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CSI: Dinosaur Provincial Park (CSPG AGM)

SPEAKER:

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Since the onset of the Great Dinosaur Rush in 1910, the strata exposed at Dinosaur Provincial Park (upper Belly River Group, Upper Cretaceous) have yielded tens of thousands of vertebrate fossils, including hundreds of complete-to-partial articulated dinosaur skeletons. By any measure, Dinosaur Provincial Park is one of the richest Mesozoic dinosaur 'graveyards' in the world! Why such fossil abundance and species richness? Multidisciplinary taphonomic and geologic studies conducted during the past 20 years by paleontological and geological 'CSIs' can now answer this question.

Skeletons of large dinosaurs are common, whereas those of small dinosaurs and other vertebrates are rare. Dinosaur skeletons are overwhelmingly associated with paleochannel facies and, thus, represent animals that probably died in, or were quickly washed into paleochannels following death. The frequent presence of skin impressions suggests significant numbers of geologically instantaneous, meter-thick burial events. Isolated bones are orders of magnitude more abundant than articulated or associated skeletons. They occur in both overbank and paleochannel facies, but are most common in paleochannel lags.

Two kinds of bonebeds are present at the Park: multitaxic and monodominant. More than 200 multitaxic bonebeds are known and consist largely of poorly sorted channel-hosted bone assemblages. Bonebed assemblages are interpreted as having been 'dumped' and buried in paleochannels during meandering or avulsion. At least 20 monodominant bonebeds, consisting mostly of bones from ceratopsian (horned) dinosaurs, have been documented at the Park. Intensive study has shown that they are derived from herds of ceratopsians that were episodically overcome by floods.

Catastrophic coastal plain flooding is the most parsimonious explanation for the taphonomic patterns observed at Dinosaur Park, and is also the best explanation for the cause of death for many of the Park's dinosaurs. Under the influence of severe coastal tropical storms and associated storm surges, southern Alberta's very-low-gradient coastal plain was episodically submerged by fresh water 200 km up-dip from the coastline. These regional floods episodically annihilated the dinosaurs, but probably spared many smaller aquatic, volant, and arboreal vertebrates. As water receded, significant numbers of bloated dinosaur carcasses were either swept into channels or stranded on the flood plain. Over a period of days to weeks, high rates of decomposition and sedimentation favored the rapid burial of many of the channel-hosted carcasses. Across the coastal plain, carcasses of solitary dinosaurs littered the landscape. Sparse groups of carcasses from dinosaur "family" groups were also present, and, very occasionally, football-field size death assemblages of migrating centrosaurs were present. In the warm temperate to subtropical Campanian climate, a few seasons of scavenging, trampling, and rotting on the coastal plain resulted in the nearly complete disarticulation of carcasses. Over many years, meandering channels and channel avulsions reworked large areas of the floodplain, dumping partial skeletons and isolated bones into the channels, creating channel-lag bonebeds.

Crime scene evidence from the Park's dinosaur victims is critical in unraveling the mystery of 'who done it' at the Park. Accordingly, it probably pays to think like a CSI when interpreting the depositional history of any vertebrate-fossil-rich unit.

BIOGRAPHY

David A. Eberth is a Research Scientist and the Curator of Geology at the Royal Tyrrell Museum in Drumheller, Alberta, where he has worked for the past 20 years. He received a B.Sc. in Zoology from the University of Massachusetts in 1977, an M.A. in paleontology from the University of California, Berkeley, in 1981, and a Ph.D. in Geology from the University of Toronto in 1987. His primary research interests include the study of dinosaur paleoenvironments and vertebrate taphonomy (the influences on vertebrate fossil preservation). He has conducted field research in Canada, Argentina, Germany, China, Mexico, and the USA, and is currently engaged in three multiyear studies:

(1) the paleoenvironments and faunal changes in the Edmonton Group of southern Alberta,

(2) the stratigraphy and paleoenvironments of middle and upper Jurassic strata in the Junggar Basin of northwestern China, and

(3) the stratigraphy and paleoenvironments of upper Cretaceous non-marine strata in Coahuila, Mexico.

He is currently enjoying the ongoing interest in Alberta's dinosaurs and upper Cretaceous gas-bearing formations.