

# Biostratigraphy and avian origins in northeastern China

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## *Abstract*

The Late Jurassic age frequently attributed to fossils from the Yixian Formation (Liaoning and Hebei provinces, People's Republic of China), including theropod dinosaurs with feathers or integumentary structures (for example, *Beipiaosaurus*, *Caudipteryx*, *Protarchaeopteryx*, *Sinornithosaurus* and *Sinosauropteryx*) and the primitive bird *Confuciusornis*, is based heavily on biostratigraphic arguments. However, most Yixian taxa are endemic, known only from singular localities and few specimens. Accurate biostratigraphic correlation requires geographically widespread taxa represented by many specimens and restricted stratigraphic ranges. Other support for a Late Jurassic age based on fauna-level differences from well-constrained Early Cretaceous faunas and assumed "stage of evolution" comparisons are dubious when taphonomic and paleoecological factors are taken into account. Precise dating of the beds is important because, if these are truly Late Jurassic, then the hypotheses advocating a maniraptoriform theropod ancestry of birds are complicated. Radiometric dates obtained from interbedded volcanics in the Yixian Formation yield Early Cretaceous ages, which contrast sharply with many of the biostratigraphic data, implying that the primitive Yixian taxa may be relicts. Given the problems with Yixian biostratigraphy, the radiometric data, which indicate Cretaceous ages between 120 and 25 my, must be viewed as the best evidence for the age of the Yixian Formation.

## *Keywords*

Sihetun, geochronology, Liaoning, birds, feathered dinosaurs, Yixian.

## Literature Cited

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