

## Linguistic Borrowings from Biology: Cross-Pollination or Cross-Bollixation?

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### I. PREAMBLE

Although few scholars today would follow Bopp 1827 in equating languages with “organic natural bodies”, comparisons between evolutionary biology and historical linguistics have a long history, and linguistic appeals to evolutionary biology have recently become so voluminous (cf., e.g., Goodenough 1992, Dixon 1997, Lass 1997, Orr 1999, Croft 2000, McMahon 2000, Labov 2001, and Bichakjian 2002) as to hint that diachronic linguists collectively suffer from biology envy — b(iological)ness envy, so to speak.

1. There are indeed many obvious similarities between the two fields —

- both fields study objects which are in some sense maintained over time via **replication**;
- both fields may propose **reconstructions** of prehistoric entities based solely on present-day evidence;
- both fields seek to posit systematic **relations and groupings** among entities with historical validity;
- just coincidentally, both fields use many identical or similar **terms** (e.g. *morphology* and *phenetics/phonetics*), plus the same or similar **constructs and methods** (e.g., arboreal / family-tree representations of relations).

— and, this was recognized relatively early on; cf. Darwin (1871[*The Descent of Man, and Selection in Relation to Sex*]): 59): “The formation of different languages and of distinct species, and the proofs that both have been developed through a gradual process, are curiously the same”.

### II. PRESENT AIMS

2. Our goal here is to survey the uses that linguists have made of notions from biology (these are the “linguistic borrowings [i.e., importations into linguistics] from biology” of our title), with an eye to clarifying some of the pitfalls and problems that have thereby been encountered (= the “cross-bollixation”) — though we must set the stage for this by sketching the history of this particular enterprise and the *dramatis personae*...

### III. THE LOCAL PLAYERS: THE OSU BIO-LING SEMINAR

3. As an outgrowth of Janda’s late-blooming general interest in biology and specific curiosity about (mis-)applications of “punctuated equilibrium” to historical linguistics, Janda & Joseph 2003 devoted considerable amount of attention (and number of pages) to biological issues, while — convergently but independently (and in fact quite coincidentally) — an invitation from John Wenzel of the OSU Dept. of Entomology to his friend Joseph in July 2003 to speak on linguistic

classification to Wenzel’s **Phylogenetics Discussion Group** (which was reading Rexova et al. 2003 on biological-cladistic methods as applied to Indo-European classification) led to meetings between a small group of evolutionary biologists (Wenzel and John Freudenstein of the OSU Dept. of Evolution, Ecology, & Organismal Biology, plus some of their students, especially Christopher Randle (now a post-doc at the Univ. of Kansas), and a small group of linguists (Joseph and Janda of the OSU Dept. of Linguistics, and Jim Unger of the OSU Dept. of East Asian Languages & Literatures, along with some of their students) — meetings which began to explore parallels between evolutionary biology and biological cladistics, on the one hand, and historical linguistics and language classification, on the other.

4. This developed into an **interdisciplinary population** of scholars banded together into a joint study-group — uniting **historical linguists with evolutionary biologists**, along with many other interested parties on campus, students and faculty alike — undertaking a **year-long investigation of substantive parallels** between the two disciplines.

- modest funding was provided by the College of Humanities and the College of Biological Sciences (each trying to outdo the other in support of such obvious interdisciplinarity) and by the OSU Institute for Collaborative Research and Public Humanities;
- during the first year (2003-2004), there were **7 public meetings**, including presentations by Janda on the history of connections between linguistics and biology, by Wenzel and Freudenstein on biological cladistic methods, by Unger on Croft 2000, and by an outside speaker (Don Ringe from the Univ. of Pennsylvania), all of which were **well-attended** (with a high of 35 at one) by **faculty and students** (graduate and undergraduate) from our own departments as well as from other parts of campus (including, Comparative Studies, English, History, Slavic, etc.);
- the group has continued to hold public events this year (2004-05): e.g., a showing of the Nova documentary “In Search of the First Language”, with commentary by Joseph & Janda, that drew 45, and a talk by another outside speaker (Sheila Embleton of York University) is planned for the spring,
- and the smaller core group represented in this presentation — recently augmented by **Megan Daly**, a recent arrival to OSU from the Univ. of Kansas — has continued to meet in order to develop conference presentations and publications.

