Molluscs

1. Paleozoic Problematic Fossils, By Ben Waggoner
The Cambrian genus *Scenella*, known from the Burgess Shale and similar Lagerstatte, has been the subject of **debate**; at least some specimens assigned to *Scenella* are more likely to be cap-shaped shells (Landing and Narbonne, 1992). Other proposed Paleozoic ‘‘chondrophorines’’ have also been reinterpreted as mollusc or brachiopod shells, trace fossils, or rotational sweep marks (e.g., Horny, 1985; Kase, 1988; Jensen et al., 2001). Page 53

2. Gastropoda, Neritidae; Late Cretaceous, By John W. M. Jagt
The origin and relationships within the Neritoidea are still under **debate** (Beck, 1992; Saul and Squires, 1997; Bandel and Fryda, 1999; Bandel, 2001; Kano et al., 2002). Page 201

3. The Late Paleozoic Gastropoda, By A. Nutzel
Subulitids have long been an enigmatic group of Paleozoic gastropods: their origins have been obscure, their phylogenetic relationships perplexing and their relationships to post-Paleozoic gastropods unclear. Page 575

Such subulitid like shells may occur in the subclasses Caenogastropoda and Heterostropha, but since subulitoids normally have a smooth shell and thus comparatively few shell characters, their classification and systematic placement is particularly difficult. As a consequence, statements about their occurrence and their phylogeny are vague. Thus, even the impact of the end-Permian mass extinction on the phylogeny and diversity of this group is largely unknown. Page 575

4. A Primitive Halobia, By Christopher A. Mc Roberts
Debate continues regarding the origin and phylogeny of *Halobia.* Several workers suggest that *Halobia* is polyphyletic, having arisen from several *Posidonia* and *Daonella* ancestors (e.g., Gruber, 1976; Polubotko, 1988). Page 602

5. Paleobiogeographic Constraints, By Purbasha Rudra
Three of Kitchin’s (1903) trigoniid species, *Trigonia trapeziformis*, *T. spissicostata*, and *T. cardiniiformis*, have been frequently examined taxonomically, but their phylogenetic relationships remain uncertain. Taxonomic designations have ranged from grouping them within a single subgenus to separating them into different subfamilies. Page 1066

6. Gastropod Phylogenetics, By Peter J. Wagner
However, paleontologists usually study only adult shells (teleoconchs), and many malacologists maintain that teleoconch characters reflect phylogeny poorly if at all. Page 1128

Euomphaloids diverged from the likely ancestors of vetigastropods, caenogastropods, etc., in the late Cambrian and high uncertainty about phylogenetic relationships is consistent with early divergences. Page 1131

7. Late Paleozoic Evolution, By Alexander Nutzel
Possible phylogenetic relationships of the largely smooth ‘‘subulitoid’’ gastropods and similar Mesozoic forms are difficult to substantiate because there are few discrete shell characters available. Page 1187

The phylogenetic relationships of the Imoglobidae are still obscure but they are probably descendants of the Early and Middle Paleozoic Perunelomorpha (family Cuchlinidae). However, it is unclear whether this group has any Mesozoic descendants. Page 1187

8. The Cambrian Explosion, By Richard A. Fortey
The evolutionary relationships between high-level taxa classes and phyla of living organisms have frequently been the subject of controversy. Page 429

The relationship of Ediacaran animals to the known phyla, with the possible exception of Cnidaria, was the subject of **debate** from the outset. The controversy continues, with some authorities claiming affinities with living animals, while others, no less vigorously, declare that the Ediacaran animals are a ‘side branch’ in the story of metazoan evolution, if relevant at all. Whatever the ultimate outcome of these **debate**s, it is certainly true that the Ediacaran animals are not, in any simple sense, obvious ‘ancestors’ of those that came later. Page 429

Likewise among molluscs, the most primitive are the aplacophorans, minute forms lacking shells, whose detailed relationships with the rest of the molluscs is still under **debate**. Page 433

9. Phylogeny of nutmeg shells, By Maria Vittoria Modica
The relationships of the Cancellariidae to other Caenogastropoda have been the subject of **debate** for a long time. Page 685

10. Phylogeny of the family Pectinidae, By Marco Barucca
Despite these very different life strategies, pectinid shells are highly conservative in shape and offer few clues for the unravelling of phylogenetic issues. Consequently, phylogenetic studies based on morphological features have not yielded conclusive results. Page 89

Their morphological features, though useful for classification at the species level, provide scarce phylogenetic information. Indeed, the attribution of several species at both the genus and the subfamily level within the current morphology-based systems is far from being univocal, as different authors give different degrees of importance to morphological features. Page 89

11. Molecular phylogeny of Mollusks, By Federico Plazzi
Despite huge fossil, morphological and molecular data, bivalves' early evolutionary history is still a matter of **debate**: recently, established phylogeny has been mostly challenged byDNAstudies, and little agreement has been reached in literature, because of a substantial lack of widely-accepted methodological approaches to retrieve and analyze bivalves' molecular data. Page 641

Bivalve taxonomy and phylogeny are long-**debate**d issues, and a complete agreement has not been reached yet, even if this class is well known and huge fossil records are available. In fact, bivalves' considerable morphological dataset has neither led to a stable phylogeny, nor to a truly widely accepted higher-level taxonomy. As soon as they became available, molecular data gave significant contributions to bivalve taxonomy and phylogenetics, but little consensus has been reached in literature because of a substantial lack of shared methodological approaches to retrieve and analyse bivalves' molecular data. Page 641

12. The long way to diversity, By Angela Dinapoli
Many questions regarding gastropod phylogeny have not yet been answered. One major question is the molecular confirmation of the Heterobranchia concept based upon morphological studies conducted by Haszprunar (1985a, 1988). This diverse taxon comprises the Euthyneura (with the Opisthobranchia and Pulmonata), and the ''Lower Heterobranchia" (with several ''primitive" or ''basal" members such as Valvatoidea, Architectonicoidea, Omalogyroidea, Rissoelloidea and Pyramidelloidea). Page 60

13. Crassostrea mitogenomes, By Xiangyun Wu
However, inconsistent or conflicting conclusions can be drawn when different DNA sequences are used for phylogenetic analyses (e.g., Zhang et al., 2005; Reece et al., 2008). Page 448

14. The Adriatic Flexopecten complex, By J. M. Pujolar
Despite including some of the most important species from the point of view of fisheries and aquaculture, the systematics and evolution of the family Pectinidae is a matter of continuing **debate**, mostly due to the demonstrated phenotypic plasticity in bivalve shell morphologies on which most of the taxonomies are based on. Page 942

Determining whether a group of organisms constitutes a species, a sub-species or a population has been a topic of **debate** among evolutionary biologists. Page 944

15. Building Gene Sets in Molluscs, By Daniel J. Jackson
Although deep-level relationships between major molluscan clades remain the topic of long-standing **debate**s and current research, monophyly for the major extant groups (Monoplacophora, Polyplacophora, Gastropoda, Bivalvia, Cephalopoda, and Scaphopoda) is generally accepted and supported by morphological and molecular data (Sigwart and Sutton 2007; Wilson et al. 2009). Page 592

Molecular and morphological analyses of extant groups often yield conflicting phylogenetic topologies generating much **debate** concerning sister-group relationships within the Mollusca (Ponder and Lindberg 2008); however, larger molecular data sets that include difficult to sample early branching taxa are yielding

increasingly resolved topologies (Wilson et al. 2009). Until these phylogenetic issues are resolved, a complete understanding of the evolutionary origins of nacre will remain obscure. Page 605

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