

of the mid-twentieth century, especially through his influential classic of 1942. Yet in a curious way Mayr does himself succeed in producing this exaggeration because, despite disclaimers to the contrary, this history gives the impression that the growth of biological thought has reached a sort of culmination for Mayr in his personal perceptions and opinions (fulsomely but incompletely indexed on p. 968) of its state as of about 1960. But as the facts related in this great volume suggest, every contributor and his contribution, no matter how fundamentally correct and triumphant they may appear contemporaneously, are liable to suffer some revision as the surprises of time and discovery emerge.

It seems likely to me that the evolutionary understandings of a half century from now will view many of our current concepts as quaint. But looking back a full century from then, to 1933 and earlier, they may well find their agreement with Mayr's history becoming more substantially complete. Let us then celebrate and learn from the earlier periods of coverage by this book, and be cautious about its account of modern times.—*William L. Brown, Jr., Department of Entomology, Cornell University, Ithaca, New York 14853.*

Vicariance Biogeography: A Critique.—Gareth Nelson and Donn E. Rosen (eds.). 1981. Columbia University Press, New York, xvi + 593 pp. \$35.00.

Vicariance Biogeography is a historical approach to biogeography which searches for general patterns of relationship among areas of endemism. These patterns are discovered through congruence among taxa cladograms—congruence which can presumably be attributed to the vicariance of a widespread ancestral biota, but not to the combined effect of chance dispersal events. Vicariance biogeography has also been called the "Platnick, Nelson, and Rosen method" (Patterson, this volume, p. 466) due to the method's formalization by Platnick and Nelson (1978) and application by Rosen (1978). A more lengthy explication of the method may be found in Nelson and Platnick (1981).

Among the more salient factors which have contributed to the formalization of vicariance biogeography are: (1) the growing evidence in support of continental drift (cf. Darlington, 1957, 1965; Tarling and Runcorn, 1973); (2) the introduction of Hennigian phylogenetics into the English language (Hennig, 1965, 1966); (3) the union of continental drift theory and Hennigian phylogenetics (Brundin, 1966); (4) the introduction of Popperian philosophy into phylogenetic systematics (Bock, 1973; Ball, 1975; Wiley, 1975); and (5) the incorporation of various aspects of Croizat's "Panbiogeography" (Croizat et al., 1974; Rosen, 1975). Application of drift theory to biogeography had already been attempted in Jeannel's *La Genèse des Faunes Terrestres* (1942). Unfortunately, this antedated the vindication of continental drift and the

development of an explicit means of inferring the relative recency of common ancestry among taxa.

MacArthur and Wilson (1967:5) have criticized historical biogeography, stating that: "The conventional issues relate to specific places and specific groups of plants and animals" and, therefore, the "major issues are *ad hoc* and historically oriented; for example: What was the ultimate origin of the Antillean vertebrate fauna?"; "Did Central America develop a discrete insular fauna during the Tertiary?"; "How can we account for the phylogenetic similarities of the biotas of southern South America and New Zealand?"; "Why is Hawaii rich in species of *Nesoprosopis* but lacking in other native bee genera?". These are exactly the kinds of biogeographic questions which systematists—neontologists and paleontologists—are most interested in. All questions concerning the distribution of organisms properly fall under the heading of biogeography; however, it should be obvious that when one is asking different questions one might need to employ different methods. Vicariance biogeography presumably obviates MacArthur and Wilson's criticism of historical biogeography in that it (1) searches for general patterns and (2) produces biogeographic hypotheses which are predictive and testable (Nelson and Platnick, 1981).

Vicariance biogeography has indirectly benefited from a de-emphasis on speciation via founder events (Mayr, 1942, 1963), a mode of speciation perfectly amenable to dispersalist biogeography. Templeton (1981), based upon a review of the population genetics literature, concludes that among divergence types of speciation (adaptive, clinal, and habitat) adaptive divergence (the erection of an extrinsic isolating barrier followed by independent microevolution) "is probably the dominant mode in both plants and animals" (p. 39). Among transilience modes, Templeton concludes that hybrid maintenance and hybrid recombination are important, particularly in plants, and that genetic transilience (speciation via a founders event) can be important for certain groups and situations. Speciation by chromosomal transilience is judged to be relatively rare. Among all the speciation modes discussed by Templeton, adaptive divergence (speciation following vicariance) is painted as the most general. Bush (1975:357) suggested that "the number of animals that may be speciating sympatrically or parapatrically (i.e., rodents, parasites, flightless insects, etc.) might exceed or at least equal the number of those speciating allopatrically." This is a ridiculous statement which implies that rodents, parasites, and flightless insects do not speciate allopatrically.

