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# AWESOME SCIENCE

EXPLORE the

Grand

Canyon

with Noah Justice



## Study Guide



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EXPLORE the

# Grand Canyon

with Noah Justice

**STUDY GUIDE  
& WORKBOOK**



March 2012

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# Introduction

Awesome Science is a kid's show taking you on a field trip to some of the most amazing geologic and historic sites around the world, where we use the Bible as our guidebook to interpret what we see and study. We'll see that the Bible can be trusted and that empirical science lines up with the biblical account of creation, the Fall, and the Flood. Science! It's awesome!

Our first stop on today's tour is at the grandest of canyons, the Grand Canyon. Secular scientists say it formed over millions of years, but now some scientists are changing their view. The facts only fit what we learn using real science. It's didn't take millions of years to form, but just days.

Then we travel upriver to Glenn Canyon Dam to learn about cavitation, a process where high velocity, high pressure water can erode through concrete and hard rock in seconds.

All this and more on Awesome Science!

## Bonus Activity:

Research the history of Glenn Canyon Dam being built, and find a map that shows where the dam is located.

## Complete Word List

anti-dunes	authority	bent layers
arid	basement rock	blast zone
asphyxiated	bedrock	boundaries

burrowing	fractures	pulverized
catastrophes	framework	recessional
cavitation	genealogies	reinterpret
channelize	geologic column	ripples
conglomerate	God	sand bars
continental shift	granite	sand waves
creation	hardening	saturated
cross-beds	interpret	scavengers
decomposition	landslide	schist
delta slopes	limestone	secular
deposits	marine	sedimentary
deterioration	mechanism	silt
dormant	mega-floods	spillway
earthen dam	megascopic	vacuum
embedded	ocean basins	vegetation
erode	organisms	velocity
evolution	plateau	windblown
flood	plausibility	worldview
fossilized		

## Key Concepts

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biblical account	fountains of the deep
empirical science	post-Flood
geologic processes	rapid burial
secular humanism	local event
biblical creation	Tapeats Sandstone
evolutionary geology	Coconino Sandstone
Genesis Flood	quick erosion
land-dwelling	rapid succession
air-breathing	

# About the Grand Canyon

**Fill in the blanks with words from the following list:**

Noah's	western	secular humanism	
reinterpret	processes	moon	present
canyon	Colorado	biblical	evidence
Genesis	scenic	evolutionary	schists
Sea	slow	worldview	Native
basement	millions	sedimentary	Arizona

The \_\_\_\_\_ United States has some of the most amazing \_\_\_\_\_ wonders of the world: Yellowstone, Yosemite, and the Grand Canyon.

The Grand Canyon is found in the northern part of \_\_\_\_\_. It has a depth of more than a mile and is as wide as 18 miles. It can be seen from the \_\_\_\_\_. It is truly an awesome sight.

The amazing \_\_\_\_\_ River has its start on the western slopes of the Rocky Mountains and runs 1,450 miles to the ocean. It travels 277 miles through the canyon. Eventually it empties into the \_\_\_\_\_ of Cortez in Mexico.

\_\_\_\_\_ Americans first dwelt here, but in 1540 explorers with Coronado were the first known Europeans to see the canyon. Finally in 1869 John Wesley Powell led the first \_\_\_\_\_ in boats down the Grand Canyon



in just three months.

The most fascinating part of the canyon is how we can see thousands of feet of \_\_\_\_\_ layers produced during the Flood.

The Colorado River also flows through the \_\_\_\_\_ granites and \_\_\_\_\_. This has fascinated the scientific community because it's one of the few places on earth you can study what happened in the past on such a grand scale.

When you walk through the park, signs are up all over the place saying the canyon was formed over \_\_\_\_\_ of years. Why?

Because secular scientists believe that \_\_\_\_\_ geologic \_\_\_\_\_ and evolution occurred over millions of years. Evolution and millions of years are parts of the religion of \_\_\_\_\_, in the same way that creation and thousands of years are part of \_\_\_\_\_ Christianity.

\_\_\_\_\_ geology says the \_\_\_\_\_ is the key to the past. In other words, the processes we see today are what formed the past, over long periods of time. By doing this, they are saying there were no catastrophes in the past, like the Flood of \_\_\_\_\_ day.

