

# ACTS & FACTS

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Engineered Musical Ability

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**DESIGNER**

Dennis Davidson

[Jesus Christ] is the image of the invisible God, the firstborn over all creation. For by Him all things were created that are in heaven and that are on earth, visible and invisible, whether thrones or dominions or principalities or powers. All things were created through Him and for Him. And He is before all things, and in Him all things consist. And He is the head of the body, the church, who is the beginning, the firstborn from the dead, that in all things He may have the preeminence. For it pleased the Father that in Him all the fullness should dwell, and by Him to reconcile all things to Himself, by Him, whether things on earth or things in heaven, having made peace through the blood of His cross.

(Colossians 1:15-20)

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Front cover: NGC 3132, Southern Nebula Ring, viewed by NASA's Webb Telescope  
Image credit: NASA, ESA, CSA, STScI



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“Next time, won’t you sing with me?” is the closing line of the ABCs so often heard from sweet little voices. Since they don’t know it’s a rhetorical question, it’s amusing to hear them sing the song over and over...and over.

Yet, this endless singing produces lifelong benefits. It aids in brain development by establishing learning processes needed to assimilate astonishing amounts of information. Because singing plays an important role in development, it’d be interesting to know if any non-singing cultures have been identified. It also explains why technical literature links both the auditory and neurological systems together with singing and speaking.

When you think about it, these systems showcase many wonderful characteristics of the Lord Jesus. On the loving side, He made singing such a super-fun activity for toddlers that they gladly partake in this brain-building activity. The technical side is equally fascinating. He integrated the children’s auditory system into the brain’s “encoding” process. In this ABC song illustration, the children not only encode the ABCs but also the sequence of the 26 letters, two short musical arrangements, six musical notes (harmonic frequencies), a sentence, the rhetorical question, and the sounds of words (phonetics). There’s a lot more going on than meets the ear.

Exploring these interesting biological systems also illustrates ICR’s current work. As discussed in my article “Finding Biblical Clues to Design,” ICR is developing a theory of biological design.<sup>1</sup>

### article highlights

- The process of singing is more intricate than one might think.
- Human-engineered processes give us insight into the profound biological processes Christ Jesus engineered into living things.
- Our auditory and neurological systems were orchestrated to work together seamlessly to give us the ability to sing, play instruments, and enjoy music.
- Humans can classify singing because our brains contain an area that specifically analyzes music—an area clearly built for this purpose!
- ICR’s theory of biological design will put the credit for creatures’ unmatched engineering where it belongs—our Creator Christ’s power, genius, and wisdom.



# CREATED TO SING OUR GLORIOUSLY ENGINEERED MUSICAL ABILITY

RANDY J. GULIUZZA AND  
AARON T. GULIUZZA

Key assumptions of this theory are demonstrated in a study of the auditory system and human singing.

### Theory: A Framework Used to Explain Observations

A theory is a working hypothesis about how something works. A working hypothesis guides the development of research questions and shapes the interpretation of observations. Assumptions are central to theories. These are beliefs that are taken for granted as true, and scientists can use them to fit their religious beliefs into their theories.

For instance, many evolutionary biologists adhere to a religion called naturalism. Thus, when they approach biology, they’re assuming that life on Earth somehow started by natural processes, biological systems simply function rather than having goal-oriented purposes, genetic changes are almost universally

random, and nature has the ability to somehow favor organisms. Since these assumptions automatically exclude many alternative explanations, they greatly simplify biology for the scientists.

Yet, these assumptions aren’t good illustrations of *valid* assumptions for scientific theories. Why? Because an assumption shouldn’t be a guess or wild conjecture; it’s expected to be testable or have a rational basis tied to human experience. Evolutionary biologists are in the unenviable position of trying to explain the origin of creatures that give every indication of exquisite engineering—but without appealing to a real engineer.<sup>2</sup> Nobody’s seen engineers design without a purpose or a complex entity spontaneously come into existence. Thus, the first article of faith for evolutionary biologists—i.e., that there’s no biological engineer—forces their assumptions to be counterintuitive to human experience.

ICR’s theory of biological design doesn’t force unreasonable assumptions. As we analyze the auditory system, we’ll see evidence that tends to reinforce three assumptions.

1. Basic research of biological functions lies within the domain of engineering practice. Researchers systematically take the elements of biological systems apart piece by piece and apply tests to discern their operation. This practice is the definition of reverse engineering.
2. An explanation for a biological function that incorporates the best tried-and-true principles used in human-produced designs (i.e., engineering principles) has a higher likelihood of being an

accurate description.

3. Analyzing human engineering practices is highly advantageous to biological research in formulating hypotheses about processes and informing research predictions, and it's *essential* to guide researchers to correct explanations of the operation of biological phenomena. The last phrase is particularly important. It's saying that when interpretations are framed within Darwin's anti-design selectionist theory, researchers are immediately put on the path to irrational explanations about the origin and operation of biological phenomena.

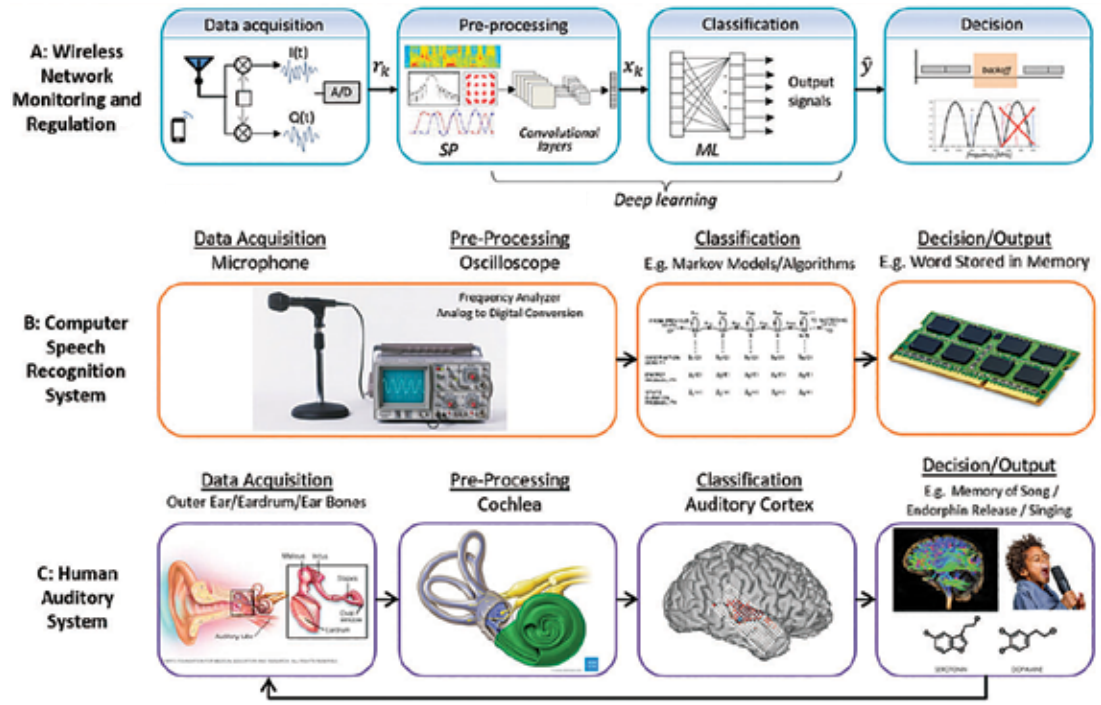


Figure 2. Comparison of systems that convert frequency data into usable information  
Image credit: Aaron T. Guliuzza. Illustration A adapted from Kulin, M. et al, End-to-End Learning From Spectrum Data, *IEEE Access*<sup>5</sup>

God could have engineered creatures so that researchers couldn't figure out their operation. But He did just the opposite. In fact, as human technology progresses, we observe an ever-increasing correspondence between the operation of highly engineered human devices and the systems in creatures that perform similar functions.<sup>3</sup>

This clear correspondence conveys powerful theological implications. First, it gives good reason to question the evolutionist's assertion that humans and all other creatures are a "mere accident" of nature.<sup>4</sup> There's no rational basis for finding *any* correspondence between human-engineered products and random biological after-effects. Second, since there's no doubt that man-made things were engineered, then there shouldn't be any doubt that creatures were also engineered.

