

A Response to Grand Canyon, a Different View by Tom Vail.

By Dan Wilson and Eric Buer

The recent 2003 publication of *The Grand Canyon, a Different View* has posed a number of interesting and provocative questions about the origins of the Grand Canyon in Arizona. While there is no doubt that the many contributing authors to this work are sincere in their beliefs, there remain a number of inconsistencies in their theories which must be addressed when considering a creationist theory of the Grand Canyon's conception. The purpose of this field log is not to attack the spiritual beliefs of the authors, but to respond to mechanisms they present which explain the creation of the Grand Canyon.

The first, and perhaps most fundamental flaw in the authors arguments appears at the beginning of the text when they explain that evolution (and consequently the practice of science) is by definition a religion. They define religion in their book as “any system of *beliefs*, practices, ethical values, etc. . . .” We argue that science is very different than religion. Science is not based on a belief, but instead is based on a testable *idea* (hypothesis) which is tested rigorously through observation, analysis, and organized experiments. Even though Mr. Vail has a lifetime of experience observing the Grand Canyon, he presents his spiritual beliefs based on readings from the Bible in conjunction with selective evidence. This is both misleading and inappropriate as a scientific practice.

The authors examine the geologic record, and question the integrity of dating materials through radioactive isotope decay. This method relies on assuming a set number of moles of some radioactive element (K, Rb, U, ^{14}C) are present at the formation of a sample. As time passes the element decays into a second element, known as a daughter element by shedding neutrons and or beta particles. The half life of a radioactive element is the time it takes for one half of moles present to decay into a daughter element. This constant of decay is, not surprisingly, constant, and when a sample is examined the ratio of parent to daughter elements present can be used to assess the sample's age. The essential complaint with this method is that science cannot conclusively prove radioactive decay constants have remained constant over the history of the earth.

As an example, the authors point to the varying ages of Diabase Sills found in the Grand Canyon ascertained from dating using K-Ar, Rb-Sr and U-Pb. The ages recorded vary from 841 million years old to 1,249 million years old, conclusive proof to the authors such dating methods are unreliable. Curiously nowhere do they note that all of these ages are consistently well beyond the 6,000 year age of the earth specified by the Bible, or the literature about the margin of error associated with such measurements. Furthermore no one has been able to ever prove that decay constants vary with time, and no mechanism is suggested which would logically explain a sudden change. The author's argument utilizes the same logic as suggesting that while an apple tree today may always grow apples, there is no way to absolutely prove that the same tree did not produce watermelons before recorded history. While no such record currently exists, based on everything we know about apple trees (and radioactive elements) from careful observation and testing, this type of change seems not just improbable, but downright impossible.

Another argument made is that if the Canyon has been dammed numerous times by lava flows which backed up the Colorado River for several miles there should be evidence of lake sediments on or below the riverbed. Indeed, standing water does yield specific deposition trends, but the river as is clear today eventually overtopped and eroded every one of those dams. The geologic record in the Grand Canyon may look like a perfect catalog of chronologic time, but in fact very little of the geologic history is ever preserved in the rock record. Additionally, today it is widely accepted that virtually all of the sediment which is found in the Colorado River is carried out rather than deposited on a long term basis. Therefore it is not unreasonable to assume that lake sediments previously deposited in the riverbed could have been eroded away again as the dams gave way to free flow.

Fossils receive particular attention within the geology section of the book with strong condemnation of the theory that the fossil record is a broken and incomplete record of life on planet earth. Rather, this text postulates that all species were created once in a finished form, and then annihilated by a Biblical flood. This postulate agrees with the creationist theory that the fossils observed make up the complete record of species created by God. There are numerous problems with this theory, beginning with

the statement that fossilization requires death followed immediately by rapid deposition. This is both overly general and simply not true. There are a variety of circumstances under which fossilization can occur. Death may occur in anoxic marshes which prevent decay of the body. Deposition sediment can be slow and sporadic and still lead to fossilization, usually in a coal bed. Death in an arid environment leads to rapid desiccation and prevention of decomposition, later the body may be washed into the a depositional environment and buried. This process gives rise to the famous “death pose” which is seen in Archaeopteryx, with the head pulled back and limbs splayed outward as the body dries out and contracts.

Fossilization is a sporadic and chancy process, only a tiny fraction of all past life forms are preserved in the rock record. The absence of intermediate fossil forms is not a testimony to creationism but a testament to the process of fossilization. Soft bodied organisms are rarely fossilized since they decompose completely, just as muscle, skin and feathers are rarely if ever found in the record. Throw a leg of mutton on the ground at the local wildlife preserve and come back in six months, finding just the bone would be a surprise. The same is true of almost every living organism when it dies, other organisms, bacteria, wind, water, and sunlight all work against fossilization to break down and destroy dead organic material and return those nutrients to the ecosystem. Even the organisms that are buried and fossilized may be destroyed by tectonic or metamorphic processes. If a few fossils are not destroyed, they still must be found again, and considering that the average thickness of continental crust hovers around 35 kilometers it is not unfair to say very little of the fossil record has actually been exposed, examined and cataloged.

