Issue #13: Diagenesis and changes in Rock over Time

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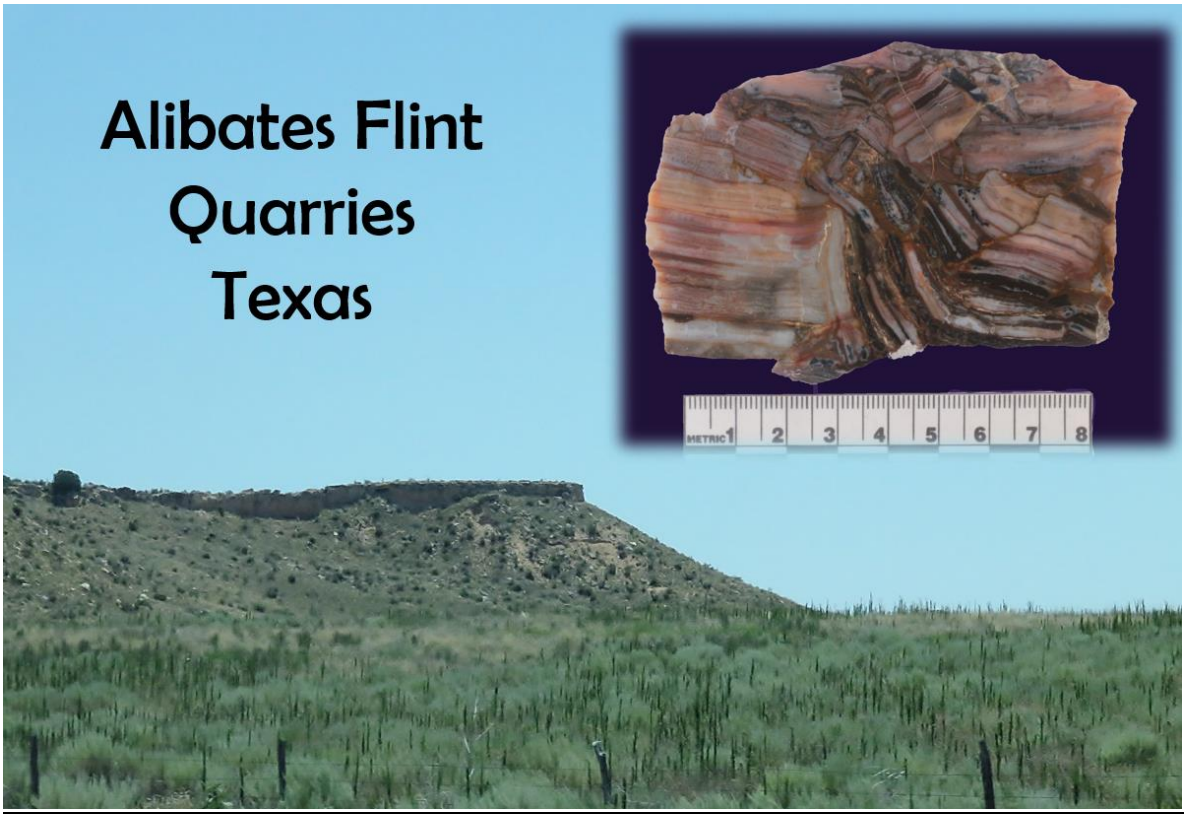


Alibates flint quarries where flint for spearheads and arrowheads were dug for over thousands of years. The rock began as lime muds that were dolomitized, and then agatized before hardening to stone.

Assertions:

1. Lime muds and sands have been changed by post-depositional processes to form rocks.
2. YEC models demand that sediments were soft for folding and then hardened very rapidly to allow men to use them as tools, etc.
3. We have identified many of the processes and can recognize that the changes occurred over longer periods than available in YEC flood geology (FG) timelines.

Key assumptions:

a) Lime muds and sands originally had properties much like those we see today.

b) The muds and sands were changed after deposition.

c) Though the rates may have been different from that occurring today, there are rates that would be unreasonable. If they were changed within days, this would be evidenced.

