

# Phytogeographic connections between Africa and South America:

## Origin and diversification of the American flora

UAB

Universitat Autònoma de Barcelona

Anna Pont Albino  
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### Introduction

Biogeography studies the distribution of organisms throughout the Earth. Phytogeography in particular studies distribution of plants in our planet.

Africa and South America have many plant species in common, and scientists have elaborated two hypotheses to find out which one can explain better these distributions: the vicariance theory and the oceanic dispersal theory.

### Objectives

The main intention of this project is to revise publications about phylogenetic relationships in plant groups that have representatives in Africa and South America.

Then, the project consists on knowing which hypotheses have been created in order to explain the plants' distribution in these continents.

Moreover, I show some examples of families or genera that fit both hypotheses or only one of them

### Material and methods

This project has been realized with books and scientific articles, by summarizing them and writing the project with my own words.

Most of the articles have been found on the Web of Science (WOS).

### Main hypotheses

#### Oceanic dispersal theory

- ✓ The oceanic dispersal theory says that plants could migrate to other continents with the dispersion of seeds and spores, mainly thanks to the wind, water and animals.
- ✓ With the appearance of vicariance theory the dispersal theory was often rejected, but nowadays it has been reevaluated, as some families are too recent and they are thought to have diverged after the fragmentation of Gondwana.
- ✓ Migrations were possible thanks to Walvis Ridge and Río Grande Islands, which were situated in the southern part of Atlantic Ocean (Figure 3).



Figure 1. Laurasia and Gondwana's distribution in Pangea (Source: 1).

