Vertebrate paleoichnology and paleobiology

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Fossilized tracks and trackways provide direct evidence of a trackmaker's position in time and space, as well as a record of its behavior. Because trackmakers can leave behind many tracks, often in different depositional environments than skeletal remains, ichnofossils can provide powerful insights into the paleobiology of extinct organisms. However, because trackways preserve the interaction between soft parts and substrate, their link to the skeletal remains of trackmakers can only be forged using indirect means, such as stratigraphic, geographic, and/or morphological coincidence. Recent investigation into trackmaker identification has prescribed a methodology for linking tracks and trackmakers using soft tissue features preserved in the tracks to identify skeletal synapomorphies diagnosing trackmaker clades, even introducing ichnofossils into cladistic or stratocladistic analysis. Due to the rather limited sample of anatomical information (typically only manus and pes), however, trackmaker identifications can be expected to be coarse. Despite the emphasis on trackmaker identification, interpretation of ichnofossils is not dependent on body fossils. Ichnofossils can complement the body fossil record or they can provide information that cannot be directly measured from skeletal remains. For example, ichnofossils provide distributional data that complements data from skeletal remains (e.g., geographic range of sauropods in the Early Jurassic), but they can also provide unique data for questions that body fossils can provide only ambiguous or indirect evidence (e.g., when did tetrapods first walk on land?). Ichnofossils also provide dynamic evidence of locomotion, placing them in a unique position to understand trackmaker capability and functionality (were basal ornithischians capable of both bipedal and quadrupedal locomotion? could theropods swim?). Last, ichnofossils record soft tissue anatomy, which provides a useful complement to skeletal anatomy, as well as information about structures that are not easily inferred from body fossils (e.g., bird feathers, sauropod heel pads).

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