### IV. THE PLAYERS IN THE BROADER PICTURE

5. While a wide range of scholars **invoke biology** in their **linguistic work**, they seem to fall into four overall categories (which can be linked with the names of their major practitioners — though we mention and label the latter at the risk of giving some offense, we realize):

- a. Hands-off biolinguists (like Chomsky, Bickerton, and Pinker) talk about language in relation to its **biological (genetic and neurophysiological) instantiation**, yet they do so without specifying any of the relevant genetic or neurophysiological details — which some critics attribute to these scholars having a **theoretical orientation** in which language is an **abstract system** that in principle could exist only as a computer program, rather than as something(s) embodied in human brains (despite much talk about a “**language organ**” and an innate “**language acquisition device**”), though most linguists today would concede that there must be **biological correlates** for some aspects of language (a view recently explicated at length by Anderson and Lightfoot 2002).

- b. Metaphorical biolinguists (like, earlier, Greenberg and now Dixon, plus perhaps also Lass) are eager to take up **concepts** developed in **biology** and to apply them to linguistics, essentially making use of another discipline's **metaphors** (or making metaphors out of other people's science); while these scholars do not necessarily make any hard claims about the relation between language and biology, they are happy **borrowers** of (their understanding of) central biological concepts.
  - c. Selectionist/adaptationist biolinguists (like Croft and R. Harris) argue that **language** can be understood only as something that has **evolved**, and simultaneously advocate a radical rethinking of "language" from a **behaviorally oriented perspective** [if language is (a) behavior, then it is not the same thing as an "organ"], whereby particular linguistic structures can be treated as undergoing replication (and often reanalysis) via **reproduction** and **selection** in a quasi-biological sense.
  - d. Cladistic biolinguists (like Ringe [with Warnow] and A. McMahon) use **methods** that have been developed (or honed) by biologists, especially **cladistic** and other evolutionary-biological techniques (though cladists like Platnick & Cameron 1977 have compared their work with that of **early comparative linguists**, who in turn had borrowed from manuscript **stematology**).
6. It is ironic that, as for the other direction of possible borrowing, few modern biologists look to language for conceptual or even terminological/metaphorical inspiration, though 21st-century biology has preserved some earlier terms like "genetic code", "**grammar of life**" (though not used only in biological circles), "**syntax of DNA**", etc., and there are many **systematists** and "**pattern cladists**" who are interested in the methods that historical linguists use for working out relationships and sub-grouping between languages — still, even this connection does not necessarily represent borrowing **from** linguistics so much as it reflects **common** use of the same terms and constructs by biologists and linguists (i.e., it is hard to find a biologist who has changed his or her biological practice [or theory] after learning in greater detail about diachronic or other aspects of linguistics).

#### V. LESSONS FOR LINGUISTS FROM THE BIOLOGY-IMPORTATION BUSINESS

- 7. We here draw no hard and fast conclusions, but we can provide a number of solid cautionary tales regarding **bollixed** interactions and missed cross-pollination(s) between linguistics and biology.
- 8. A general observation, valid for all scholarly fields, is that there are numerous potential pitfalls in cross-disciplinary work (even as it becomes more and more highly valued in academia), given that it ideally requires at least some individuals with considerable expertise in two or more fields, whereas the temptation is for crossover work to attract people who have only a little learning — indeed a dangerous thing — about two or more fields; no interdisciplinary group can be entirely free of this danger (no exceptions!), and historical linguists should be particularly alert, in this respect, because they know how much garbling can accompany borrowings from one culture into another.
- a. There can be great successes of interdisciplinary collaboration, as cases like the study of the Praenestine Fibula show: this clasp, once thought by linguists to bear the oldest Latin inscription, has been revealed by cross-disciplinary work to be a 19th-century forgery (as some linguists had already suspected); cf. Guarducci 1984 (vs. Gordon 1975).
- b. Yet it is easy to get things wrong, since field X proceeds at its own pace, while practitioners of Field Y who cross over into Field X, primarily immersed as they are in Y, cannot always keep up with the latest in X, or, even if they do hear about the latest developments in X, do not always