## The Auditory System and Corresponding Engineering Principles



Figure 1. Sample audio track  
Image credit: James Turner

Machines can record singing and graphically represent its many characteristics (e.g., intensity, timing, etc.). One example looks like Figure 1. How does the

brain of a toddler make sense of all this data? We now have some answers. Like systems that engineers have devised, our auditory system and brain solve the same problem using the same engineering principles—but at exceedingly higher levels of performance.

Engineers methodically lay out all the elements necessary to solve problems. For example, engineers identified the necessary steps to track frequency data to optimize the efficiency of wireless networks (Figure 2A).<sup>5</sup> Computer systems utilize the same arrangement for speech recognition (Figure 2B). Creatures use the same system ele-

ments to detect sounds, assign meaning to the data, and make decisions (Figure 2C).

## Describing Four Corresponding Engineered Elements

### 1. A mechanism to convert air waves into useable data

Many sound-making devices compress air into pulses, and a system is needed for the initial pulse sensor and data converter. Human-engineered microphones and our ears fill this need and, as expected, have corresponding parts. Both have a membrane that flexes with air pulsations (our ear drum) connected to a mechanical linkage (the hammer, anvil, and stapes bones).

A fluid-filled chamber known as the cochlea located in our inner ear acts as a sound amplifier by transforming the vibrations conveyed by the linkage bones into fluid pulses. The movement of fluid in turn vibrates another sensor comprised of hundreds of tiny, yet highly sensitive, outer and inner hair cells that convert mechanical pulses to electrical signals.

### 2. A data preprocessor

The next step is to begin analyzing raw data. An oscilloscope is a device that produces a visual representation of the data from a microphone. The images help engineers study sound characteristics such as frequency (pitch) and amplitude (volume).

Similarly, humans have a remarkably sensitive frequency analyzer in our cochlea called the organ of Corti. So, imagine a piano with 16,000 keys. Your organ of Corti can recognize each distinct frequency. A built-in filtering feature allows us to simultaneously hear complex frequencies like a guitar chord of six strings or the harmony of a barbershop quartet. These parts work together so that "incoming sound pressure is transformed by the cochlea into vibrations of the

basilar membrane which are then transformed in a series of neural impulses.”<sup>6</sup>

### 3. A classification and logic processor

Engineers develop algorithms that analyze data to classify incoming sounds into distinct categories such as speech. Humans perform the same function largely in our brain’s auditory cortex and other regions of the brain. The brain works at blindingly fast speeds that surpass even powerful computers, while using a tiny fraction of the energy. We rapidly distinguish between cars on a road, coins hitting the floor, or a cat’s purr. In an instant, we differentiate musical sounds as humming, whistling, vocal, instrumental...or singing toddlers.

This classification step highlights another corresponding engineering principle. Engineers design by working from the big picture down to individual parts. This goal-focused approach is called “top down.” That is, when a need arises, engineers design into an entity the up-front (i.e., innate) capability to meet the need.

We have the ability to rapidly classify sounds as singing because “the human brain contains a neural population specific to the analysis of song.”<sup>7</sup> This unique area of the brain, which appears purpose-built to analyze singing, was identified by researchers studying people’s brains with magnetic resonance imaging (MRI) scans as they were exposed to various sounds. The results showed that “the response to sung music was substantially and significantly higher than the sum of the response to speech and instrumental music.”<sup>7</sup>

Even infants have a built-in ability to classify music. Our auditory and neuro-systems analyze rhythm patterns and group beats into regular meters. Research indicates that it’s a top-down “hard-wired” capability, given “that infants can impose a top-down, internally generated metre on ambiguous auditory rhythms, an ability that would aid early language and music learning.”<sup>8</sup>

### 4. Decisions and outputs

Computers can store processed sound data, manipulate it, display it on a screen, or even convert talk to text on your cell phone. Even though there are some profound differences between our brains and a computer, there are fascinating functional correspondences. After the auditory cortex processes data, the data are somehow “stored” for later access.

The auditory and the premotor cortex brain regions are also tightly integrated. One purpose of the premotor cortex is to queue up other parts of the brain and the body for motor movements when performing a sequence of learned activities—such as a balance beam routine, reciting the alphabet, or prompting the next song verse.<sup>9</sup> This characteristic of the premotor cortex may contribute to the behavior of toddlers singing the same song repetitively, or might explain why adults can get a song stuck in their heads.


## Crediting Christ as Creator for Our Musical Abilities

The Bible’s many references to singing make it clear that sing-

ing is important to the Lord. Singing elicits emotion, memories, anticipation, passion, and, in the spiritual sense, reverence and awe. It can calm or energize.

Compared to other communication methods, singing adds unique elements to communal worship. Listening to a church choir embodies a glorious demonstration of the spiritual unity of Christ’s body, the church. We witness multiple people sing different parts and integrate that harmony with a message of their shared beliefs into a cohesive whole. From the design perspective, we’ve barely scratched the surface in examining the corresponding engineering principles of our marvelous auditory system.

Yet, the world system of government, education, and entertainment has an anti-Christ agenda and seeks to corrupt our churches and families. When it comes to the origin of our auditory system, some evolutionists ask, “How did music and song selectivity arise over the course of development or evolution?” Their answer is that “unlike reading, singing could plausibly have shaped neural circuits over the course of evolution.”<sup>7</sup>

The creation scientists at ICR don’t believe that it’s enough to simply point out that evolutionists don’t have a clue about origins. Or to only expose their projection of selective abilities onto nature, a process that distorts nature into an idolatrous creative agent of auditory systems, thus rejecting God’s agency. ICR’s work to build a theory of biological design will magnify how the engineered workmanship seen in living creatures corresponds to the engineered workmanship of man-made things that perform similar functions—glorious evidence of unmatched design that is the primary and undeniable revelation of Christ’s power, genius, and wisdom. 

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# Entablature Reveals Flooding of Columbia River Basalts

Many creationists are familiar with the breached-dam explanation for the Channeled Scablands of eastern Washington.<sup>1</sup> During the Ice Age, the dam holding glacial Lake Missoula in western Montana burst. This sent an estimated peak flow of 740 million cubic feet per second through the Spokane Valley and down the Columbia River, draining all 540 cubic miles of water in just three days.<sup>2,3</sup> However, few realize that the basalt lavas that were exposed by the catastrophic outflow also open a window into the great Flood.

The Columbia River cuts through the middle of the Columbia Plateau. This broad, flat region was formed by massive outpourings of lava that covered 81,000 square miles in Washington, Oregon, and Idaho. Known as a flood basalt,<sup>4</sup> these lavas are even less viscous (i.e., flow easier) than the Hawaiian basalts. Individual lavas extend up to 470 miles.<sup>5</sup> Similar flood basalts are found around the globe, such as the Deccan Plateau in India.

Many basalt lavas have particular cooling textures, such as columnar jointing that makes vertical hexagon-shaped columns. Some textures can indicate whether the lava erupted underwater. Lavas can flow great distances underwater as long as a thin film of insulating steam bubbles protects the flow from cooling.<sup>4</sup>

The Columbia Plateau lavas also have flat tops and bottoms, with no indication of erosion or vast time between the flows.<sup>4</sup> The tops of many flows are filled with gas holes and are often glassy. Some flows are pillowed, especially on the edges. Pillow structures (rounded spherical shapes) only form underwater, indicating that water was covering the land.

Another significant texture called entablature verifies that many of the lava flows were cooled by active flooding. Entablature has an irregular curvi-columnar or wavy-distorted fracture pattern (Figure 1).<sup>4</sup> In the

## article highlights


- Washington's Channeled Scablands were created by the emptying of Ice Age Lake Missoula.
- The powerful water flow exposed lava deposits known as flood basalt.
- Distinctive fracture patterns called entablature verify that many of the lava flows were cooled by active flooding.
- Columbia Plateau geology is evidence of the global Flood and subsequent Ice Age.

