

Preface

This publication comprises original research articles of a group of Indian and Brazilian paleobotanists and palynologists. These papers are results of the Project of International Scientific Cooperation entitled “*Palaeobotanical Studies in Brazilian and Indian sedimentary basins with special reference to the marine dinoflagellate-cysts, Gondwana Flora and their applications*” sponsored by Brazil-CNPq 490829/2007-4 and by India-DST RPO 24/2007, coordinated from the Brazilian side by Dr. Mary Elizabeth Cerruti Bernardes-de-Oliveira (Instituto de Geociências/USP) and from the Indian side by Dr. Naresh Chandra Mehrotra (Birbal Sahni Institute of Palaeosciences).

Dr. Mary directed her professional life from the beginning studying the lush Late Palaeozoic paleofloras of the Paraná Basin. Her PhD thesis, defended brilliantly in 1977, expounded on one of these paleofloras from the Rio Bonito Formation of the State of Santa Catarina. From 1977 until today she is tireless in the study of Late Palaeozoic paleofloras of Brazil and abroad, becoming renowned expert of floras of Glossopteridales and other plant groups.

Globalization, since the last decades of the twentieth century increased the participation of our geologists and paleontologists. This volume is one step further in this process. Indian and Brazilian researchers who have contributed to this volume are recognized experts. They will not be cited here to avoid extending this preface.

The first paleobotanical report regarding the Glossopteris flora came from India by Brongniart (1822), who described the first two species of the genus *Glossopteris* (*G. angustifolia* and *G. browniana*).

Gondwana is an historic region in central India, comprising parts of Madhya Pradesh, Telangana, Andhra Pradesh and Maharashtra states. It was inhabited by the *Gonds*, an ancient tribe of Dravidian-speaking people. The name “Gondwana”, as we know, was derived from Sanskrit *Gondavana* and means “the forest of the *Gonds*”. H.B. Medlicott (1872) described for the first time “Gondwana System” for the upper Paleozoic and Mesozoic nonmarine sedimentary rocks of peninsular India, in an unpublished report to the Geological Survey of India. Then, Ottokar Feistmantel (1876), while describing the Glossopteris flora from the Paleozoic Sequence in India introduced the expression ‘*Gondwana System*’ into the scientific literature. Later, more or less similar lithostratigraphical sequences were known from Africa, Australia, South America and Antarctica mostly characterized by the presence of the *Glossopteris* Flora in all these continents. The term *Gondwana-Land* was coined by Edward Suess, an Austrian geologist (1885) for the regions with Glossopteris flora. In 1912 A. Wegener used the term *Gondwanaland*, to designate the amalgamation of all these continents into a big southern continent.

Common elements of that flora between India and Brazil are known since a long time but the comparisons and correlations of the floras of both countries are still at an incipient stage, completely justifying this Project.

Among the 10 contributions here presented, one deals with Conifers of Itararé Group; two papers are on macrofossils from Itararé Group to Rio Bonito Formation; three papers deal with taphofloras of the Rio Bonito Formation, where, in all these their correlations with the Indian Early Permian taphofloras are presented; the others deal with palynostratigraphy of a Karharbari Stage assemblage of India compared with equivalent assemblages from other Gondwanan continents; Indo-Brazilian Late Paleozoic Palaeo-Wildfires; similarities of the K/Pc Dinoflagellates cysts associations between South Atlantic and Indian Proto-oceans; Jurassic-Cretaceous phytoclasts from different basins of India respectively.

The first paper deals with the first conifers from Paraná Basin found in the Pennsylvanian Monte Mor taphoflora (a Pre-Glossopteris flora) of the Itararé Group which has no correspondent in the Indian Cisuralian Talchir Group.