Here at the Grand Canyon, they say the small Colorado River was able to form this huge \_\_\_\_\_, given enough time. Catastrophe, which means a lot of change over a little period of time (think “\_\_\_\_\_ Flood”), is something most secular scientists don't believe can happen on such a grand scale.

In the evolutionary \_\_\_\_\_, everything developed by chance over billions of years, and creation by God is just a “myth.” But some scientists, even though grudgingly, are having to \_\_\_\_\_ their thinking, because they realize that a proper interpretation of the \_\_\_\_\_ just doesn’t match up with the millions of years.

What evidence??? I’m glad you asked!

### Discussion Questions:

1. How does a worldview reveal how one understands the geologic evidence at places like the Grand Canyon?
2. Why does the secular explanation of the small Colorado River carving the massive Grand Canyon not make sense?
3. Who were the first inhabitants of the Grand Canyon?

### Bonus Activity:

See if you can learn more about the daily lives of Native Americans who lived in the Grand Canyon by looking for books at your local library or online sources. How were they affected by the terrain and climate in this area?

# Evidence: Colorado River Plausibility Questions

**Please note if the following statements are true (T) or false (F).**

The Rocky River has its start in the Colorado Mountain National Park at over 10,000 feet. \_\_\_\_\_

The river then winds its way down through Utah and empties into Lake Powell at about 3,700 feet. \_\_\_\_\_

After leaving Lake Powell, it meanders through the Grand Canyon. \_\_\_\_\_

A very large plateau rises to 780 feet to the west of the Painted Desert, called the Kaibab Plateau. The Grand Canyon goes through this. \_\_\_\_\_

How does a river rise 4,000 feet to carve a canyon? A river can always run uphill. Modern-day observations can reasonably explain how a river could have done this.  
\_\_\_\_\_

The Colorado River should have gone a different direction. \_\_\_\_\_

Some theorize that the plateau rose while the canyon was formed, but there is no evidence for this to be the case.  
\_\_\_\_\_

In fact, most scientists are convinced the plateau rose

before the canyon was cut, so some other mechanism to carve the plateau was at work. \_\_\_\_\_

Then there is the water flow. When you take the volume of water of the Colorado, even in flood stage, it makes sense a river this small (compared to the size of the canyon) could have eroded away this much material over any period of time. \_\_\_\_\_

Because of gravity, a river always erodes downward.  
\_\_\_\_\_

Floods do come and change the direction of a river, but a river 18 miles wide with the current water volumes would be so shallow that it would have very little erosional power. Some major event would need to have happened to carve this canyon. \_\_\_\_\_

### Discussion questions:

1. Why is it important to understand how water flow and erosion can create land features in trying to see if the Colorado River could have carved the Grand Canyon?
2. What is gravity and how does it impact how a river flows?
3. What is the process known as erosion?

### Bonus Activity:

See if you can find images of the Painted Desert. Why was it given this name, and how is this coloration made possible?

# The Biblical Record

The Bible tells us that about 4,500 years ago, the world was an awful and ungodly place, leading God to be grieved because He made man. God was grieved because of man's rebellion and that he was bent toward violence, wickedness, and evil. The Bible (Genesis 6) highlights the following points:

- “Then the LORD saw that the wickedness of man was great in the earth, and that every imagination of the thoughts of his heart was only evil continually.”
- “And it repented the LORD that he had made man on the earth, and it grieved him at his heart.”
- “And the LORD said, I will destroy man whom I have created from the face of the earth; both man, and beast, and creeping thing, and the fowls of the air; for it repenteth me that I have made them.”
- God was going to judge the world.
- God would send a global Flood to destroy mankind, except for one man and his family.
- Noah found favor with God because he was a righteous man.

## Bonus activity:

Read the following biblical passages

Genesis 6:8–12  
Genesis 7:2–3

Genesis 6:18–20  
Romans 12:19

## Discussion questions:

1. Originally, it was just Adam and Eve that sinned in the Garden. Yet by the time of Noah's Flood, the Bible tells us that every intent in the heart of man was evil. What does this tell us about sin?
2. God was preparing to judge the world because of sin. God is perfect and without sin — and as long as mankind was sinful, they could have no relationship with God. How does this tie back into the events around the Garden of Eden and the original Fall of man?
3. Why were Noah and his family to be saved from the coming Flood?

