BIOGEOGRAPHY FROM A CREATIONIST PERSPECTIVE I: TAXONOMY, GEOGRAPHY, AND PLATE TECTONICS IN RELATION TO CREATED KINDS OF ANGIOSPERMS

George F. Howe*

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Biogeographical theories in the past have been based solely on the evolutionary model. One of these evolution theories is discussed (the Theory of Generic Cycles). The data of classification and distribution (as published by Ronald Good) for families, genera, and species of angiosperms are reinterpreted here from the creationist perspective. The average family is judged too large and diverse to represent a created kind. But since the typical angiosperm genus is narrow and coherent, this category may regularly represent the monophyletic product of a created kind. Certain problems of plant disjunction are neatly solved under the assumption that there has been a breakup of one original land mass in conjunction with the Flood.

A. Introduction

Certain biogeographers have maintained that their subject can be interpreted only in terms of the general evolution theory. Ronald Good, a leading botanist, has put it boldly:

> "The short history of the study of plant geography in the Introduction is enough to show the enormous influence that evolutionary conceptions have had on the development of the subject, and it is no exaggeration to say that its whole background has become an evolutionary one, as, indeed, is true of any biological subject. Evolution is, as it were, the medium in which the picture of plant distribution is painted."[1]

In another passage, Good affirmed that evolution must be understood as a gradualistic process lest it come to resemble special creationism too closely:

> "If there is no theoretical limit to the magnitude of evolutionary change there must be visualized the possibility of some new form, widely different from anything hitherto existing, arising quite suddenly and unheralded, and there would be considerable difficulty in divorcing this kind of origin from the suggestion of an act of special creation. It was all-important rather, to show that evolution was an orderly process as opposed to the condition of arbitrariness, which must in one sense at least be inherent in the conception of special creation."[2]

Yet such wholesale espousal of evolutionism and disavowal of special creation as "arbitrary" is somewhat surprising in face of the fact that the main problem of plant geography is as far from solution today as it was during the days of Charles Darwin, concerning which Schuster has commented:

> "The general conclusion we must arrive at, however, as Darwin (1903) stated in a celebrated letter to Hooker, is that from a biogeographic point of view the origin and early history of flowering plants remain largely an 'abominable mystery.' "[3]

Botanists have come to realize that there are very few evidences to support the idea that plant groups are related, as noted in this clear statement written by G. H. M. Lawrence:

> "Within the conifers it has become increasingly clear that the several families are of a more remote relationship to one another than was formerly believed and that the family Pinaceae of older works deserves to be treated taxonomically as an order or suborder, and its tribes raised to the family level. No ancestors are known for the Gnetales, Welwitschiales, or Ephedrales, and none of these orders is closely allied to other gymnosperms. Like the ferns, the gymnosperms are certainly of polyphyletic origin, and there is no evidence to suggest a common ancestor for the cycads, ginkgo, taxads, and the conifers. Similarly, there is no evidence to suggest phyletic relationships between the pteridophytes and the gymnosperms; the available evidence suggests that the latter are not derived from the vascular cryptograms."[4]

Thus the plant world presents an array of unrelated types—a picture that fits the creationist predictions accurately. The evolutionist, however, is left with a feeling of dismay upon viewing the botanical data:

> "The subject of the phylogeny of vascular plants is not one to give the student a sense of satisfaction, for neither a cursory nor an exploratory study of it engenders the feeling of having grasped or comprehended a segment of scientific knowledge. This regrettable sense of insecurity is due in part to the speculative nature of many of its findings or conclusions, speculations by many botanists—based on the same or different evidence—and of great diversity."[5]

The logical fallacies in the evolutionary mindset become obvious in the following statement with its glaring internal conflict:

> "There also can be no doubt that the Angiosperms arose, by the processes of organic evolution, from some pre-existing group of plants, although what kinds of plants these ancestors were is uncertain."[6]

It is not apparent how a scientist can be "certain" that flowering plants arose by evolution from earlier plant ancestors when it is at the same time impossible to identify those ancestors! The following statement by an evolutionist portrays evolution as a "master-factor" which takes on a metaphysical rather than a scientific character:

> "It is necessary here, therefore, only to emphasize once again the degree to which the evolutionary factor is, as it were, a master-factor, determining in

*George F. Howe is Professor of Biology at the Los Angeles Baptist College, Newhall, California 91322.

one way or another the operations and results of all those others that have now to be reviewed. Evolutionary factors may be regarded as inherent or predisposing factors."[7]

In the face of such attitudes, it is extremely important for creationist biologists to undertake the systematic study of biogeography as well as all other fields in the life sciences.