possess the requisite critical and evaluative sense of that field that would allow them to avoid jumping on the wrong bandwagons.

- c. And there is always the issue of institutional evaluation — for all the fact that academic administrators like to tout interdisciplinarity, who should evaluate such work for the purposes of academic rewards (salary raises, promotion, tenure)? Should the evaluators be folks in field X, or folks in field Y, or the much smaller population of folks who have successfully negotiated between X and Y (but who have a foot planted solidly in each field — though most scholars have a foot placed more strongly in one field than in the other), or just who?
- 9. A case in point, *ad* (8b), concerns **punctuated equilibrium** [here also **P.E.**; for biologists often **Punc.Eq.**], a term which has been employed by a surprising number of contemporary linguists on the basis of a string of publications in biology that was started by **Eldredge & Gould 1972**; in biology, this notion has to do with the claim that most speciation occurs in rapid temporal bursts which punctuate long spans of relative evolutionary stasis — but the attention that P.E. has received in linguistics (especially diachrony) is all **out of proportion** to the attention that it has received in biological theorizing and practice (and it should be noted that biological priority regarding P.E. actually belongs to Eldredge 1971).
- a. That historical linguists might be favorably predisposed toward a notion like P.E. is shown by **Labov's 1994: 24** statement that "**catastrophic events... play... a major role in the history of all languages, primarily in the form of population dislocations: migrations, invasions, conquests... Other abrupt political changes ... le[a]d to alterations in the normative structure of the speech community. ... [S]ignificant external effects are of this catastrophic type, while all gradual effects are internal, structural reactions set off by these rare disruptions.... The external history of most languages shows the uneven path of development that corresponds well to the sporadic character of sound change [(sporadic, that is, in its unpredictability of occurrence, despite the regularity of its outcome) — RDJ, BDJ, JMU, MD, JVF, ~~GR~~ & JWW].... It remains to be seen whether the two types of uneven development can be fitted together, or whether language and social change are both erratic and independently motivated."**
- b. Yet the very different timescales involved in linguistic change vs. biological evolution are immediately evident from some of Eldredge's 1999 remarks concerning P.E. to the effect that "most species' histories are marked by stability (...little or no accumulation of anatomical change)... [and so] most... change in evolution, assumed to be... [via] natural selection, occurs... in conjunction with the actual process of speciation, which for the most part occurs through... geographic variation and isolation" (p. 22), while "speciation — the derivation of two or more descendant species from an ancestral species ... [—] is commonly regarded as requiring, on average, from several hundred to several thousand years to complete. To an experimental biologist, the process is hopelessly slow ... [to] a paleontologist, ... speciation seems almost blindingly quick, especially when contrasted with much longer periods (millions of years, often) ... [during which] species appear to persist relatively unchanged" (pp. 37-38).
- c. Such statements by Eldredge (and Gould) notwithstanding, however, a number of linguistic works (like Lightfoot 1999) have ignored the fact that the relevant biological punctuations are brief only in **geological time**, for which a 10,000-year-long process counts as virtually instantaneous — so that Lightfoot's invocation of P.E. in connection with one language-learning child's abrupt (indeed instantaneous) reanalysis of an older generation's speech (along the lines of Thom's 1975 "catastrophe theory") must be considered a serious distortion.

