

## In a galaxy far, far away... traces? Astrobiological potential of ichnology

Andrea Baucon <sup>ab\*</sup>, Carlos Neto de Carvalho <sup>b</sup>, Roberto Barbieri <sup>c</sup>, Federico Bernardini <sup>d</sup>, Barabara Cavalazzi <sup>c</sup>, Antonio Celani <sup>e</sup>, Fabrizio Felletti <sup>f</sup>, Annalisa Ferretti <sup>a</sup>, Hans Peter Schoenlaub <sup>g</sup>, Antonio Todaro <sup>a</sup>, Claudio Tuniz <sup>c</sup>

<sup>a</sup> *Università di Modena, Dipartimento di Scienze Chimiche e Geologiche, via Campi, 103 - 41125 Modena (\* corresponding author; andrea@tracemaker.com; ^ presenting author)*

<sup>b</sup> *Geopark Naturtejo da Meseta Meridional – UNESCO Global Geopark. Geology and Palaeontology Office, Municipality of Idanha-a-Nova – Centro Cultural Raiano. Av. Joaquim Morão, 6060-101 Idanha-a-Nova, Portugal*

<sup>d</sup> *ICTP - Strada Costiera, 11 I - 34151 Trieste Italy*

<sup>e</sup> *Università di Bologna - Via Zamboni, 33 - 40126 Bologna*

<sup>f</sup> *Università di Milano, Dipartimento di Scienze della Terra “Ardito Desio”, Via Mangiagalli, 34 20133 - Milano*

<sup>g</sup> *GeoPark Karnische Alpen 9635 Dellach/Gail 65 Austria*

**Keywords:** astrobiology, biosignatures, exobiology

Organism-substrate interactions and their products – individual traces and ichnofabrics – are important biosignatures on Earth as they represent direct evidence of biological behaviour.

Nevertheless, ichnology received relatively little attention as a tool for searching life beyond Earth, and iconic traces such as burrows, footprints and coprolites have widely been ignored in the field of astrobiology, with few exceptions (microbially induced sedimentary structures, microborings).

In the context of astrobiology, traces are characterized by the following characteristics:

- 1) Trace fossils preserve the activity of soft-bodied organisms;
- 2) Biogenic structures are resilient to processes that obliterate other biosignatures (e.g. mechanical and chemical degradation, diagenesis, tectonism, metamorphism);
- 3) Traces are very visible biosignatures;
- 4) Traces indicate environment and behaviour;
- 5) Traces are evidences of behaviour, therefore they can indicate life independently from morphology, size and biochemistry of tracemakers.

These properties make ichnology a promising tool for the search for present and past life beyond Earth.

This work has been supported by the ROSAE project.