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Conference Logo: The logo for the 2012 Canadian Paleontology Conference is inspired by the fossils of the Burgess Shale. *Anomalocaris canadensis*, the top predator of its time and arguably the most iconic animal of the Cambrian Explosion, is backed by the dramatic Toronto skyline. The lobopod *Hallucigenia sparsa* remains one of the most enigmatic Burgess Shale fossils. The Royal Ontario Museum houses the largest collection of Burgess Shale fossils in the world, with ongoing expeditions since 1975.

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MIRABEL'S ANCIENT SURFERS: INSIGHTS FROM CAMBRIAN TRACE FOSSILS AND SEDIMENTOLOGY OF THE POTSDAM GROUP, QUÉBEC

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Trace fossils from Cambrian sandy coastal facies provide insights about the initial colonization of land by animals, and the Potsdam Group of Québec, Ontario, and New York contains some of the best-preserved evidence for this event. Fine-to medium-grained quartz arenites of the "upper" Potsdam Group (Series 3-Furongian) in Mirabel, Québec have primary sedimentary structures and paleocurrents that are internally consistent with deposition in emergent to extremely shallow sandy marine settings. Some unrippled surfaces were blanketed by microbial films whereas others were dominated by wind blowing across damp sand. The strata also contain a low-diversity assemblage of trace fossils including forms typical of epicratonic sheet sandstones elsewhere, including the small, bed-parallel furrows, cf. *Archaeonassa*, *Diplichnites* and *Protichnites* trackways, *Climactichnites* trails, and shallow bed-penetrating non-spreiten cf. *Teichichnus* burrows. The *Diplichnites-Protichnites* and *Climactichnites* trackways are extremely large relative to occurrence from elsewhere in the world, with trackway widths more than double the size of comparable trackways elsewhere. Pushback mounds in *Diplichnites* trackways together with medial ridges, internal collapse features, and folded lateral ridges in *Climactichnites* suggest their producers moved across moist cohesive but unsaturated sand as well as saturated sediment. Considered together, these features suggest that large euthycarcinoid arthropods, soft-footed molluscs, and perhaps other animals inhabited the intermittently emergent sand flats of southern Québec nearly 500 million years ago.

TESTING EVOLUTIONARY SIZE TRENDS IN THE SKULLS OF OPHIACODONTIDS (SYNAPSIDA, EUPELYCOSAURIA)

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Members of the synapsid family Ophiacodontidae provide the earliest record of amniote diversification, and are known from the Middle Pennsylvanian to Early Permian of North America and Europe. Within the family, there is a clear trend of increasing body size, from the smallest ophiacodontid, the Middle Pennsylvanian species *Archaeothyris florensis*, to the largest, *Ophiacodon major* from the Early Permian. Increasing skull length relative to trunk length through time has also been reported within Ophiacodontidae, with the

