Eukaryotes And Protozoa

1. Phylogenomics, By Danielle Gadelle
We have not rooted the trees of Fig. 5 since phylogenetic relationships between the three domains of life are still highly **debate**d. Page 241

2. A kingdom's progress, By Patrick J. Keeling
Although they lack classical mitochondria, the Parabasalia do contain a double membrane-bound metabolic organelle called the hydrogenosome whose origin has been the source of some **debate**. Page 90

3. The eukaryotic nucleus, By David Moreira
The origin of eukaryotes remains a hotly **debate**d issue. Various models have been suggested, generally explaining only partially how one or more properties of the eukaryotic cell might have arisen from simpler ancestors. However, none of them explains satisfactorily the origin of one of the most crucial eukaryotic features: the nuclear compartment. In particular, no convincing selective forces have been proposed for its formation from nucleus-lacking ancestors, and a definite explanation that satisfies cell biologists is still missing. Page 525

4. The origin of eukaryotes, By Anthony M. Poole
To our knowledge, the only proposed phylogenetic result suggesting eukaryotes group within archaea is the eocyte tree, which instead groups eukaryotes with crenarchaea, not euryarchaeota. The eocyte tree is a source of ongoing **debate** and, rightly or wrongly, the prevailing consensus is that archaea and eukaryotes are sister groups. Page 79

5. Nucleomorph genomes, By John M. Archibald
The exact number of secondary endosymbioses that have occurred during eukaryotic evolution is hotly **debate**d, although a minimum of two (and probably three) events are required to account for the known spectrum of secondary plastid-containing organisms. Page 393

6. Events in plastid evolution, By Debashish Bhattacharya
Over time, the prokaryotic endosymbiont surrendered its autonomy and became the light-harvesting, carbon dioxidefixing, oxygen-producing organelle present in modern-day eukaryotic photosynthesizers. The number of times this occurred is actively **debate**d. Page 1240

But it is not known with certainty whether the plastids in these groups evolved once or multiple times. The answer to this question has a fundamental impact on our understanding of eukaryotic evolution. Page 1240

7. The origin of eukaryotes, By Yaacov Davidov
The identity of the primordial protomitochondrion host and how the association between the two evolved are still hotly **debate**d. Page 748

The exact origin of the archaeal signal is **debate**d, as some analyses suggest that it forms a sister group to the Crenarchaeota, while others propose that it originated from within the Euryarchaeota, or from an ancient, unknown archaeal lineage. Page 750

The origin of the eukaryotic cell is one of the most **debate**d and enigmatic issues in evolutionary biology. This **debate** includes many cycles of discarded and subsequently rediscovered hypotheses. Here, we have addressed a few central questions concerning the different eukaryogenesis models in the light of the recently published literature. Page 755

8. The origin of Metazoa, By Kirill V. Mikhailov
The origin of multi cellular animals and the nature of their ancestor are long-**debate**d and challenging questions in both classical and modern biology. Page 758

9. The cytoplasmic structure, By David S. Thaler
Fundamental questions in evolution concern deep divisions in the living world and vertical versus horizontal information transfer. Two contrasting views are: (1) three super kingdoms Archaea, Eubacteria, and Eukarya

based on vertical inheritance of genes encoding ribosomes; versus (2) a prokaryotic/eukaryotic dichotomy with unconstrained horizontal gene transfer (HGT) among prokaryotes. Page 774

The present article asserts that sequence analysis alone is not able to solve the most important evolutionary problems it has framed (because the distinction between ‘‘vertical’’ and ‘‘horizontal’’ evolution becomes ambiguous) and that ‘‘bench experiments’’ – which have so far not played a role in this **debate** – have the potential to break the conceptual logjam. Page 778

10. A whole-genome phylogeny, By Maria Pia Di Bonaventura
High levels of topological incongruence are not unusual in genomic datasets. For instance, Rokas et al. (2003) presented evidence from yeast genomes in which 45 of the 106 gene partitions conflicted with the concatenated hypothesis. Page 955

11. Phylogeny of calcareous dinoflagellates, By Marc Gottschling
The systematic position of Thoracosphaera and its putative phylogenetic affinity to Calciodinellaceae have been discussed controversially. Page 445

12. Salmonella enterica strains, By Eric W. Brown
Horizontal transfer has played an active role in structuring several regions of the Salmonella genome, though its evolutionary impact on the entire chromosome remains a matter of **debate** (Groisman et al., 1992; Ochman et al., 2000). Page 103

13. Evolution of arginine deiminase, By Manuel Zuniga
These incongruities have been previously observed for a large number of proteins (see, for example, Brown and Doolittle, 1997) and have led to a lively **debate** among researchers favoring a view in which horizontal gene transfer has played a major, continued role in evolution (Doolittle, 1999; Jain et al., 1999) and others who consider that unrecognized paralogy explains many of these anomalous phylogenies (Forterre and Philippe, 1999; Glansdorff, 2000). Page 440

14. Chagas’ disease parasite, By E. Pfeiler
Although considered valid species in the present study, the taxonomic status of members of the phyllosoma complex has been the subject of **debate** for many years. Page 218