The present volume, *Vicariance Biogeography: A Critique*, is the product of a three day symposium (May 2–4, 1979) organized by the Systematic Discussion Group of the American Museum of Natural History. The purpose of the symposium according to Rosen (Introduction, p. 4) was to provide a

forum to discuss whether vicariance theory and method as recently discussed by various authors, was useful, useless, or irrelevant for dealing with problems of historical biogeography. According to Rosen (Introduction, p. 3): "It was the decision of the altered committee that the symposium should include speakers who, except for Croizat, had never before written on vicariance theory and who represented recognizably different points of view in biogeography." Although I found the entire text interesting and enjoyable reading, I question whether the volume as a whole constitutes a thorough critique of vicariance biogeography. This may be due in part to the choice of speakers and in part to the speakers' choice of topics.

Rosen (Introduction, p. 1) refers to Croizat as a vicariance biogeographer, and yet Croizat (1982) flatly denies being a Hennigian. One can only conclude from Croizat (1982) that Croizat is not a vicariance biogeographer. Vicariance biogeography is apparently a hybridization between Brundin's phylogenetic biogeography and Croizat's "Panbiogeography," and it presumably incorporates the best aspects of each. "Panbiogeography" offers to vicariance biogeography the concept of generalized tracts (congruent distribution patterns) against a background of allopatric speciation by vicariance which sidesteps the Neodarwinistic and largely dispersalistic approaches of Darlington (1957) and Simpson (1965). Croizat's (1982) falling out with vicariance biogeography may be due to its piecemeal incorporation of various aspects of "Panbiogeography" and the unsolicited editorial notes interjected within his contribution to the present volume.

Vicariance biogeography, as mentioned previously, searches for congruence between area cladograms (generalized tracks, *sensu* Platnick, Nelson, and Rosen). A critique of vicariance biogeography should, therefore, be a critique of generalized tracks. Other pertinent issues would include phylogenetic methods, Popperian philosophy, and models of speciation. Continental drift is not really an issue.

Six of the twelve invited papers are largely ancillary as critiques of vicariance biogeography. These include: Erwin's discussion of "taxon pulses"; Solem's discussion of land-snail biogeography; Hallam's review of plate movements, eustasy, and climate since the early Mesozoic; two papers discussing evidence for a lost Pacific continent, one by Melville and one by Nur and Ben-Avraham; and the paper by Haffer on Neotropical bird speciation. It is interesting, and perhaps no coincidence, that these six papers are buried centrally and consecutively within the text. Not surprisingly, discussions of these six papers are equally ancillary as critiques of vicariance biogeography. This is due to no fault of the discussants.

Of the remaining six formal papers, only the paper by Simberloff et al. really constitutes a serious critique of vicariance biogeography by directly questioning the statistical significance of congruent cladograms. Udvardy's

paper is a useful interpretation of the possible position of vicariance biogeography within biogeography as a whole. The contributions by Brundin and by Patterson are recommended reading for an understanding of the difference between "phylogenetic biogeography" and "vicariance biogeography," a division which in some respects parallels the divisions referred to as "process" and "pattern" cladism (Platnick, 1979). Wolfe's paper on "Vicariance biogeography of angiosperms in relation to paleobotanical data" should be noted for the interesting discussion which it elicited. The final invited paper in the volume by Croizat is equally as entertaining as his 1982 paper in *Systematic Zoology*.

Nelson's summary of the symposium is clearly partisan and his manipulations of what the participants actually said are unwarranted. His reference to participants' reservations and criticisms of vicariance biogeography as "stumbling blocks" casts an air of naiveté upon the participants—a display of arrogance which will be more of a disservice than a shot in the arm for vicariance biogeography.

The format chosen for the symposium and this volume—contributed paper followed by discussants' comments and a final response—is excellent. I detected very few typographical errors in the text. I have reservations about symposium volumes in general; however, given the excellent format, good physical production, and the relatively low cost of this volume, I would recommend it to anyone with more than a passing interest in biogeography. — *Stephen W. Nichols, Department of Entomology, Cornell University, Ithaca, New York 14853.*

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