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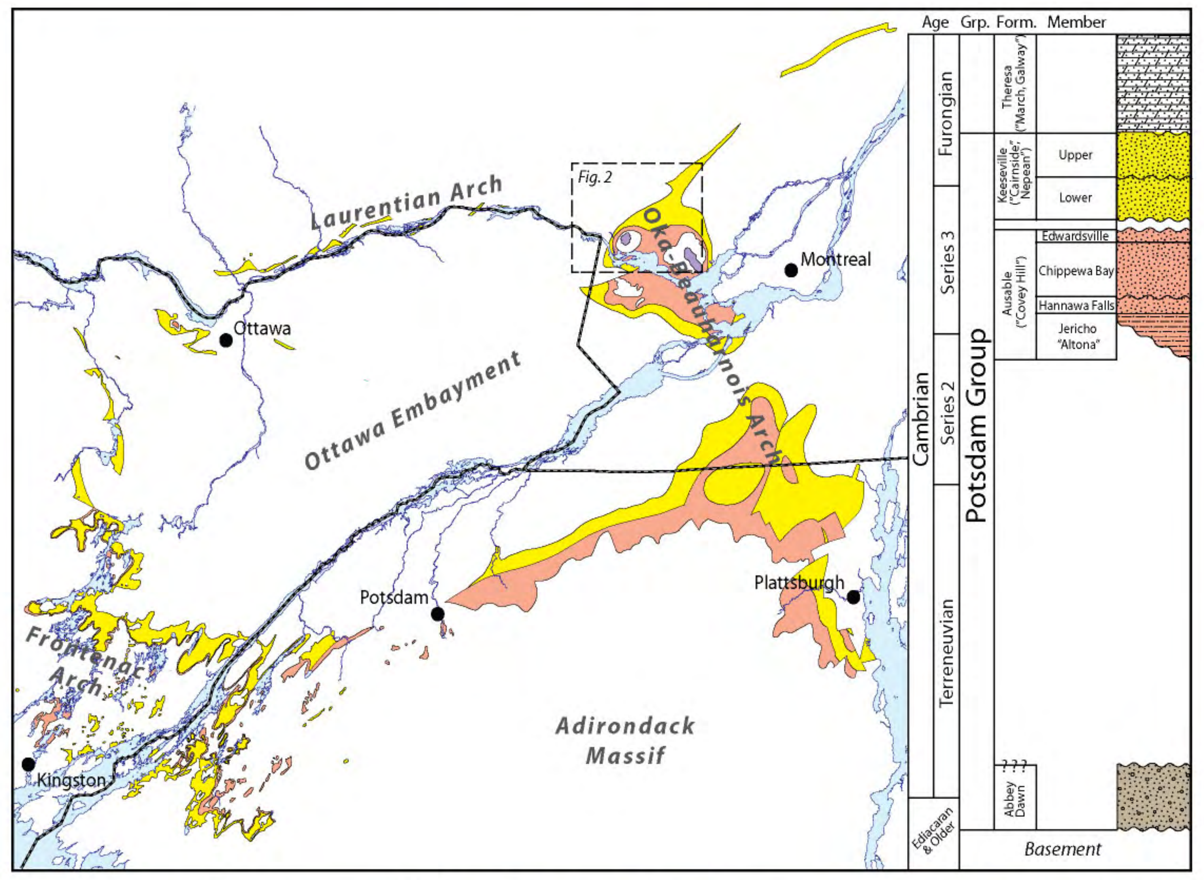
ABSTRACT