## **Using the numbers 1 to 14, put the sequence of the great Flood in order.**

\_\_\_\_\_ At the end of those 150 days, the waters began to recede, which took about five months. It took another two months of drying time for the land.

\_\_\_\_\_ The fountains of the great deep burst forth, which included water and volcanic activity.

\_\_\_\_\_ The ark rose above on the waters and the floodwaters were sustained for 150 days.

\_\_\_\_\_ Then the volume of water became less and began to channelize, forming canyons and some valleys.

\_\_\_\_\_ Once on the ark, the Flood came seven days later.

\_\_\_\_\_ God told Noah to build an ark.

\_\_\_\_\_ Giant water currents carried silt and mud across the globe.

\_\_\_\_\_ Sea creatures were rapidly buried by sediment and fossilized.

\_\_\_\_\_ As the catastrophe began to wind down, the moving continents came to a stop, buckling rock layers and pushing up mountains thousands of feet in just days.

\_\_\_\_\_ While the water covered the entire earth, continents moved under the oceans.

\_\_\_\_\_ Noah was to fill the ark with two of every land-dwelling, air-breathing animal (including dinosaurs) and seven of every bird and clean animal.

\_\_\_\_\_ Water ran off the continents causing huge sheet erosion, pulling silt and soft soil into the oceans.

\_\_\_\_\_ Water became trapped in valleys between the mountains, formed gigantic inland lakes.

\_\_\_\_\_ It rained for 40 days and nights.

### **Remember:**

The post-Flood earth was drastically different from before the Flood. The earth went through a catastrophe like it had never seen before. All life was destroyed beneath the water and on the land. Mankind, except for Noah and his family, was wiped out. It was God's judgment upon the earth for sin and rebellion.

# Looking at the Evidence — the Canyon Walls

**Fill in the blanks with words from the following list:**

recessional	creation	crust	scavengers
pressure	volcanic	water	decomposition
ocean	below	basement	layers
recede	sedimentary	sea level	canyon
sediments	megascopic	sand	metamorphic

The key to help us understand what carved the canyon may be in the \_\_\_\_\_ of the canyon walls and the \_\_\_\_\_ rocks at the bottom.

There are up to 40 major \_\_\_\_\_ layers in the Grand Canyon area.

Sedimentary layers are rock layers formed by \_\_\_\_\_ laying down silt, mud, and \_\_\_\_\_. The layers were soft at one time.

Once the water departed, the \_\_\_\_\_ hardened into rock layers, though some lower layers surely began forming into rock prior to being dry due to the \_\_\_\_\_ from above them.

\_\_\_\_\_ the sedimentary layers at the Grand Canyon are the basement rocks of granite and schist.



The basement rocks are not sedimentary, but often \_\_\_\_\_ or \_\_\_\_\_. They were there before the sedimentary layers were laid down. They usually include granites.

What's most interesting about the basement rocks is that they don't contain any \_\_\_\_\_ marine fossils, meaning they were not formed during the Flood, but were part of the original \_\_\_\_\_, about 1,600 years earlier.

Signs at the Grand Canyon will tell you that the sedimentary layers seen in the \_\_\_\_\_ walls were laid down on the basement rocks over millions of years by \_\_\_\_\_.

Oceans would come in, then \_\_\_\_\_, leaving layers, and repeat the same process at least 47 times, one on top of each other, over and over.

But this has problems since ocean floors are not places known to form fossils because of \_\_\_\_\_ and \_\_\_\_\_, and the Grand Canyon layers do have fossils.

Since oceans do not rise above the ground now 4,000 to 7,800 feet above \_\_\_\_\_, secular scientists say that the ground was lower, then pushed up after the oceans left their deposits.

As creationists, we agree in one sense with secular scientists; the earth's \_\_\_\_\_ has risen and fallen. But we believe this all happened during the Flood and especially during the \_\_\_\_\_ stage, as mountains rose and valleys sank.

## It's the Timing!

The difference is in our belief about the timing . . . it's not millions of years, but months and weeks . . . and that is a very important distinction.

Even if this rising of the dry layers happened over millions of years, as secular scientists believe occurred repeatedly, the layers would be full of HUGE cracks and many fractures. But we don't see that.

### Fill in the blanks with words from the following list:

marine	boundaries	cross-beds	deterioration
time	desert	quickly	bent
burrowing	pebbles	wet	sequence
fast	sandstone	geologic	uplifting
sinking	root systems	fossils	bottom

We do see some \_\_\_\_\_ layers, but not large-scale fracturing or snapping, indicating the layers were moved and bent while still \_\_\_\_\_, prior to being fully hardened into rock.

