CAUSES FOR THE BIOGEOGRAPHIC DISTRIBUTION OF LAND VERTEBRATES AFTER THE FLOOD

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ABSTRACT

This study evaluates patterns in the global spread of land animals after their release from the Ark, and shows that: 1) most families have a heterogeneous biogeographic distribution; 2) causes for this include sweepstakes routes caused by the Ice Age and selective anthropogenic introductions. The distribution of problematic groups (e. g. Australian marsupials) appears to be explicable in a Creationist context.

INTRODUCTION

The (imagined) inability of the Creation model to explain the biogeographic distribution of living things was a major factor in its 19th century rejection in favor of organic evolution (Laferriere 1989). Although, as pointed out by the anti-Creationist Jeffery (1983), it is untrue that modern Creationists have ignored biogeography, the global distribution of animals has never been systematically studied from a modern Creationist perspective. This work is a pilot study designed to investigate some of these factors. It is of direct relevance to the young-earth concept in showing that millions of years of organic evolution (i. e. in isolated populations) are not necessary to explain the peculiar biogeographic distribution of certain land vertebrates.

As is the case with most sciences, biogeography as a discipline was largely founded by scientific Creationists (Browne 1983):

> The idea of an Ark in which pairs of animals were preserved during the Deluge had been a concept of far-reaching significance, as had the disembarkation on Mount Ararat and the subsequent dispersal of animals over the unoccupied globe. The biblical story, in fact, had done a great deal to stimulate investigations into the natural world and, among other things, provided the first systematic explanation for the phenomena of biogeography. Far from being the intellectual impediment ridiculed by Darwin and his circle,.. the idea of an Ark focused scholarly attention on the topographic arrangements of species, as well as encouraging naturalists to build up a repertoire of theoretical commitments and practical expertise in the analysis of organic distribution.

METHODOLOGY

This work is limited to animals released from the Ark. It does not consider the biogeography of living things before the Flood (a subject considered elsewhere (Woodmorappe 1983) as part of the explanation for the stratigraphic separation of fossils). Only land vertebrates are recognized as having been on the Ark for the reasons given in Jones(1973). Non-volant vertebrates are emphasized, since the birds and the bats have fossil records too fragmentary (see Carroll 1988) for a meaningful paleobiogeographic analysis of their extant families. At the same time, it should be remembered that most extant avian families are not endemic to particular continents (see Fig. 31 in Rich and Van Tets 1984), while some avian families have near-hemispheric distributions (see Table 1 in Keast 1984).

Throughout this work I assume only naturalistic causes for biogeographic patterns and reject the notion, advocated by some, that post-Flood vertebrates were guided back supernaturally to their former locations on the antediluvian earth. Only Late Tertiary rock contains faunas similar to extant life, but this is not evidence for such a return. Miocene/Pliocene rock is qualitatively different (in terms of thickness, areal distribution, and other features: see Ronov 1982) from earlier rock, so there is ample reason for concluding that Late Tertiary rock and its fauna are mostly post-Flood).

Most biogeographic studies to date have been at the specific level, yet it is almost universally recognized by Creationists that the original Created kind is broader than this. There are numerous instances of interbreeding between species, including those throughout large portions of families (for example, species within Anatidae: Scherer 1986), to say nothing of interbreeding between members of different genera (see Van Gelder 1977 for mammalian examples). Of course, many types of living things must have lost the capability of interbreeding at some time since the Creation. Jones (1972), using Biblical and scientific evidence, has concluded that the original Created kind most closely corresponds to the family level of current taxonomy. This is accepted here. Since biogeographic distributions within kinds (i. e. usually within families) must have resulted from "microevolution" since the Flood (see Lester and Bohlin 1984 for examples of rapid speciation), they are not considered further.

This work approaches biogeography on an intercontinental, not subcontinental, scale. It should be noted, however, that biogeographic differentiation of families on a subcontinental scale is not great. Raup(1982), using computer-based randomly-chosen points on earth (as centers of circular areas of specified radius), has shown that a randomlychosen hemisphere encompasses, on average, all living individuals of only 12% (and maximum of 25%) of terrestrial families.

