



## Phytological patterns during the rise of dinosaurs in the Chinle Formation of northern New Mexico, U.S.A.

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In the Upper Triassic Chinle Formation of northern New Mexico a diverse suite of basal dinosauromorphs and dinosaurs co-existed for many millions of years. Faunas with both these basal forms and dinosaurs, and basal archosaurs have so far only been recovered from the Petrified Forest Member, whereas assemblages from the younger “siltstone” member include only dinosaurs and basal archosaurs.

New palynological data from the Paleo Sandstone, and the overlying Petrified Forest and “siltstone” members of the Chinle Formation indicate major changes in the vegetation over this interval. In general all the spore-pollen assemblages are dominated by bisaccate gymnospermous pollen, mainly *Alisporites* and *Protodiploxylinus*. However, in the Petrified Forest Member monosaccate conifer pollen assigned to *Enzonalsporites* become dominant, and this probably indicates dryer conditions. Within that same member the enigmatic palynomorph *Froelichsporites traversei* is abundant. The circumpolloid conifer pollen *Camerosporites* appears to be restricted to the Paleo Sandstone and the Petrified Forest Member. Within the overlying “siltstone” member the *Enzonalsporites* decrease in abundance, and ferns and fern allies for the first time become common components of the palynoflora; this may indicate the on-set of more humid conditions in the area.

A single crystal U-Pb IDTIMS date of  $213.1 \pm 0.4$  Ma based on 16 zircon analyses from a redeposited sandstone within the lower part of the Petrified Forest Member places most of the Chinle Formation in New Mexico within the Norian, and indicates that basal dinosauromorphs and dinosaurs co-existed for at least 15 million years. In addition, it provides better constraints on the ranges of key Late Triassic palynomorph taxa, indicating that “Carnian” palynomorph assemblages from the Chinle Formation are actually Norian in age.