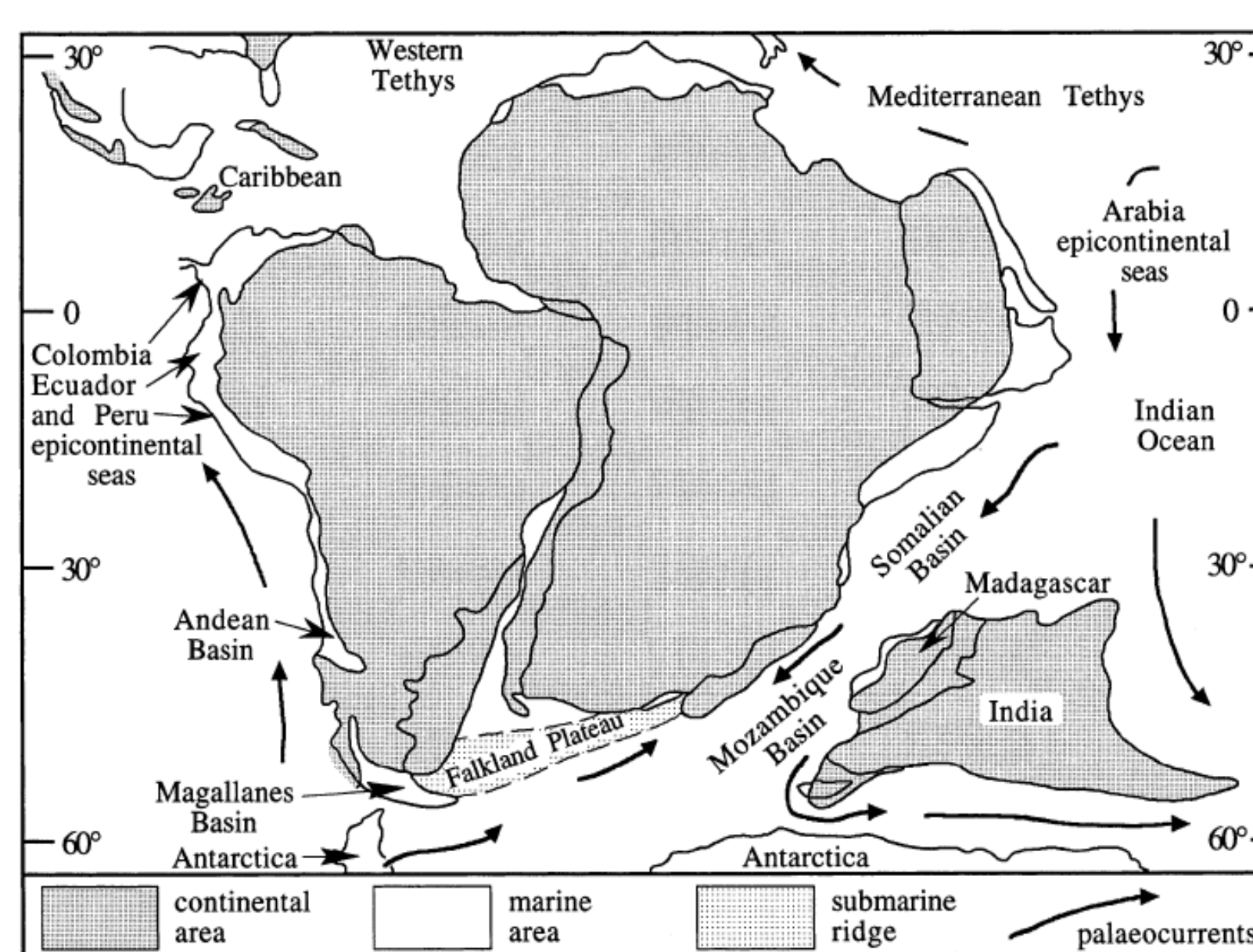


Figure 2. Africa and South America were still connected at the beginning of Cretacic (Source: 2).

#### Vicariance theory

- ✓ During the Triassic (252 Mya) there was a supercontinent called Pangea, which was formed by two blocks: a northern part called Laurasia and a southern part called Gondwana (Figure 1).
- ✓ The vicariance theory is based on the continental drift and plate tectonics. This hypothesis says that ancestors of the vascular plants which can be found in Africa and South America initially were distributed in a continent called Gondwana.
- ✓ South America and Africa started to break up in the beginning of Cretacic (135 Mya), although they were connected until the final of Cretacic (110-95 Mya) (Figure 2).
- ✓ With Gondwana's fragmentation, plants were broken away and they evolved separately.