The paleontological record shows that many if not most living things have had a more widespread distribution than they do today (for example, consider tortoises: Auffenberg 1974). A comprehensive source for the biogeography of extant families as seen from both extant and fossil distributions (Carroll 1988) was therefore used as the primary source throughout this work. Since we cannot know which families have gone extinct only since their disembarkation from the Ark, no extinct families (except for extinct Australian marsupials) are considered here. It should be added that biogeographic differentiation at all levels (but especially lower taxa) has been overstated because of "chauvinotypy" (Rosen 1988): the tendency to generate synonyms by naming taxa from one's nation, biogeographic unit, etc., as unique.

This work assumes that continents have always been fixed. However, if continental drift took place during the Flood, it is irrelevant to post-Flood biogeographic distributions. If it took place at the time of Peleg (Gen 10:25), then all the factors discussed here remain valid. Only their sequence and timing would change.

ANALYSIS

The biogeography of extant (Nowak & Paradiso 1982) and extinct(Carroll 1988) mammalian families, as well as that of reptiles (Carroll 1988), has been examined for biogeographic heterogeneity. Large areas of high endemicity (e. g. Australia, Madagascar) are considered separately below, while the initial focus is on the families native (or once native) to Eurasia/Africa versus North/South America

The table gives the number of families particular to a given group of continents. Of the 40 families common to both blocs of continents, 4 are families presently restricted to one bloc but once living also on the other (as seen from the Miocene/Pliocene: hence post-Flood sediments). We see that 81 of the 112 families occur in at least one of the continents proximate to Ararat, whereas the remaining 31 occur only in North and/or South America. This latter group demands an explanation.

TABLE 1

	Eurasia/Africa	N. & S. America	All 5 Continents
REPTILIAN ORDERS			
Chelonia	0	0	1
Squamata	6	6	14
MAMMALIAN ORDERS			
Rodentia	10	12	6
Carnivora	2	0	5
Insectivora	4	2	3
Primates	11	3	0
Edentata	0	5	1
Artiodactyla	4	1	4
SUM of Families	41	31	40

FACTORS IN POST-FLOOD DISTRIBUTION OF LAND VERTEBRATES

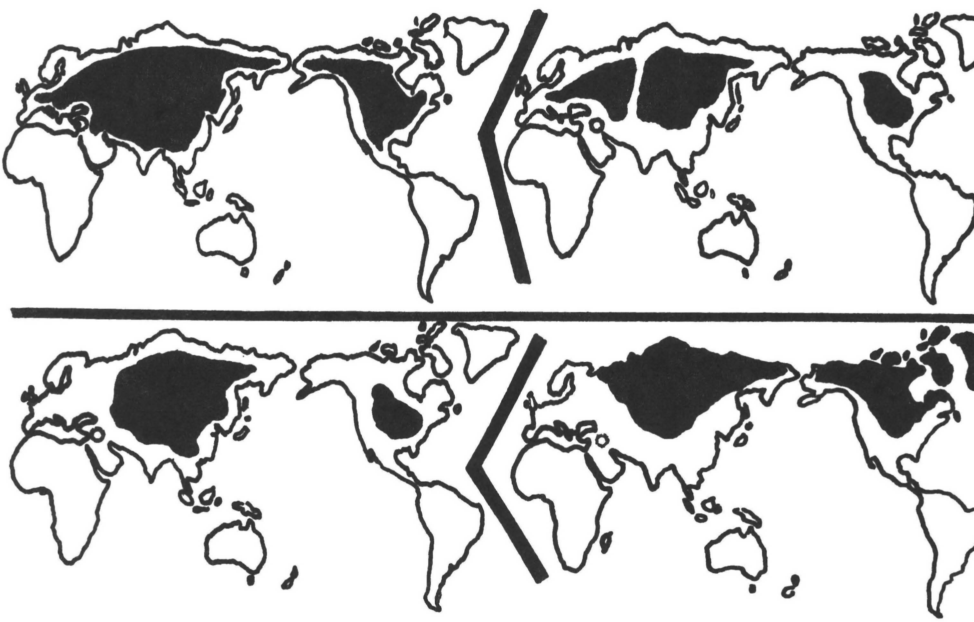
Since animals left the Ark after their kinds (Jones 1973), there was ample opportunity for vicariance (splitting) of faunas in the Middle East, even to some extent without sweepstakes routes. Yet the key to the dispersal of animals from Noah's Ark are the many sweepstakes situations in existence. The Ararat region is mountainous, generating nonrandom routes for migrating animals. The geography includes the Caspian and Black seas as barriers. The fauna, already separated by these local and regional sweepstakes routes, was in a position to be separated on an intercontinental scale.

