# Origin and early diversification of Artiopoda

Yang Yang* , Jean Vannier[1], and Qiang Ou[2,3]

[1]Laboratoire de Géologie de Lyon - Terre, Planètes, Environnement [Lyon] – Université Claude Bernard Lyon 1 – France

[2]China University of Geosciences, Beijing (CUGB) – Early Life Evolution Laboratory, State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences, Beijing 100083, Chine

[3]University of Kassel – Department of Zoology, University of Kassel, 34132 Kassel, Allemagne

**Résumé**

The phylogeny of arthropods has long been debated. However, recent phylogenies provide a clear framework and possible evolutionary scenarios to be tested. Their are two main arthropod branches on the top of the tree, the mandibulates and the chelicerates with millions of extant species and a third important extinct clade, the artiopoda that contains the iconic trilobites. The trilobites that were a key element of marine ecosystems throughout the Palaeozoic. Artiopods are represented by a great variety of dorso-ventrally flattened euarthropods adapted to living on the seafloor. The phylogenetic relationships between artiopods remains very unclear and the relation of Artiopoda, Chelicerata and Mandibulata equally unresolved. Here we describe new well-preserved material of Acanthomeridion which appears in a basal position in recent phylogenetic analyses. *Acanthomeridion* is a well-documented species with a well-preserved holotype from the Chengjiang Lagerstätte. The additional fossil material I am studying is also from the Chengjiang Lagerstätte but a different locality and reveals key new features including the cephalic exoskeletal elements and appendages, eyes, trunk tergites and ventral plates and the tail area. These new specimens lead to a better definition of *Acanthomeridion*. Artiopodan euarthropod with a semi-elliptical head shield bearing a pair of narrow librigenae. Lateral margin of head shield with an optic notch accommodating an elliptical stalked eye. Trunk composed of 11 tergites (T1-T11) that gradually change from a sub-rectangular to an inverted U-shape from anterior to posterior. Last tergite forms two lobe-like branches almost parallel to the sagittal plane. Axial area with moderate lobe-like relief tapering gradually in width from 1st to last tergite. Pleural ends pointed. T9 with more elongated posteriorly directed pleural extensions. Termination a very small telson spine, with bipartite ventral posterior sclerite. Libriginae with a ventral doublure connect to a trapezoidal hypostome and pre-hypostome sclerite. Uniramous antennules. Lateral eyes protruding through eye notch, possibly stalked and compound (ommatidia). Four post-antennular head appendages with gnathobasipods bearing strong opposing serrated margins and a 6-segmented endopod bearing endites. Trunk appendages biramous. We compared *Acanthomeridion* with trilobites, identifying homologous structures like the librigena and pre-hypostomal sclerite, and reconstructed its molting process. These insights suggest that *Acanthomeridion* may represent an ancestral artiopod form, leading to trilobite features like dorsally positioned eyes and sinuous sutures. Additionally, *Acanthomeridion* shares postventral plate features with aglaspidids, offering clues to the origin of this

*Intervenant

structure and its function. Bayesian phylogenetic analyses provides a comprehensive phylogenetic framework to evaluate the evolutionary placement of *Acanthomeridion* and related artiopods. New knowledge of cephalic features, not least the lateral eye notches, liberigenae, and facial sutures, of *Acanthomeridion* provides new insights into the chephalic evolution of arthropods, suggesting that both liberigenae and eye notches might have convergently evolved.