PROJECT TITLE: ***Did the hydrodynamic performance of harpid trilobites change during growth?***

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Project keywords: trilobites, Computational Fluid Dynamics, ontogeny, morphometrics

Proposed start date: 8 July 2024

Project description:

Trilobites were a diverse clade of Palaeozoic arthropods known from more than 20,000 species, that originated during the Cambrian period over 500 million years ago, becoming extinct 250 million years later during the Permian Mass Extinction. During this time, the group displayed a huge array of different morphologies, of which the harpids – with their large cephalon, extensive fringe, genal prolongations and short simple thorax and pygidium – represent an unusual group.

A number of hypotheses have been put forward for the function of the harpid brim, however other aspects, such as the role of genal prolongations, have received less attention. Trilobites grew by moulting, making it necessary that any functional hypothesis withstand testing across a range of different sizes as the animal grew.

For this project, the student will first use morphometrics to quantify the changing morphology of the harpid trilobite *Bohemoharpes ungula* from the Ordovician of Bohemia, using 3D models of museum specimens (already available). Particular attention will be paid to the changing morphology of the cephalon, including length of genal projections and relative size of the fringe. Then the hydrodynamic performance of the trilobite will be assessed, with reflection on the morphology and different flow speeds commonly experienced by animals that live in similar environments today.

The student will thus resolve the extent to which the cephalon of *Bohemoharpes ungula* was shaped by increasing hydrodynamic demands with increased size. Depending on time, there is the opportunity to expand the scope of this project to explore more harpid species (3D models are available).

Candidate requirements: Enthusiasm for learning new software; interest in fossil arthropods; some knowledge of trilobite anatomy; some experience of R.

Background reading: Beech & Lamsdell 2021 *Papers in Palaeontology* https://doi.org/10.1002/spp2.1399; Pates & Drage 2024 *BioRxiv* https://doi.org/10.1101/2024.01.26.577348

Approximate Work Schedule in weeks: Week 1:Reading, preparing dataset, familiarisation with software to be used; Weeks 2-4: Morphometric data collection and analysis; Weeks 5-6: Fluid dynamics simulations and discussion of results; Week 7: Finalise figures, prepare report and short talk for group; Week 8: Finalise report, reflections on report with supervisor, feedback on short presentation, consider future goals.