Discussion:

If Abraham used flint for weapons, could it have hardened in the time available in the Young Earth model? The general term for processes that alter rocks after deposition is "diagenesis." Sediments were deposited soft and then "lithified" by diagenesis to the state that we find them in today. One example is flint. We can see how it started as lime mud and ended up as hard flint. Diagenesis provides conflicts for YEC flood models. For instance, they propose that folded rocks were able to fold because they were unlithified, soft and pliable. They were soft enough to allow canyons to be carved in brief periods. On the other hand, within a very short period, they were hard enough to hold up canyon walls, build pyramids, carvings, and make arrowheads and knives. Think about what leading YEC flood models describe. They propose that about 4,500 years ago, the Earth was covered with massive unconsolidated and unlithified flood deposits. The only hardened materials that would have been available for making tools or building would have been rocks that were consolidated before the flood. It really makes no sense to claim that flat-lying beds were deposited by the flood and then, instantly lithified so that people could use them as building stones.

We will look at 3 diagenetic examples that as a geologist seem very challenging to the YEC flood models. First, I want to look at an issue about changing limestone to dolomite. Next, we will look at sandstones and how diagenesis makes them strong enough to stand up. Finally, we will come back to flint and how it forms.

Example 1: Lime sediments changed to dolomite.

Figure 1 shows a cross section from West Texas with only the dolomites colored purple. Notice that they are thick and extensive. The sediments began as lime - calcium carbonate. However, they were chemically altered from calcite to dolomite (calcium magnesium carbonate). We see many, many fossils that were originally aragonite or calcite that have been changed to dolomite. We often find remnants that remained lime. The change in properties often increased the porosity making them better oil reservoirs.

It is true that geologists don't really have a full understanding of the process that changes limestone to dolomite (dolomitization) over very broad areas like this. Many models have been proposed and several are apparently true for particular zones, but none of which seems adequate for all dolomite rocks that we find. Converting large areas of limestone into dolomite would seem to be a slow process though. Much of this sediment would not have

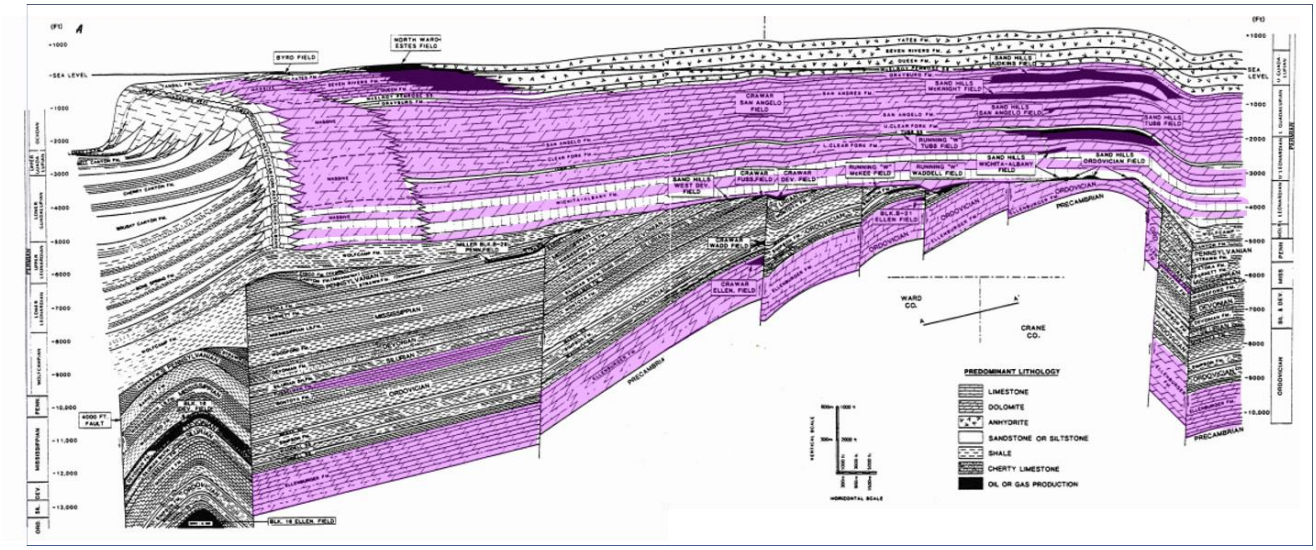
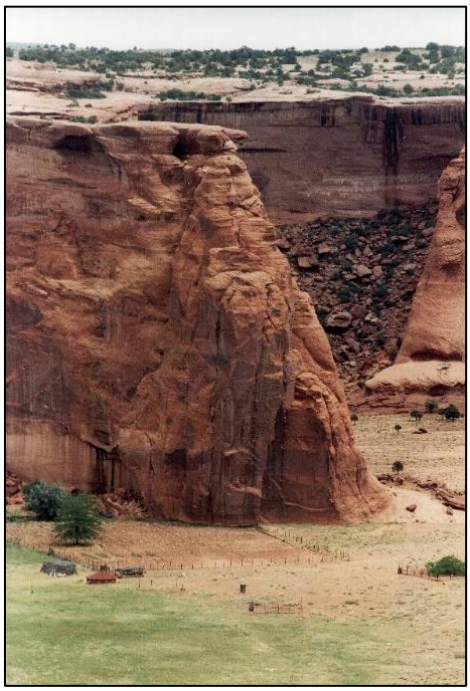