Columbia Plateau, entablature makes up the bulk of most lavas.<sup>4</sup> It forms when water floods across a fresh lava surface that has begun to cool.<sup>6</sup> Water seeps into the cracks and rapidly quenches the remainder of the flow, making entablature's distinctive chaotic texture.

Because entablature requires flooding, conventional geologists argue that the lavas flowed across dry land and dammed local rivers, causing water to overflow on top of the lavas.<sup>4</sup> The problem is that not many

lava flows would have encountered a river or water source to flood the lava. Entablature is too common in the Columbia Plateau for this scenario.

Flood geologists have a better explanation. The Columbia Plateau lavas erupted near the end of the Flood's receding phase (Miocene).<sup>7</sup> Floodwater likely hadn't fully drained from the region, and rapid creation of new ocean crust was ongoing, resulting in large earthquakes and tsunamis. These massive waves were still crashing across Oregon and Washington and over the tops of the fresh lava flows, quenching the molten centers and forming entablature.

The global Flood and the subsequent Ice Age provide the best explanation for the geology of the Columbia Plateau. The receding phase of the Flood provided the water necessary to make the entablature and rapidly cool the lavas. And the outflow from a dammed Ice Age lake provided the erosional forces needed to create the modern landscape and cut canyons through the lavas. When conventional geology has problems, Genesis has solutions. 

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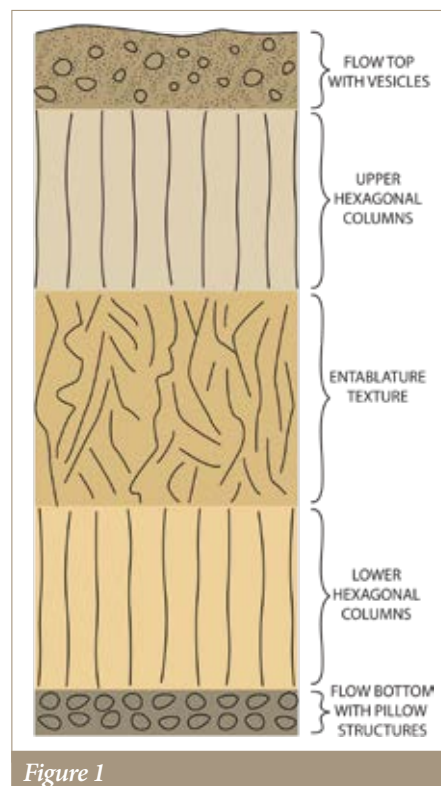
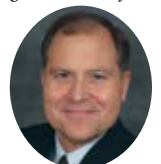


Figure 1

Dr. Clarey is Research Scientist at the Institute for Creation Research and earned his Ph.D. in geology from Western Michigan University.



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# Grand Canyon Adventure Tour

This past September, ICR geologist Dr. Tim Clarey led another of ICR's Grand Canyon tours. Participants rafted through the canyon, seeing one of nature's wonders up close. Along with hikes and fellowship, they received biblical teaching on the geology and history of the site from a scientist who knows it well. One of the attendees commented, "It was such a pleasure to spend time with you last week on the river! I enjoyed watching you delight in every single moment of the adventure."

As with other parks across the United States, Grand Canyon showcases profound evidence of the global Genesis Flood. Join us on a future ICR tour to see this for yourself. Visit [ICR.org/events](https://www.icr.org/events) to keep up with ICR offerings, or follow us in *Acts & Facts*.



  
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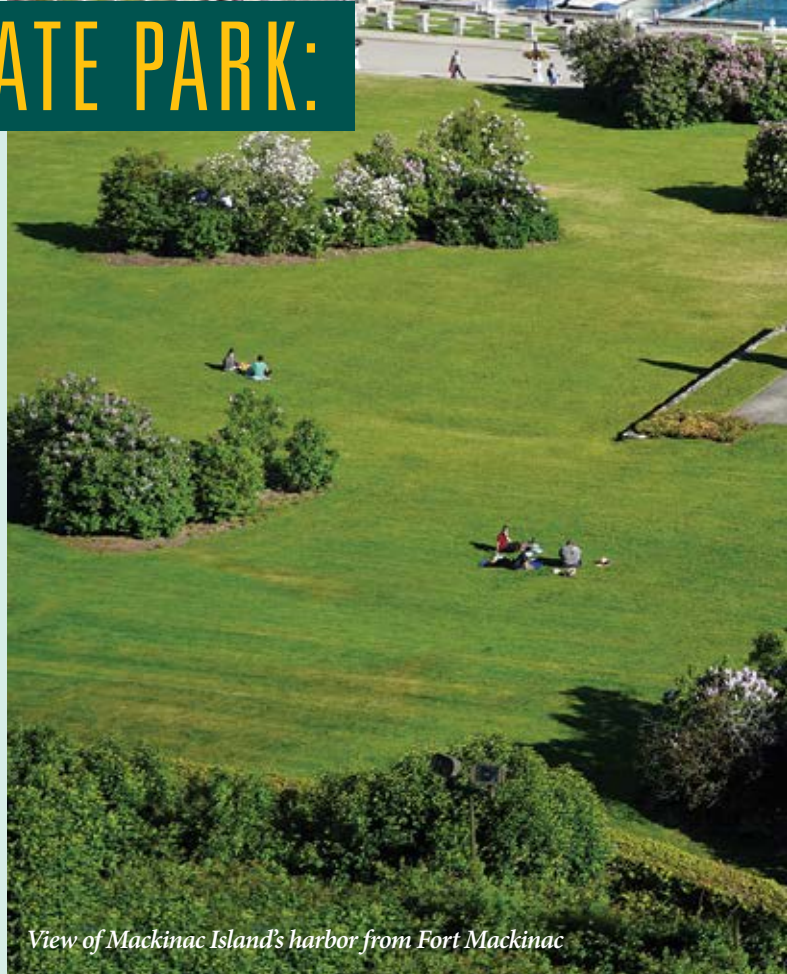




## MACKINAC ISLAND STATE PARK:

# FLOOD, ICE AGE, and... DIGESTION?

T I M C L A R E Y , P H . D .



*View of Mackinac Island's harbor from Fort Mackinac*



*The Mackinac Bridge connecting Michigan's Upper and Lower Peninsulas*

Originally designated in 1875 as America's second national park, Mackinac Island's federal land was transferred to the State of Michigan in 1895 and became its first state park.<sup>1</sup> It remains one of the top tourist destinations in the state. Pronounced "mak-in-aw," the 3.8-square-mile island is nestled between Michigan's Upper and Lower Peninsulas on the Lake Huron side of the nearly five-mile-long Mackinac Bridge. Known for its lack of automobiles,





### article highlights

- Iconic Mackinac Island in Michigan is a showcase of early Flood geology.
- The wave-cut cliffs lining the island document Ice Age lake levels.
- The island is also known for a gunshot accident that resulted in discoveries about the human digestive system.

the island boasts a Revolutionary War-era fort and the Grand Hotel, with a 660-foot porch.

But the story of the island goes back to the global Flood, with rocks exposing sediments from the earliest weeks of that cataclysm. Post-Flood wave-cut cliffs preserve a history of fluctuating lake levels during the Ice Age. And an accident on the island involving a bullet wound that didn't fully heal revealed God's design in the human digestive system.



*Photo of the majestic Grand Hotel on Mackinac Island circa late 1920s, built in 1887*



## Flood Beginnings and Collapses

Mackinac Island exposes rocks from two of the earliest megasequences of the Flood, the Tippecanoe and the Kaskaskia. The Kaskaskia is the younger of the two and lies on top of the Tippecanoe. Globally, these layers are filled with shallow-water marine fossils since at that point the floodwaters had not yet begun to cover the dry land.<sup>2</sup>

Some of these rocks are visible near the center of the island on the highest point. Referred to as the Ancient Island, its peak is about 275 feet above today's Lake Huron.<sup>1</sup> Here, near the War of 1812-era Fort Holmes, some of the lower Kaskaskia sediments are exposed, known as the Devonian Bois Blanc Formation. Below this half-mile-long hill and across most of the island reside carbonate rocks of the upper Tippecanoe Megasequence (Silurian St. Ignace Dolomite). These two sedimentary layers make up the bulk of the island and were most likely deposited within the first 40 days of the Flood.<sup>2</sup> They were exposed as the floodwaters receded and were further sculpted by the post-Flood Ice Age.