15. GC/AT distribution patterns, By Elisa Calistri
The origin and fixation of isochores has been the object of a long lasting **debate** between the supporters of neutral and selectionist models. Page 229

16. Microsatellite Variation, By M. Imwong
The unusual patterns of variation in the P. Falciparum genome have generated a lively **debate** about parasite origins and evolutionary history (Su, Mu, and Joy 2003; Hartl 2004). Recent studies have also revealed conflicting views on the ancestry of the related parasite Plasmodium vivax. Page 1016

17. Complex Spliceosomal Organization, By Lesley Collins
A number of trees representing eukaryotic evolution (Embley and Hirt 1998; Dacks and Doolittle 2001; Simpson and Roger 2002) have been published, but there is still **debate** as to the placement of many lineages on these trees. This is expected because there are inherent problems associated with reconstructing the deeply diverging lineages. Page 1054

18. Networks of Gene Sharing, By Thorsten Kloesges
A hefty **debate** is currently ablaze about the utility and meaning of the ‘‘tree of life’’ (see Doolittle and Bapteste 2007 vs. Galtier and Daubin 2008 cf. Bapteste et al. 2009), particularly in the context of the overall evolutionary history of prokaryotes. One could argue that the **debate** boils down to the difference between attempts to reconstruct the whole of the evolutionary process and attempts at organismal classification (Doolittle 1999). Page 1063

19. Lateral Transfer of Genes, By Martin G. Klotz
Only recently, with the flood of available whole genome sequence data and a renewed intensity of the **debate** about the universal tree of life, a very few reports on lateral gene transfer (LGT) from prokaryotes into the Eukaryota have been published. Page 1098

20. Grouping of Plant and Animal, By Gayle K. Philip
Despite substantial work, the phylogeny of malaria parasites remains **debate**d. Page 1192

Appropriate molecular markers and methods for reconstruction of Plasmodium phylogeny have long been subjects of **debate**. Page 1192

In particular, the evolutionary position of the most virulent human parasite Plasmodium falciparum and the closely related chimpanzee parasite Plasmodium reichenowi has been the subject of **debate**. Page 1192

21. Plastid-Derived Genes, By Claudio H. Slamovits
Details of this complex evolution are still **debate**d, and one major problem in resolving several of these **debate**s lays in the accurate determination of the distribution of plastids. Page 1297

Ever since the discovery of the apicoplast, its possible relationship to dinoflagellate plastids has been **debate**d, and this question is intimately tied to the larger hypothesis that all eukaryotes with secondary plastids derived from red algae acquired them in a single event, the so called chromalveolate hypothesis (Cavalier-Smith 1999). Page 1304

22. Phylogeny of Lobose Amoebae, By Jose F. Fahrni
Furthermore, the position of pelobionts—the free-living amitochondriate amoebae—is **debate**d. Page 1881

23. The Protein Import Channel, By Michael J. Dagley
The identification of mitosomes in Giardia generated significant **debate** on the evolutionary origin of these organelles, whether they were highly reduced mitochondria or the product of a unique endosymbiotic event in an amitochondrial organism. Page 1941

24. Archaeal Roots of Eukaryotes, By Natalya Yutin
The emergence of eukaryotes is one of the central, and hotly **debate**d, themes in evolutionary biology. These **debate**s have led to multiple, competing hypotheses that present drastically different scenarios for the origin of the complex eukaryotic cell (Martin and Muller 1998; Embley and Martin 2006; Kurland et al. 2006; Martin and Koonin 2006; Dagan and Martin 2007; Poole and Penny 2007b). Page 1619

Because the position of the root of the eukaryotic tree is still subject to **debate** (see e.g., Stechmann and Cavalier- Smith 2002), the trees are presented in an unrooted format, with a basal trifurcation. Page 1883

25. Evolutionary History of Gene Duplication, By Shehre-Banoo Malik
However, the evolutionary relationships among these genes are unclear, with some **debate** as to whether eukaryotic homologs originated by lateral gene transfer. Page 2827

26. Closest Relatives of Animals, By Guiling Sun
These notions have constantly been under **debate** (Stiller and Hall 1997; Stiller et al. 2001; Nozaki et al. 2003; Nozaki 2005; Sanchez-Puerta and Delwiche 2008; Bodyl et al. 2009), and recent studies have painted a more complex picture of the evolutionary history of photosynthesis in eukaryotes. Page 2887

27. The Evolution of SMC Proteins, By Neville Cobbe
Consequently, it is not clear from the codon usage data in which direction this transfer event occurred, whether from archaea to cyanobacteria or vice versa, and there is still **debate** as to which is actually the older group of prokaryotes (Hedges et al. 2001; Cavalier-Smith 2002). Page 338

28. Eukaryotic Marine Green Alga, By Nigel Grimsley
Understandably, the frontiers of the species concept is still a matter of **debate** in single-cell organisms (Schlegel and Meisterfeld 2003), and the ‘‘pragmatic’’ definition of species can either rely on morphological observation ‘‘morphospecies’’ or on molecular markers ‘‘operational taxonomic units’’ (Weisse 2008). Page 52

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