hermit, or a medieval Mongolian warrior. Evolutionists were looking for a missing link, seeing this as a possible connection. However, they were simply humans

with stocky, shorter bodies than many people today. They had broad noses and their brain size was slightly larger than that of modern humans.

6. Neanderthals had a spoken language, seemed to care for each other (those injured), and used flowers to decorate those buried.

## CHAPTER 2

### Terms to Know and Spell

---

anthropods — some creatures live on land and some in water (including crustaceans, centipedes, millipedes, spiders, scorpions, and insects)

bidirectional air circulation — air flowing two ways

cul-de-sac — cave with only one entrance

echolocation — bats send out sound waves that hit an object and an echo comes back, helping them identify the object

troglobites — creatures which live only in caves (from Greek for “cave dwellers”)

troglophiles — creatures which spend some part of their life in caves (from Greek for “who like caves”)

trogloxenes — creatures that got into a cave by accident and which try to leave (from Greek for “foreign to caves”)

unidirectional air circulation — air flowing one way

### Short Answer

---

1. Egypt, Phoenicia, Assyro-Babylonia, Greece, Rome, and Maya

2. The cave olm
3. Troglophiles
4. A spectacular cave environment where several new species of creatures were found
5. An 86°F temperature fluctuation in the atmosphere above them is reduced to less than 33.8°F.
6. Usually about 90 percent

### **Discussion Questions**

---

1. Often one or two other females spread their wings underneath the delivering mother, ready to catch the little one if needed.
2. Thirty-eight Ukrainian Jews hid during World War II for nearly two years.
3. Ice can accumulate in cul-de-sac shafts because they act as traps for cold air.
4. Some caves have an abundance of negative ions in the air, which are usually oxygen atoms. Someone with a cold or flu can improve more quickly because of the absence of cosmic radiation.

## **CHAPTER 3**

### **Terms to know and Spell**

---

cave — considered a natural opening in rocks, accessible to humans, which is longer than it is deep and is at least 33 feet in length

emergences — karst springs when there is no evidence of the origin of the waters that emerge

endogenetic — internal processes that can create caves

exogenetic — external process that can create caves  
karsted — rich in karst features, especially caves  
orthokarst — true karst features  
parakarst — near karst features  
pseudokarst — false karst features  
resurgences — the re-emergence of a known stream  
sinkholes — funnel-shaped hollows, from a few feet to  
hundreds of feet in diameter

### **Short Answer**

---

1. Soluble rocks on which most landforms are formed by solution (karren, sinkholes, blind valleys, swallets, uvalas, poljes, etc.)
2. 12 percent
3. Carbonic acid
4. Rock gypsum, rock salt, evaporite rocks, and chalk
5. The exit point(s) of cave waters of a known stream, also called karst springs
6. Karst springs are called emergences when there is no evidence of the origin of the waters that emerge.
7. Up to 4,060.7 cubic feet per second; 115 tons of water every second, enough to supply the needs of more than two New York's every day.
8. Rhythmic springs flow intermittently, due to the very special shape and spatial distribution of the caves and conduits involved, as well as the constancy of water supply to the caves. Fontaine de Fontestorbes in southern France.

## Discussion Questions

---

1. Endogenetic caves are formed within moving lava. Lava tubes form when and where there are long-term lava flows. Often, stalactites also form. Exogenetic caves are the result of either chemical processes or physical processes, as volcanic ash and other pyroclastics are deposited.
2. Named by Austrian geographers and geologists in the 19th century while studying limestone terrains. They Germanized the Slovenian name “Kras” used by the locals. Probably comes from an old pre-Indo-European root “kara” meaning “desert of stone.”
3. It might be riddled with all sorts of runnels, grooves, and small hollows called karren. Funnel-shaped hollows called sinkholes fill the terrain. Also, large hollows (depressions) called *polje* fill the karst terrain.
4. Northeastern South America (Venezuela and British Guiana). Quartzite sandstone.
5. Many scientists agree today that this area was the result of the limestone being dissolved by sulfuric acid rising (not seeping down as in the case of proper karsting).