Scattered around the island are several prominent "sea" stacks composed of broken and angular pieces of rock. These resistant spires, stacks, arches, and even a cave are composed of Mackinac Breccia. Breccia is made up of broken, angular chunks of rock melded together. The largest stack of Mackinac Breccia is called Sugar Loaf and is about 75 feet tall. Arch Rock is a rare formation of

limestone breccia and stands on the Lake Huron shoreline 146 feet above the water.

These stacks formed in a manner similar to a sinkhole and were the product of salt dissolution and collapse. In this case, the sediments composing the broken pieces were deposited on top of the St. Ignace Dolomite. Below this dolomite lie earlier Flood rocks that are rich in salt.

During the Flood's continued advance, water was forced into the ground and dissolved some of the salt. With no support from below, the overlying sediments collapsed, dropping fragments from above into the vacant cavity. Swirling groundwater cemented these broken fragments together, and, rather oddly, they became more resistant than the surrounding bedrock.

As the receding Flood stripped away the surface layers, the breccia stacks were left behind as "sea" spires. Glacial lake water further carved some of these into caves such as Skull Cave and arches such as the previously mentioned Arch Rock.

## Rapidly Carved Ice Age Cliffs

Native Americans referred to the island as Michilimackinac,



*Sugar Loaf, the tallest of the Mackinac Breccia, with Dr. Clarey and one of his grandsons at the base*

Image credit: Erin Clarey



*Arch Rock*

Image credit: Tim Clarey



or “place of the great turtle,” because in profile the island resembles a turtle’s back.<sup>3</sup> This appearance is due to erosion during the two primary Ice Age lake levels, the older Lake Algonquin and the younger Lake Nipissing. The Ancient Island was all that was exposed above the water line when Lake Algonquin crested at over 230 feet above the present lake level. Its waves carved a steep cliff marking the edge.

As the lake levels further dropped, over two dozen successive shoreline ridges were formed prior to the formation of Lake Nipissing. This younger level was only about 50 feet above the level of Lake Huron today. It also formed a 45- to 50-foot wave-cut cliff that nearly circles the island. Fort Mackinac was established on this cliff in 1780, as was the Grand Hotel in 1887.<sup>3</sup>



Old Fort Mackinac showing the wave-cut cliff representing the Ice Age Nipissing Lake level

Image credit: Tim Clarey

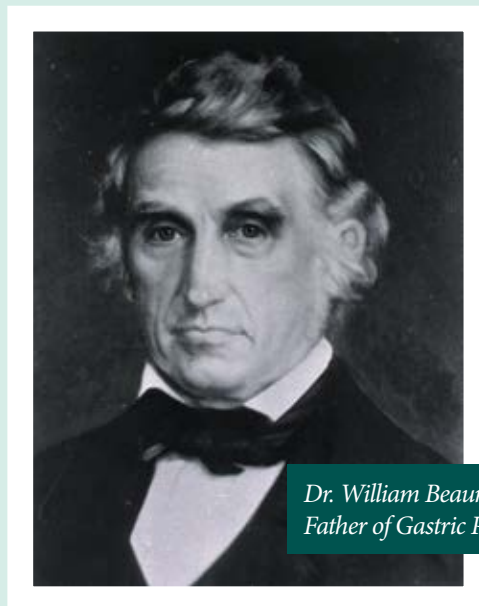
The two prominent wave-cut cliffs and the numerous shoreline ridges preserve evidence of the many changing Ice Age lake levels. These features always seem to be present wherever Ice Age lakes resided. In fact, similar wave-cut terraces are found surrounding the Great Salt Lake in Utah (ancient Lake Bonneville) and around the glacial Lake Missoula in western Montana.

Wave-cut cliffs don’t take thousands or even hundreds of years to develop. In fact, these landforms can occur in just a few weeks.<sup>4</sup> Creation scientists calculate that the Ice Age lasted about 500 to 700 years after the Flood.<sup>5</sup> The development of these landforms easily fits within the biblical timeline.

## Design in Human Digestion Revealed

Mackinac Island is also famous for a digestive-related reason. And it’s not the island’s delicious fudge that’s made each summer to fuel hungry tourists. Rather, it’s because an accident on the island led to some of the earliest studies of human digestion.

It began with a blast in 1822 in the American Fur Company store on the island’s Main Street. A gun accidentally discharged into the abdomen of Alexis St. Martin, a young French Canadian. Fort Mackinac’s post surgeon, Dr. William Beaumont, was called. After




Dr. William Beaumont, the Father of Gastric Physiology

St. Martin was patched up, he was left with a hole, or fistula, in his stomach that didn’t fully heal. In 1825, Dr. Beaumont decided to do some experiments on his young patient since at the time no one knew much about the digestive process.

Beaumont commenced his experiments in May at Fort Mackinac. As St. Martin lay on his right side, the doctor peered into his stomach and observed the stomach’s reaction to food and drink. He siphoned out fluids and retrieved food with a spoon to see how it had changed since entry. Frequently he suspended pieces of raw or roasted meat on string to find out how long digestion took. Once he substituted a plug of beef for cloth over the orifice; five hours later, he noted it had been “completely digested off, as smooth and even as if it had been cut with a knife.”<sup>6</sup>

Dr. Beaumont conducted a total of 250 experiments on St. Martin that first year. He eventually published the results of his groundbreaking discoveries in a book on human digestion.<sup>7</sup> A horrible accident on a remote island and an inquisitive army doctor who had a lifelong faith in God together unlocked some of the mysteries of our wonderfully designed human body.

Mackinac Island State Park thus showcases the Flood, the Ice Age, and the engineering prowess of our Creator, the Lord Jesus Christ. 

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NGC 3132, Southern Nebula Ring,  
viewed by NASA's Webb Telescope

Image credit: NASA, ESA, CSA, STScI



# James Webb Telescope vs. the Big Bang

## article highlights

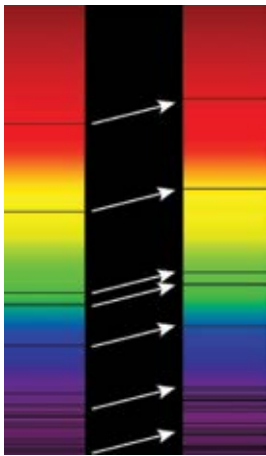
- The new James Webb Space Telescope's images are causing consternation among conventional scientists.
- The telescope was designed to be sensitive to infrared radiation, which allows better images of very distant galaxies.
- These distant galaxies are unexpectedly bright and mature, an unsettling result for Big Bang scientists.
- The galaxy redshifts Webb detects could be due to something other than a currently expanding universe, which would contradict the Big Bang.
- More work is needed in constructing a biblical creation cosmology, but Christians can be confident that the heavens do indeed proclaim their Creator.

The new James Webb Space Telescope is thrilling astronomers with spectacular images of distant galaxies, but preliminary data contradict Big Bang expectations. In order to understand these results, some background information is needed. In this article, I suggest, without being dogmatic about my personal position, a scientific test that creationists can perform that could clarify at least one basic issue in cosmology.

## Galaxy Redshifts

Details in the light from distant galaxies are "shifted" to the red part of the electromagnetic spectrum (Figure 1). Astronomers use the letter  $z$  to denote the value of this redshift. Galaxy redshifts are a rough





*Figure 1. Dark absorption lines from a cluster of galaxies are shifted toward the red part of the electromagnetic spectrum as compared to the same absorption lines in the sun's spectrum.*

Image credit: Georg Wiora. CC BY-SA 3.0. Derivative work Kes47

proxy or stand-in for distance—the higher the  $z$  value, the farther away the galaxy is from us. Galaxy redshifts are usually interpreted as evidence that space itself is expanding, causing galaxies to recede from us with speeds that increase with increasing  $z$ .