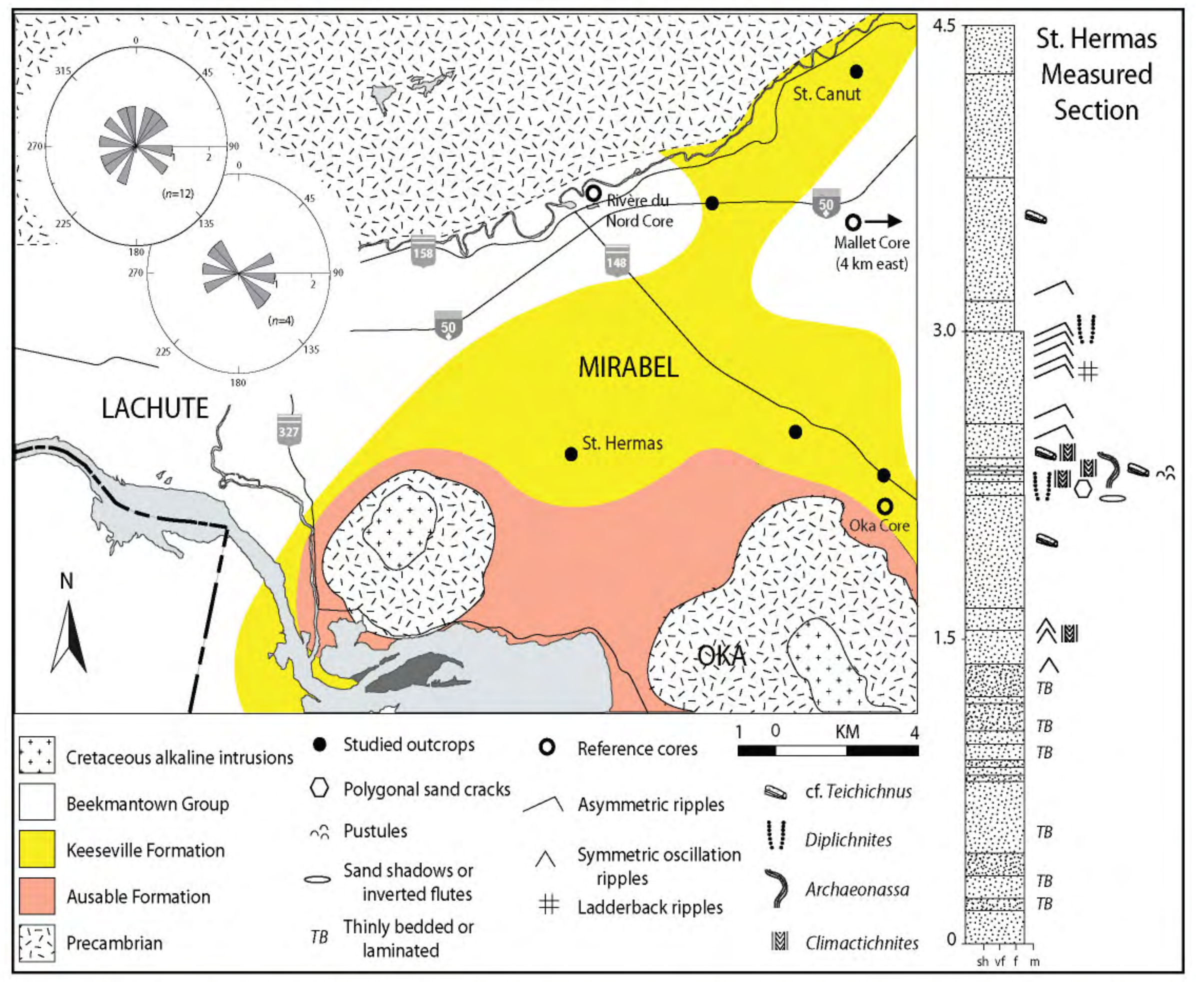
Trace fossils from Cambrian sandy coastal facies provide insights about the initial colonization of land by animals, and the Potsdam Group of Quebec, Ontario, and New York contains some of the best-preserved evidence for this event. Quartz arenites of the Series 3-Furongian Keeseville Formation ("upper" Potsdam Group) in Mirabel, Quebec have primary sedimentary structures and paleocurrents that are consistent with deposition in an emergent to extremely shallow sandy marine setting in which some surfaces were blanketed by microbial films or mats. The strata contain a low-diversity assemblage of trace fossils, including the small bed-parallel furrows *Archaeonassa*, *Diplichnites* and *Protichnites* trackways, *Climactichnites* trails, and shallow bed-penetrating cf. *Teichichnus* burrows. The *Diplichnites* and *Climactichnites* trackways are extremely large, with trackway widths more than double the size of comparable trackways elsewhere. Pushback mounds in *Diplichnites* trackways and medial ridges, internal collapse features, and folded lateral ridges in *Climactichnites* suggest their producers moved across moist cohesive sand as well as water-saturated sand. Considered together, these features suggest that large euthycarcinoid arthropods, soft-footed molluscs, and perhaps other animals inhabited the intermittently emergent sand flats of southern Quebec, nearly 500 million years ago.

STRATIGRAPHY AND GEOLOGIC CONTEXT



Regional geologic and stratigraphic context for the Potsdam Group. Surface exposures of the Ausable Fm. (pink) and Keeseville Fm. (yellow) are indicated; surface exposures of the Abbey Dawn Fm. are so small that they are not visible in plan view. The relative thickness of the upper and lower member of the Keeseville Fm. is not known and the relative location of the disconformity between the units is stylized. The contact between the Keeseville Fm. and the Theresa Fm. is locally conformable, and elsewhere is disconformable.

