

A Cambrian detective story by Agatha Cruziana

This activity features trace fossils which are probably related to the activity of trilobites. The activity was produced by Peter Kennett (Kennett, 1986) and linked to an article and data response questions on the understanding of trace fossils which were written by David Thompson (Thompson, 1986). These items were published in the same issue of *Geology Teaching* as Peter's activity. The original diagram for this exercise has been updated. Additional diagrams, photographs and web links have been added to extend the activity and to give background information about the trace fossils featured in the activity. Images include new photographs of some of the trace fossil specimens originally collected by Peter Crimes (Crimes, 1970).

Introduction to trace fossils associated with trilobites

The study of trace fossils (ichnology) is concerned with understanding how sediment is disturbed by living organisms. Trace fossils are therefore called biogenic sedimentary structures. These fossils often occur in places where no body fossils have been preserved or where only soft-bodied organisms lived. Examples of trace fossils are tracks, trails, burrows and borings. These fossils are an important record of life and events that took place at the time of deposition, or soon after the sediment was deposited. Trace fossils are useful because they may be used to interpret the environment of deposition. They also make it possible to determine whether layers of rock are the right way up. Trails of bottom feeders, u-shaped burrows of suspension feeders and traces of root systems for example can provide clear evidence of way-up.

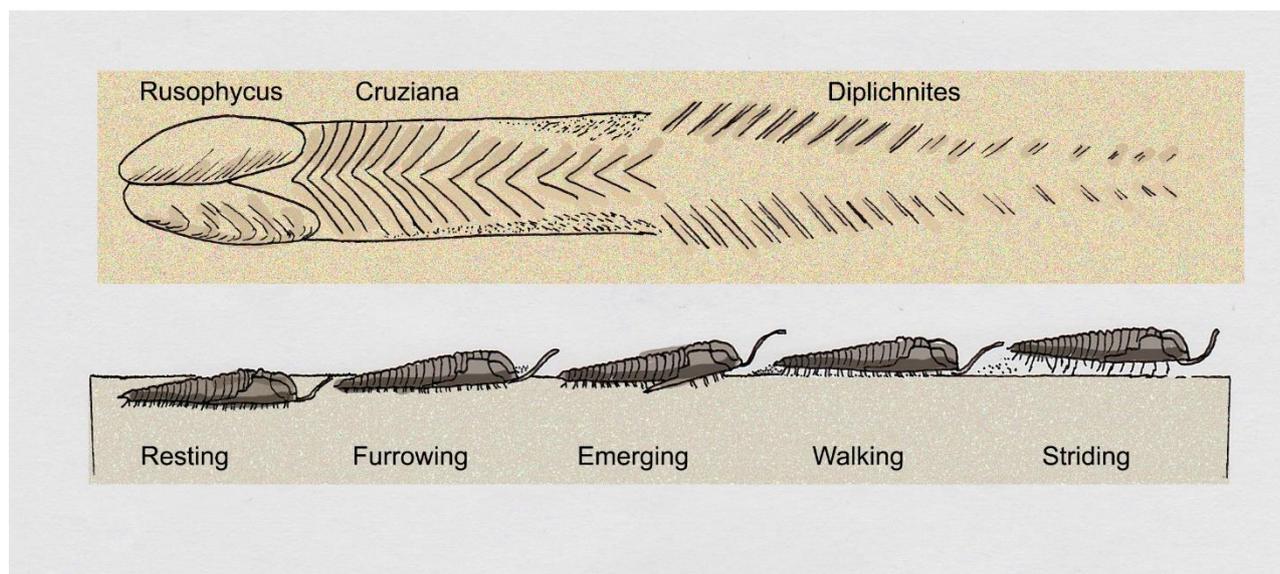


Figure 1: Diagram of an idealised trace fossil suite and modes of activity of trilobites which may be related to the different trace fossils marks. [Adapted from the Treatise of Invertebrate Palaeontology, Part W. Trace Fossils (Revised)]

Three main named trace fossils associated with trilobites are *Rusophycus*, *Cruziana* and *Diplichnites* (Figure 1). A resting trilobite, partially buried in sediment, leaves a two-lobed impression called *Rusophycus*. Tracks left by partially buried trilobites as they moved or furrowed through sediment are known as *Cruziana*. These tracks have parallel outer furrows, marking the widest part of the shell, and chevron-shaped marks in their centre, produced as the trilobite moved its legs. *Diplichnites* is the trace fossil formed as the trilobite walked or strode across the sediment surface. These trace fossils are paired leg marks: their spacing is related to how quickly the animal was moving across the surface.

Examples of trace fossils

Figures 2 - 8 show photographs of different trace fossils associated with trilobites. Trace fossils 2 – 5 are from the collection made by Peter Crimes during the time he worked at the University of Liverpool. For this exercise, try giving your students a copies of these photographs and ask them identify the different trace fossils.



Figure 2: Photograph of a trace fossil 1 (Photo Peter Williams)



Figure 3: Photograph of a trace fossil 2 (Photo Peter Williams)



Figure 4: Photograph of a trace fossil 3 (Photo Peter Williams)



Figure 5: Photograph of a trace fossil 4 (Photo Peter Williams)



Figure 6: Photograph of a trace fossil 5 (Photo Peter Williams)



Figure 7: Photograph of a trace fossil 6 (Photo Kennethcgass at English Wikipedia)

A Cambrian detective story – the activity

For this exercise, try giving your students a copy of Figure 8 and ask them, given the following information, to try to work out all that happened in the correct sequence, on the bed of the Cambrian sea 520 million years ago.