The whole \_\_\_\_\_ of layers had to be deposited rapidly, and then bent immediately before hardening occurred.

During the recession stage of the Flood, many areas of the earth's surface were going through great \_\_\_\_\_ or \_\_\_\_\_, causing some of this bending of the soft layers. Many mountains were formed, for example, by day 150 of the Flood.

When we see evidence of \_\_\_\_\_ fossils in these sedimentary layers, it helps us realize that the ocean waters indeed covered this region quickly in order to bury these creatures, so they fossilized.

\_\_\_\_\_ are created when an animal or vegetation is buried quickly in sediment. If not quickly, then scavengers will eat the remains or they will rot and decay, but NOT be fossilized.

But we don't see large scale erosion at the \_\_\_\_\_ of many layers at the Grand Canyon. Most layer surfaces are very even, one on top of the other, with hardly any erosion \_\_\_\_\_. It's like they were laid down very quickly on top of each other, with no time for erosional features to develop.

Furthermore, there should be evidence of animals \_\_\_\_\_ into these layers.

In addition, vegetation would have built up \_\_\_\_\_.

But such features are absent in the Grand Canyon. The layers are simply stacked one on the other without any evidence of large \_\_\_\_\_ breaks between them.

Another challenge, in some sedimentary layers, especially near the \_\_\_\_\_ of the canyon, is that there are many large embedded boulders in them, some of which are 15 feet in diameter. This would mean there was fast-moving water carrying these large stones along.

The Shinarump Conglomerate covers 100,000 square miles and is full of \_\_\_\_\_. So the water that formed these layers was likely moving extremely \_\_\_\_\_ over a very wide area in order to round so many pebbles by erosion.

The sedimentary layers were laid down \_\_\_\_\_, one on top of the other.

Many Grand Canyon sandstones contain cross-beds. \_\_\_\_\_ are sedimentary layers which are laid down as tilted or inclined layers during their deposition, and are usually caused by water or wind. This widespread \_\_\_\_\_ feature is often seen in ripples, dunes, anti-dunes, sand waves, bars, and delta slopes.

Some of these \_\_\_\_\_ layers at the Grand Canyon are thought by secular scientists to have formed by wind in arid \_\_\_\_\_ with blowing sand.

### Bonus activity:

Read Psalm 104:8–9 and Genesis 7:19–20 and 8:4. How do these verses fit in with the biblical account of the Flood and the formation of places like the Grand Canyon?

See if you can find pictures of erosion, dunes, and the Shinarump Conglomerate.

# Dunes

**Please note if the following statements are true (T) or false (F).**

We know from empirical scientific testing that windblown sand dunes achieve an angle of at least 33–34 degrees on the front faces of the dunes. \_\_\_\_\_

All of the cross-beds in the Grand Canyon sandstones are at the steep angle produced in desert dunes. \_\_\_\_\_

Underwater sand waves have front faces with angles less than 10 degrees. \_\_\_\_\_

This is exactly what we find at the Grand Canyon. This sandstone layer was created underwater.

These layers at the Grand Canyon are a part of what's called "The Colorful Staircase." \_\_\_\_\_

There are 10–12,000 feet of sedimentary layers in the Grand Staircase, starting at the bottom of the Grand Canyon, and the top layer is at Bruce Canyon in Utah.

\_\_\_\_\_

All layers appear to have been laid down quickly due to the features we have already discussed. \_\_\_\_\_

Secular scientists use the fossil record to tell the story of evolution, but the same evidence is better explained by quick burial of animals during the Flood. \_\_\_\_\_

In the fossil record we find buried animals and plants.

\_\_\_\_\_

This is not what we would expect to find in light of the biblical account. First, shallow marine organisms, then fish, which were asphyxiated by a lack of oxygen, then animal tracks, and finally land animals in the bottom layers. \_\_\_\_\_

Normally when an animal dies, its remains decompose and are eaten by scavengers. Over millions of years there should be no remains. \_\_\_\_\_

But if decomposition and scavengers were absent due to rapid burial, a fossil could then easily have been made.