Plant geography is exceedingly broad and involved since it impinges on these numerous fields and many more: taxonomy, morphology, ecology, physiology, paleontology, geophysics, soil science, meteorology, climatology, plate tectonics, and human history. To cover the subject properly from the creationist vantage would require at least a full book, a complete lifetime of research experience, and a broad reading knowledge in most of the fields mentioned. This paper is therefore not a comprehensive treatise but rather an attempt to initiate a series of creationist inquiries into the vast field of biogeography.

The following topics are among those which will be crucial to explaining plant geography from the perspective of scientific creationism:

1. The taxonomy and geography of plants today.
2. Post-Flood plate tectonics and effects on the distribution of living plants.
3. Post-Flood plate tectonics and effects on the distribution of fossil plants.
4. The survival, dispersal, and variation of plants after the Flood.
5. The geographical distribution of plants in the pre-Flood world.
6. The original geographical distribution of plant kinds at the time of creation.

Only a cursory introduction to the first two topics can be undertaken in this paper. It is hoped that the author and other creationist biologists will address themselves to these topics—perhaps in a series of individual papers or even letters to the editor in subsequent issues of *C.R.S.Q.*

Certain corollary biological topics will constantly come under consideration when creationists begin to forge a comprehensive alternative to evolutionary biogeography:

1. What categories and taxa of today correspond most closely to the kinds that were originally created?
2. What types of changes has the Creator employed with the kinds since the time of Creation and what means has He used to enact such modifications?

B. The Taxonomy and Geography of Plants Today

Plant taxonomy is by no means an exact science since it is constantly subject to interpretation, reinterpretation, and wholesale revision. The degree of objectivity and scientific reliability decreases with ascending order in the taxonomic hierarchy from species upward. Although biologists frequently disagree regarding the criteria for defining a species, this group is the most readily identifiable category and the one most directly subject to scientific analysis. But designating orders or even families involves subjective philosophy and personal judgment in addition to scientific standards. The categories have decreasing reliability in the following order: species, genus, family, order, class, and division. (The "division" is the botanical counterpart of the zoologists's "phylum".)

1. Plant Families.

a. Taxonomy of families. Good has estimated that there are approximately 435 plant families if one draws the boundaries in the narrower sense. The word "plant" here and elsewhere in the paper is used to designate angiosperms or flowering plants unless otherwise indicated. Since there are about 225,000 species, in Good's judgement, the average plant family contains about 29 genera and about 600 species. Frequent use will be made of Good's exhaustive treatise on plant geography. He has written on a global basis and has shown unusual breadth and objectivity in discussing most problems.

The leading family, as regards number of genera among the monocots[8] is the Orchidaceae which contains approximately 600 genera. The dicot[9] family with the most genera is the Asteraceae (sunflower family) with about 1000 genera or 20,000 species. There are 20 other flowering plant families that have 2000 or more species (see list on p. 50 of Good). From the standpoint of number of taxa included, the typical plant family appears broad and polyphyletic.

b. Geography of families. Numerous plant families can be called "cosmopolitan" in the sense that one or more of their genera are represented on most major land masses or in most aquatic habitats. For example, of the 435 plant families, approximately 215 (50%) could be designated "widespread" to the extent that they are either cosmopolitan, subcosmopolitan, or at least pan-tropical (see Table 1.)

Only 124 of the 435 families (28%) are limited to one continent (endemic) and 96 or (22%) have a "disjunct" distribution—being represented on only a few widely separated land masses.