- d. On geological vs. human time, cf. also Twain/[Clemens] 1905-1909-MS/1962/1963 [{"The Damned Human Race, I: Was the World Made for Man?"}]: "That it took... hundred[s] of million[s] of years to prepare the world for...[Man] is proof that that is what it was done for. I suppose it is. I dunno. If the Eiffel Tower were now representing the world's age, the skin of the paint on the pinnacle-knob at its summit would represent's Man's share of that age, and anybody would perceive that that skin was what the tower was built for. I reckon they would, I dunno".
10. For many linguists, popularizing works on biology written for the layperson — especially those published in large numbers by the late Stephen Jay Gould — have been the sole point of reference regarding P.E. and its importance in biology.
- a. Yet note the following statement by the eminent biologist John Maynard Smith (as part of a November-1995 review-article in the *New York Review of Books*, later cited approvingly by Dawkins 1998: 207): "Gould occupies a rather curious position, particularly on his side of the Atlantic. Because of the excellence of his essays, he has come to be seen by non-biologists as the preeminent evolutionary theorist. In contrast, the evolutionary biologists with whom I have discussed his work tend to see him as a man whose ideas are so confused as to be hardly worth bothering with, but as one who should not be publicly criticized because he is at least on our side against the creationists. All this would not matter, were it not that he is giving non-biologists a largely false picture of the state of evolutionary theory."
- b. Yet Dixon 1997 draws heavily on Gould (and Eldredge) alone in a short book that fervently embraces (Dixon's version of) Punctuated Equilibrium, and Lass 1997 echoes Dixon with further linguistic applications of P.E.; much more recently, Henning Andersen's comparative discussion of language and biology presents liberal (perhaps even excessive) quotes from Gould (and relatively few other biologists), thus indirectly exaggerating the centrality of punctuated equilibrium in biology.
- c. In fact, linguists who invoke punctuated equilibrium have mainly overlooked the fact that one aspect of P.E. must be evaluated as most central, while some apparent aspects turn out to be peripheral or even misleading. For example, in the estimation of Gould (1982): "Of the two claims of punctuated equilibrium — geologically rapid origins and subsequent stasis — the first has received the most attention, but ... [it must be] repeated[ly] emphasized that ... the second ... [i]s most important. We ... [may], and not facetiously, take... as our motto: stasis is data... [i.e., s]tasis can be studied directly... [and t]he (potential) validation of punctuated equilibrium will rely primarily upon the documentation of stasis" (p. 86). "Punctuated equilibrium is a specific claim about speciation and its deployment in geological time; it should not be used as a synonym for any theory of rapid evolutionary change at any scale" (p. 84).
- d. Thus, indeed very much like speakers who unknowingly distort words borrowed from another language, linguistic diachronicians often replicate attractive biological concepts in garbled form — thereby unwittingly getting them bollixed up.
11. Another case in point, *ad* (8b), has to do with (the) founder effect(s) — cf. Ernst Mayr 1954, 1963 and later elaborations by others — which is a phenomenon that has received varying but converging definitions in biology; e.g.:
- a. Ridley 1996: 136, following Mayr 1963: "[t]he establishment of a new population by a few original founders (in an extreme case, by a single fertilized female) that carry only a small fraction of the total genetic variation of the parental population";
- b. Strickberger 2000: 641: the "effect caused by a sampling accident in which only a few 'founders' derived from a large population begin a new colony... [s]ince these founders carry only a small fraction of the parental population's genetic variability, radically different gene frequencies can become established in the new colony";
- c. Freeman & Herron 2001: 682: "a change in allele frequencies that occurs after a founder event [“the establishment of a new population, usually by a small number of individuals”], due to genetic drift in the form of sampling error in drawing founders from the source population”.
12. Yet Mufwene 1996, 2001: 25-80, who borrows into creolistics the concept “founder effect” from human ecology, rather than from biology as a whole, views the wide distribution of otherwise-rare traits across a group descended from a small founder-population as an indicator that those traits must have been **pathological** in at least some contexts.
- a. Thus, an introductory-biology text such as Ridley 1996 (again cf. 11a above) may indeed use a connection like that between (i) the high incidence of porphyria variegata among Afrikaners and (ii) the small size of the original population of the Cape Province as an example of a founder effect, but that notion as introduced by Mayr 1954, 1963 (and later elaborated by others) involves no limitation to pathology.
- b. Hence Mufwene's characterization of various creole constructions as necessarily having been originally “disadvantageous” is suspect on biological grounds alone — even if Labov 1972ff. had not already demonstrated that constructions having their origin in non-standard speech are likely to be less marked, not more so.
13. Finally, there are a missed opportunities which reflect historical linguists' failure to explore several more plausible parallelisms between linguistic and biological evolution:
- a. It is true that, e.g., Labov 1994 addressed similarities between frequency-matching in humans vs. animals.
- b. But Labov 1994 did not address the apparent similarity between the qualitatively-hypercorrecting mechanism of “generational change” in language vis-à-vis certain progressive evolutionary trends in biology like the gradual exaggeration of reproduction-related (competition- and courtship-oriented) traits which led to, e.g., peacocks' tail-feathers and the 4-meter-wide antlers of the extinct deer *Megaloceros giganteus*, aka the “Irish elk” (cf., e.g., Grafen 1991).
- c. Yet even this seemingly close parallelism ultimately breaks down when subjected to closer scrutiny: in linguistic hypercorrection — whether qualitative or quantitative (cf. Janda & Auger 1992) — the driving force follows from a semi-conscious awareness by speakers of the principle “In case of doubt, do (more)”, but neither semi-consciousness nor the intentions of male animals lie behind the evolution of increasingly larger feathers or antlers in males; rather, it is females who guide these trends by apparently evaluating such costly structures as indicators of great(er) fitness (cf. Zahavi 1975, Maynard Smith 1993: 15, and especially Møller 1994) and by presumably therefore preferring to mate with such highly fit males.

