

Controversy

The following conversation is between Carl, who believes in God and a literal Creation, and Ed, who doesn't believe in either. They are going on a geology field trip together in the western United States, and their differing views dominate the conversations during the trip. If you are not familiar with scientific or biblical terms or concepts in the following chapters, you may wish to spend some time in the glossary on page 93 and the figure on page 9.

CARL. There, I think we're ready to go. We have our rock hammers, field notebooks, GPS, topographic maps, a jug of water, and plenty of lunch. You brought the shovel, which will be important if we get stuck in the sand. I'm glad you could come along, as it is a lot safer to have two of us together out in the wilderness. And I have the research permit that allows us to study the stone in the abandoned flagstone quarries. We have a long drive ahead of us.

ED. It's my pleasure to go with you. I look forward to being part of this research trip. But I'm curious about your approach to the research. We'll be studying the Coconino Sandstone at our first stop, which essentially all geologists believe was eolian, formed by the wind into desert sand dunes. You suggest it was not eolian but was deposited underwater, right? This should be an interesting trip!

CARL. It's true that I consider possible explanations that are not taken seriously by many other scientists. I want to know what explanation best fits the evidence, whether that explanation is popular or not. Are you comfortable with that?

ED. I will actually enjoy exploring some novel ideas. But do you worry that your approach could be influenced by your religious views? By your belief in the biblical Creation and literal Flood? I don't object

Creation? Really?

to the Bible belief, but is it possible that it might bring some types of bias into the research? You may be aware that there is plenty of concern about that sort of thing among qualified scientists.

CARL. Oh, yes. Some geologists are afraid that people like me are trying to prove the global flood described in the Bible. And to be fair, some of them *are* trying to prove it. That is not my approach.

I read widely in the literature that argues that creationists are wrong and ignorant, so I am definitely aware of the concerns. I presume you have read Jerry Coyne's book *Faith Versus Fact*. He leaves no doubt what he thinks about it—faith has nothing to contribute to the discussion. In his view, a discussion between religion and science will be a monologue. Religious people would have nothing to say!

ED. You've certainly noticed that Jerry Coyne doesn't tiptoe around the issues. He doesn't think it's possible for religious people to accomplish viable science research. Others may use gentler words, but many still share his thinking. I am personally willing to work on keeping an open mind, but you will need to convince me. The scientific worries about religious bias in research have been growing for a couple hundred years, and that has become a solid part of, well, the scientific attitude.

CARL. We can address these concerns in the most practical way when we start looking at the rocks and trying to interpret them. For now, let me mention an example that I find useful in illustrating the bias problem. I presume you're familiar with biology textbooks and other books that discuss how the first living things arrived—transitioning from the nonliving world to the first living cells. All those books I have read describe in clear certainty that life arose by the naturalistic process of chemical evolution, or abiogenesis.

In these descriptions, life happened by natural processes—the laws of chemistry and physics—with absolutely no intelligent input. How much evidence supports this interpretation? Can physical evidence be presented to support this idea? Is there evidence that shows this to be the only valid, or even the most valid, explanation?

ED. You've presented a challenging example! Of course, you do realize that life began so long ago that finding evidence is almost

impossible. So perhaps you are expecting too much.

CARL. I am expecting a lot, but this emphasizes my point. We have no direct evidence about the origin of the first life, so how can anyone have so much confidence that we know how life began? How can we test hypotheses for life's origins?

ED. You must be aware that biochemists do test such hypotheses. Researchers are studying the RNA world as possibly the first chemical stage in the origin of life, preceding proteins and DNA. RNA molecules can serve as catalysts for biochemical reactions, in addition to their role in genetics, which makes RNA an ideal molecule for beginning life. This is testing a life-origins hypothesis. Why does this not answer your skepticism?

CARL. I do agree with you, but only in part. You're describing some good laboratory science but not addressing the larger question. Biochemists are seeking to understand how chemical processes could occur *by chance* to result in a living cell. This has resulted in some good biochemistry research that may not have been done otherwise. This is, I suggest, an example of a bad hypothesis or theory leading to insightful research and biochemical advances. This is not uncommon in science. The scientific value of a hypothesis has more to do with its ability to stimulate productive research than with the ultimate truth of the hypothesis.