1. The drawing represents the upper surface of a slab of shale which was overlain by sandstone (Figure 8).
2. The marks shown on the slab are common in rocks of Cambrian and Ordovician age, but less common and less diverse in rocks of Silurian to Permian age. They are not known in Mesozoic or Cenozoic rocks.
3. The marks only occur in rocks which can be inferred (from associated fauna) to have been of marine origin.
4. Few body fossils have yet been found in close association with the linear marks, but trilobites have been occasionally found with these linear marks. In the Ordovician, trilobites have been found occasionally in the heart-shaped depressions

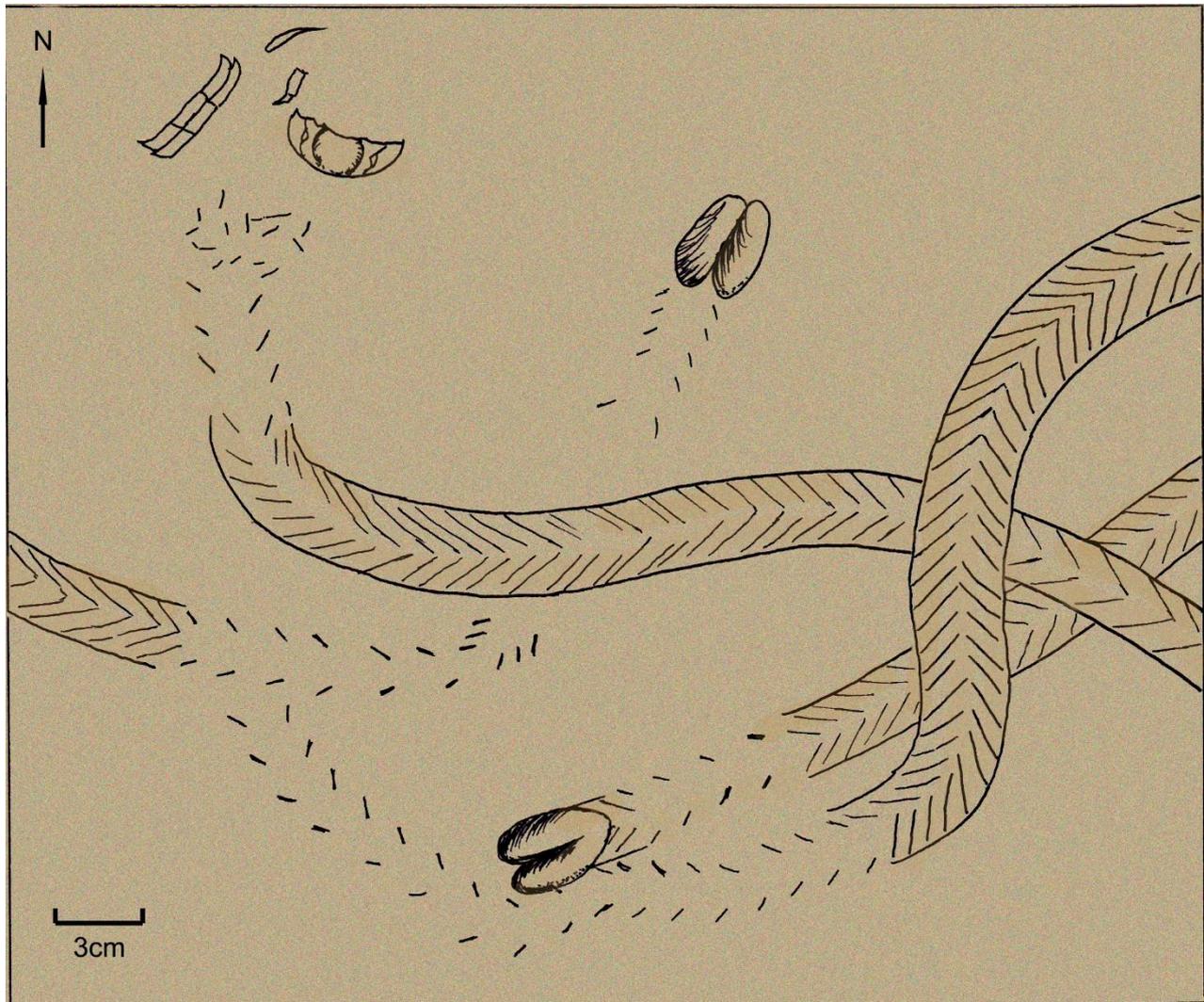


Figure 8: Drawing of the marks found on the upper surface of a slab of shale which was overlain by sandstone.

References

Crimes, T.P. and Harper, J.C. (eds) (1970) Trace fossils. Liverpool: Seel House Press.

Kennett, P. (1986) A Cambrian detective story by Agatha Cruziana. *Geology Teaching*, **11** (1), p.26.

Thompson, D.B. (1986) Exercises on the understanding of trace fossils. *Geology Teaching*. 11 (1), pp 22 – 25.

1. Trilobite types shown in video clips from the BBC series *Lost Worlds, Vanished Lives* - <http://www.bbc.co.uk/nature/life/Trilobite> [Accessed November 2015]

2. Where to download a cut-out model of a trilobite - <http://www.bgs.ac.uk/discoveringGeology/time/puppets/trilobite.html> [Accessed November 2015]

3. An award-winning website devoted to understanding trilobites and which contains a large collection of trilobite photographs - <http://www.trilobites.info/> [Accessed November 2015]

4. Life styles of trilobites -

<http://www.cornellcollege.edu/geology/courses/greenstein/paleo/trilobites.pdf> [Accessed November 2015]

5. A useful gallery of trilobites from different parts of the world -

<http://www.amnh.org/our-research/paleontology/faq/trilobite-website> [Accessed November 2015]

6. A useful source of information about trilobites - <https://en.wikipedia.org/wiki/Trilobite> [Accessed November 2015]

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