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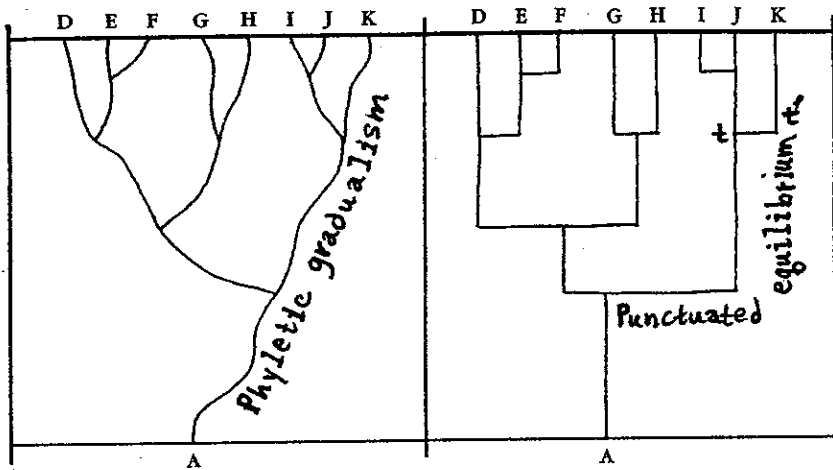


FIGURE 1 [Dennett 1995-1996: 283 (Fig. 10.6.)]

