

need to classify organisms as species? The beautifully edited answers to these questions make for an enjoyable read. The practical issues were less than satisfactory, but resolving the biological issues wasn't the main purpose of the book – most authors were more interested in species concepts as a way of studying how we think.

If the social scientists in this book are intellectual parasites on biology, they thrive in the festering wounds that we biologists have inflicted on ourselves. Practical issues are in ferment today¹. 'Rank-free taxonomy' is a proposal for a new 'PhyloCode' to replace the 300-year-old Linnean binomial nomenclature. The impetus for a new code arises from conflict between taxonomy (naming) and classification (in particular, phylogeny). Linnean generic and higher taxon names have become unstable because species skip merrily between named taxa, whose position in the hierarchy is arbitrary. But, if the genus is scrapped how can we preserve the useful cataloguing function of the Linnean binomial? In the December 1999 issue of *Systematic Biology*, a panel listed 13 conflicting systems of nomenclature for the PhyloCode². A brief, but perhaps unfair, summary is that most proposals will alter the binomial *Homo sapiens* to a uninomial format, something like *homosapiens*, *Homo sapiens*, or *homo-sapiens*. The name, often supplemented with a unique registration number, will mostly keep the cataloguing function of the generic name while discarding its phylogenetic implications. However, this revolution won't happen tomorrow²: 'the authors...do not agree which of the proposed methods for naming species is best'.

There are even worse disagreements among rank-free systematists. According to the PhyloCode team and many evolutionists, 'species are fundamental units for organizing biological diversity'^{2–4}. However, in his chapter 'Getting rid of species?', Mischler writes '[species]...are real, but only in the sense that taxa at all levels are real. Species are not special.' Mischler devises a species-free code. Humans become *Sapiens Homo Homidae Primate Mammalia Vertebrata Metazoa Eukaryota Life*. Naming every clade to which taxa belong would be at the least tedious, if not impossible, thus Mischler proposes a strangely familiar abbreviation: *Sapiens Homo*. In the December issue of *Systematic Biology* can also be found the first species-free taxonomic revision employing these principles on a group of polychaete worms by Pleijel⁵; this has now been followed by a paper explaining conceptual issues⁶.

Naming phylogenetic nodes is inherently unstable because new information might lead to a different phylogeny. To

avoid instability, most PhyloCode proposals separate classification from nomenclature of basal taxa (species). (Mischler and Pleijel don't believe in basal taxa and use clade names that must change in either meaning or spelling whenever a revision alters component taxa). By divorcing the uninomial from hypotheses of phylogeny, the PhyloCodes have the nomenclatural effect of freezing the paraphyletic or polyphyletic generic information that is rife in traditional nomenclature. Uninomials useless for classification are thus used as substitutes for binomials that contain some phylogenetic information, albeit crude. Bizarrely, the PhyloCode can therefore seem retrograde from a phylogenetic point of view. Hopefully, most journals won't promote any particular system until international agreement is reached; 'let's talk to one another' first¹.

The debate about 'reality' depends, in part, on Ghiselin's argument that species are, philosophically speaking, 'individuals' rather than classes⁷. If species originate suddenly in a bottleneck, they have a unique 'birth' similar to real individuals: 'species as individuals' fit with punctuated equilibrium ideas of evolution (Sterelny). The species as an individual then becomes the only 'real' or fundamental taxon (a variant idea is that all clades are real and individuals). Other authors also express, with more reservations, the belief that species are basal (Hull, de Queiroz, Boyd, Wilson, Griffiths and Ereshefsky). But some point out, I think correctly, that postulating reality and individuality represents a return to Aristotelian essentialism (Boyd, Wilson, Griffiths, and Keil and Richardson). Realists (e.g. de Queiroz) usually argue that some biological feature of species is fundamental, and they treat exceptions as minor imperfections that do not affect the underlying purity of the essence itself (Dupré, Hull and Nanney): the species becomes a virtually unfalsifiable 'truth'.

Perhaps a yearning for essentialism is hard-wired (Atran, and Keil and Richardson). Personally, I doubt this – historical inertia seems more probable. Darwin vociferously rejected any such essence of species, and for the following 100 years Darwin-influenced taxonomists and evolutionists proceeded successfully with a vague but utilitarian cluster concept of species, similar to Wittgenstein's cluster interpretation of the meaning of words in ordinary language. In the mid-20th century some influential Hegelians began to promote interbreeding as the true essence in the 'biological species concept': its general acceptance (in zoology, at least) re-opened the Pandora's box of essentialism. Alternative essences of ecology, phylogeny and premating compatibility soon arose, all equally irrefutable.

Species and their names

Species: New Interdisciplinary Essays

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More species concepts! I opened the book with a sense of foreboding. Its authors are anthropologists, philosophers and psychologists, as well as systematists. We biologists can't solve the species problem, so call in the shrinks, eh? However, I was pleasantly surprised. The book lays out the following questions. (1) Is there one type of species (monism) or many (pluralism)? (2) Are species real or just human constructs? (3) How useful are species definitions? (4) To what extent are species concepts influenced by the history of human thought rather than biological reality? And (5) from where comes our psychological

This book's combination of philosophy, anthropology and biology is fascinating and thought-provoking. Thinking again about species and individuals, I realize there is no controversy about 'individual concepts' – but why not? Individuals can be born singly as seeds or eggs, or from wombs, thus offspring and, more dubiously, their parents remain 'monophyletic' after birth. But, other individuals bud from peripheral parts, such as *Kalanchoe* plantlets or potato tubers, thus making their parents 'paraphyletic'. Some organisms are uniparental (monophyletic), while others are produced sexually ('tokogenetic' or 'diphyletic') and recombine reticulately. Some individuals cannot be circumscribed, such as mat-forming lichens or

corals, and it is difficult to tell in clonal taxa, such as bracken or aspen, where one individual stops and another begins: by individual do we mean 'ramet' or 'clone genotype'? I claim priority for a new 'individuals as species' idea: individuals and species are both useful terms, even though they are demonstrably fuzzy and phylogenetically unreal.

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