\_\_\_\_\_

At the bottom of the canyon is an area called the “Great Conformity.” The layers below the horizontal sedimentary layers are inclined, as though a great upheaval had happened. \_\_\_\_\_

Then these layers were eroded off flat with little time to be subject to further erosion of valleys or other features. The muds, silts, and sand were then quickly laid on top.

\_\_\_\_\_

At the beginning of the Flood, we think that the earth experienced a huge upheaval. The fountains of the great deep burst forth. The land shifted, but none of the continents moved. This was just a local event. \_\_\_\_\_

The sedimentary layers of the Tapeats Sandstone and Redwall Limestone stretch across the continents of North America, Europe, and parts of Asia. \_\_\_\_\_

Traces of the Coconino Sandstone can be traced to Oklahoma, and some sand grains as far as the Northern Appalachians. \_\_\_\_\_

Secular scientists say an ancient river carried the sand 1,800 miles, but there is no evidence, so that must mean those scientists are right! \_\_\_\_\_

A global Flood could have carried this sand west. Current direction indicators in many strata have been interpreted to show the waters were moving from the NE, directly from the northeastern part of America. \_\_\_\_\_

The Bible best explains so many of the geologic features we find in the geologic column, including how these vast sandstones were formed. \_\_\_\_\_

Science, it's awesome!

### Discussion questions:

1. Do secular scientists and creation scientists look at different evidence because they explain how the canyon formed differently?
2. Why do these scientists not agree on one explanation for how the Grand Canyon formed if everyone looks at the same evidence?
3. Why is it important for people to know the Bible matches up with the evidence we see around us when it comes to understanding our planet's history?

# Receding Floodwaters

Around day 150 of the Flood, the continental shifting started to slow down. The springs of the great deep were stopped. The windows of heaven were restrained, and mountains were forming, implying the continental plates had collided and the water started to decrease. Scripture implies this was all going on under the surface of the water. As the mountains rose, the great continental collisions slowed.

Giant areas of land were uplifting or sinking, causing the floodwaters to recede across the continents and into the new ocean basins. When water recedes, it first goes in sheets, then it channelizes, eroding canyons. With the huge amount of water associated with the Flood, this erosion was massive, across entire continents.

Because the plateaus and mountains were formed during the stages of the Flood, large bodies of inland water were trapped.

## The Two Lakes

**Fill in the blanks with words from the following list:**

weather	weakened	post-Flood	leaches
rainfall	polar	Kaibab	miles
greater	limestone	soft	hurricanes
stabilizing	Canyonlands	saturated	evidence
Grand Canyon			



It is now believed that two large lakes formed behind the uplifted \_\_\_\_\_ Plateau.

\_\_\_\_\_ has been left behind of two main lakes, holding an estimated 3,000 cubic miles of water, three times that of Lake Michigan. In addition to the lakes, there's strong evidence that we interpret as harsh \_\_\_\_\_ right after the Flood. Most creationists believe there was a \_\_\_\_\_ Ice Age.

To aid this, there may have been super-size \_\_\_\_\_ that roamed the earth as weather patterns were \_\_\_\_\_, causing massive flooding and producing enough precipitation from the warmer climate in the early post-Flood world to create the \_\_\_\_\_ ice sheets in a few hundred years.

The \_\_\_\_\_ in the warmer regions would build these lakes to overflowing.

Since the plateau blocking the lakes had \_\_\_\_\_ in it, and water \_\_\_\_\_ limestone, the integrity of the plateau began to \_\_\_\_\_, probably over several years. The limestone could have also still been \_\_\_\_\_ right after the Flood, making it even more susceptible to quick erosion.

At some point, the integrity of the Kaibab Plateau gave way and the \_\_\_\_\_ began to be cut.

As when most dams break, once the first waters were through, all the water behind it pushed forward, causing even a \_\_\_\_\_ amount of erosion. It is thought that Hopi Lake broke through first, then

\_\_\_\_\_ Lake. In just a few days, over 1,000 cubic \_\_\_\_\_ of earth was eroded away.

Since this massive erosion was not long after the Flood, many of the layers in the Grand Canyon were still saturated and comparatively \_\_\_\_\_, so erosion could have been very quick.