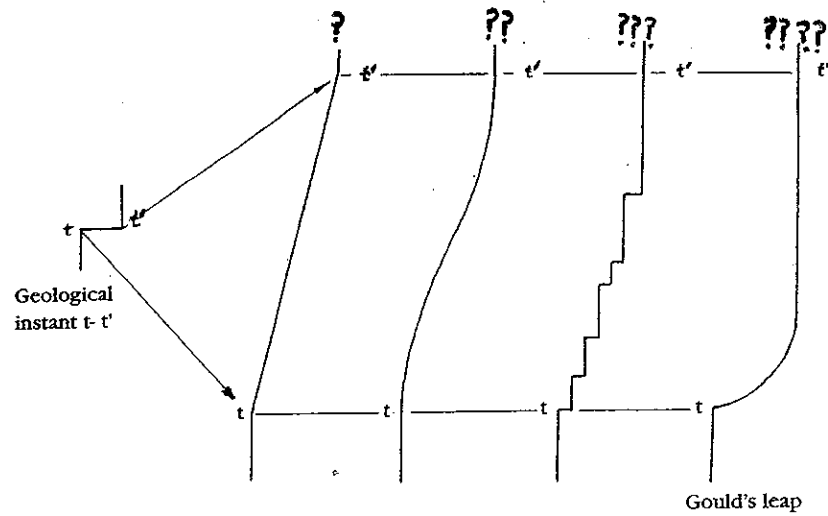


FIGURE 2 [Dennett 1995-1996: 286 (Fig. 10.8.)]

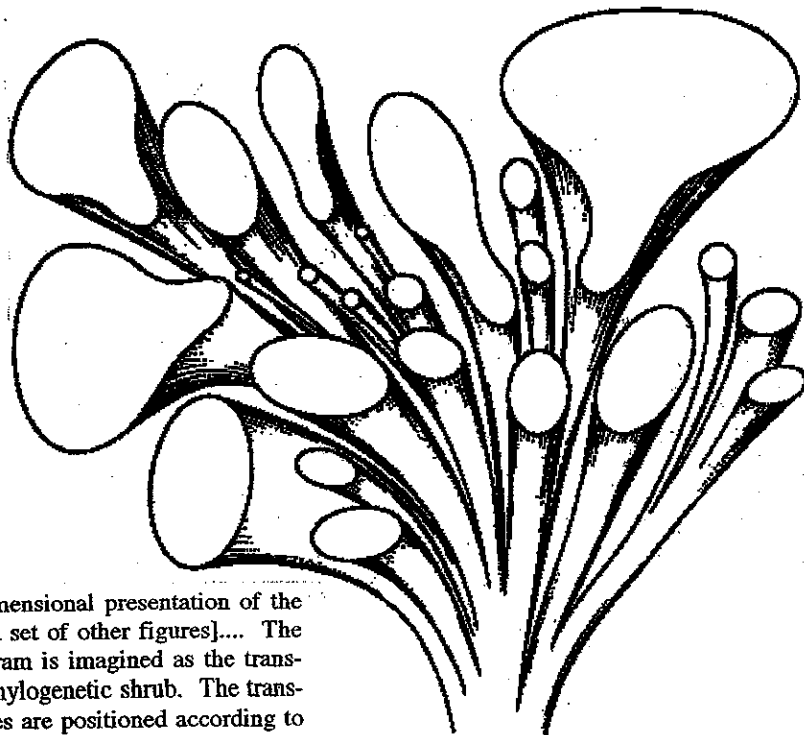


Fig. 3 3-dimensional presentation of the [diagrams in a set of other figures].... The [tubular] diagram is imagined as the trans-section of a phylogenetic shrub. The transsected branches are positioned according to degree of similarity and have a size depending on, but not directly proportional to, the number of varieties. [After Dahlgren et al. (1985).]