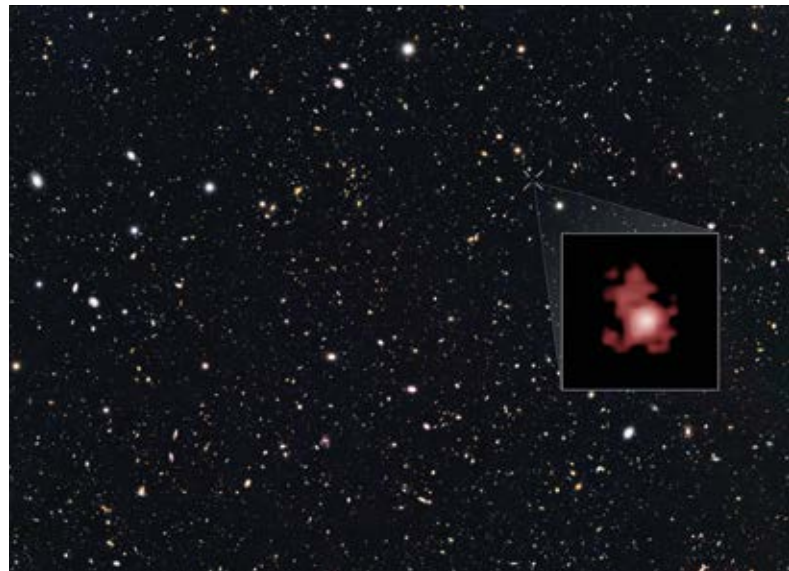
The James Webb Space Telescope (JWST) was constructed primarily to be sensitive to infrared radiation rather than visible light. Because light from very distant galaxies is redshifted to the infrared part of the spectrum, the JWST is obtaining better images of them than even the wonderful images provided by the Hubble Space Telescope (HST).

### The Mature Distant Galaxy Problem

Big Bang theorists assume distant starlight takes billions of years to reach us. Although that may seem reasonable, creationists think this assumption is open to challenge.<sup>1</sup> By Big Bang reckoning, it's implied we don't see very distant galaxies as they are now but as they were billions of years ago shortly after the Big Bang occurred. For this reason, theorists expect very distant galaxies to look extremely immature and unevolved. However, this expectation is routinely contradicted by observations.<sup>2</sup> Preliminary data from the JWST make this problem much more acute.

For a long time...scientists believed the universe's earliest, oldest galaxies to be small, slightly chaotic, and misshapen systems. But...JWST-captured imagery has revealed these galaxies to be shockingly massive, not to mention balanced and well-formed—a finding that challenges, and will likely rewrite, long-held understandings about the origins of our universe.<sup>3</sup>

Evolutionary theorists now say the first stars formed between 100 and 250 million years after the Big Bang, and the first galaxies then formed a few hundred million years later.<sup>4,5</sup> However, about 10 years ago, they were saying it took 400 million years for the first stars to form.<sup>6</sup> So, a galaxy existing only 400 million years after the Big Bang puts a lot of stress on the theory. Yet, the HST has already imaged such a distant galaxy, with a redshift of  $z = 11$  (Figure 2). With new data



*Figure 2. By evolutionary reckoning, the galaxy in the inset formed 400 million years after the Big Bang.*

Image credit: NASA and ESA

from the JWST, astronomers are reporting galaxy redshifts as high as 16, and possibly even 20. These high redshift values imply that galaxies existed 250 million years (or less) after the Big Bang, in clear violation of the theory.<sup>4</sup>

Granted, these results are preliminary, but even these initial reports are causing angst among theorists. University College London cosmologist Richard Ellis said, "It worries me slightly that we find these monsters [galaxies] in the first few images."<sup>7</sup> University of California at Santa Cruz astronomer Garth Illingworth rhetorically asked, "How do you do this in the universe at such an early time? How do you form so many stars so quickly?"<sup>3</sup> And University of Kansas in Lawrence astronomer Allison Kirkpatrick said, "Right now I find myself lying awake at three in the morning wondering if everything I've ever done is wrong."<sup>4</sup>

The existence of very distant "mature" galaxies is just one more in a long list of failed Big Bang predictions.<sup>8,9</sup> Some popular science news sources now claim that pointing out these problems amounts to "science denial."<sup>10</sup> But one only has to read the initial news reports to see that Big Bang scientists were greatly unsettled by these results.<sup>11</sup>

### Unexpectedly Bright Distant Galaxies

This brings to mind another failed Big Bang expectation. Astrophysicist Michael J. Disney helped construct cameras for the HST. On his personal blog, he congratulated the James Webb team for their successful deployment of the telescope and recalled his experiences working on the HST.

Before they design a single lens or circuit Space-camera teams must look deeply into the kinds of science they might be doing

20 years ahead and my team asked me to look into high redshift galaxies. Knowing nothing of that subject at the time (1977) I naturally went round to ask the real experts. They were unanimous: “Don’t bother with them because you’ll never be able to see them owing to the Tolman effect.”<sup>12</sup>

The Tolman effect is a surface brightness test that physicist Richard Tolman devised for an expanding universe. It involves the brightness of “extended” objects in space, objects that are not merely star-like points.<sup>13</sup> A galaxy’s surface brightness is defined as its brightness divided by the area of angle measure that it “covers” in the sky. In a static, non-expanding universe, surface brightness should remain constant regardless of the value of  $(1+z)$ .<sup>14</sup> In an expanding universe, however, surface brightness should rapidly decrease with higher values of  $(1+z)$ .

If galaxy surface brightness data fail to satisfy the Tolman test, this would imply that the redshifts, though real, are caused by something other than an expanding universe. Disney continued:

Extended objects like galaxies would be dramatically dimmed by redshift in an expanding universe, so dimmed in practice as to become invisible in any decent Space camera. Imagine my shock then in 1993 when we got our first really deep Hubble image. It was plastered all over with very distant but quite distinct galaxies not dimmed in the least. That meant the universe couldn’t be expanding—not according to Tolman.

But when I tried to point this out the new self-appointed experts said; “No; it just means that young galaxies in the distant past were intrinsically much brighter than the galaxies today—after all they were younger in the past and generating more brilliant young stars.”<sup>12</sup>

It’s reasonable for Big Bang theorists to expect galaxy brightness to vary in a systematic way with increasing redshift since they believe galaxies evolve over time. So, in principle, theorists can claim these more ancient and distant galaxies were intrinsically brighter. However, Disney doesn’t find this explanation convincing, as he thinks it requires too much fine-tuning.<sup>12</sup> Nevertheless, he still apparently believes the universe is expanding and has proposed his own explanation for this unexpected result.<sup>15</sup>

### The Tolman Test: Contradictory Results

Conventional astronomers, including the late Allan Sandage, claim galaxy surface brightness data are consistent with an expanding universe, provided one assumes galaxy size and brightness evolve systematically with redshift.<sup>16</sup> However, Big Bang critic Eric Lerner claims that surface brightness data are much more consistent with a static universe and that it’s impossible to reconcile the data with simple

models of galaxy evolution when low- $z$  nearby galaxies are included in the analysis.<sup>17</sup>

I don’t presume to know who is correct. Sandage was a renowned, competent astronomer. On the other hand, Big Bang scientists were apparently surprised that the HST was able to see very distant galaxies. And one Big Bang astrophysicist has conceded that Lerner’s results provide at least some support for the idea of a non-expanding universe.<sup>18</sup> But it seems to me that creationists must nail

down this issue if we want to construct a biblical creationist cosmology. We cannot afford to take others’ word for it, and we should perform our own Tolman test using all publicly available galaxy data. A negative result would strongly indicate that redshifts are due to something other than an expanding universe. In that case, it would be very strong evidence

against the Big Bang. But it would also mean that creation scientists have much work to do, as we would need to provide a viable alternate explanation for galaxy redshifts, one that so far has remained elusive.

