Geoscience Canada

Paleogeographic Provinces and Provinciality

Bernard Mamet

Volume 2, Number 1, February 1975

URI: https://id.erudit.org/iderudit/geocan2_1br02

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Publisher(s)

The Geological Association of Canada

ISSN

0315-0941 (print)
1911-4850 (digital)

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Cite this review

Mamet, B. (1975). Review of [Paleogeographic Provinces and Provinciality]. *Geoscience Canada*, *2*(1), 69–69.

Paleogeographic Provinces and Provinciality

Edited by C. A. Ross
SEPM Special Publication No. 21, 233 p., 1974.
SEPM and AAPG Members $11.00, Others $12.50.

Reviewed by Bernard Mamet
Département de Géologie
Université de Montréal
Montréal, Québec

The past distribution of geological provinces, its bearing on the reconstruction and location of continental blocks and its biostratigraphic applications prompted the Society of Economic Paleontologists and Mineralogists to sponsor a Research Symposium held in Denver (1972). Dr. Charles Ross, whose interest in faunal distribution is well known, edited the papers. The thirteen articles deal with widely different aspects of the provinciality concept and attempt to evaluate the factors responsible for its existence. This symposium is therefore a welcome addition to Hallam's "Atlas of Paleobiogeography" (Elsevier, 1973); to the 1972, 24th International Congress section 7 ("Paleontological Evidences For or Against the Relative Movements of Continental Blocks") and to "Organisms and Continents through Time" (Paleontological Association, 1973).

In his introduction, Ross reviews the various paleontological, paleobotanical and biological approaches used in defining geographically restricted dispersion of organisms.

Durden presents eleven paleogeographic distribution maps of Late Paleozoic insects, on both sides of the Atlantic. The extreme latitudinal elongation of the provinces is attributed to a shift in the geographic location of the continents and of the paleoequator.

Suttner described the limitations of mineralogic provinces interpretations. Worsley and Jorgens report the distribution of Oligocene nannofossils. A sharp latitudinal differentiation is observed. Tedford shows that a plate tectonic model of the Cretaceous world is compatible with marsupial dispersion patterns.

According to Swain, provincialism of freshwater ostracodes would be caused by prolonged climatic stability, while provincialism among marine forms is thermophilic and due to water mass temperature differences.

Gordon reviews the different factors affecting the dispersal of Jurassic ammonoids and Foraminifera and concludes that the temperature is the primary agent. The Tethys is the cradle of evolution from which the fauna migrated, while the boreal realm is highly endemic.

Permian palynoflora shows strong provincialism. Hart relates this to latitudinal zonation, but does not explain how temperatures can be deduced from the associations.

The most informative paper is that of Boucot on Paleozoic brachiopods. He shows that provincialism and cosmopolitanism are of cyclic nature. In the same group of animals, with little ecological variations, one observes peaks of dispersals, and, with no plausible paleogeographic modifications, periods of strong to negligible endemism. High and low rates of evolution are encountered for specific groups under conditions of both provincialism and cosmopolitanism. Isolation is related to high climatic fluctuations, regressions, increase in bathymetric communities, reefoid build-ups, strongly differentiated water currents and hypersaline basins.

The study of early Paleozoic acritarchs leads Cramer and Diez to conclude that "on a Wegenerian palinspastic reconstruction of Atlantic Pangeae, the parallelism of biofacies lineations, lithotopes and perhaps even paleomagnetic latitudes is conspicuous".

The striking difference between the North American Mid-continent conodonts and those of the North Atlantic Province is attributed mostly to temperature control by Sweet and Bergstrom.

The dominant themes of the papers is the relation between provincialism and driftist reconstructions. However, when such reconstructions are compared, little or no harmony is observed. For instance, the paleobotanical data of Hart indicate a 30°N latitude for France-England in the Permian with a temperate to arid climate. The same region is equatorial in Durden's paper.

There is also little resemblance between the maps of the Denver symposium and those presented independently at the Paleontological Association symposium in London. For instance the Silurian Pangeae of Cramer and Diez is distinctively different from that of Cocks and McKerrow.

If the main factor for specific diversity is latitudinal and if most postulated modern plate movements are longitudinal, one can expect little relations between them in Mesozoic and Cenozoic time. Moreover if provinciality fluctuates in a given group at the rate demonstrated by Boucot, one must conclude that the relations between faunal provinces and reconstruction of continental blocks remains a difficult task. In particular, the hypothesis that distinctive faunal provinces necessarily evolved on isolated continental masses, as proposed by Whittington and Hughes for Ordovician trilobites, needs additional verification.

This is highly interesting symposium with provocative articles. It proves that paleontology, far from being static and parochial, offers wide avenues for speculation. It is a must in the library of any stratigrapher.

MS received, December 2, 1974.