Thus families can be described as "widespread" in geographical terms and as broad taxonomically. The created kinds of angiosperms in most instances appear to have been narrower than present families. To the cretion minded botanist the characteristics of the family then are above the created kind and may represent a "trademark" or set of traits incorporated into several kinds at the time of their formation. Accordingly, at the onset several separately created groups of plants were

Table 1. Patterns of geographic distribution among angiosperm categories. This table is based on numerical counts and/or estimates published by Ronald Good, Reference 1.
The asterisks indicate per cents not actually published by Good, but easily calculated from the numerical data which he has given.

Category	Total number within angiosperms	Number and per cent having widespread distribution	Number and per cent having endemic distribution	Numberand percent having discontinuous distribution
Family	435	215 (50%)*	124 (28%)*	96 (22%)*
Genus	12,500	475 (4%)*	10,000 (80%)*	765 (6%)*
Species	225,000		202,500 (90%)*	

given the same cluster of common traits which presently identify the bean family (Fabaceae), for example. The hallmarks of a family or higher taxonomic category such as an order, class, or division do not spring from organic descent but from an originally created imprint. Such activity on the part of the Creator would not be "disorderly" or "arbitrary" as Good implied but would be in close keeping with the concepts of outline and economy in manufacturing design as practiced by man himself.

Wherever monogeneric families exist, on the other hand, such groups may be created kinds themselves, this matter deserving further study.

In animal taxonomy or among non-flowering plants, the taxonomic boundaries of the created kinds may be somewhat different than with the angiosperms. From an analysis of taxonomy among the pigs (*Sus* and *Potomochoerus*) Lammerts has asserted that zoologists have generally been much narrower in delineating families and genera than have the botanists.[10] In fact, after an exhaustive study of Bible lists and animal taxa, Jones concluded that ". . . in vertebrates the *min* [kinds] of the Mosaic food lists generally lie at the family level in current classification systems."[11] From this assumption, Jones concluded in a later paper that, ". . . biological arguments against a universal Flood are invalid, and . . . the number of animals under Noah's care probably did not exceed 2,000."[12] Thus it may well be that the family is indeed the created kind in the animal world as the families of zoology are so narrow that they stand as counterparts to plant genera—but zoologists will have to speak further to this question in later reports.

2. Plant Genera

a. Taxonomy of genera. Angiosperm genera present a different picture than do the families as regards both taxonomy and geography. Good computed that there are about 12,500 genera into which flowering plants have been subdivided (pp. 84-86). He estimated that one third of all these genera are monotypic (containing only one species in the genus) and about one eighth of the genera consist of only two species. Concerning such genera with low numbers of constituent species, Good wrote ". . . the two may account for one half of the total."[13]

A moment's reflection from the creationist's vantage suggests that these genera which have only one or two species (half of all angiosperm genera!) may very well represent monophyletic units or kinds in the Creation model. However we must recall that genera of today are plant groups that have emerged from the Flood and the assumed continental rift and may have undergone some creative change (either by natural selection, speciation, polyploidy, or other means). Thus our judgment that the genus is frequently the created kind in angiosperm botany should be considered tentative. It is of great interest, however, that very low species numbers are the rule, rather than the exception, among plant genera.

But what may be said concerning species numbers among the other half or so of the established plant genera? The number of constitutent species varies from three on up to thousands. Good tallied 14 genera which are subdivided into 100 or more species. The genus with the highest number of species is *Astragalus* (a member of the bean family) having 1800. *Ficus* (the fig genus) is estimated to contain more than 1000 species.

Concerning the others, Good wrote, "For the rest there are genera of almost every species number down to the extreme condition of monotypy."[14] 470 genera contain 100 species or more per genus.

b. Geography of genera. Good considered genera "endemic" if they are limited to one of 37 floristic regions into which he divided the world (see Plate 5 opposite p. 80 of Good). For example, the North American continent is divided into 8 such zones and South America into 6. Accordingly, a genus had to have a much narrower distribution to be classed as endemic by Good than did a family. On page 132 Good concluded that 10,000 of the 12,500 (80%) of all angiosperm genera are endemic. It is important to emphasize here that while genera have much smaller taxonomic scope than families, they also have a narrower geographic distribution on the average than do plant families.

