

## Gigantic trace fossil from the Upper Cretaceous of southern Mongolia: ecological adaptation of tiny organism to desert environment

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The reddish eolian sandstone of the Upper Cretaceous Djadokhta Formation at Bayan Zag in southwestern Mongolia, is considered to have been deposited in semi-arid desert environment. The Djadokhta Formation is not only known as famous dinosaur fossil bearing deposits, but also yields numerous and diverse trace fossils. Loope and Dingus (1999) reported a unique spreite trace fossil *Teichichnus* isp. from the eolian sandstone at the Bayan Zag. The present study provides detailed description on the trace fossil, and discusses new insight on paleoecology of the *Teichichnus*-animal adapting to desert environment.

*Teichichnus* isp. is a spiral spreite structure formed by series of long inclined burrows stacked upward. Each burrow, 1 - 2 cm diameter, consists of sandy sediments similar to surrounding strata. The exterior wall of the burrow is ornamented by many hemisphere sandy knobs, each about 5 mm diameter. Longitudinal-section of the burrow shows upward or downward meniscate structures. Cumulative spreite structure is gigantic; the width is up to 100 cm, and the height is more than 250 cm. Transverse-section of cumulative spreite represents bundle of concave-up hemisphere laminae.

It is obvious that width of the trace producing organism corresponds to that of the isolated cylindrical burrow. Hence, producer of *Teichichnus* isp. was tiny (1 - 2 cm wide), although the trace fossil is gigantic and has a complex architecture (occasionally attaining meter-scale). Concave-up sandy laminae observed in transverse-section of the spreite indicate active excavation of burrow roof and burial of burrow bottom by a deposit feeder. These behaviors cause upward migration of the tube, and produce the spreite structure. Because the internal meniscate structures show upward or downward movements of the trace-maker, cumulative spreite might be formed by successive upward or downward movement of the trace-maker. These findings represent that the trace fossil *Teichichnus* isp., namely the gigantic and complex burrow system, was formed by systematic feeding behavior of a tiny organism.

In general, sediments of desert environment are poor in organic matter and nutrient, because eolian sediments are mostly composed of siliclastic sandy particles. Hence, the systematic feeding implies adaptation of the tiny trace-maker to oligotrophic desert environment.