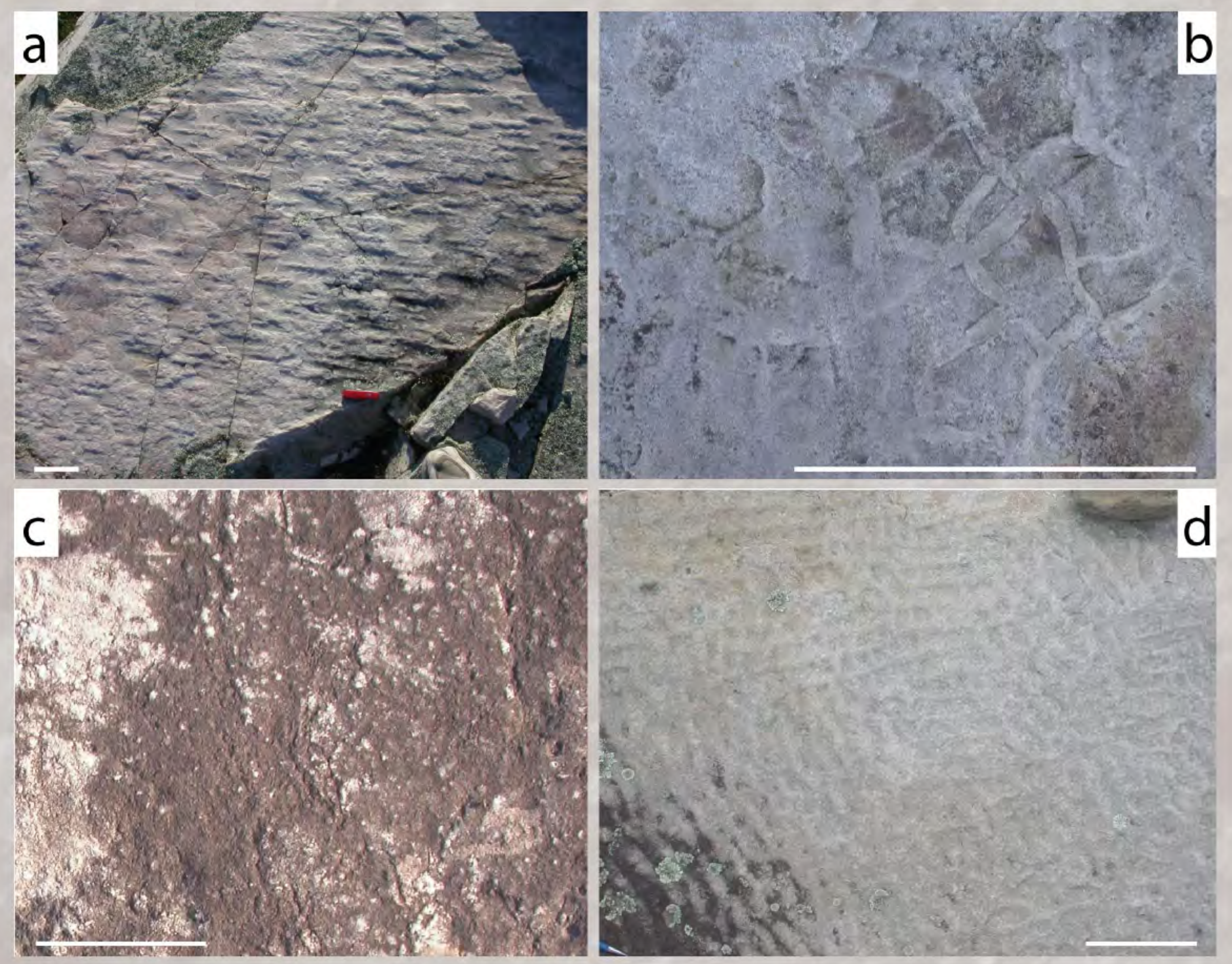
SEDIMENTOLOGY, PALEOCURRENTS AND STUDIED LOCALITIES