The most widespread land plant genus noted by Good was *Senecio* of the sunflower family (p. 87). There are about 50 other genera that are designated as "more or less cosmopolitan" (p. 86). If these 50 are added together with the genera designated as widespread tropical, widespread temperate, or southern distribution, a grand total of only 475 plant genera emerge out of the 12,500 (4%) as being somewhat widely distributed—as compared to 50% of all flowering plant families that are widespread (see Table 1). Genera that are widespread in the tropics and other genera that have a broad distribution in the north temperate regions may hark back to a vast pre-flood and early post-flood distribution as part of a vegetational carpet which was dissected later by climatic and geographical changes. In the creationist view, endemism may have arisen as a result of shrinking ranges after the Flood and glaciation or as a result of sweepstakes survival and dispersal after the Flood.

To account for the existence of widespread, endemic, and discontinous taxa along evolutionary lines, Good defended the "Theory of Generic Cycles." In this view a species starts in one limited locality and is thus endemic at its onset. A "juvenile stage" comes first during which the taxon is "establishing itself and gradually extending its range from nothing to a maximum determined by various environmental conditions."[15]

A second or "maturity" stage follows when the species will attain and hold its maximum range. Next, "In the third stage the species is passing into obscurity . . . For a time it may maintain its range, but sooner or later this must tend to decrease."[16] Good assumed that disjunction of genera or species occurs during and was a result of this third stage when the group is passing into obscurity but disappearing ". . . earlier in some places than in others."[17] During the fourth and final stage the taxon vanishes and as a result will appear to be endemic at the very end.

Since the taxon will be endemic once again at the end of the Cycle, ". . . for some time before final extinction the size of its range will be indistinguishable at sight from that of a species but newly formed."[18] In terms of this theory it would be impossible to tell whether a particular endemic species is "coming" or "going"!

Reflecting on the implications of such a view, one might expect to find various genera at all stages of the cycle with approximately equal numbers or at least generous representation for each of the various stages. But why are 80% of all genera (and even a higher percentage of all species) endemic? Where are all the genera and species that should generously exemplify the supposed second and third stages of this particular scheme? Such paucity of intermediates is an inherent weakness in the Theory of Generic Cycles as is also the fact that it would be impossible to tell nascent taxa from vanishing ones. Certainly then this theory does not preclude alternatives from the special creation vantage.

Good has undertaken to prepare and revise a list of discontinuous genera which encompasses an amazing array of discontinuities (pp. 439-444). The list contains discontinuities of 5 different types. A total of 765 discontinuous genera is enumerated which accounts for about 6% of all angiosperm genera as opposed to 22% of the angiosperm families that are discontinuous. The Fabaceae (bean family) has the largest number of discontinuous genera with the sunflower and euphorb families next in sequence.

3. Plant Species.

a. Taxonomy of species. Concerning both the taxonomic and geographic aspects of flowering plant species, Good made the following significant statement:

> "That many genera consisted of but one species, and that the ranges of others are but the sums of their superimposed ranges of their constituent species, are enough indication that there is no real difference between the distribution of species and that of genera, except, of course, that the latter are usually more extensive."[19]

As stated earlier, there are about 225,000 flowering plant species and this averages 18 per genus. Plant species were originally distinguished from each other on morphological grounds but in more recent years such considerations as chromosome number, hybridization, microscopic anatomy, and other data have been taken into consideration. The trend in general has been to reduce the number of species in a particular genus by taxonomic revision.

There have been, of course, both "splitters" and "lumpers" among botanical taxonomists. Considerable revision should be undertaken in plant taxonomy to broaden the species groups so that each includes all those types which will interbreed. This genetic concept of species has been applied by Jens Clausen in erecting what he called "cenospecies"—aggregates of all the species in a subgenus that would allow any type of genetic exchange among themselves.[20] Perhaps a continuation of such research will demonstrate that the number of plant species can be reduced significantly.