Ice Age and Climate

The ice age after the Flood (Oard 1986) must have closed off large portions of the northern hemisphere to the animals originally spreading from the Ararat region. But an ice cover is not even necessary. If Oard's hypothesis is correct, volcanic dust caused a reduction in surface land temperatures. By analogy with nuclear winter models (Covey et. al. 1984), interior portions of continents (especially Eurasia) would have been too cold to support life for some time after the Flood.

Consider the situation depicted in top, left. Except for coastal regions, where oceanic warming is a factor, Eurasia and North America are inhospitably cold (i. e. the dark region). The inhabitants disembarking from the Ark are introduced to this situation. After the Middle East is populated, the animals effectively have only 2 sweepstakes routes to take--southwestward to Africa or southeastward to southeast Asia and Australia. This causes an immediate bifurcation of faunas and, among other things, explains why the tropical faunas of Africa, southeast Asia, and (later) South America have little in common.

Subsequently, (top, left) mountainous regions (such as the Urals) warm up. This is caused by the temperature inversion engendered by the atmospheric dust. A new sweepstakes route now opens up, allowing animals to migrate northward from the Middle East. Since a polar ice cap does not yet exist, the Asian Arctic is at first hospitable to these animals. Many of these continue to expand their distributions along this coast, eventually reaching North America via the Bering land bridge. Eventually the Gulf Stream becomes dominant, warming Europe and western Asia (as predicted in a nuclear winter situation: Covey et. al. 1984). This creates yet another sweepstakes route--from the Middle East to Europe. Some of the fauna that has by now populated the Asian Arctic (and North America) also moves to Europe. This explains the faunas that occur only in Europe and North America.



Since the earlier movement of faunas between Eurasia and North America had been disjointed and subject to sweepstakes routes, it is not surprising that the faunas are so different. The ice age seals this situation (bottom, right). Life along the Asian and North American Arctic coasts is snuffed out, and there is no further possibility of interchange between the faunas of Eurasia and North America.

The scenario described above is an oversimplification. In reality, sweepstakes routes must have opened and re-closed repeatedly as regions of inhospitable cold changed over a time span ranging from days to decades. This caused a further vicariance of migrating animals.

Anthropogenic Introductions

A major factor, heretofore neglected in the understanding of the spread of exotic faunas throughout remote parts of the world (i e. relative to Ararat), is the fact that humans began a large-scale dispersal from the Middle East region only after the Tower of Babel incident (Gen 11:78). Prior to this time, they must have been tending many of the animals that had been rapidly multiplying following their release from the Ark. As humans were forced to leave their habitations around Babel, they undoubtedly took animals with them for husbandry, game, and as a reminder of their former area of living. (For a summary of the numerous and diverse reasons for historically recent anthropogenic introductions of animals, see Table 4 in Myers 1986).

These recent examples can offer only a very limited analogy to what must have taken place after the Flood. Post-Babel humans were actually in a position to bring along with them (and introduce to other continents) a much greater diversity of living things than would later be the case (when, for example, only European faunas could be brought by the post 15th century colonists to the New World). First of all, introductions into barren continents had a much greater effect on biogeography than the later introductions of living things into already-populated continents. Also, the diversity of living things in the Middle East was very great soon after the Flood. After all, first the Ark itself and then the whole Middle East region was a microcosm of the full diversity of land vertebrates that would eventually populate the entire globe. Most every group of animals initially taken from the Middle East had a good chance of being a unique faunal assemblage when introduced to distant continents.

