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5th International Symposium on Lithographic Limestone and Plattenkalk

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Edited by
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JURA CH – RÉPUBLIQUE ET CANTON DU JURA

COMMISSION OF THE SWISS PALAEONTOLOGICAL MEMOIRS

IAS – International Association of Sedimentologists

IPA – International Palaeontological Association

SPG – Société Paléontologique Suisse / Schweizerische Paläontologische Gesellschaft / Società Paleontologica Svizzera

EAVP – European Association of Vertebrate Palaeontologists

Methodology of systematic excavation and documentation of dinosaur tracksites along the Transjurane highway (Canton Jura, NW Switzerland)

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Since 2002, the Palaeontology A16 has excavated dinosaur tracksites near Porrentruy along the future course of the Transjurane highway A16. This resulted in the development of a complex excavation-, documentation-, and protection-methodology of dinosaur tracksites.

First, tracksites are located by geological surveying followed by palaeontological prospecting with shovel excavators. Large-scale excavations are then planned and scheduled in agreement with the civil engineering office prior to the construction of the highway. The tracks are found on multiple superimposed palaeosurfaces within horizontally bedded laminites of Late Kimmeridgian age, which accordingly have to be excavated level-by-level. At the beginning of an excavation, as much overburden as possible is removed with the aid of shovel excavators. Within the laminites, the track-bearing levels are then excavated and cleaned with hand tools, a time-consuming and difficult affair.

Tracks are then searched for, identified, and whenever possible attributed to trackways. This includes analyses at night with oblique lighting, indispensable to find and study small tracks and track details. Simultaneously, all tracks are outlined with black chalk and labelled on the surface itself using specified acronyms. Subsequently, tracks and trackways are analyzed and described, and their parameters measured in a consistent fashion and gathered in a database. They are also photographed including stereoscopic photographs of selected tracks. Further, macrosedimentary features (e.g., desiccation cracks, ripple marks) are analyzed and the encasing sediment is logged and sampled.

Afterwards, a geo-referenced 2x2 metre grid is installed on the surface and tracks and normal faults are drawn at a scale of 1:10 or 1:20. These drawings are vectorized in the office and assembled in a map. As outline drawings represent one person's simplified interpretation of a complex three-dimensional object, the most important palaeosurfaces are likewise documented with 3D imaging techniques using high-resolution laser scanning and extreme close-range (2-10 m from camera to object) photogrammetry. These are merged in a virtual 3D model, on the basis of which tracks and trackways can easily be vectorized and their parameters measured in CAD software, if previously they were labelled and outlined with chalk. Similarly assembled data can later also be integrated into a GIS database.

If a surface is going to be destroyed or exposed to weathering after excavation the 3D documentation is the most accurate way to document its original state, especially if applied together with complementary, classical illustrative and descriptive techniques as well as replicas. Consequently, future generations of researchers will have access to virtually the same database. Nonetheless, judging by our own experience, the 3D methods cannot fully replace careful observations and descriptions of the actual tracks in the field because the interpretation of small tracks or track details (e.g., digital pads, claws, skin impressions), poorly-preserved tracks, and/or crossing trackways (track interferences) is a difficult and subjective task done at best on the original specimens. Also, 3D methods are expensive and cannot always be applied. Another drawback is that adequate safeguarding of the imaging data for posterity may be difficult to guarantee. After their documentation, the most important tracks and trackways are either recovered as slabs or replicated, and then the underlying level is excavated. Such level-by-level excavation and documentation offer important insight into the formation, taphonomy, and preservation of tracks, notably the identification of undertracks, true tracks, and overtracks.

At the end of an excavation recovered slabs, samples, and replicas are archived, and the documentation (e.g., photographs, track parameters, etc.) is assembled in a database (collection and documentation management). The main track level of the Transjurane tracksites is commonly located at the top of massive limestone and at the base of laminites. Consequently, it cannot be removed and will be either covered or (partially) destroyed by the construction of the highway. The importance of a tracksite has to be evaluated "in context" based on abundance, quality, and uniqueness of the tracks. Whenever possible it has to be preserved as a geotope *in situ*. Actually, a tracksite is already preserved for posterity by the construction of an additional highway bridge.