Furthermore no mention is made of the fact that the fossil record in the Grand Canyon lacks modern species. If all the faunas of the world were created at once, shouldn't tigers and antelopes have perished to be found in this record? The fact that most of the fossils addressed by name in the books are marine fossils, clams, trilobites, sponges, crinoids, brachiopods, jellyfish, sea urchins, sea cucumbers, swimming crustaceans and sea lilies that would be well suited to live under water (biblical or otherwise) is overlooked. With the exception of jellyfish and sea lilies, these named few organisms are largely hard bodied which favors fossilization. An argument is made that

Crinoids found in the record are often broken and incomplete, and this must be evidence of transport by a violent flood wave. A simpler explanation includes that Crinoids filter feed in moderate energy environments. After death wave action could easily dismember and rework disparate body parts such as the stalks and calyx left behind after ligaments decompose.

The authors also argue that the Colorado River was not responsible for the creation of the Grand Canyon. This was poorly explained, in a single paragraph that remains somewhat cryptic. From the perspective of a geologist, the Grand Canyon morphology clearly reflects creation by the erosive action of the Colorado River as the plateau it once rested on was uplifted. The Canyon is much narrower where it has cut through granites and schists than in the less resistant sandstones and limestones. The meanders of the Grand Canyon support this theory since such river morphology forms in low gradient streams while braided, often straighter channels result from higher gradient ones. If the Colorado River is indeed responsible for acting as nature's buzz saw, the initial riverbed would have meandered across the flat plateau. As the plateau was uplifted and the river continued to incise those meanders would be preserved as they are today.

In the biological section of the book, the authors say that evolution from a molecular state to "man" requires mutations which would increase genetic information with a "kind" of species. They explain that this is not possible and assume that mutation results in a loss of genetic information. Their assumption is partially wrong. There are four types of chromosomal rearrangement mutations. These four types include deletions, duplications, inversions, and translocations and reciprocal translocations. Of the four types of mutations only one of them, deletion, results in a loss of genetic information. Duplication is an effective mechanism in providing new functions. After a gene has been duplicated via polyploid mutations, uneven crossover or reverse transcription, the duplicated gene has three major fates; it can retain the same function, have no function (which can undergo future mutations and produce a new protein of new function), or diverge in function over time resulting in copies that provide very different functions. Based on these well documented genetic phenomena, it is relatively safe to assert that mutation does not solely result in the loss of genetic material, and gene duplications allow for copies to evolve new functions without losing their old functions.

The arguments the authors pose for the presence of plants and animals is more compelling. They argue that animals were made “after their kind.” However, the fact that there has been documented hybridization between native Flannelmouth Suckers and razorback suckers seems to imply that from the scientific perspective each “kind” is hardly static, but rather continuing to evolve with time. After all, if animals of the Grand Canyon were created “after their kind,” then how could fish of different species successfully hybridize together?

The authors neglected to mention the Native American use of the Grand Canyon. As of now, National Park Service archaeologists have only studied 3% of the Grand Canyon. With only 3% of the Grand Canyon studied, archaeologists have uncovered 43 artifact sites. Some of these sites contain Paleo-Indian artifacts dating back 10,000 to 12,000 years ago (Balsam, 2005). Not only does the use of the Grand Canyon by Native Americans pose a problem for Vail et al. arguments but so does the date of the artifacts. These dates show that humans occupied the Grand Canyon during and well before the accepted beginning of Anno Domini.

Throughout their colorful text, the authors seem to neglect that the Grand Canyon is not static. Physical processes that shape the Grand Canyon are ongoing, debris flows occur yearly, sandbars grow and shrink, rapids form and wash out (Crystal Rapid was recently reworked as recently as 1996 -- see Buer, 2005) and vegetation continually encroaches only to be ripped out by high flows.

The creation of the Grand Canyon is more of a never ending story rather than a footnote in the book of Genesis. Catastrophic events have certainly contributed to the way the Grand Canyon appears today and will continue to reshape it in the future. It is a long stretch to credit Noah’s flood as the sole driving force in forming and shaping the Grand Canyon in light of everything that has been observed. With global warming causing climate changes the Grand Canyon might be in for round of drastic physical and biological changes. Hopefully these questions will contribute to the ongoing discussion with regards to the formation and history of the Grand Canyon. Irrespective of its origins, the Grand Canyon is an image of majestic beauty and of intrinsic value which continues to inspire visitors year after year.

Works Cited

Balsam, Janice. Personal Communication 3/28/2005.

Buer, E.F. 2005. "Debris Flows in the Grand Canyon" In. J. Mount, P. Moyle and C. Hammersmark (eds.). Ecogeomorphology of the Grand Canyon and its Tributary Streams. Davis, CA. http://watershed.ucdavis.edu/grand_canyon/history.html.