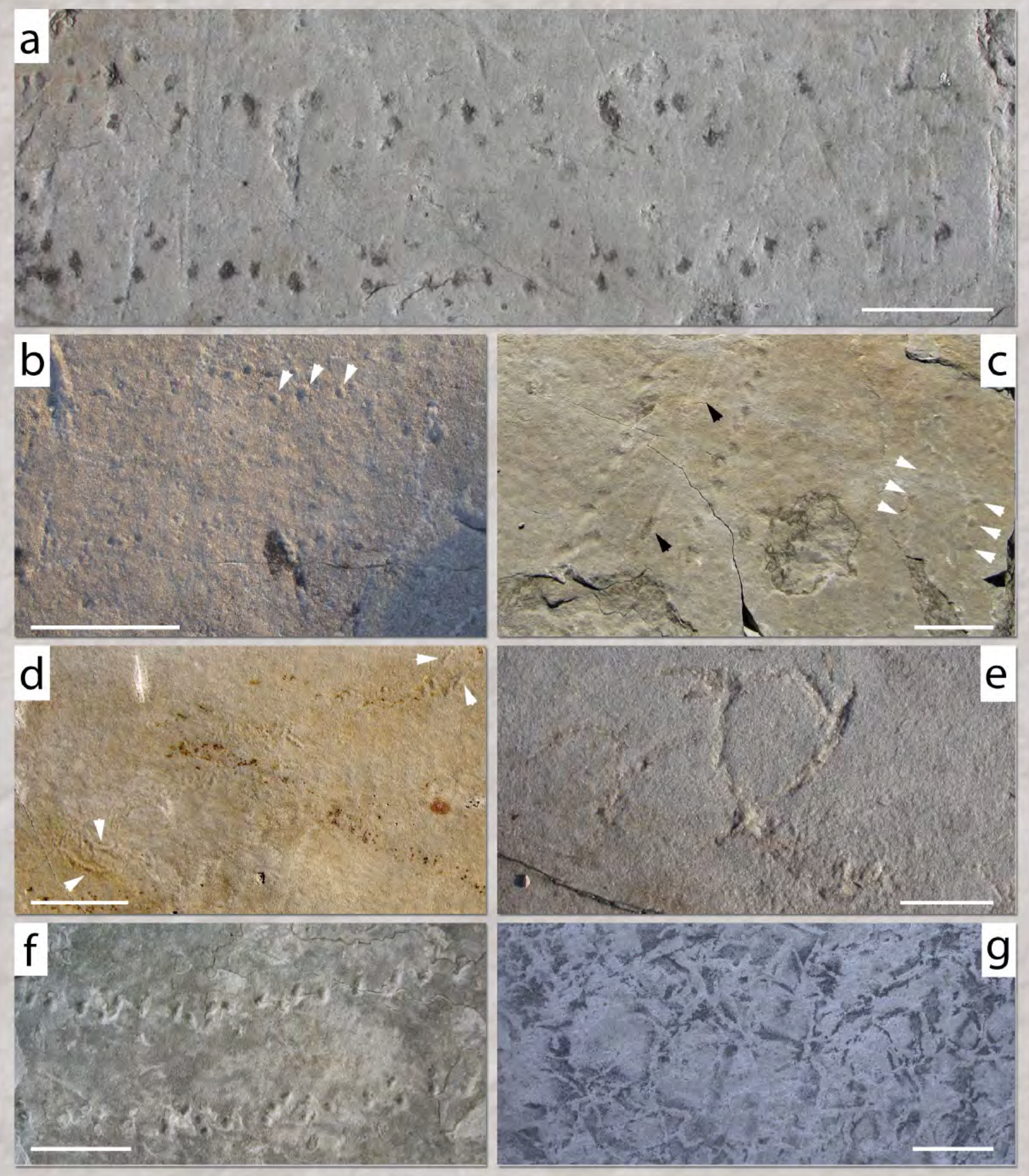
Geographic and geologic context. Graphic log and paleocurrent roses are from exposures at Ferme Leroux, near St. Hermas. Exposures at this site are isolated, and may be part of the upper or lower member of the Keeseville Fm. Solid circles are outcrops examined as part of this study; open circles are cores logged by previous workers. Paleocurrents are based on plan-view exposures of ripples, and are plotted as unidirectional flow directions (upper left) or bidirectional flow directions (lower right) relative to present-day north.