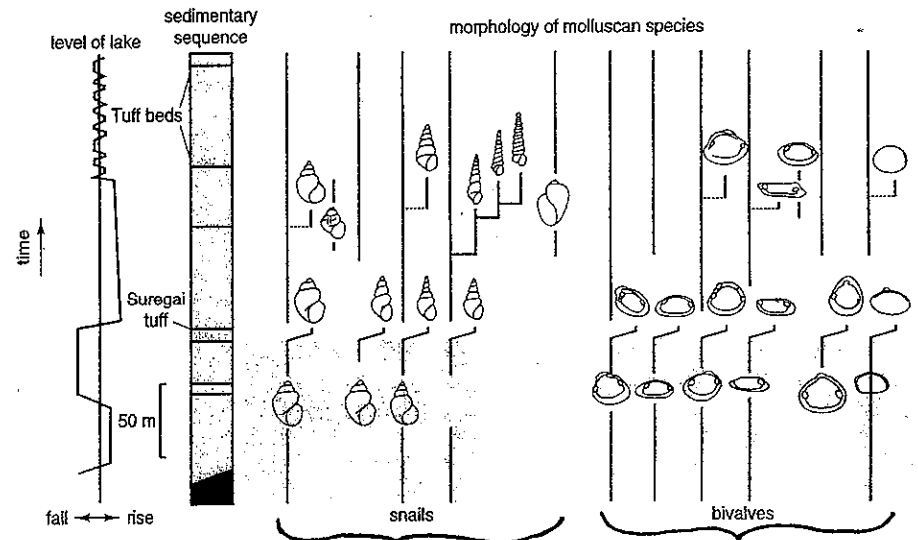


Fig. 4 Fine-scale evolution in fresh-water snails and bivalves in Lake Turkana, Kenya, through the last 4 Myr. The volcanic tuff beds allow accurate dating of the sequence. Major speciation events seem to take place at times of lake-level change: are these examples of punctuational speciation, or merely ecophenotypic shifts? [Cf. Williamson 1981. Benton & Harper 1997: 59 (Fig. 3.9).]

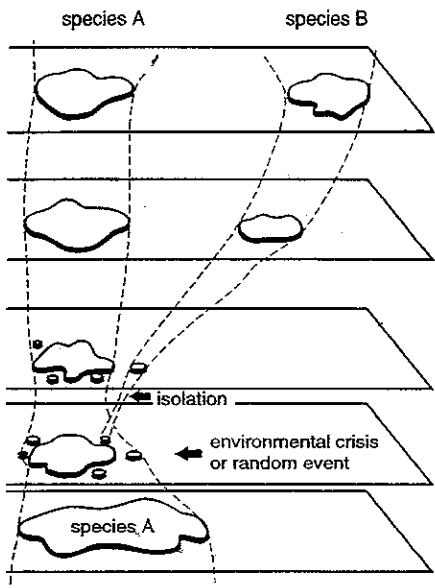


Fig. 5 Allopatric speciation models, occurring where a small peripheral population is isolated... [the parent species may continue unaltered, and the peripheral population may evolve rapidly into a new species. [Benton & Harper 1997:52 (Fig. 3.7).]