Taxonomic creationists could also well undertake wholesale revision of the genus category. Perhaps a genus that contains such great numbers of species is actually too broad to be classed as a genus and would be best broken down into many genera along the lines of its existing subgenera.

b. Distribution of species. Good noted that four kinds of rather widespread species include the following types:

a. freshwater aquatics (example is cattail).

b. temperate species introduced into the tropics (examples are temperate weeds introduced throughout the tropics.)

c. tropical species introduced into the temperate zone (example Bermuda grass.)

d. halophytes (example Russian thistle or as it is also called—tumbleweed.)

In terms of the Theory of Generic Cycles, Good reminded the reader that the locality which contains numerous species of one genus is not necessarily the point of geographic origin for that genus. It could rather be the place where specialization took place and the actual point of origin may lie somewhere off to the side of its range.

Patterns of distribution among the species even in one genus may vary quite widely so that a particular genus may contain both widespread and endemic species (Good p. 162). In some genera like *Juncus* (the rush) about half of the species are widespread and half endemic. In other genera like *Begonia* most of the species are wide, only a few being endemic. But in still other genera like *Dioscorea* (the yam) there are only a few widespread species—most being endemic.

On the basis of certain assumptions, Good placed the percentage of endemic species at 90%—even 10% higher than that of endemic genera (p. 189—Good and Table 1 this paper).

Concerning discontinuous species, Good gave no exact numbers but did indicate on p. 226 that " . . . the detailed account that has already been given of discontinuous genera applies in outline almost equally well to species. Indeed, genera often owe their discontinuity to that of one or more of their constitutent species."[21] As a general rule, one could say, as the genera go, so go the species. This type of evidence causes the present author to suggest that creationists take the genus, in many instances, as representing the modern counterpart of the created kinds among angiosperms.

Endemic species may be relicts of species that were at one time more widespread. It is known as an end result of this sequence that species may actually undergo extinction. A narrowly restricted species may consist of as few as one individual (p. 234, Good)! The subsequent extinction of a particular flower plant species may or may not signify the extinction of a Genesis kind.

In other cases, narrowly distributed or endemic species may be the Creator's product (by means of natural selection or some other process) from the genus stock to meet the demands of a changing post-Flood environment. For example, polyploidy may have been frequently used to derive certain species within a created kind—a matter that will be analyzed to a greater extent in a subsequent paper.

C. Post-Flood Continental Rift and Its Plant Geographical Implications

Some controversy in both evolutionary and creationist quarters still surrounds the reality and mechanism of continental drift. For the purposes of this review, however, it will be assumed that a rapid continental drift (rift) took place in early post-flood times and that before the rift the earth had but one main land mass (see paper by Mark Tippetts in this same Annual Issue of *C.R.S.Q.* in which is found a coherent statement favoring continental rift from creationist vantage.) Lawrence commented that the major reticence of scientists in adopting the theory of continental rift was the lack of an adequate mechanism.[22]

It is reasonable to assume that after the Flood different floras appeared in various regions of Laurasia and Gondwanaland. When the continents divided, separating land areas that had been adjacent, these post-flood floras were also split providing the basis for some of the disjunction seen among genera and species—without recourse to the evolutionary Theory of Generic Cycles. A brief listing follows of some of the known discontinuities which are readily explained if we assume that Pangaea divided along the lines usually suggested:

1. The flora of Patagonia (South America) has a close relationship to that of New Zealand (Good, p. 222).

2. Many discontinuous species exist in North America, Europe, and Siberia (an example of an earlier Laurasian distribution modified by the rift.) Example here is *Ostrya virginica* (a member of the birch family) which presently occurs in North America and East Asia—Good, p. 226.)

3. Some species and genera show a disjunction correlating with the ancient Gondwanaland—South America, Australia, and New Zealand, *e.g. Nertera depressa* which is called the bead plant and is a member of the madder family—Good, p. 228).

4. An Asian and African link exists between many species and genera. *Asparagus racemosus* was one of many examples listed by Good, p. 228.)