SEDIMENTARY STRUCTURES

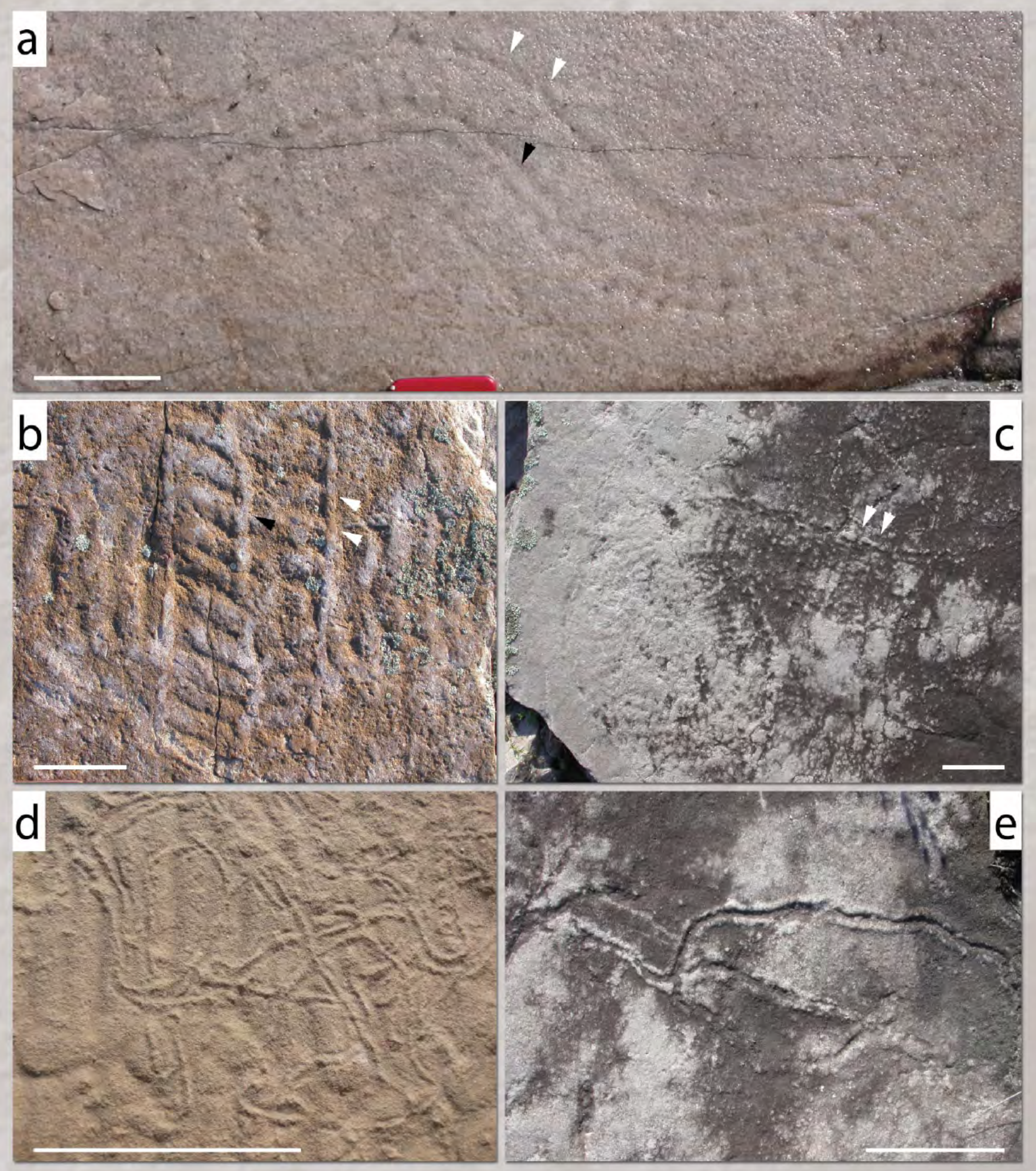
Sedimentary structures suggesting shallow, subaerial, and/or microbial depositonal processes; all images are bed tops. (**a**) Sand-shadows (aka 'setulfs', inverted flutes) form in either subaerial or subaqueous settings, and can be microbially mediated. (**b**) Polygonal sand cracks are similar but can also be produced by subaerial dessication. (**c**) Pustular to knobby bedding planes (white dots in photo) can also be microbially mediated, as biofilms form small domal buildups that mantle pre-existing bedding features, such as the Archaeonassa furrows pictured here. (**d**) Ladder-back ripples suggest sediment reworking in extremely shallow-water. (**e**) Patchy ripples are abundant at some sites, with areas between oscillation and ladderback ripples characterized by knobby to pustular raised bumps of sand, akin to surfaces in (**c**) and on other microbially bound bed surfaces. All scale bars are 10 cm. Images a-d: St. Hermas; e: St. Canut.



