

GRAND JUNCTION GEOLOGICAL SOCIETY

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NOTE DATE

MARCH MEETING

WEDNESDAY 7, 2018

Joint meeting with the CMU Geology Students
7:30 PM

Saccomanno Lecture Hall
(In the Wubben Science Building)

AAPG Distinguished Lecturer
Thomas Ewing

Will Speak On

“Tectonics and Subsidence in the West Texas
(Permian) Basin. a Model For Complex Intracratonic
Basin Development”

ABSTRACT ON REVERSE

Guests Are Always Welcome

TECTONICS AND SUBSIDENCE IN THE WEST TEXAS (PERMIAN) BASIN, A MODEL FOR COMPLEX INTRACRATONIC BASIN DEVELOPMENT

The West Texas (Permian) Basin is a complexly structured intracratonic (IC) basin with prolific oil and natural gas production. It began as a subsidence basin ('Tobosa Basin') from Middle Ordovician to Devonian time, a response to the Cambrian rifting that separated Gondwana and Laurentia. In the Pennsylvanian to early Permian, it formed part of the Ancestral Rocky Mountains (ARM) orogen. The Texas-New Mexico segment of the ARM contains small to medium basement-cored uplifts, folds, thrust faults and two trends of strike-slip faults, with a pattern that is consistent with SW-NE compression. The largest thrust fault known in the basin is SW-vergent, and faces the deepest part of the Delaware Basin. This direction of compression is similar to that observed in the southern Oklahoma part of the ARM, which shows NE-vergent thrusting and left-lateral faulting.

This SW-NE compressive stress is grossly inconsistent with the northwestward convergence of the Ouachita-Marathon thrust belt southeast of the ARM. The ARM-generating stress may have originated either from the Pacific side (by flat subduction) or from strong continental collision in the Appalachian Orogen. Lines of weakness generated during the Proterozoic and/or Cambrian concentrated stress and created the complex structures.

The West Texas branch of the ARM is buried by over 2.5 km of post-deformational Permian strata -- the Permian Basin. Subsidence began during ARM deformation, then increased in rate and continued to the end of the Permian. Permian subsidence resulted in the maintenance of isolated deep-water marine basins until Late Permian time. The Marathon orogen also subsided, and shed little clastic material into the basin. Despite Mesozoic basin-margin modifications, the Permian isopach pattern suggests a bowl-shaped subsidence centered on the Central Basin axis of uplift. The size and shape of the Permian Basin are similar to other IC basins (Illinois, Michigan, Williston). Similar to some IC basins, the central basin area hosts a 1100-Ma mafic complex, which was subjected to compression in Pennsylvanian time. Sinking of a mafic crust or its subjacent lithosphere, begun during compression, may have been a driving force for Permian subsidence.

Over most of the basin, later Permian subsidence was responsible for putting source rocks into the oil window. Further maturation to gas occurred within the deep basins generated by ARM deformation and Marathon thrust loading.

As of 2/20/18, 56 members have paid their 2018 dues. If you have not paid --\$15.00- make your check to the GJGS Foundation for a tax deduction as it is a non-profit organization. Bring to meeting or mail to GJGS, P O Box 4045, Grand Junction, CO 81502