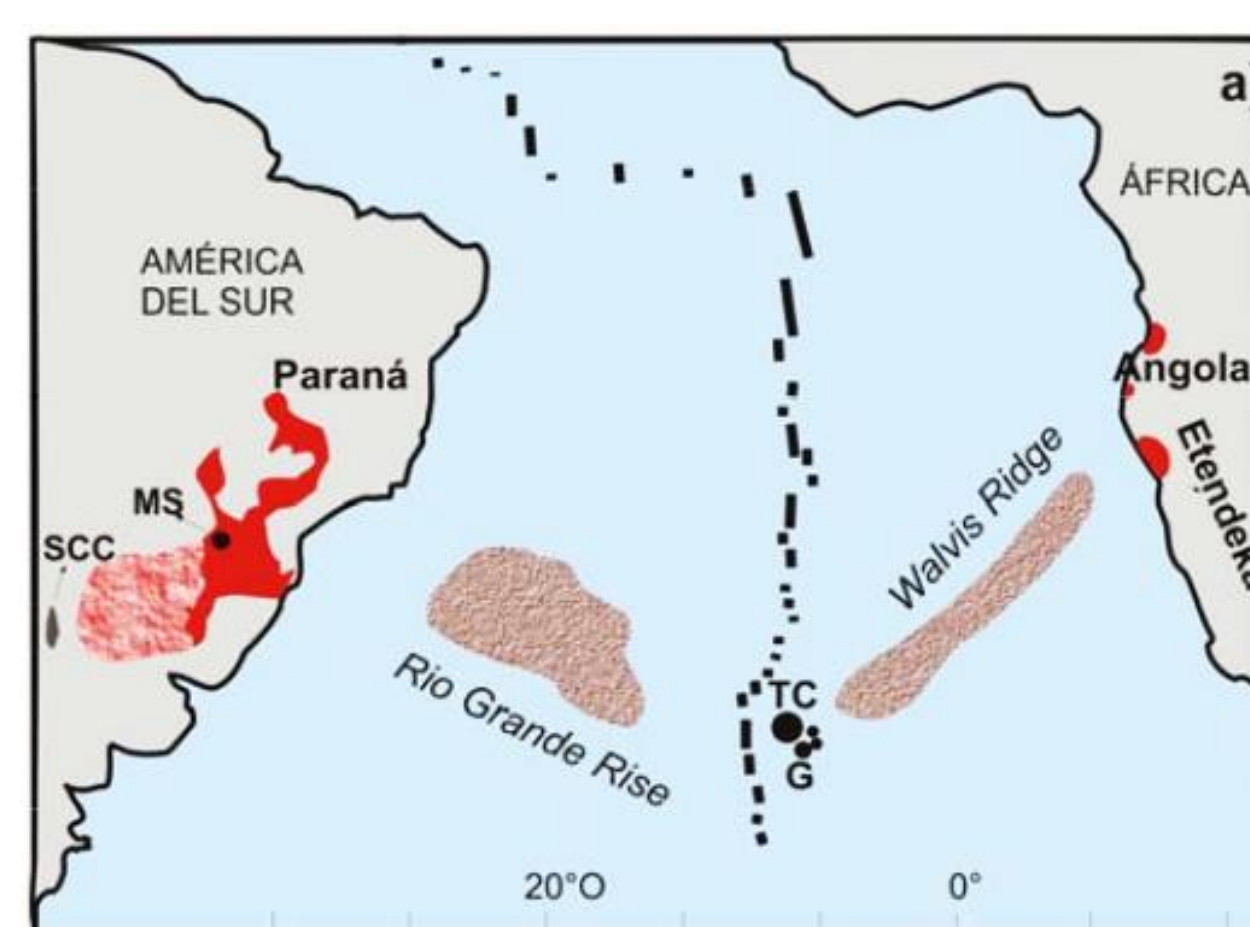


Figure 3. Walvis Ridge and Río Grande Islands (Source: 3).

### Main examples based on dated molecular phylogenies

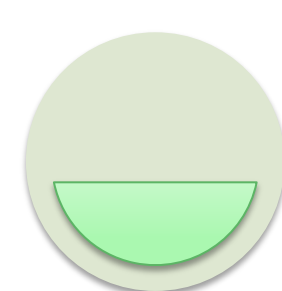


#### Genera *Raphia* and *Mauritia*:

Both are part of the Calamoideae family, which was in Gondwana before its fragmentation. In this case, vicariance theory is the most suitable option.



Figure 4. *Mauritia flexuosa* (Source: 4)

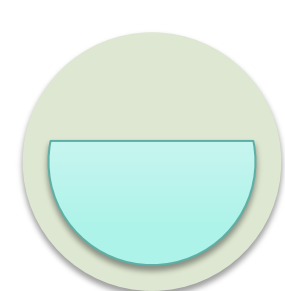


#### Genus *Vanilla*:

This genre is part of Orchidaceae family; *Vanilla* migrated from South America to Africa, after Gondwana's fragmentation. In this case, the oceanic dispersal theory is more suitable.



Figure 5. *Vanilla planifolia* (Source: 5)

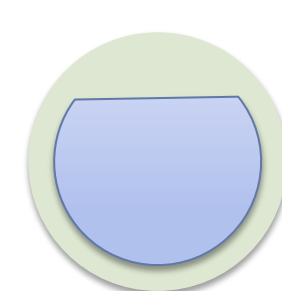


#### Proteaceae family:

Its distribution is in general explained by vicariance theory, although there are some cases which can be explained by the oceanic dispersal theory, as for example *Brabejum* genus.



Figure 6. *Brabejum stellatifolium* (Source: 6)



#### Fabaceae family and genus *Bauhinia*:

It is thought that all the species of this family arrived to South America by oceanic dispersal. An example is the *Bauhinia* genus, which arrived there at the end of the Eocene.