### Bonus activity:

Take sand and dirt, and place it in layers in a plastic pan. Take your hand and shape the top into an uneven surface. Be sure to add in some small and larger rocks in the mix of dirt that you include. On one end of the pan, use your hand to make a small circular hole like a small lake with a small edge along the top. Then take a pitcher of water and slowly fill up the “lake.” Get the water right to the top of the lake and stop for a moment. Notice how the surface of the “land” in the pan appears. Then quickly pour the remaining water in the pitcher in the “lake.” Did part of the rim get washed away when it overflowed? How did the surface of the “land” change after the lake overflowed?

# Examples at Mount St. Helens

We can look at other examples of large canyons to help answer some of the questions about how it may have been formed. For example, was the Grand Canyon formed over millions of years by the small Colorado River or during an event like Mount St. Helens's mini grand canyon, only on a larger scale? Let's discuss it with the following questions!

1. Empirical scientific methodology means you can observe it and should be able to repeat something over and over. Even though the formation of the Grand Canyon was not observable and we cannot repeat it, we've seen other canyons on a smaller scale form before our eyes. This is what we find at Mount St. Helens in southern Washington State. Why are the events surrounding the eruption of Mount St. Helens so important versus the rock layers or other evidence?
2. Mount St. Helens was a dormant volcano. In 1980 it quickly came to life, and a major eruption occurred, blowing out the north side of the mountain and creating a blast zone unlike anything seen in recent history. What is the difference in a dormant and an active volcano? How important do you feel it was for scientists to have an opportunity to view the processes in real time that they feel shaped the earth, especially those who have a biblical worldview about it?

3. Through a giant landslide and many eruptions, several hundred feet of pulverized rock and ash were deposited. It became a wasteland. How does this barren landscape remind us of what might have happened right after the great Flood receded?
4. After the main eruption in 1980, Mount St. Helens went quiet for about two years. During this time, snow built up within the crater. The crater rim was like a large earthen dam that held back the snow and water for two years. Compare this to the “lake” you created earlier in this study guide. Why was it almost a certainty that the earthen dam at Mount St. Helens would be destroyed? (Hints: The water being collected and the volcanic activity at the site.)
5. Then in 1982 the mountain became alive again, melting the snow and ice. The water quickly eroded through the soft volcanic soil and came cascading across the blast zone. It quickly created canyons in the volcanic rock and ash layers. See if you can find any video footage of the eruptions of 1980 and 1982. Notice the shape of the mountain before the 1980 eruption and the surrounding landscape — how did these eruptions impact the land and wildlife in the area?
6. Even though the Grand Canyon has sedimentary layers, the same principals of erosion apply — lots of water cutting deeply in a little bit of time. Discuss what you think based on what you have learned. Little water and a long time? Or a lot of water and a short amount of time? What makes the most sense to you?

# Examples at Glenn Canyon Dam and Cavitation

A fact of nature which helps us better understand how water could cut through solid rock very quickly is a process called “cavitation.”

In the spring of 1983 the Colorado River went into flood stage, filling Lake Powell at 148,000 cubic feet of water per second. Glenn Canyon Dam was in danger of overflowing. The power plant was running at full capacity, moving 28,000 cubic feet of water per second through the turbines.

Engineers opened the four outlet tubes, which increased the flow by 17,000 cubic feet of water per second, but much more was needed to prevent disaster. The 40-foot diameter tunnel spillway was opened and the flow was eventually increased to 32,000 cubic feet of water per second.

Scientists were aware of cavitation, a dangerous process where water can tear apart almost any surface or material when enough pressure and flow is taking place.

## **What Happened Next?**

Engineers were worried this much flow would destroy the spillway tunnel of Glenn Canyon Dam if opened too much. Their worst fears were realized when the outgoing water became red and the ground started to shake. They

saw pieces of bedrock and concrete being hurled into the air at the bottom of the tunnel. This all happened in just a few minutes. They quickly shut down the spillway and went in to investigate. What they found totally surprised them.

1. The tunnel, constructed of three-foot-thick steel-reinforced concrete, had been penetrated by pits. The sides of the tunnel were missing and the rebar was torn into pieces. Take a ruler and measure three-feet. Think about the sides of the tunnel being that thick and made of concrete — what does that make you think about the power of water being able to rearrange the landscape?
2. Where the tunnel elbow was, near the bottom, there was a giant hole 32 feet deep, 40 feet wide, and 150 feet long. Estimates were that cavitation destroyed the tunnel at 1,000 cubic feet per second during the peak. Does this change or support what you think about a little water over a long time or a lot of water in a short time?
3. When water comes down a surface at high pressure and flow, if it hits an uneven surface, the water is thrown upward by the obstruction, which causes a partial vacuum, and a vapor cavity develops, which starts to wear away at the surface. Once a pit is made, it causes more upward waves, which makes more pits, and there begins a leapfrog process of erosion. Having read this explanation, can you explain why cavitation is just a destructive process?