5. There is a major affinity between the flora of Australia and that of South Africa. For example the genus *Restio* has a species in South America as well as Madagascar and Australia—Good, p. 250.)

6. There is an Antarctic element in the flora of Australia. Discussing this antarctic element, Good wrote:

> "Not only so but this 'Antarctic' element is characteristic also of Tasmania and New Zealand, which, since they are the only other appreciable southern lands at the same latitude, may be thought of as natural neighbours, being linked together by the presence of an attenuated version of the same element throughout the South Temperate Oceanic Islands, which to-day represent what there is good reason to believe was once a more direct connection across the present Antarctica."[23]

7. There is a floristic problem as regards the flora of Australia and that of New Guinea being in such close proximity and having such widely diverse affinities. Good described the problem as follows:

> "Putting the problem in its simplest terms the reason for this anomaly is that the flora of Australia differs from that of New Guinea to a degree which many people find inexplicable if the gulf between the two has never been more than the hundred miles of very shallow sea, thickly strewn with islands, that it comprises to-day. The question is, therefore, whether they have always been so placed, and, more particularly, whether Australia and New Guinea are as would appear at first sight and is commonly assumed, parts of one and the same great land-mass or not."[24]

Good continued by asserting that the foregoing problem is now somewhat artificial and outmoded because originally people assumed the continents were immobile. While he admitted that continental drift does not automatically solve the problem of why the Australian flora and the nearby New Guinean flora are so vastly different, he made the following assertion:

> "This concept of continental movement certainly helps to resolve the anomaly of the position of the Australian flora, because it allows that it may have moved . . . biologists are generally agreed that the peculiar features of the Australian biota (and some of the zoological facts are even more striking than the botanical) can only be explained on the supposition that they have developed under conditions of great and prolonged geographical isolation, and thus those who do not accept continental drift in this dilemma . . . find themselves in the untenable position of maintaining that the present isolation of Australia . . . is sufficient to account for the facts."[25]

Good, of course, goes on to suggest that possibly Australia and New Guinea have been parts of different land masses and that they may thus be in close proximity now and yet have been widely separated during history.

Schuster has written a chapter on plate tectonics and angiosperm dispersal in a recent symposium. Schuster concluded from his studies that angiosperm families and often genera were present before the breakup of the Australian complex.[26] This, of course, would fit with the creationist assertion of recency for the entire history of the earth. He affirmed, as Good had done, that the rifting of continents caused old coherent floras to separate and new juxtapositions of diverse floras to occur. For example, he discussed the way in which the Indian plate had juxtaposed a Gondwanalandic flora next to a Laurasian flora—the Winteraceae family, for example, being brought very close in its range to Laurasian families such as the Magnoliaceae in the region of Australia versus New Guinea that was previously discussed.[27]

Much of Schuster's treatment centers on mosses, gymnosperms, and fossil plants—subjects which deserve separate discussion in later papers.

D. Some Creationist Speculations about The Relationship of Present Floras to The Flood

Cretaceous fossil remains of flowering plants demonstrate a broad geographic extension of tropical and temperate life much farther north and south than at present. In that regard, Good wrote:

> "Regarding the constitution of Cretaceous floras in general, Berry (59, 61) has emphasized the fact that they contain a mixture of what would be called today tropical and temperate genera such as is now found in southern Chile, south Japan and New Zealand. That is to say, they may be described as indicating the occurrence in their time of a warm-temperate or sub-tropical climate."[28]

The same description of broad temperate and tropical floras applies to the distribution of Eocene fossils (Good, p. 319).

It is generally believed that before the Flood climates were more moderate. At that time many of the created kinds were distributed widely. Such a pattern would still be reflected in the many pan-tropical or cosmopolitan species and genera presently existing.