It is important to note that introduced animals spread much more rapidly as a result of repeated anthropogenic introductions than they do through their own biological capabilities (Myers 1986). This means that, even if normal spreading tends to make faunas more homogeneous over geographic areas, anthropogenic introductions will make faunal distributions more heterogeneous at a faster rate. Also, consider the rate of population increase among Ark-released animals. If, soon after the Tower of Babel incident, the inhabitants of the Middle East knew (i. e. from advance parties) that remote areas of the earth lacked vertebrates, they had that much more motivation to take many animals with them as "they scattered all over the globe.

LAND VERTEBRATES WITH PECULIAR BIOGEOGRAPHIC DISTRIBUTIONS

There are a number of animals groups that provide classic examples of endemic distribution. Many of these, at first, seem difficult to explain in terms of an origin from the Ark at Ararat. This work offers some novel solutions, with anthropogenic introductions being the main factor.

We have modern examples of entire faunas whose original biogeographic distributions have been completely inverted by anthropogenic introductions combined with geographically-selective extinctions. For instance, wild camels, native to north Africa and the Middle East, are now extinct there, whereas camels introduced to Australia form the largest free-living herd in the world (Myers 1986). The Middle East, originally crowded with the entire diversity of animals released from the Ark, could permanently support only a fraction of these. The rest were doomed to local extinction (or global extinction if they had no representatives beyond the Middle East). For example, the Australian marsupials are a group which was introduced there (see below) but has been long extinct in the Middle East.

Australian Marsupials

These creatures are not only highly endemic and far removed from Ararat, but also comprise a closely related group (as opposed to random assortment of unrelated exotic faunas). However, it must be remembered that the diversity of marsupials (and especially Australian ones) is exceedingly low in comparison to placentals. Only 15 of 53 principal ecological niches exploited by placentals are used by any marsupial (Lee and Cockburn 1985). Furthermore, there are only 17 families (including 4 extinct) of Australian marsupials in contrast to over 250 living and extinct placental families worldwide (Carroll 1988). It would have been no great difficulty for a post-Babel adventurer to have brought with himself 17 pairs of marsupial kinds from the Middle East to Australia. Having a reminder of one's homeland is a powerful motivator for the introduction of animals (Baker 1986) and, if some of the descendants of Noah's family had grown accustomed to marsupials near their respective homes in the Middle East region, they would thus have the motivation to take marsupials with them.

I now consider possible deterministic factors in the exclusive introduction of certain marsupials to Australia. There are a number of features which nearly all Australian marsupials have in common that may have made them especially appealing for the knowledgeable traveler to have taken them along (and at the expense of placentals). Their low rates of postnatal growth (Lee and Cockburn 1985) and lesser food requirements would have made them especially suitable for long voyages, as would the near-lack of diurnal marsupials.

There is some suggestive evidence that Australian marsupials are not a naturally-occurring group but an introduced one. The thylacine, or marsupial wolf, shows close dental and pelvic resemblance to the South American borhyaenids, and evolutionists must invoke "a remarkable amount of convergent or parallel evolution" (Thomas et. al. 1989) to reconcile this with DNA-based evidence that the thylacine is closer to other Australian, and not South American, marsupials. Once it is accepted that marsupials were specially Created and eventually subject to anthropogenic dispersal, it is not surprising that there are astounding similarities between marsupials found on continents occurring at opposite parts of the globe. Thus, the South American Dromiciops stands out in close similarity to Australian, not South American, marsupials (Szalay 1982). Such an oddity makes sense in the light of anthropogenic dispersals of fauna: some marsupials now found only in Australia were also introduced to South America, possibly by the same crew. Indeed, the crew may have largely pre-traced the route taken by later explorers (i. e. James Cook) which would have taken them first to South America and then Australia.

It is also interesting that there are very few truly carnivorous Australian marsupials (Lee and Cockburn 1985), in contrast to the large group of carnivorous South American marsupials. It is the dingo that (apart from bats and rodents) is the only "native" Australian placental. In conventional evolutionary thought, it is claimed that the Australian marsupial fauna evolved over millions of years whereas the dingo was introduced by humans only a few thousand years ago. Accepting both the dingo and the entire Australian marsupial fauna as having been recently introduced provides us with a simple unified explanation: the ancient postdiluvian colonists evidently had preferred to bring along with them the familiar eutherian dog instead of a large group of carnivorous marsupials.

