The Death of the Dinosaurs: UNO Department of Geology's Contribution

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9/13/2002

All geologists are now familiar with the widely accepted hypothesis about the cause of the extinction of the dinosaurs at the end of the Cretaceous Period by an impact of an asteroid or comet (bolide) in the Yucatan Peninsula, Mexico. What many NOGS members may not be familiar with is the role UNO played in providing evidence to support the hypothesis.

Former UNO professor Al Weidie had a Mexican connection dating back to his graduate school days working on Gulf Coast geology in northeastern Mexico. After coming to UNO and helping start the Department of Earth Sciences, Weidie continued his interest in the geology of eastern Mexico. In order to extend his work into the Yucatan Peninsula, Weidie convinced PEMEX (the Mexican Petroleum Company) to ship him samples of the cores from deep wells PEMEX drilled in Yucatan. When Dr. Bill Ward joined the faculty in 1970, the cores were available for a thesis project by his first graduate student, Bob Marshall (1974).

Cores from near the Cretaceous-Paleogene boundary proved to be difficult to understand. A blanket of polymitic breccia at the top of or overlying the Cretaceous section was particularly problematic, causing some to accuse Ward of looking at concrete that had been drilled out in the wells. However, in the breccia were fragments of anhydrite, limestone, and dolomite, and the matrix was dolomitized. Ward reasoned that all the anhydrite chunks and splinters in the breccia, which spread across the peninsula, would amount to a lot of anhydrite. Its likely source was the Middle Cretaceous, deeper underground. How could that material have gotten to its present stratigraphic position? Anhydrite is soluble and easily abraded; so it had to have been eroded and re-deposited

*Many thanks to Dr. Bill Ward for his recounting to me the history of UNO's involvement in studying the Yucatan Impact Crater.

quickly. The mechanism Ward reluctantly hypothesized at the time was block faulting. Years later, electric logs and seismic would show that this explanation couldn't be supported.

In the years after Marshall's thesis, a high concentration of iridium at the Cretaceous-Paleogene boundary was found in many places around the globe. The likely source of iridium is extraterrestrial, in comets or asteroids. Its wide distribution at a single time indicated the possibility of a massive impact. The timing also corresponded with the end of the Age of Dinosaurs. The hunt was on for a large crater caused by the impact. Geophysical evidence indicated the presence of such a crater in the subsurface of the Yucatan Peninsula.

Geologists seldom believe geophysicists unless there is supporting evidence from rock data. One of the deep PEMEX wells was drilled near the center of the supposed crater, but the cores from the wells were thought to have been lost. Then someone came across a reference to Marshall's thesis and contacted UNO. In the cores, they found shocked quartz (Hildebrand et al., 1991) and fragments of melt rock and basement rock (Schuraytz et al., 1994). Other evidence accumulated, including a big accumulation of altered glass microtektites at the K-T boundary on the other side of the Gulf of Mexico (near Linares).

In 1995, Ward and others authored an article that appear in *Geology*, presenting evidence from the subsurface sedimentary rocks for an impact, especially the breccia first recorded in Marshall's UNO masters thesis. They concluded by saying,

> Near the top of the Cretaceous interval across the entire northern Yucatan peninsula are unusual breccias containing clasts of dolomite, limestone, and anhydrite, as well as shocked quartz and feldspar, fragments of basement rock, and altered melt rock. The most likely origin for this breccia is an impact by an asteroid or comet with the northwestern Yucatan platform.

A subsequent discussion of the article by Friedman in *Carbonates and Evaporites* (1996) raised the question of whether the breccia studied by Ward and others could be a collapse feature. In refuting this, Ward makes one of his most convincing points:

> There is no evidence that the anhydrite in this breccia was dissolved. On the contrary, the anhydrite clasts are "fresh as a daisy." Even tiny cleavage splinters of anhydrite are sharp and unaltered by dissolution. . . . there is no reason for anhydrite clasts in collapse breccias to be wrapped in glass (now altered glass), as some are in the Yucatan breccia.

The possible relation of the Yucatan impact to dinosaur extinction was part of a long series of programs on dinosaurs narrated by Walter Cronkite. A camera crew came to UNO and filmed a geologist going into the lab where the cores were stored, across the hall from Ward's office. The geologist had a flashlight in his hand, looking like an archaeologist entering King Tut's tomb.

Suddenly he discovered the long-missing cores. (Of course, the geologist passed up a light switch at the door, and it looked as if UNO didn't pay the electric bill.) Preserving and studying those cores was UNO's indirect contribution to understanding the death of the dinosaurs.

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