4. The tunnel had to be quickly repaired. It took 63,000 cubic feet of concrete to fill. This shows us that given enough water flow and pressure, cavitation can create huge erosional features in a very short amount of time. What about other destructive water events — like floods, or tsunamis, or large waves — can they impact the landscape as well? What do you think?
5. The water flow at Glen Canyon Dam was nothing compared to the amount of water behind the two lakes spilling across the Kaibab Plateau to create the Grand Canyon. The process of cavitation would have torn the ground apart beyond imagination. Look at a picture of the Grand Canyon. See what information you can find about how tall the cliffs are. Answer the following essay question: What geologic processes helped form the Grand Canyon, and why?

# Example of Mars

**Please note if the following statements are true (T) or false (F).**

There are similarities in canyons on the planet Mercury like those of the Grand Canyon. \_\_\_\_\_

Surprisingly, on Mars we see what looks like huge canyons formed by water, but there is very little water found on Mars, and when there is some, it's pretty much just ice. \_\_\_\_\_

Ninety percent of the earth's surface is still covered by water. \_\_\_\_\_

Secular scientists deny that a global Flood happened in the past as presented in the Bible. \_\_\_\_\_

The Bible tells us why these scientists ignore the truth. We read in 2 Peter 3:4–6: “They will say, ‘Where is this “coming” he promised? Ever since our fathers died, everything goes on as it has since the beginning of creation.’ But they deliberately forget that long ago by God’s word the heavens existed and the earth was formed out of water and by water. By these waters also the world of that time was deluged and destroyed” (NIV). \_\_\_\_\_

If they can deny the Flood and God’s judgment by the great Flood in the past, they can then deny the biblical record . . . and most importantly they think they can deny the Second Coming of Jesus Christ and the second judgment that’s coming to this earth. \_\_\_\_\_



But we've shown that the Bible can be trusted, so Jesus is coming back! Come quickly, Lord Jesus!

### Bonus activity:

See if you can find a NASA image of Mars, the red planet. If you can find an image of Mar's surface that is even better — so you can see for yourself the canyons that exist there and the channels that show water once flowed on the planet. Find any library books you can to learn more about the surface of Mars.

Are there any other planets in our solar system that show evidence of flowing water or canyons that were formed by mega-floods?

### Discussion question:

Why do secular scientists choose to believe so quickly that the canyons on Mars were possibly formed by mega-floods without the huge amount of water to be found, yet they don't think the same sort of event caused the formation of the Grand Canyon?

# Conclusion

The Bible explains that the global Flood covered everything. It was catastrophic. Not only did the rain come from above, but the Bible says the fountains of the great deep burst forth, which was water and volcanic activity. The biblical Flood provides the framework for a proper mechanism and forces necessary to produce these types of sedimentary layers in a rapid succession.

The Bible is the true history book of what happened on the earth. It was not long periods of time, but a short catastrophic period, validating the earth as being young. Those who believe in the literal biblical account of earth's history have long thought that the canyon was not created in millions of years, but just days.

The Bible indicates the earth is young, about six thousand years from creation to the 21st century, indicated by reading the genealogies of Christ, and then from history forward. So much of the earth's features we see today would be due to catastrophe, not long processes.

God wants us to use reasoning based on the authority of Scripture, and not follow after man's opinions or guesses.

Evidence for the Great Flood is a reminder that God has judged the world. The Bible says He will judge the world again through fire. This knowledge should cause us to be serious in making things right with our Creator. Have you done this? We invite you to begin now.

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EXPLORE the

# Grand Canyon

with Noah Justice



Designed to make science fun, the *Awesome Science Series* is an educational and entertaining opportunity for everyone.

This study guide was designed for use with *Episode 1: Explore the Grand Canyon* to display the knowledge the student has obtained by watching Noah ascertain how this magnificent canyon was truly formed. Found out how the 40 layers of the Grand Canyon were laid down by the global Flood, then cut quickly, all through catastrophic processes.



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