The flip side of anthropogenic introductions as a cause of the Australian marsupial fauna is that there is an explanation for otherwise surprising absences. For instance, the South American freshwater fish are completely unknown to Australia (Briggs 1987). It is not difficult to imagine why if the distributions of faunas was largely governed by the vicissitudes of anthropogenic introduction.

The Fauna of Madagascar

Next to Australia, the island of Madagascar is a striking example of a highly endemic fauna. Occurring off the east coast of Africa on a southerly maritime route from the Middle East, it is not difficult to understand why. The island was a major stopping point for colonists from the Ararat region. This not only explains the endemism of the Madagascaran biota, but also its great diversity (Mittermeier 1988). At the same time, the uniqueness of the Madagascaran fauna finds a partial explanation through African extinctions (as demonstrated, for example, by the faunas found in Madagascar and South America but not Africa: Briggs 1987).

The South American Fauna

The South American fauna contains unique groups, such as the caviomorph rodents. Its avifauna is quite endemic, involving 31 unique families (Rich and van Tets 1984).

Part of the South American fauna, of course, came from Eurasia via North American. This can be illustrated by those elements of the South American fauna which occur only as fossils in North America or Eurasia. Other South American forms were undoubtedly introduced by voyagers from the Middle East. Since South America is relatively close across the Atlantic on a southwesterly route from the Straits of Gibraltar, it is not surprising that it was repeatedly colonized soon after the Tower of Babel incident.

The Fauna of Mid-oceanic Islands

For the colonization of Pacific islands, it has been found that animals are much more capable of colonizing islands even hundreds of km's from a mainland than had been earlier supposed (Diamond 1987). At the same time, oceanic islands vary considerably in terms of diversity of vertebrate life and its similarity to that of the nearest continent. This can be explained by the varying successes of colonization as well as the uneven anthropogenic introductions of vertebrates. Flightless birds occur on certain islands. They do not form a taxonomic group themselves, as they are individual counterparts to volant varieties. Flightless birds can arise from volant ancestors in a few generations (Olson 1973, Worthy 1988), making it possible for islands to have been colonized by volant birds whose recent ancestors had been released from the Ark. (This rapid "devolution" via mutations that cause loss of function and/or structure also solves the apparent problem of vestigial wings. We need not suppose that God created birds with nonfunctional wings).

CONCLUSIONS

The Creation model not only explains the distribution of living things on earth, but is also scientifically superior to the evolution model. This is because the Creation model is more parsimonious. For example, it is much simpler to explain the similarities between the Australian and certain South American marsupials in terms of anthropogenic introductions after the Flood than it is to accept their evolution, over millions of years, while the continents drifted.

Biogeographic studies can either be approached in terms of testable hypotheses or cumulative inductive evidence (Rosen 1988). This pilot study must be followed up by more detailed research into factors relevant to the spread of animals following their release from the Ark: 1) Climatic factors (i. e., the Ice Age) as a cause of sweepstakes routes operable on a trans-continental scale; 2) Anthropogenic introductions involving entire faunas of closely-related forms of life; 3) Identifiable features in Australian marsupials and Madagascaran lemurs leading to their onetime collective introductions by post-Babel humans; 4) the immediate post A-Flood period and the Ararat region with its constantly-changing sweepstakes routes.

REFERENCES

1. Archer M. & G. Clayton (eds). 1984. Vertebrate Zoogeography and Evolution in Australasia. Hesperion Press, Australia, 1203pp..

2. Auffenberg W. 1974. Checklist of Fossil Land Tortoises (Testudinae). Bulletin of the Florida State Museum 18(3)121-251.

3. Baker S. J. 1986. Irresponsible introductions and reintroductions of animals into Europe with particular reference to Britain. International Zoo Yearbook 24/25:200-5.

4. Briggs J. C. 1987. Biogeography and Plate Tectonics. Elsevier, Amsterdam,204pp.

5. Browne J. 1983. The Secular Ark. Yale University Press, 273pp.

6. Carroll R. L. 1988. Vertebrate Paleontology and Evolution. Freeman and Company, New York, 698p.

7. Covey, C., Schneider, S. H. & S. Thompson. 1984. Global atmospheric effects of massive smoke injections from a nuclear war. Nature 308:21-5.