Figure 1. Cross-section from West Texas over the Central Basin Platform. Units in purple are dominantly dolomite today. (Ward, et al, 1986)

allowed fluids to pass through them quickly. No possibilities have been identified that might have rapidly changed big areas. Dolomitization was not a one-time thing. It occurred over and over in the Permian Basin and in many parts of the world. This site describes the processes recognized: "Dolomite and dolomitization model- a short review".

What we are looking at is a change that happened over time. Many of the lime sediments formed in arid sabkha (salt flat) settings. These were ideal settings for fluids to percolate through, changing the lime to dolomitic mud that hardened to dolomite. No one has ever proposed a rapid solution. How long do geologists estimate that dolomitization might take? Fullmer and Lucia (2010) estimated that it could take as little as 500 years to dolomitize a 1.3m bed from modeling the process on a Cretaceous dolomite in Austin Texas. As they report, this process was probably actually more episodic and took longer. Remember that the FG model tells us that all of this happened during the 1-year flood interval.



Figures 2 and 3. Canyon de Chelly, Arizona with canyon walls ~1000 feet high. Notice the hogan that provides scale on second photo.

Example 2: Sand changed to sandstone

Next, we will look at sandstone diagenesis, in this case, considering sandstone in the canyons of Arizona and Utah. **Figures 2 and 3** show Canyon de Chelly, where the canyon is ~1000 ft deep. In this post, I am not considering how the sands were deposited, though geologists interpret them to have been formed as desert sand dunes. FG models tell us that canyons like this were cut quickly, because the sediments were soft after the flood. (Snelling, 2014). Let's think about what that looks like. Imagine bringing load after load of sand, until the pile is 1000 ft tall. Then, using some huge tool, carve out a sharp trench until it goes totally through it. (this is a mind game, so this is okay.) How vertical do you think the sides of your trench would be a year later? 5 years later? Then, at some point later, we will build your home at the base of that trench, like the hogan near the base in the second photo or perhaps as a cliff dwelling (300 to 1300 A.D). My question is: how long after the trench was cut would you be comfortable having your home at the foot? For me, the answer is basically never. The book, "*The Grand Canyon: Monument to an Ancient Earth*" provides a useful figure that illustrates this on page 166.

At some point, the sands in these canyons changed from sand to sandstone, including the Lower Permian Canyon de Chelly Sandstone. The sands have had various degrees of compaction due to burial. Many pores and the space around them have been filled with cement to various degrees. Mineral cements include calcite, siderite (Fe carbonate), dolomite and quartz. alHow long does this take? Walderhaug, 1994 showed that quartz

cementation is controlled mostly by temperature. He calculated rates and showed them to be very slow in the terms of the periods that we are considering here. I don't know the temperature profile thousands of years ago, but it is hard to make a case that the region was tremendously hot, especially if it is still soft from flood waters above it. Walderhaug noted:

> "*On the other hand, for the sandstones where the present temperature is below 100°C, it must also be kept in mind that at these low temperatures, it may take several million years to precipitate enough quartz cement to close a fluid inclusion large enough to permit measurement of homogenization temperature*"

That cementation took place with some burial. I try to imagine a scenario where the diagenesis took place after the canyon formation. The sands were regionally turned to sandstone over some period of time.

YEC authors believe that diagenesis took place very rapidly and there are a few types that do. Snelling (2009) stated:

> "*Nevertheless, all sedimentary strata do become lithified, hard, and brittle, because under normal conditions sediments lithify relatively quickly, often in a matter of years, but at most, perhaps hundreds of years. Given ideal conditions, lithification can happen within days*."