TRACE FOSSILS



Key trace fossils. (**a**, **b**, **c** - right, **f**) *Diplichnites* is characterized by two parallel tracks rows composed of overlapping series of tracks that vary in shape from subround to slightly elongated or ellipsoidal. Examples with pushback mounds (arrowheads in (**b**)), and examples that occur on bed surfaces with adhesion structures are not likely undertracks; their lack of central drag marks suggest that some tracemakers held their tails aloft, a behavior that has been documented from eolian facies elsewhere in the Potsdam Group. (**c** - left) *Protichnites* have tapering dragged central abdomen impressions (black arrowheads). (**d**) Drag marks (two sets indicated by arrowheads) also occur and appear to be part of squiggly to meandering (i.e., not straight, arcuate or sinuous) trackways in which there are multiple series of these paired impressions. This trackway example extends from lower left to upper right. (**e**, **g**) Shallow scoop- to trough-shaped bed-penetrating burrows interpreted as cf. *Teichichnus* include an example from a horizon ~1 cm below the bed that was initially burrowed by the tracemakers (**e**) and an example from the top of an oscillation rippled bed (**g**) interpreted to represent the seawater-sediment interface at the time of burrowing. These types of traces are common in lithologically homogenous epicratonic sheet sandstones and although their preservation suggests they were formed by successive excavation of a trough-like burrow at greater and greater depths, they lack visible spreiten. All scale bars are 10 cm. Images a, b, e, g: St. Hermas; c, d, f: St. Canut. All images are bed-tops except for (f).



Trace fossils of bed-parallel furrowing. (**a**, **b**, **c**) *Climactichites* trails have preservational characteristics that are environmentally diagnostic. The trail in (**a**) has collapsed lateral ridges preserved in negative epirelief (white arrowheads) as well as collapsed or shallow transverse furrows that are arranged perpendicular to the longitudinal axis of the trace and whose most prominent demarcation is where each intervening transverse bar joins with a sunken central ridge (black arrowhead); these features are typical of *Climactichnites* produced on the surface of wet to soupy semi-cohesive sediment. The trail in (**b**) has well-defined and overlapping to continuous raised lateral ridges (white arrowheads) and well-defined deep chevron-shaped transverse bars and furrows whose apexes terminate in a well-defined raised central mound; these features are consistent with traces produced on moist and/or microbially influenced sediment. The looping trail in (**c**) has well-defined but shallow straight transverse bars and furrows, and beaded to crenulated lateral ridges with scalloped depressions between the lateral tips of transverse bars and lateral ridges; such features are typical of modern gastropod trails that are formed in damp to dry sediment and/or under intermittently subaerial and microbially dominated conditions. This bed and the trails on it are mantled by many small dome-shaped bumps and pustules, possibly representing microbial binding of the surface after tracemaking activity occurred. (**d**, **e**) Furrows that lack transverse bars can be placed within the loosely defined ichnogenus *Archaeonassa*. All scale bars are 10 cm. Images a, c-e: St. Hermas; b: St. Canut.

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