“Right now I find myself lying awake at three in the morning wondering if everything I’ve ever done is wrong.”  
— Allison Kirkpatrick

### Redshifts in a Biblical Cosmology

But what if conventional astronomers are correct and the data *are* consistent with an expanding universe? Does this mean the Big Bang is in the clear? No. If redshifts do indeed represent the speeds of galaxies moving away from us, this can be interpreted to mean that our galaxy is at the center of the universe, a possibility acknowledged by even the late Stephen Hawking!<sup>19</sup>

But Big Bang theory demands that there be no “special” places in the universe, including no unique center. Moreover, if we are the result of a cosmic accident, there is absolutely no reason to believe we would be located in such a special place, even if it exists. So, Big Bang theorists reject this possibility and claim that hypothetical observers in other galaxies would *also* see galaxies receding away from them. Of course, that’s an unverifiable assumption. But for Christians, it makes perfect sense that both Earth and our galaxy might be in a special place, since “this is the location God chose to situate His image in man.”<sup>20</sup>

Even if galaxy redshifts are due to an expansion, this doesn’t necessarily imply that the universe is expanding today. What we believe about the time it takes distant starlight to reach us critically influences the way we interpret astronomical data. Because time and space are intertwined in Einstein’s theory of relativity, it appears impossible to calculate the time for distant starlight to reach us without making unproven (and possibly unprovable) assumptions.<sup>1</sup> Evolutionary scientists assume distant light requires billions of years to reach us, and this seems reasonable in their atheistic worldview. On the other hand, biblical creationists assume that God somehow got






Figure 3. The first JWST deep field image of distant galaxies

Image credit: NASA, ESA, and CSA

the light to us quickly, because He stated it was His intent to do so (Genesis 1:14-15).

In one recent creation cosmology, God caused the size of the universe to rapidly expand during Days 2 through 4 of the creation week. This expansion then slowed, and perhaps even stopped, afterward.<sup>21</sup> Light emitted on Day 4 by these newly created galaxies would be redshifted if we are seeing light that was emitted before God slowed or stopped the expansion. So, depending on the means God used to get distant starlight to us quickly, these redshifts could be evidence of a past expansion of the universe, even if that expansion is no longer occurring today.

## Conclusion

In any case, data and images from the James Webb Space Telescope (Figure 3) are proving enormously problematic for advocates of the Big Bang. Bible-believing Christians can be confident the heavens will continue to testify to their supernatural creation by the Lord Jesus Christ. As ICR President Emeritus Dr. John Morris likes to say, “It’s a great time to be a Bible-believing Christian!” 

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# MOUNT HERMON WAS FLOOD-FORMED

Mount Hermon is a topic that seems to pop up increasingly these days, especially among Christian prophetic and end-times teachers. Much of this interest has to do with intriguing discussions surrounding Genesis 6:1-4 and the topic of giants and *nephilim*. This is primarily due to a connection between these Scriptures and the apocryphal Book of Enoch, which contains a more detailed *nephilim* account and mentions Mount Hermon as a central part of the story.



According to the Book of Enoch, 200 fallen angels (watchers) descended from the heavenly realm to the top of Mount Hermon. They then began nefarious activity with human women, resulting in the offspring of giants often referred to as the *nephilim* (meaning “fallen ones” in Hebrew). Therefore, many Christians like to point to the present-day Mount Hermon as the historical site of this angelic intrusion.

Regardless of where one stands on the controversial issue of *nephilim*, there’s one geographical aspect of the whole debate that’s decidedly in error. In fact, this is a common type of historical error some Christians make in other geographical speculations concerning the Bible. Specifically, it’s the important issue of the Genesis Flood and its relation to the current global landscape. The popular but errant idea that the present-day Mount Hermon is the same geological feature that existed in the pre-Flood world serves as an important teaching point.

Present-day Mount Hermon is actually a mountain cluster at the southern end of the Anti-Lebanon mountain range. It’s 2,814 meters (9,232 feet) tall at its summit and straddles the border between Syria and Lebanon, with the highest point being in Syria. The southern slopes of Mount Hermon extend to the Israeli-occupied Golan Heights, where a ski resort is located.

Mount Hermon is composed of global Flood sediments that were deposited close to the high point of the floodwaters (Jurassic

## article highlights

- The Book of Enoch mentions Mount Hermon as the location where fallen angels descended and then bred the *nephilim* of the pre-Flood world.
- Some Christians overlook the effects of the global Flood in their geographical speculations about the Bible.
- The original surface of the earth was destroyed by the Flood, so modern Mount Hermon was Flood-formed.
- We need to study the Genesis Flood to understand the world we live in.


and Cretaceous), corresponding to what stratigraphic geologists call the Zuni Mega-sequence.<sup>1,2</sup> There’s also evidence of volcanic activity and magma flows that occurred after initial uplift of the mountain during the Flood year, dated by conventional geologists as Early Cretaceous.<sup>1</sup> The final uplift of Mount Hermon ensued as the floodwaters were receding (Neogene), forming the mountains we see today.

In the creation model, the global Flood was a progressive and violent ebb-and-flow cataclysm that occurred over a year-long period. Thus, given the fact that today’s Mount Hermon is composed of Flood-formed rocks that were deposited and/or erupted

just prior to Day 150, assumptions that it’s a remnant of the pre-Flood world are in error.

The world that existed before the Flood was totally destroyed, and the present-day (post-Flood) Mount Hermon, which is mostly composed of sedimentary Flood rock, cannot be the pre-Flood Mount Hermon alluded to in the Book of Enoch. If there actually were a pre-Flood Mount Hermon, we have no idea where it was located on the pre-Flood supercontinent Pangaea before Pangaea split apart during the Flood into the present global continent configuration.

Christian philosophers and theologians would do well to include the research done by creation scientists that not only fits closely with a literal interpretation of Genesis but also empirically supports such key events as the global Flood. The total global destruction of the pre-Flood world was such an important topic that the apostle Peter said, “By which the world that then existed perished, being flooded with water” (2 Peter 3:6). The Greek verb used for perished in this verse (*apollymi*) means to be utterly destroyed and completely lost, and its historical past tense (aorist) indicates a completed action.

Thus, both geological and biblical evidence show Mount Hermon was Flood-formed. 

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Most zoologists and vertebrate paleontologists have reached an imaginative consensus—birds are actually flying dinosaurs. This belief includes the soaring Andean condors, painted buntings, and even the world’s smallest bird, the bee hummingbird of Cuba. They all supposedly evolved from theropod dinosaurs.

Such an extraordinary evolutionary transformation is clearly a highly subjective interpretation based on an individual’s worldview. Evolutionary researchers with such a worldview are convinced that birds not only descended from dinosaurs, they *are* dinosaurs. One of their newest arguments for this idea comes from studying the embryology of birds that live on the earth today.

It was recently reported that some scientists could allegedly “see” bird embryos passing through a dinosaur stage during their development.

All baby birds have a moment prior to hatching when their hip bone is a tiny replica of a dinosaur’s pelvis. That’s one of the findings in a new, Yale-led study in the journal *Nature* that explores the evolutionary underpinnings of the avian hip bone. It is also a modern-day nod to the dramatic transformation that led from dinosaurs to birds over tens of millions of years.<sup>1</sup>

If this progression sounds familiar, it’s because it harkens back to a failed theory evolutionists used for decades called the biogenetic law, or embryological parallelism, in which a vertebrate embryo goes through supposed evolutionary stages. German zoologist Ernst Haeckel (1834–1919) popularized the idea with the phrase “ontogeny recapitulates phylogeny,” or in simpler terms, the development of the individual repeats evolutionary descent.

For example, folds in the neck (pharyngeal pouches) of the human embryo are said to correspond to the gills in our fishlike ancestor. However, according to two developmental biologists:

The first pair of pharyngeal pouches be-



## Bird Pelvis Doesn't Come from a Dinosaur

### article highlights

- Many people believe dinosaurs evolved into today’s birds.
- Vertebrate embryo development has mistakenly been used as evidence for evolution.
- A recent study claimed a bird embryo goes through a “dinosaur” stage in which its hip bone looks like a dinosaur pelvis.
- Dinosaurs, like birds, are irreducibly complex creatures. God created them as their own separate kinds at the beginning.

come the auditory cavities of the middle ear and the associated eustachian tubes. The second pair of pouches gives rise to the walls of the tonsils. The thymus is derived from the third pair of pharyngeal pouches.<sup>2</sup>


Haeckel’s idea of recapitulation hasn’t survived.<sup>3</sup> More recently, five evolutionists gave their evaluation of the biogenetic law.

