Title: " **Bone Cells to Big Dinos: Using Liquid Crystal Polarimetry as a New Tool to Learn about Fossil Vertebrates.**"

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Abstract:

Over the past century, palaeontology has progressively embraced quantitative methods, enriching its traditionally qualitative domain. Integration of multivariate statistical analyses and imaging modalities has made the quantification of morphological characteristics possible. However, despite the growing importance of quantitative approaches in palaeontological research, palaeohistology, the study of fossilized bone microstructure, has remained predominantly qualitative. Here we introduce a modification to Liquid Crystal Polarimetry (LCP), an imaging modality not previously applied to fossil tissues, that permits the direct measurement of fossil bone microstructure, providing unique quantitative insights into the fossil record. This new methodological workflow offers promising avenues for advancing our understanding of ancient life through the quantitative identification of shifts in bone fibre density and orientation.