It would have been nice if he had provided a reference to support this. He uses Mount St. Helens volcanic ash deposits to support this, but every geologist knows that volcanic deposits often weld quickly. This is hardly the same as the regional lithification of sandstone or limestone. It is particularly not the case for quartz cement. Snelling suggested that overpressure would speed diagenesis, but quartz cementation is actually slowed down. David Catchpoole (2010) proposed that bacteria can speed the cementation of rocks and that is certainly true for limestones and dolomites, but not quartz. The fact that some diagenesis takes place quickly does not mean that all does.

Example 3: Lime to flint

Now to consider the existence of flint for early humans. Flint, chert, jasper, and agate are all terms for quartz that is crystallized at a microscopic scale. The first three are typically formed in sedimentary rock by diagenetic processes. Several settings are recognized. The formation of flint speaks to the antiquity of the rocks. Originally, in many places, the sediments would have been almost entirely calcareous. Often, nodules formed as sparse silica, from sponge spicules and other siliceous components, was concentrated to form nodules and thin beds. The flints formed as silica replaced previous materials. It would have initially been amorphous opaline gel that had to go through several stages of chemical changes before that final agate or flint formed. **This had to dewater and harden over the course of time**. We have no way of quantifying exactly how long this took, but there is no evidence that this took less than thousands of years. More about chert formation here: New Discoveries about Stonehenge vs. Flood Geology

Now to think about how this fits into YEC flood models. If the flood took place ~1656 years after creation (Masoretic text) and Abraham lived ~1900 BC, then the period between the flood and Abraham was just 450 years. If Whitcomb and Morris were right to date Abraham to 2166, then less than 200 years were available. That means if cherts and flints were formed in rocks deposited by the flood, as most FG models propose, then they just had 200 - 500 years to be converted to silica gels, then hardened to chert, and for erosion to expose the chert nodules or beds. Soft silica gels would have been pretty useless.

In my post: "Llano Estacado in New Mexico and Texas Vs. YEC and Flood Geology", I described how ~12,000 years ago early North Americans were using cherts and agatized dolomites to make "Clovis" points near where I grew up in New Mexico. (**Figure 4**). Some of the material flint or chert or agatized dolomite (known as Alibates flint from the Alibates Flint Quarries in Texas) came from Latest Permian and Triassic sediments (see image featured at start of the post). Even if one chooses to interpret the spear points to have been made much later, such as in the time of Abraham, very little time is available after the flood before they were carved according to FG.

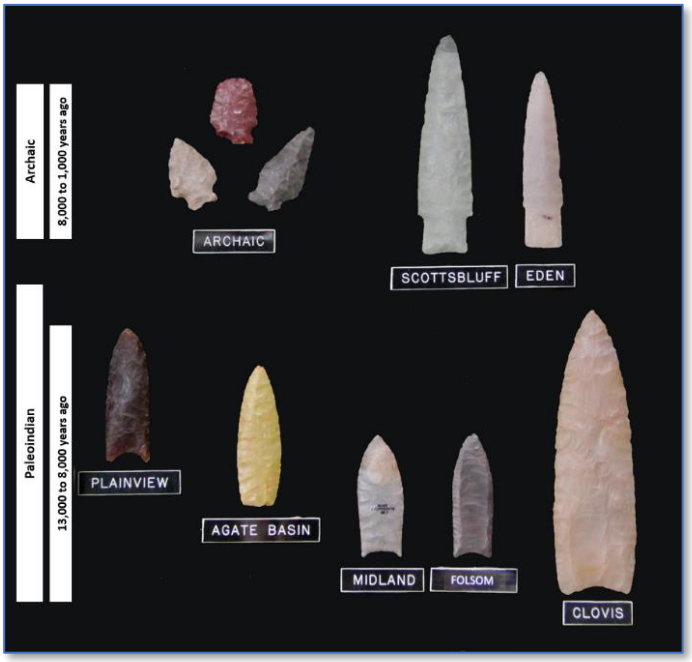


Figure 4. Arrowheads from Blackwater Draw representing different cultures. The different cultures formed at different levels in the sediment at the site. Blackwater Draw Museum, Eastern New Mexico University, Portales, NM.

YEC flood models demand that sediments were soft, to allow folding and deformation during and after the flood, but then to harden very quickly after the flood to allow the use of building stones, knives and other artifacts. They seem to be caught between a rock and a hard place. You cannot have it both ways, and in fact, the data tell us that hard rocks fold and plenty of time was available to harden stones. This was just God providing the materials that man would need to fulfill His purposes for him.

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