8. Diamond J. M. 1987. How do flightless mammals colonize oceanic islands?, Nature 327: 374.

9. Jeffery D. E. 1983. Dealing with Creationism. Evolution 37(5)1097-1100.

10. Jones A. J. 1972. Boundaries of the Min: An analysis of the Mosaic lists of clean and unclean animals. Creation Research Society Quarterly 9(2)114-23.

11. Jones A. J. 1973. How many animals in the Ark? Creation Research Society Quarterly 10(2)102-8.

12. Keast A. 1984. Contemporary ornithogeography: the Australian avifauna, its relationships and evolution. (pp. 457-69) In Archer & Clayton (eds) op. cit.

13. Laferriere J. E. 1989. Certainty and proof in Creationist thought. Skeptical Inquirer 13(2) 185-8.

14. Lee A. K. & A. Cockburn. 1985. Evolutionary ecology of marsupials. Cambridge University Press, Cambridge, London, 274pp.

15. Lester L. P. & R. G. Bohlin. 1984. The Natural Limits to Biological Change. Zondervan, Grand Rapids, Michigan, 207pp.

16. Mittermeier R. A. 1988. Primate diversity and the tropical forest: case studies from Brazil and Madagascar and the importance of the megadiversity countries (pp. 145-57) In Wilson E. O. (ed). Biodiversity, National Academy Press, Washington, D. C., 521pp.

17. Myers K. 1986. Introduced vertebrates in Australia, with emphasis on the mammals (pp. 121-136) In Groves R. H., and J. J. Burden. (eds). Ecology of Biological Invasions, Cambridge University Press, London, New York, 166pp.

18. Nowak R. M. & J. L. Paradiso. 1983. Walker's Mammals of the World. 4th Ed., John Hopkins University Press, Baltimore, Vol. 1, pp. xxi-xliv.

19. Oard M. J. 1987. An ice age within the Biblical time frame. (pp. 157-66) In Walsh R., Brooks C. L., & R. S. Crowell. (eds). Proceedings of the First International Conference on Creationism, Creation Science Fellowship, Pittsburgh, PA, Vol. II, 254pp.

20. Olson S. L. 1973. Evolution of the rails of the south Atlantic islands (Aves:Rallidae). Smithsonian Contributions to Zoology 152:1-53.

21. Raup D. M. 1982. Biogeographic extinction: a feasibility test (pp. 277-81) In Silver L. T. & P. H. Schultz (eds). Geological implications of impacts of large asteroids and comets on the earth. Geological Society of America Special Paper 190, 528pp.

22. Rich P. & G. Van Tets. 1984. What fossil birds contribute towards an understanding of origin and development of the Australian avifauna. (pp. 421-47). In Archer & Clayton (eds) op. cit.

23. Ronov A. B. 1982. The earth's sedimentary shell. International Geology Review 24(2)1365-1388.

24. Rosen B. R. 1988. From fossils to earth history: applied historical biogeography. (pp.437-81) In Myers A. A. & P. S. Giller (eds). Analytical Biogeography. Chapman & Hall, London, New York, 578pp.

25. Savage D. E. and D. E. Russell. 1983. Mammalian Paleofaunas of the World. Addition-Wesley, London, Amsterdam, 432p.

26. Scherer, S. 1986. On the limits of variability (pp. 219-241) In Andrews E. H., Gitt W. Gi H., & W. J. Ouweneel (eds). Concepts in Creationism., 266pp.

27. Szalay F. S. 1982. A new appraisal of marsupial phylogeny and classification (pp. 621-40) In Archer M. (ed). Carnivorous Marsupials., Royal Zoological Society of New South Wales, Sydney, Vol. 2, 804pp.

28. Thomas R. T., Schaffner W., Wilson A. C., & S. Paabo. 1989. DNA Phylogeny of the extinct marsupial wolf. Nature 340:465-7.

29. Van Gelder R. G. 1977. Mammalian hybrids and generic limits. American Museum Novitates No. 2635, 25pp.

30. Woodmorappe J. 1983. A diluviological treatise on the stratigraphic separation of fossils. Creation Research Society Quarterly 20(3).

31. Worthy T. H. 1988. Loss of flight ability in the extinct New Zealand duck Euryanas finschi. Journal of Zoology (London) 215:619-28.