## CHAPTER 4

### Terms to Know and Spell

---

active caves — live caves that have a flowing stream in them

compoundrelict caves — fossil caves above the water table

detrital formations — sediments brought into the caves by streams and residual material left by the limestone

dripping speleothems — stalactites, stalagmites, and columns that are growing

phreatic caves — those below the water table

relict caves — caves without a flowing stream, which may have ponds or dripping water

speleothems — secondary crystalline formations

vadose caves — those above the water table

## Short Answer

---

1. A live cave which has a flowing stream
2. Three: inflow, outflow, and through caves
3. A special type of drapery made up of two semicircular plates growing parallel to each other. They can grow more than three feet in diameter.
4. Two kinds — those that grow from stalactites (helictites) and those that grow from stalagmites (heligmites).
5. When cave pool water is saturated and also very calm, thin flakes of calcite start growing, floating on the water, and are called cave rafts.
6. Cave in northern Romania with rapid growth.

## Discussion Questions

---

1. Gypsum flowers (anthodites), angel hair (mirabilite), moonmilk
2. Ice forms in most caves of temperate and cold climates, usually in the entrance areas as ice stalagmites and stalactites.

3. Speleothems are nearly pure calcite that was removed from the limestone and redeposited inside caves. When removed from the limestone, some other soluble minerals accompany calcite, and some contain the radioisotope uranium 234. This decays through a long series of intermediates into lead 206. This is calculated based on a certain rate of decay.
4. Recorded growths of speleothems refute the necessity of tens or hundreds of thousands of years.

## CHAPTER 5

### Terms to Know and Spell

---

desiccation cracks — cracks that formed in the drying of a fine layer of dusty clay (often in polygonal shapes)

master joints — passages follow joints and faults

scallops — spoon-shaped scoops

### Short Answer

---

1. Alexander the Great in 325 B.C.
2. Jaques-Yves Cousteau
3. The Stermers (a Jewish family from Ukraine)
4. Popowa Yama Cave

### Discussion Questions

---

1. Good footwear (hiking boots or rubber boots), good rope, flashlights, hard hat, gloves, pack, wool socks, and knee pads.



2. This would include ascending and descending by rope, crawling through muck and water, moving through large and small chambers, following master joints and scallops, and discovering amazing sights seen by few other people.
3. Humidity increases the absorption of light; unpleasant colors can result when using artificial light films; much time is required to take simple shots with artificial lights.

## CHAPTER 6

### Terms to Know and Spell

---

cenote — a water-filled shaft

concavities — corresponding niches to convexities

convexities — a vertical succession of ledges

diagenesis — turning sediments into rock

karstlands — the terrains that host caves

xibalba — the Mayan “Underworld”

### Short Answer

---

1. The karst denudation rate
2. The precipitation water and the fluvial water
3. Hydrograph; chemograph
4. As a transport and storage device
5. About 500 years

## Discussion Questions

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1. Subterranean geomorphology deals with the complex morphologies encountered under the ground and their relationship with the surface; geology studies the survey of all formations encountered to tectonics; geochemistry studies the direct chemical interactions of rocks with the environment; hydrology helps in understanding how waters move or are stored in the rocks; hydrogeology combines hydrology, geology, and chemistry.
2. Water has a way of finding its way through karst aquifers, draining away from the artificial water reservoir.
3. What happens on the surface has a significant effect on what happens under the ground because infiltration from surface water can be extremely fast.
4. Stage 1 (insoluble rocks, soluble rocks, hyperactive hydrothermal solutions generated during the Flood, large karst cavities excavated after diagenesis), Stage 2 (global tectonic uplift, global sheet flow, massive rain, new detrital sediments), and Stage 3 (karstic sediments).







**C**aves are a fascinating area of exploration – with unique examples found all around the world! Join cave expert Dr. Emil Silvestru in a journey through some of the world’s most unique caves and learn about what makes this underground world so remarkable!

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- How caves form, and features above and below the surface

This study guide is a great tool for small group study and homeschool. Use the time-tested method of filling in answers, reviewing glossary terms, and having discussion questions as you read for greater comprehension and retention.

*Use this book to be better prepared to defend and proclaim the authority and relevance of God’s Word.*

#### ABOUT THE AUTHOR:

Dr. Emil Silvestru was born in Romania where he began exploring caves at the age of 12. He has written numerous articles and research papers, as well as continuing his avid exploration of cave systems in Europe and the Americas. His research and experience have made him an authority on the geology of caves. He now lives and works in Canada with his family, and travels internationally as a speaker.



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