Haeckel based his biogenetic law on the flawed premise that evolutionary change occurs primarily by successively adding new features onto the end of an unaltered ancestral ontogeny while condensing the ancestral ontogeny into earlier developmental stages. This notion was based on Lamarck’s concept of the inheritance of acquired characteristics.<sup>4</sup>

“It was unexpected to find these initial

stages of bird development look so much like the hips of an early dinosaur,” said Christopher Griffin, lead author of the *Nature* study.<sup>1</sup> But perhaps what they “see” is actually a flawed interpretation, not unlike the subjectively “flawed premise” upon which Haeckel promoted his biogenetic law.<sup>4</sup> Importantly, certain evolutionary biologists today aren’t convinced that heavy-tailed theropod dinosaurs evolved into birds. However, their views aren’t necessarily less problematic.

A university’s educational website stated, “Embryos do reflect the course of evolution, but that course is far more intricate and quirky than Haeckel claimed. Different parts of the same embryo can even evolve in different directions.”<sup>5</sup> If this were true, then researchers have overlooked a much larger problem. Each animal—especially the wondrous avian kind—is an irreducibly complex unit of life that’s genetically, biochemically, and functionally programmed to develop from a fertilized egg to a reproductive adult. Different parts of the same embryo could never “evolve” or develop in different directions and still produce the highly unified organisms we marvel at today. We therefore see another layer of doubt added to the idea that bird embryos somehow transition through a dinosaur stage.

God created birds as birds on Day 5 and dinosaurs as dinosaurs on Day 6 of the creation week about 6,000 years ago, just as Genesis says. 

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# When Bats Dine Out at Night

**B**ats are mysterious, marvelous mammals of prey, even in a fallen world where omnivorous predation is common.<sup>1</sup> Because bats are mostly nocturnal, only beginning their aerial hunting at sunset, their nighttime foraging habits often go unseen by human observers.<sup>1,2</sup>

Scientists can discern certain aspects of bats' gustatory preferences by their digestive byproducts.<sup>2</sup> But even apart from reviewing the menus of bat diets, consider how preying bats hunt for "fast food" using echolocation, a perfect illustration of continuous environmental tracking.<sup>3</sup> Let's look at seven critical factors and real-time challenges of a bat employing sound to locate and capture its food.

First, the bat must factor distance.

A bat's call must be strong enough to make the outward journey to a target and the return journey back to its ears. But sounds quickly lose energy as they travel through air, especially when they're high in frequency, so echolocation only works over short ranges.<sup>4</sup>

Second, ultrasound volume counts, too. Big brown bats emit sonar calls at 138 decibels, like ambulance sirens. Other bats shriek at 110 decibels, like chainsaws. Thankfully, these anatomy-enabled noises are pitched beyond human hearing.<sup>4,5</sup>

Third, speed matters. Each sonar call/echo pair is the sound equivalent of a snapshot. These serial snapshots must be updated

## article highlights

- Bats hunt at night using a range of specifically engineered abilities.
- This flying mammal's hunting success depends on accurately judging distance, proficient sound production and reception, precise physical speed, and on-the-fly mental processing.
- The bat must constantly and rapidly adjust its use of these abilities to hone in on its prey.
- Only the ingenious bioengineer Christ Jesus could create flying creatures like these.

(and interpreted) quickly enough to resemble watching a movie. Otherwise, evasive prey—like flies, mosquitoes, wasps, caddisflies, moths, crickets, frogs, small birds, or near-surface fish—can flee and escape.<sup>4,6</sup>

Fourth, emitted calls cover a band of sound-wave frequencies at one or two octaves, bouncing sound waves off specific body parts of targeted prey. The bat's sonar data-analysis software/hardware systems interpret this real-time data to produce detailed images of the target's physical shape and changing locations.<sup>4,5</sup>


Fifth, as the bat flies—one active example of complicated motion—the repeated sonar emissions must unerringly track the targeted-yet-dodging prey, which is another active example of complicated motion.<sup>6</sup> As the capture distance shortens, the prey's ever-

changing location must be precisely adjusted for, with brief-yet-close-together pulses of sound that are separated enough to avoid garbled "blurring" of overlapping calls and echoes.

The bat must compute space from the timing of its echoes, and since echoes returning from the two equidistant [objects] would arrive after the same delay, they might sound like the same object.<sup>4</sup>

Sixth, there's a sonar version of camouflage. Tiny prey, like mosquitoes or flies, can get "lost" against a larger background (like radar chaff) such as leaves or tree bark.<sup>4</sup> Seventh, bats live in colonies; they often hunt in packs. Thus, bats must informationally distinguish their own call-echo sound data from that of other bats in order to focus on their own prey pursuits. Yet, sonar data from other bats can't be ignored. Otherwise, bats would collide into each other as they hunt.<sup>1,4</sup>

There's more, of course, but this sufficiently shows how the supposedly "simple" habit of bats going out to eat—while actively acquiring external information (continuous environmental tracking)—demands that bats be bioengineered by someone who is a whole lot smarter than the smartest of humans.

That super-ingenuous someone is the Lord Jesus Christ (John 1:1-3). 

## References

1. The author visited the "bat bridge" (Congress Avenue Bridge) in Austin, Texas, where up to 1.5 million Mexican free-tailed bats literally hang out thereunder in North America's largest urban bat colony. These summer migrants energetically emerge at dusk to hunt mosquitoes and other insects along the Colorado River.
2. Like moles, the habits of bats are difficult to observe (Isaiah 2:20). Bat diets are better known now by scrutinizing their feces (guano) at surprising levels of detail, including recognizing DNA of digested prey. See Jones, P. L. et al. 2020. Sensory ecology of the frog-eating bat, *Trachops cirrhosus*, from DNA metabarcoding and behavior. *Behavioral Ecology*, 31 (6): 1420-1428.
3. Visit [ICR.org/cet](http://ICR.org/cet) for more information on this engineering-based biological model.
4. Yong, E. 2022. *An Immense World: How Animal Senses Reveal the Hidden Realms Around Us*. New York: Random House, 249-254, quotes from 248-249, 252.
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6. Übernickel, K. et al. 2016. Sensory challenges for trawling bats: Finding transient prey on water surfaces. *The Journal of the Acoustical Society of America*, 139 (4): 1914-1922.

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# The ICR Discovery Center Celebrates Its Third Anniversary!

The ICR Discovery Center in Dallas, Texas, held its grand opening on September 2, 2019. Since then, thousands of people have come through our doors and seen the scientific and historical evidence that affirms the accuracy and authority of the Bible.

On September 3, 2022, we celebrated three years of showcasing the harmony between the Bible and science. Hundreds came to see our new exhibits, visit the petting zoo, hear scientific discussions, watch performances, and enjoy fun activities and giveaways. We continue to grow and expand, so we'd love to have you visit and see what we've done. Go to [ICRDiscoveryCenter.org](http://ICRDiscoveryCenter.org) for details.

Our Discovery Center is one of the many ways we proclaim the message that God's Word can be trusted in everything it speaks about—from how and why we were made, to how the universe was formed, to how we can know Christ and receive all He has planned for us. Please join us in sharing God's creation truth.