DISCUSSION

First Mr. Woodmorappe states that some animals were carried into South America by repeated colonizations of peoples from the Middle East. If this is so, why do South American Indians more closely resemble Asians rather than their Middle Eastern progenitors?

Secondly, within the author's views, why are living kangaroos only found on Australia *and* why are the only fossil kangaroos found on Australia? Some evolutionists have criticized creationist biogeography on this point. How does Mr. Woodmorappe address this problem?

Glenn R. Morton, M.S.
Dallas, Texas

Mr. Woodmorappe is to be congratulated for tackling a problem - large scale biogeographic distribution - that many evolutionists regard as completely unsolvable on any young earth model. While I enjoyed the paper, and found it highly suggestive for further avenues of research, I have two criticisms:

1) The paper says nothing about the shortcomings of various evolutionary biogeographic models (e.g., dispersal or vicariance hypotheses). While these shortcomings may be well known to Mr. Woodmorappe, and to many evolutionists, they are, in my estimation, unknown to most of the creation community. It is vitally important that we learn from the failures of others, so we do not repeat them.

2) In that vein, Mr. Woodmorappe provides few if any constraints to his hypothesis of anthropogenic introductions. However, the unconstrained use in explanation of merely possible hypotheses has led many evolutionists to reject earlier theories of dispersal biogeography.

Can Mr. Woodmorappe suggest constraints (perhaps by way of <u>tests</u>) on his interesting hypothesis of anthropogenic introductions?

Paul A. Nelson
Chicago, Illinois

Commendation: Mr. Woodmorappe's simultaneous consideration of Mid-Eastern geography post-flood climatology, and anthropogenic introductions is a valuable contribution to creationist biogeography.

A Caution: There is too much uncertainty on such things as the stratigraphic location of the flood/post-flood boundary and the identification of created kinds for the author to be as certain as he is about the former being the Oligocene/Miocene boundary, and the latter being families. He needs to exhibit much more caution and qualification on these points.

Corrections: Mr. Woodmorappe claims that he cannot know which baramins [sic] went extinct after the flood. It seems that can be known. According to Scripture, all land baramins were represented on the ark. If so, then all land baramins survived the flood, so any extinct land baramins went extinct *after* the flood.

If the Flood/Post-Flood boundary turns out to be significantly earlier than the Oligocene/ Miocene boundary, then plate tectonics will have to be considered as another factor in post-flood biogeography. Tectonics allows for (e.g. Africa-to-Sough America) migrations to occurs easily that are very difficult without it.

Critiques: Mr. Woodmorappe's table needs recalculating. Extinct families need to be considered. Amphibians need to be considered, and *all* orders need to be listed. All continents and Madagascar need to be listed separately. The current table seriously understated the biogeographical import of South America, Australia and Madagascar.

The author does not explain why Europe is not initially a third "sweepstakes" route. It looks like it should be in his figure, and I see no reason why the coast could not be a migration route.

The *extremely* important South American endemism is not dealt with properly. How do post-Babel peoples communicate with one another via advanced parties when their languages have been disrupted?

Conclusion: Mr. Woodmorappe's biogeographic "explanations" are nothing more than scenarios — untested, non-&-all-explanatory just-so stories which are inadequate biogeographic explanations.

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CLOSURE

This is a response to both the written questions above as well as to those given orally after the speaker's presentation.

Mr. Mats Molen is correct in pointing out that the maps do not show glaciated and nonglaciated areas with total accuracy. However, this is because the maps are intended only for schematic and illustrative purposes. The absence (or near-absence) of humans in the Miocene can be explained by the fact that human population growth after the Flood was much slower than that of the animals released from the Ark. Consequently, there may not have been a large enough population of humans to contribute to the Miocene faunas. Moreover, humans probably lived primarily in upland regions and were therefore unlikely to be fossilized during post-Flood catastrophic depositional events.