After the Flood there would be widespread survival and dispersal of plants. Plant life may have produced a carpet of vegetation somewhat similar to the original floral distribution. There would, however, be a decrease in geographic ranges for many taxa because of post-Flood changes in soil and climate. Such changes would have been intensified as glaciation occurred and furthermore, glaciation would have brought with it widespread changes in plant geography:

> "In short, if these suppositions be correct, the effect of the Ice Ages on the Flowering Plants was completely to upset, over much of their range, the balance between plant and habitat. Since there has not been, in the time which has elapsed since the fourth glaciation, any appreciable restoration of the long-term pre-glacial conditions, the botanists of today are studying a world vegetation but lately subjected to a devastating disaster. The study of the geography of the Flowering Plants, is peculiarly the study of the consequences of this disaster, and this being so, the outstanding importance of the Pleistocene in relation to the general story can scarcely be overestimated."[29]

Apparently this writer has unwittingly paid tribute to the Flood itself and not just glaciation when suggesting that plant geography manifests the after-effects of a great catastrophe!

The high degree of endemism found among genera and species of today may in various instances be the result of:

1. limited survival and dispersal after the Flood
2. decrease in range of plants after the Flood as a result of glaciation
3. formation of new taxa (subspecies or even species) within the Genesis kind to meet the needs of a diversified habit with new niches.

Disjunction in survival and dispersal after the Flood may account for the disjunct distribution of certain genera and species today. Schuster has noted that disjunct ranges arise more frequently from extinctions across major section of an earlier, larger range than they do by long distance dispersal.[30] However, a certain number of disjunct patterns today may be attributable to the sweepstakes survival and chance dispersal following the Flood.

In post-Flood times a characteristically southern flora may have reinhabited the lower region of Pangaea (Gondwanaland) while a northern (Laurasian) assemblage of plants prevailed above. A shifting of continents in post-Flood times could then account for many of the strange disjunctions and bizarre juxtapositions of diverse floral assemblages found today.

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[1]Good, Ronald. 1964. The geography of the flowering plants, third edition. Longmans, Green and Co., Ltd., London. p. 33.

[2]*Ibid.*, p. 35.

[3]Schuster, Rudolf M. 1974. Plate tectonics and its bearing on the geographical origin and dispersal of angiosperms. In Origin and early evolution of angiosperms, edited by Charles B. Beck. Columbia University Press, N.Y. pp. 52-53.

[4]Lawrence, George H. M. 1951. Taxonomy of vascular plants. The Macmillan Company, N. Y. pp. 102-103.

[5]*Ibid.*, p. 107

[6]Good, *Op. cit.*, p. 315.

[7]*Ibid.*, p. 332.

[8]The "monocots" (short for the subclass name Monocotyledonae) include all the flowering plants that have leaf veins parallel to the midvein, single seed leaf or "cotyledon" in the embryo, conducting bundles scattered throughout the cross sectional area of the stem, and flower parts in 3's or multiples of 3.

[9]the "dicots" (short for the subclass name Dicotyledonae) include all flowering plants that have netted veins, two cotyledons in the embryo, conducting bundles arranged in a peripheral ring, and flower parts in 4's, 5's, multiples of 4 or 5, or in great numbers.

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[11]Jones, Arthur J. 1972. Boundaries of the min. *Creation Research Society Quarterly* 9(2): 114-123. See p. 120.

[12]__________. 1973. How many animals in the ark? *Creation Research Society Quarterly* 10(2): 102-108. See p. 102.

[13]Good, *Op. cit.*, p. 85.

[14]*Ibid.*, p. 85.

[15]*Ibid.*, p. 44.

[16]*Ibid.*, p. 44.

[17]*Ibid.*, p. 44.

[18]*Ibid.*, p. 44.

[19]*Ibid.*, p. 154.

[20]Porter, C. L. 1959. Taxonomy of flowering plants. W. H. Freeman and Co., San Francisco. p. 66.

[21]Good, *Op. cit.*, p. 226.

[22]Lawrence, *Op. cit.*, p. 143.

[23]Good, *Op. cit.*, p. 261.

[24]*Ibid.*, p. 266

[25]*Ibid.*, pp. 266-277.

[26]Schuster, *Op. cit.*, p. 48.

[27]*Ibid.*, p. 69.

[28]Good, *Op. cit.*, p. 317

[29]*Ibid.*, p. 331.

[30]Schuster, *Op. cit.*, p. 66.