



Evolutionary Patterns: Growth, Form, and Tempo in the Fossil Record

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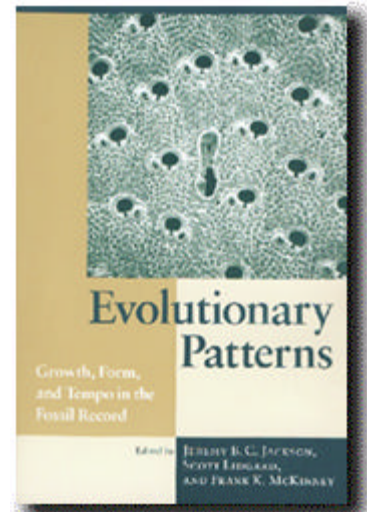
A glance at the Preface indicates with adequate clarity what the reader can expect to encounter in the way of a fossil record, granted that the volume is in effect a Festschrift dedicated to Alan Cheetham, the well known worker on fossil bryozoans. The 12 contributions report the results of a North American Paleontological Society symposium "Process from Pattern in the Fossil Record", held in Utah in 1997. Most of the text is devoted to colonial organisms, bryozoans and corals, by students and close associates of Cheetham. As always in such compilations, by the very manner in which they come about, the standard of the material presented is uneven. Moreover, the title belies the scope of the contents. This notwithstanding, I do not doubt that researchers involved in the study of fossils of colony-builders will be grateful for the publication of the book. In the first pages of the volume it is claimed that Cheetham was the first to apply methods of quantitative genetics to fossils; this is wrong by at least 20 years, unless the concept of fossils is meant to be entirely restricted to bryozoans. In any event, the statement points to a mournful lack of knowledge of

what goes on in statistical genetics.

There are three sections. (1) Modes of development, hierarchies of morphological orientation and the adaptive significance of colony form: (2) Recognition of species and

the tempo of speciation and extinction: (3) Macroevolutionary patterns and trends.

For the specialist dealing with colonial organisms there are several items of interest. Knowlton and Budd report on modern work concerning the delineation of coral species, recent and fossil. In this work, the authors say they have used "Geometric Morphometrics" for achieving some of their goals (p. 104) and Fred L. Bookstein's remarkable monograph of 1991 is cited in the list of references. This is indeed so, but at a very elementary level and drawing on methods that are of histor-



ical interest only. The reporting of statistical results is, furthermore, often uninformative and disappointing. Of perhaps wider interest to the palaeontologist at large is the contribution by Buss which deals with the computer-based simulation of the growth of colonies. I gained the impression that some of the modelling presented could be applied in other palaeontological connections. The same remark applies to the article by McShea.

Nehm's contribution treats patterns of growth and developmental processes in margellinid gastropods, and thus shears off sharply from the main input as regards organisms. The bases presented for morphometric analyses are reasonable, but the way in which the results were obtained is neither adequately described, nor referenced. The principal component analysis of morphological variability within clades needs to be more clearly explained as also some of the statements made that, to the statistician, are shrouded in mystery. What does the statement concerning PCA/difference scoring high at 0.8 mean in plain statistical English? Clearly, some piece of essential information is lacking here. In Fig. 6.7 the ratio of height divided by length is plotted against height itself. Were the contributions of J. Huxley and G. G. Simpson concerning differential growth and the danger of the imprudent use of ratios in vain? There is an essay by Stephen Gould. Always readable, his contribution is largely philosophical being a look von oben of the way in which the model of punctuated equilibria has fared over the years in the hands of protagonists and heretics. Doubtlessly, good cases can be made for speciation by the mechanism of punctuated equilibrium, as many of us would agree, not least if viewed within the mathematical framework of Thom's Catastrophe Theory (N.B. "Catastrophe" in the francophonic sense). In passing, it strikes

me as strange that it is still necessary, after nigh on 30 years, for Gould to be obliged to argue the point about evolution by punctuation.

Okamoto, Harmelin and Jackson join forces in a thoughtful overview of the cryptically terse chapter entitled "Refugees Revisited". This turns out to be a set of interacting models concerned with spatial limitation, acquisition of nourishment and environmental factors, in relation to a "cryptic habitat".

The section on macroevolutionary studies contains two entertaining articles of potentially wider palaeontological consequence. One by Hayek and Bura treats the study of taxon-ranges, the other, by Foote, recasts some of the concepts surrounding the application of actuarial techniques to birth/death cohorts, thus reviving an approach that was quite popular a few years back, but which seems to have attracted less attention of later years.

I have a general criticism of the quantitative level realized in the publication. Firstly, Mathematical Statistics is a subject that is in an expansive phase of development and it is not useful to attempt other than simple statistical analyses, without a knowledge of what is going on in that subject. Why then are so extremely few professional statistical publications cited in the volume? There are references to some methods of applied Physics but the statistical expertise of all contributors seems to have been obtained by word-of-mouth to which such a statement, doubtlessly derived from "lab-jargon", as "splitting to the highest significance levels" in reference to Canonical Variate Analysis would seem to attest. I also noted that the treatment of generalized statistical distances is not unchallengeable and there seems to be an unawareness of the need for taking account of compositional constraints where such occur (cf. p. 104). Study of

John Aitchison's brilliant sequence of contributions on this topic can be highly recommended to all natural scientists concerned with compositional data. I also observed that a ratio was used in a principal component analysis as though it were a true variable. These points are all well known in the statistical literature, some dating back more than 100 years (see, for example, Karl Pearson on the subject of spurious correlation). Again on p. 104, my reading of the briefly reported canonical discriminant analysis leads me to suspect that Knowlton and Budd have tried their hands at reifying canonical vectors. This is a dubious exercise at best, as has been well shown by N. A. Campbell in a series of fundamental statistical papers. Barbarisms occur occasionally; for example, quoting negative t-values (p. 149).

On a more positive note, it is gratifying to be able to record that the University of Chicago Press seems to be one of the more altruistically motivated publishing

houses and one that produces a typographically appealing product (but what are they charging for offprints?). We have already noted that the volume is directed towards people working with colonial organisms which perforce limits the range of possible sales to a select few. Symposium publications are an infallible way of burying scientific results - they possess a "low impact factor", to invoke the spectre of the current preoccupation of grant-seekers with hoped-for readership of their travail. On the other hand, they do afford an opportunity for work to be published that otherwise might not have been deemed worthy of inclusion in "high impact" journals for various reasons, such as "poor impact", or exaggerated length.

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