Mr. Paul Nelson is correct in noting that I did not discuss the difficulties which conventional evolutionary theory encounters in attempting to explain biogeographic distributions. This is because the focus of this work is the positive explanatory power of the Creationist-Diluvialist paradigm. However, I did mention that the Creationist view is more parsimonious in that, for example, it is much simpler to explain the amazing similarity of some Australian and South American marsupials in terms of anthropogenic introductions than in the evolutionary view of common ancestors and drifting continents. I am well aware of the difficulties of evolutionary theory in the explanation of biogeography. Even without a Creationist explanation, evolutionary theory does not ipso facto encounter fewer difficulties in explaining biogeographic distribution.

Mr. Glen Morton's remark about the distribution of kangaroos seems odd in the light of my discussion of Australian marsupials. Perhaps Mr. Morton has not read my entire paper. Likewise, the similarity of fossils to their extant distribution has been discussed. It is true only for the uppermost strata — hence post-Flood rocks (thus fossil kangaroos in Australia). As to the similarity between south American Indians and east Asiatic peoples, this can be easily explained by the differences between successive waves of immigrants. The Indians, coming from eastern Asia, could have easily supplanted the original settlers from the Babel region just as the Indians were in turn overshadowed by the European settlers who now form the bulk of the population of the Americas.

Here are some replies to Dr. Wise's comments:

Both the family unit as the closest Linnean equivalent to the Created kind, and the Oligocene/Miocene boundary as Flood-post-Flood boundary seem to be supported by strong independent evidence. This is not to say that all Miocene-Recent rocks are post-Flood nor that there are no post-Flood pre-Miocene rocks. Consequently, while I agree that all land vertebrates, fossil and extant, were on the Ark, I maintain that we cannot know for certain which Miocene/Pliocene extinct land faunas with their biogeographic distributions were governed by post-Flood factors. I could easily expand my Table to include all extinct faunas as Dr. Wise suggests, but I doubt if it would significantly alter any of the positions and conclusions of this work. I disagree that amphibians need to be considered, for the simple reason that they were not taken on the Ark (see Jones 1973). I can see how Europe could have served as a sweepstakes route, but that would have depended on the degree of its connection with North America.

I would fully agree with Mr. Nelson and Dr. Wise that it is difficult to test fully the biogeographic theories advanced by my paper, but it must be remembered that this is only a pilot study. The theories advanced here are not <u>ad hoc</u> for the following reasons:

1) We know that anthropogenic factors are very significant in biogeography. How much more so if terrestrial vertebrate biogeography had to start "from scratch" from the Ararat region!

2) The climatic sweepstakes routes are not ad hoc because we know of the reality of glaciation from independent evidence.

3) The areas with the most exotic faunas (Madagascar, Australia, and South America) are not randomly distributed on earth: their geographic placement (especially Madagascar) is one that would intercept ships carrying passengers from the Ararat region.

4) The views advanced here do _not_ explain "any and every" possible biogeographic distribution.

For example, the theories are falsifiable at least to the extent that we could conceive of biogeographic situations which would be very difficult if not impossible to explain by an origin from Ararat combined with anthropogenic introductions. For example, the Australian marsupial fauna could have consisted of hundreds of endemic families (not 17, as is the case) in which case anthropogenic introduction would have been a nonviable explanation. Also, if the diversity of terrestrial vertebrate families in the Americas had been much greater than that in Eurasia/Africa, it would be very difficult to explain this in terms of a single origin from the Ararat region. If Madagascar, South America, and Australia were found very close to Ararat (say, in the Mediterranean Sea), it would be difficult to even imagine how they could have such exotic faunas in the light of anthropogenic introduction.

As a matter of fact, the theories in this work suggest many areas for further study as well as testable hypotheses (some of which have been suggested by the audience). Some examples: possible (pagan) religious factors leading to humans having been attracted towards marsupials as a group (Oard), the utility of South American endemics as pets, and the use of certain reptiles for medicinal purposes.

For a truly comprehensive scientific test of my hypothesis of anthropogenic introduction, we need a much more thorough understanding of it, as examples in the scientific literature are basically limited to the relatively few modern examples. Of course, there is no strong conceptual driving force in the evolutionary paradigm to study it in great detail. We especially need to know the factors that may have motivated humans to introduce specific groups of animals (such as the Australian marsupials). The discovery of such factors would support my hypothesis, while the failure to discover any would tend to falsify it.

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Section 3

Additional Topics

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