EXCEPTIONALLY PRESERVED AMMONITES FROM THE CHARMOUTH MUDSTONE FORMATION (LOWER JURASSIC) AND THEIR SIGNIFICANCE FOR AMMONITE TAPHONOMY

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Very rarely, examples of ammonites that are preserved in nodules from the Charmouth Mudstone Formation in Dorset, UK, retain some shell material attached to the internal mould of the shell. The shell material is always only a very thin, highly iridescent veneer of the innermost shell layer and only occurs at the rear of the body-chamber. Normally ammonites preserved in nodules part cleanly between the inner shell and the internal mould when the nodules are split. The body-chambers are filled with various amounts of sediment and diagenetic calcite, but the anterior boundaries of the iridescent veneer and of the diagenetic calcite fill do not coincide. Equally, nodules with several ammonites only one of which is iridescent indicate that the iridescence is not due to unusual preservation of a specific nodule. Thus, this exceptional preservation indicates an original difference in the shell microarchitecture between the rear and front of the ammonite body-chamber rather than a result of diagenesis. The small amount of sediment in the anterior body-chambers of most examples suggests these ammonites could retract their bodies a short distance into the shell when threatened.

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INTRODUCTION

Ammonites are common fossils in nodules within the Charmouth Mudstone Formation of Dorset (e.g. Cope, 1994; Curtis *et al*., 2000; Page, 2004, 2010 and references therein; Andrew *et al*., 2010). Most commonly, the nodules are split open to reveal perfectly preserved, uncrushed ammonites within (e.g. Cope 1994, pls 1, 2; Andrew *et al*., 2010, figs 2, 5, 11, 12). When the nodule is split, normally the ammonite shell parts from the internal mould along its smooth inner surface, thus revealing the fill of sedimentary rock and diagenetic calcite that makes up the internal mould. In uncrushed ammonites from within nodules the phragmocone chambers are almost always undamaged and filled with diagenetic calcite. In contrast, the body-chambers usually contain some original sediment, which may fill the entire body-chamber or be confined to variable amounts of the anterior portion only. The preservation of these clean internal moulds also allows study of the ammonite suture lines, which help determine whether or not the ammonites are fully grown.

Very rarely (perhaps one in 500-1000 specimens) the ammonites preserved in nodules are iridescent. Cope (1994, p. 58) mentioned that "*Occasionally iridescent aragonite is preserved as a thin layer on these internal moulds*", but did not specify where on the ammonites the thin layer occurred. In the examples described herein the iridescent veneer of presumed aragonite is very thin and confined to the rear of the body-chamber; it does not extend back onto the phragmocone, nor forward into the anterior of the body-chamber. In these exceptionally preserved ammonites the boundaries between the iridescent and 'normal' parts of the body-chamber and those between the diagenetic calcite-filled and sediment-filled parts do not coincide. Thus, it would seem the presence of the iridescence is unrelated to the fill of the body-chamber. This is especially true of a small number of examples in which the sediment preserves a geopetal fill. Thus, one side of the body-chamber is sediment-filled and the other side calcite-filled. Furthermore, we have seen several examples of nodules with more than one ammonite preserved within, only one or in one case (LYMPH 2015/21) two of which show the unusual iridescence. So, again, it would seem this is not the result of some unusual diagenetic reaction within a specific nodule. Close inspection shows that the iridescence is due to a very thin veneer of the original ammonite shell remaining attached to the internal mould and showing the pearly lustre characteristic of the inner layers of all molluscan shells. The question then arises, 'why should only the rear part of the body-chamber split within the shell layers to allow the veneer to remain attached to the internal mould, when the other parts of the shell split from the internal mould along the inner shell surface?' Most of the ammonites belong to the genus *Promicroceras* Spath, 1926, the commonest ammonite genus at the stratigraphic interval from which most of our specimens originate, but we have also seen rare examples of iridescent *Asteroceras* Hyatt, 1867, *Xipheroceras* Buckman, 1911 and even one Upper Liassic *Dactylioceras* Hyatt, 1867, from Yorkshire. *Promicroceras* and *Xipheroceras* may be microconch and macroconch, respectively, of the same biological taxon (Cope, 1994; Howarth, 2013, p. 40), although Kevin Page doubts this (*in lit* 5 June 2015).

Iridescent ammonite shells preserved in clays and shales are not particularly rare and it is usually assumed that the iridescence results from the original aragonite being preserved. We have no mineralogical information to confirm this assumption, but what is undoubtedly clear is that the iridescence requires the original layered structure of the shell to be preserved, as in the examples of *Promicroceras* from the Marston 'Marble' (Andrew *et al*., 2015). Ammonites preserved