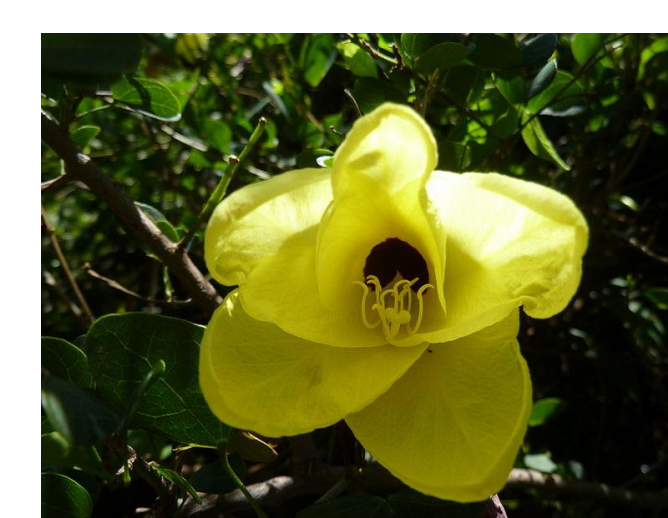
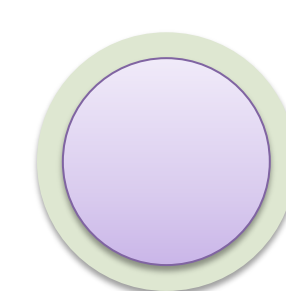


Figure 7. *Bauhinia tomentosa* (Source: 7)



#### Melastomataceae family:

This family could have been originated in two places, following the oceanic dispersal theory: in South America or in Africa.



Figure 8. *Tibouchina semidecandra* (Source: 8)

### Conclusions

- ✓ There are some examples of plants that fit vicariance theory (genera *Raphia* and *Mauritia*), both theories (Proteaceae family) or oceanic dispersal theory (genus *Vanilla*, Fabaceae and Melastomataceae families).

### Bibliography

1. Wikimedia Commons. The continents Laurasia and Gondwana 200 milion years ago. [On line]. <<http://ca.wikipedia.org/wiki/Gondwana#/media/File:Laurasia-Gondwana.png>>. [Consult: 27-05-15].
2. Néraudeau, D. & Mathey, B. Biogeography and diversity of South Atlantic Cretaceous echinoids: Implications for circulation patterns. *Palaeogeography, Palaeoclimatology, Palaeoecology* 156, 71–88 (2000).
3. Lagorio S.L i Vizán H. El volcanismo de Serra Geral en la provincia de Misiones: aspectos geoquímicos e interpretación de su génesis en el contexto de la Gran Provincia Ígnea Paraná-Etendeka-Angola. Su relación con el volcanismo alcalino de Córdoba (Argentina). *GEOACTA* 36, 27-53 (2011).
4. Wikimedia Commons. *Mauritia flexuosa*. [On line]. <[http://en.wikipedia.org/wiki/Mauritia\\_flexuosa#/media/File:Buriti.JPG](http://en.wikipedia.org/wiki/Mauritia_flexuosa#/media/File:Buriti.JPG)>. [Consult: 25-05-15].
5. Wikimedia Commons. *Vanilla planifolia*. [On line]. <[http://commons.wikimedia.org/wiki/File:Vanilla\\_planifolia\\_1.jpg](http://commons.wikimedia.org/wiki/File:Vanilla_planifolia_1.jpg)>. [Consult: 04-05-2015].
6. Wikimedia Commons. *Brabejum stellatifolium*: flower buds. [On line]. <[http://commons.wikimedia.org/wiki/File:Brabejum\\_stellatifolium\\_-\\_flower\\_buds.JPG](http://commons.wikimedia.org/wiki/File:Brabejum_stellatifolium_-_flower_buds.JPG)>. [Consult: 04-05-2015].
7. Wikimedia Commons. *Bauhinia tomentosa*. [On line]. <[http://commons.wikimedia.org/wiki/File:Bauhinia\\_tomentosa\\_bloem\\_a\\_a\\_Manie\\_van\\_der\\_Schiff\\_BT.jpg](http://commons.wikimedia.org/wiki/File:Bauhinia_tomentosa_bloem_a_a_Manie_van_der_Schiff_BT.jpg)>. [Consult: 04-05-2015].
8. Wikimedia Commons. *Tibouchina semidecandra*. [On line]. <[http://en.wikipedia.org/wiki/Tibouchina#/media/File:Tibouchina\\_semidecandra.jpg](http://en.wikipedia.org/wiki/Tibouchina#/media/File:Tibouchina_semidecandra.jpg)>. [Consult: 27-05-15].