To understand what is happening here, however, we have to look at the larger context. If it is even possible for life to begin without a creator, it would have been a very long sequence of random, rambling biochemical events—millions of reactions, probably billions. But for this discussion we can be conservative and suggest it would take a million such events. The RNA world involves only a handful of these events and is seeking to determine if it was possible, perhaps, for RNA to fill the needed role for this very small segment of the million events. This has led to some fruitful biochemistry research, but it does not address the larger question: Did biochemistry—and not a designer or creator—bring life into existence? Does the evidence show that life arose by chemical evolution rather than by the work of an intelligent designer? It cannot answer that question. And the RNA-world research is not succeeding in its attempt to show that RNA can fill the

Creation? Really?

proposed role in origins, even in a small segment of the million steps.

ED. OK, a valiant effort, and the problems you describe are real. We don't know how life began. But modern science can't deal with supernatural ideas—that is the big item that you've missed! It is simply not possible for science to test whether a god or some kind of designer was involved in the origin of anything. Science has made tremendous progress since abandoning supernatural explanations. I suspect you really do believe there is a god. But the idea of a God that can do supernatural miracles—how can we reconcile that with our modern understanding of the laws of chemistry and physics?

CARL. In time I will try to give some answers to those questions. For now, can we agree that the foundation of our understanding of the origin of life is dependent on something other than the evidence? That it's something to do with philosophy and assumptions? We could discuss, or even argue about, the biochemical evidence all day, and at the end we would still differ for reasons that are not based on the available evidence itself. Is that not true?

ED. I'm thinking about that—and I guess it's correct. We do agree on that much, but there's much more we need to talk about.

CARL. That's true, but if we're going to make it through this trip, maybe today we should discuss something less controversial. Maybe politics!

ED. Good idea!

CARL. While we've talked, the miles have slipped past. We're about to turn onto Interstate 40 at Barstow, California, the interstate's westernmost point. Notice that sign over there?

ED. "Wilmington, North Carolina, 2,554 miles"! Somebody in the highway department has a sense of humor.

CARL. Absolutely! We won't be going that far, but our first stop will be in Arizona.

Assumptions, Questions, and Science

After a rigorous discussion of politics, the two scientists are closer to their Arizona destination.

CARL. Since we've reached an agreement in our critique of current politics and decided that the Republicans and the Democrats are all of questionable virtue, we can move on to other topics.

Interstate 40 has served us well, carrying us quickly into Arizona. In the next town is the Roadkill Cafe, and despite its name, it has pretty good food. It's in Seligman, famous for its tourist emphasis on Highway 66 history. Shall we stop?

ED. We might as well. I haven't had any roadkill for a long time!

CARL. Soon we'll be turning off I-40, heading to the area with flagstone quarries. The flagstone, from Coconino Sandstone, is quarried and sold for building material. They don't actually build buildings from the flagstone, as they do with limestone, but the quarried sandstone slabs are used for decorating or for building walls along property lines. My interest is in learning how the sandstone was formed—in what ancient environment was the sand deposited?

ED. I'm curious why you suggest the sandstone was deposited underwater instead of in a desert, as everyone else thinks. Why are you being difficult? You mentioned that some geologists think you are trying to prove that old story of Noah's flood described in the Bible. Is there anything to that?

CARL. I can answer your question if you will answer another question first. There are many rock formations, and the sediment that forms many of them is generally believed to have been deposited by water. A few others are thought to have been deposited by wind. If we find

Creation? Really?

that *one additional* formation, the Coconino Sandstone, was formed underwater, how would that prove Noah's catastrophic flood?

ED. Science doesn't properly claim to prove things. Only advertisements on TV prove things! Just kidding—they don't really prove anything, no matter what they are paid to say. Science finds evidence that can support or challenge a theory, and it is always possible that new evidence will refute what seemed to be a good theory. This is why science doesn't prove things.

To answer your question more directly, I guess changes in the explanation of one rock formation can't prove or disprove a grand-scale idea like the Bible's great flood. Is that what you mean?

CARL. Yes, I would never claim to have proved the Flood on evidence alone. And I liked your description of why science doesn't prove things. It tells us that science can't give us truth with certainty. As you say, new evidence can always disprove what seemed like a good theory. Consequently, we can't claim our scientific theories as truth. Science just shows us which are the best models or theories that we have, based on the evidence that is now available from the study of nature and, as always, subject to the assumptions science is using.