*A representative from the long-running musical The Promise chats with a guest. The Promise is performed annually in Glen Rose, Texas.*



*Dancers from the musical The Promise entertain the crowd.*



*Scientists in the making!*



*Day 4's James Worrell demonstrates the part gravity plays in planetary orbits. The Day 4 Astronomy Group periodically meets at the ICR Discovery Center.*



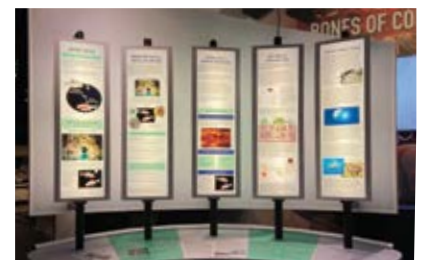
*Children check out fossils up close and learn they were formed during the Genesis Flood.*



*Digging for fossils*



*Our new interactive sand tables let visitors shape their own geological formations.*



*The new CET (continuous environmental tracking) exhibit describes creature adaptation in detail.*



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I just read your excellent article about nitrogen recycling ["Lightning, Soil Bacteria, and God's Providence," July/August 2022 *Acts & Facts*] that describes the roles of lightning and bacteria. It increased my knowledge about nitrogen. I have thought about oxygen and carbon recycling being marvelously designed for life... **Your statement is so true that all parts of the recycling system in nature had to be in place at the same time in the beginning for life to exist.** This and all scientific data strongly indicate there must be a superior being to design and create all of nature. There are no scientific facts that support the theory of evolution. The Bible identifies Jesus Christ as the Creator of everything.

— W. V., Ph.D.



I always enjoy reading every edition of *Acts & Facts*, but I recently got a surprise nugget of joy. I was playing Trivia with friends, and my question was "In Einstein's theory of relativity,  $E = mc^2$ , what does the 'c' stand for?" **Fortunately, I had just read Dr. Jake Hebert's article "Seeing Distant Starlight in a Young Universe"** [July/August 2022 *Acts & Facts*]. In this fascinating article, he explained that "c" is the speed of light. When I gave the answer immediately, everyone thought I was so knowledgeable. I just smiled, thinking, "I just know what to read!"

— A. T.



I just wanted to share how much I love this magazine [*Acts & Facts*] and how it has blessed me and my family. When I am done learning about God's beautiful designs and structures, I implement them into my home-school curriculum by using the Creation Kids section, and we cut out the pictures for fun! Right now, we are studying the creation week in our curriculum, and your pictures were

a perfect complement to illustrate God's creation designs. I thank God for ICR for how they are emphasizing that science confirms God's majesty and does not refute it. Jesus designed it all, and He has revealed so much to us already.

— R. B.

**Editor's note:** For past Creation Kids activity pages, visit [ICR.org/CreationKids](http://ICR.org/CreationKids)



That face you make when you spend the morning chatting with an amazing paleontologist from your favorite dinosaur book! So grateful for Dr. [Brian] Thomas taking time out of his day to bless this young man of mine!

— R. R.

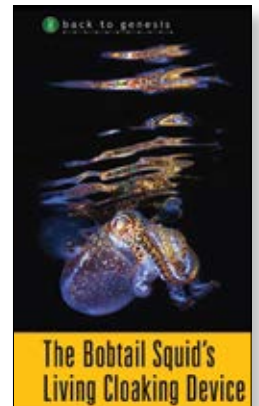


Reverent awe and wonder. That's the way I would describe how this month's issue of *Acts & Facts* [July/August 2022] captivated me. Two articles in particular held me in awe of our Creator: "Seeing Distant Starlight in a Young Universe" by Jake Hebert, Ph.D., and "The Bobtail Squid's Living Cloaking Device" by Brian Thomas, Ph.D.

**I couldn't stop reading and rereading how God's masterful hands beautifully designed all things in a way which causes us to pause in awe and wonder of His wisdom.**

And who are we that we could fathom His design? Yet, He delights to reveal things otherwise unknowable as we humbly seek Him and His glory! Keep honoring Him, and He will surely honor and bless your ministry.

— A. Q.



Have a comment? Email [Editor@ICR.org](mailto:Editor@ICR.org) or write to Editor, P. O. Box 59029, Dallas, TX 75229.

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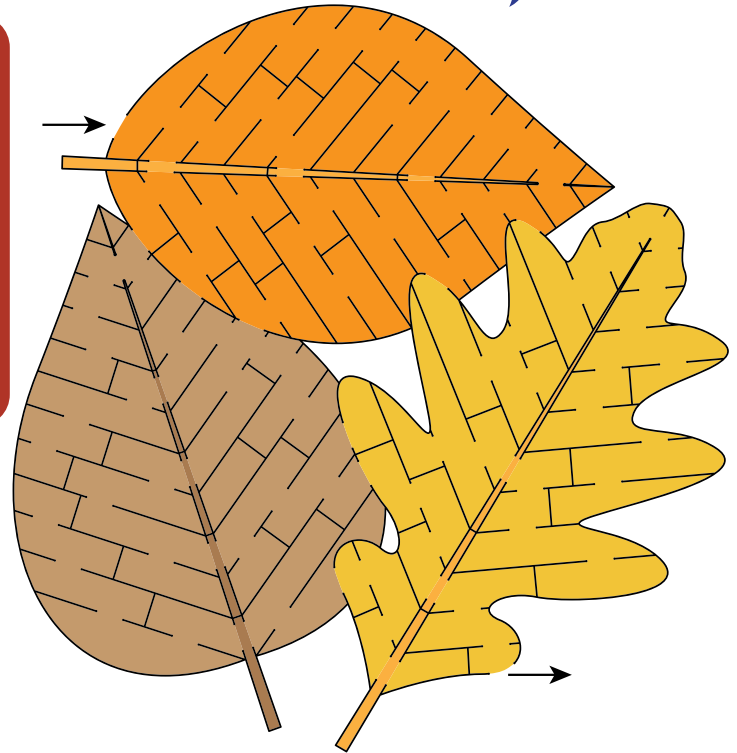
Written by Trey Bowling. Illustrated by Lori Fausak.



## Trees and Leaves

Our Creator, Christ Jesus, made trees on Day 3 of the creation week. Trees and most plants use sunlight to make their own food in a process called photosynthesis. This word is the combination of “photo,” which means light, and “synthesis,” which means putting together. Since humans and many animals eat plants, photosynthesis is very important for life on Earth! Did you also know...

- ✓ Leaves are the main food factories of the tree, using chlorophyll to capture the sun’s energy.
- ✓ There are over 60,000 species of trees but only two main types: deciduous and evergreen.
- ✓ The deciduous trees drop their leaves when winter comes, but the leaves change color before they fall to the ground!

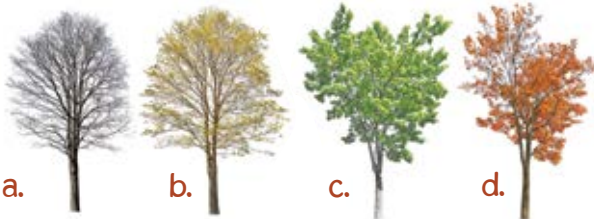


Did you know? Tree roots are hidden underground and pull water out of the soil. Tree roots usually spread out farther than the tree.

Fill in the blanks.

“He shall be like a \_\_\_\_\_ planted by the \_\_\_\_\_ of water, that brings forth its fruit in its season, whose \_\_\_\_\_ also shall not wither.” (Psalm 1:3)

Name the season shown for each maple tree.



a. \_\_\_\_\_  
b. \_\_\_\_\_  
c. \_\_\_\_\_  
d. \_\_\_\_\_



Circle the two leaves below that are the same.

Answers to fill in the blanks: tree, rivers, leaf  
Answers to maple trees: a. winter, b. spring, c. summer, d. fall

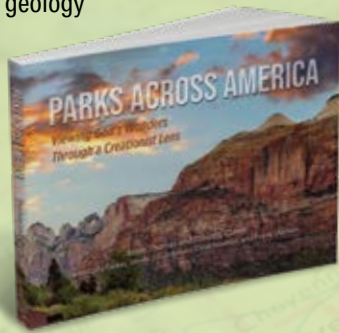
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## Parks Map

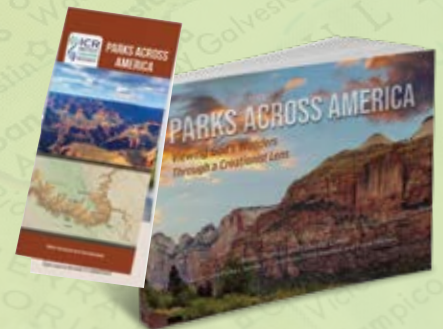
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