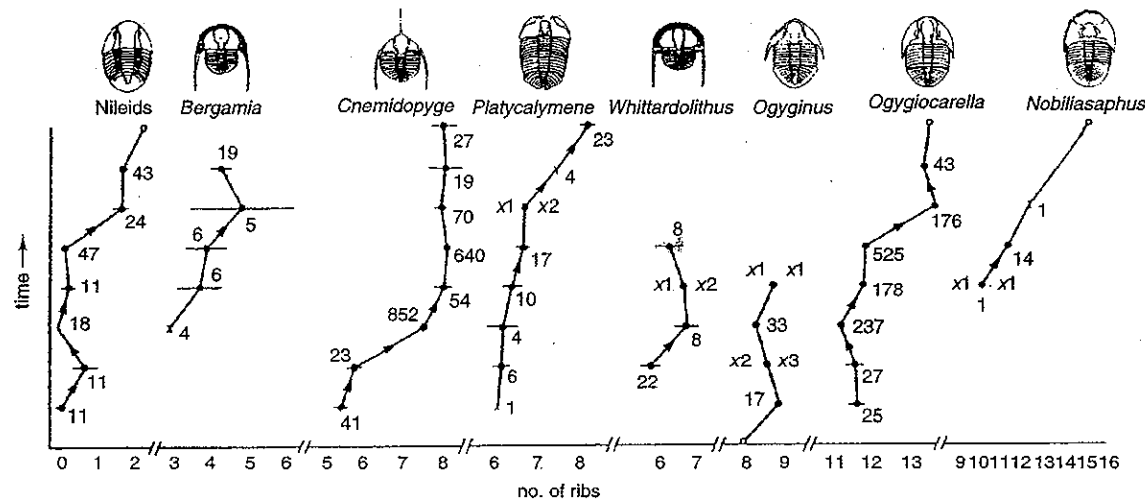


Fig. 6 Evolution of trilobites in an Ordovician sequence from central Wales, representing a total time span of about 3 Myr. In each genus, there seems to be gradualistic evolution in the number of ribs in the pygidium, or tail segment (statistically significant shifts between consecutive samples are indicated by arrows). Numbers indicate sample sizes, and horizontal lines 95% confidence intervals for each sample... [cf. Sheldon 1987. Benton & Harper 1997: 54 (Fig. 3.10).]

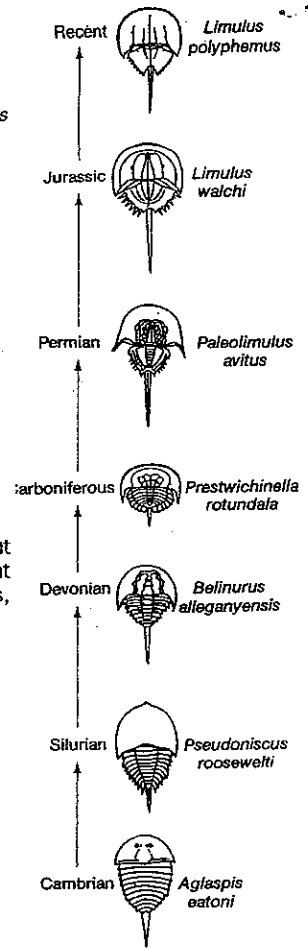


FIGURE 7 Phyletic evolution (anagenesis) in merostome arthropods (horseshoe crabs), indicating relatively small phenotypic changes over long periods of time. That evolution proceeds only in such a linear direction is, of course, a diagrammatic illusion. As in other such sequences... [there were variations within and between each of these stages.... [Strickberger 2000 242 (Fig. 11.3), adapted from Newell.]

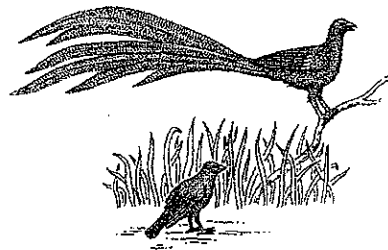


Figure 9 The sexual dimorphism in long-tailed widow birds (*Euplectes prognus*) The male is black with long tail feathers and red and yellow shoulder patches; the female is brown and cryptic. [Freeman & Herron 2001: 291 (Fig. 9.3).]

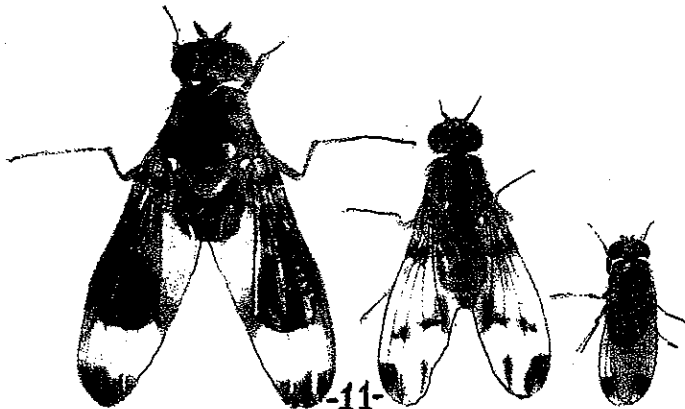


Figure 8 Hawaiian *Drosophila* As these photos of *Drosophila nigribasis*, *D. macrothrix*, and *D. sukuzii* (left to right) show, the *Drosophila* found in Hawaii are remarkably diverse in body size, wing coloration, and other traits. (Kenneth Y. Kaneshiro, University of Hawaii) [Freeman & Herron 2001: 411 (Fig. 12.6).]