But I know why some might want to accuse Bible-believing researchers of trying to prove the Flood. People like me do think differently about the history of our earth, and that makes some other scientists nervous. Coming back to your original question, I became interested in the Coconino because of some papers I read that described fossilized animal trackways in the sandstone. It seemed to me the story of how this happened needed more study. I do think there was a great flood, and I wondered if this sandstone with its animal tracks was formed in that flood, or if the tracks were not formed in water.

ED. As you say, that does make me nervous. What do you mean when you say you think differently about the history of the earth?

CARL. Some of us believe that the geological record with its fossils developed in a more catastrophic, rapid manner.

ED. Aren't you letting your religion interfere with science?

Assumptions, Questions, and Science

CARL. It could interfere if I were to let it. This is an important point, and I will try to clearly explain. One step in research is asking a question. The next step is trying to answer it. A question can come from many different places, like from what we read or see in the rocks. Or—and this is the part you may disagree with—the question could even come from my biblical beliefs.

ED. Yes, you are losing me on that one. Like I said, religion is getting mixed up with science.

CARL. In a way it is, but whether that is a problem depends on what I do with the second step—answering the question. No matter where the *question* comes from, if I seek a scientific *answer* I must use the accepted scientific process to search for the answer; in this case, for the explanation of how those animal trackways formed. It will be necessary to make careful observations, to collect evidence—data—and use that evidence to answer the question.

If I do that, the question is getting a scientific answer, no matter where the question came from.

ED. So you propose that any question, even a crazy question, can lead to legitimate research if it can be answered with methods that any scientist can use?

CARL. Well, I would say any reasonable question can function that way. Ah—here we are—we have arrived at the quarry I was looking for. See the fossil trackways on the cross-bedded sandstones over there? The trackways go up these sloping sand surfaces. If I am asking whether the animals making the tracks were on a desert dune or an underwater sand wave, is that not fair? I suggest it is a more open-minded search than if I began with the unproven assumption that they formed in a desert and then considered only explanations allowed under that assumption.

ED. I can see your point, but I'm not used to thinking that way. The eolian desert interpretation is so well accepted, supported by a lot of evidence, that it doesn't seem realistic to doubt its accuracy.

CARL. Many geologists see it that way. But think back a few decades to the time before 1960, when it was quite uniformly agreed among

Creation? Really?

geologists that the theory of continental drift was not valid. Then some new evidence came to light, and in a few years, continental drift and plate tectonics became uniformly accepted.

In, say, 1955, a scientist who was willing to take seriously the possibility of moving continents would have looked like a maverick, when in fact he or she was making the wise choice. Should we learn anything from that episode? We can't spend our time chasing every novel idea that anyone suggests, but if some evidence raises doubts about an accepted theory, it could be wise to not be too committed to the favored theory.

ED. Sure, that logic looks good, because we can look back and see that the unconventional maverick was on the right track. But it seems that we know the history of this Coconino Sandstone already. Why spend time chasing the wild idea, as you say, that the Coconino Sandstone was not a desert deposit? Don't these sandstone surfaces look like they were once part of a sand dune?

CARL. Before 1960, all of us geologists also thought the idea of drifting continents was clearly wrong. Why should we now think that we have all our other ideas "in the bag," with no possibility we are wrong again? There are evidence-based reasons for questioning the eolian interpretation of the Coconino, and science has had to make many of these changes of direction in our theories. I prefer to think for myself on some of these things.

I will also admit that I have a theological reason for my questioning, and this may make you nervous again. I would like to find evidence of whether the Coconino could have been, or could not have been, formed during a time when water covered this land. I am willing to ask questions that others may not think worth asking, and in my experience this willingness to ask new questions often results in significant insights that would be missed if we limited ourselves to the "conventional" questions that everyone else is asking.

I will make one other point on this issue, then I will be quiet. Remember our discussion of the origin of the first life-forms? I think we concluded that the accepted theory of biochemical evolution was based more on naturalistic assumptions than on evidence, and yet it is a firmly held belief of many scientists. I can't help wondering

Assumptions, Questions, and Science

what other accepted theories are in the same category—widely and firmly accepted and yet based on assumption rather than evidence?

ED. Since you have given me the last word on this topic, I will say that you make some good points, but still this does leave me a little nervous, so you will need to convince me that you are not abusing the scientific process.

CARL. OK, let's leave the philosophizing and look more carefully at these rocks. Maybe that will help.