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Towards a better understanding of the origins of microlens arrays in Mesozoic echinoderm

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Echinoderms possess a unique “all-purpose” endoskeletal tissue called stereom, which can be optimized for multiple functions. For instance, one of the most fascinating biominerals can be found in some light sensitive brittle stars and star fish. These echinoderms form calcitic plates with multi-lens arrays acting as photosensory organs [1]. The evolutionary origins of these lens-like microstructures are not clear. It has been recently suggested that the origins of such visual systems with microlenses can be traced back to at least the Late Cretaceous (Campanian, 79 Ma) [2]. Here we show that similar microlens arrays have been acquired in the Early Cretaceous (Valanginian, 136 MA) brittle stars and star fish that are approximately 57 million years older than the oldest echinoderms with microlenses described so far. Data on developmental mechanisms of microlenses in recent echinoderms suggest that such sophisticated photosensory organs in Cretaceous echinoderms likely evolved by secondary deposition of calcite on the pre-existing porous tubercles that were already present in ancestral Jurassic forms.

References:

[1] S Aizenberg J, Tkachenko A, Weiner S, Addadi L and Hendler G (2001) *Nature* 412: 819-822.

[2] Gorzelałak P, Salamon MA, Lach R, Loba M and Ferré B (2014) *Nat. Commun.* 5: 3576 (doi 10.1038/ncomms4576).