The second paper is a proposal of emended diagnosis for the species *Gangamopteris buriadica* Feistmantel. This paper is a good example of the result of this Indo-Brazilian scientific interchange because in the holotype deposited in an Indian collection (Geological Survey of India, Kolkata) it was possible to recognize that the leaf was fossilized with its borders curved inwards as noticed in Brazilian specimens. The virtual unrolling enabled the description of veins hidden by the winding allowing comparison with specimens of the same species in the Paraná Basin, leading to an amended diagnosis of the species.

The third paper is a reevaluation of the species *Samaropsis mendesi* Rigby, 1972 (Rio Bonito Formation, in Santa Catarina State) and *Samaropsis gigas* Marques de Souza and Iannuzzi, 2007, Cisuralian of the uppermost Itararé Group and Rio Bonito Formation (State of Rio Grande do Sul), in Paraná Basin, comparing with Indian species *Ottofeista milleri*. This resulted in a synonymy of the three species under the same specific name, highlighting the potentiality of use of the morphology and abundance of these seeds in Gondwana strata. This is also a wonderful example of the results of this Project.

The fourth, fifth and sixth papers versed about floras of Rio Bonito Formation and their comparison with the Lower Gondwana Indian floristic stages.

The fourth presents a reevaluation of the Cambaí Grande, Rio Grande do Sul taphoflora. In this case, marine assemblages are disposed side by side with deposits containing elements of *Glossopteris* Flora. According to Holz et al. (2010) marine deposits of the Rio Bonito Formation are normally older than the deposits of Siderópolis Member, thus favoring the correlation of this taphoflora with the Paraguaçu Member of Rio Bonito Formation. The presence of *Glossopteris* –type leaves in Cambaí Grande permitted better correlation with other Indian floristic stages.

The fifth contribution, dealing with floristic similarities between Siderópolis Member macroflora (Rio Bonito Formation) with Cisuralian Paleofloras of India (mostly with Lower Barakar) highlights the importance of the decline of the *Gangamopteris* – *Noeggerathiopsis* complex and the predominance of *Glossopteris* species as the best criterion for intercontinental chronological correlations than the simple comparison between the specific compositions of the assemblages.

The sixth contribution deals with the comparison of Siderópolis Member macroflora of the Santa Catarina State with contemporaneous or older deposits of the Rio Grande do Sul State. This comparison is difficult because they are deposits of different environments. Those of Santa Catarina were characterized by deltaic plains with small marine influences, while in Rio Grande do Sul, the subsidence was bigger and would have been a lagoon depositional environment, with appreciable marine influence (Holz & KÜchler, 2003 and Holz et al., 2010). These authors cited the outcropping of Encruzilhada do Sul, where transgressive coastal sandstones are overlapped by fluvial sandstones which can be correlated with the Siderópolis Member, with similar lithologies and also with coal beds, in spite of being thinner and rare. These authors arrived to these conclusions based on sequence stratigraphy. Based on these considerations, the authors of the sixth contribution could consider the Siderópolis Palaeoflora (occurring in four distinct areas of the State of Santa Catarina: Lauro Müller, Criciúma, São Marcos and Treviso) which is characterized by an evident dominance of the genus *Glossopteris* over *Gangamopteris*-*Noeggerathiopsis* complex and other genera associated to the coal beds of Santa Catarina as the youngest or the uppermost than all paleofloras of Rio Bonito Formation registered in Paraná Basin. According to these authors this palaeoflora only presents few similarities with Morro Papaleo (upper section) and Quiteria taphofloras of the Rio Bonito Formation of Rio Grande do Sul, distinguished by its high diversity and many exclusive taxa.

The seventh to the tenth contributions deal with subjects concerned to the Gondwanan theme although not directly with the *Glossopteris* Flora.

The seventh paper is an overview on Gondwanan “charcoal remains” that means organic deposits related to paleo-wildfires registered by charred gymnosperm woods of the Paraná Basin (Brazil) and the Damodar Basin (India) occurring from the Cisuralian to the Lopingian. This paper reinforces the relevance of the paleo-wildfires as evidences of continental environmental disturbances over large areas of Gondwana during the Late Paleozoic.

The eighth work highlights the presence of the pollen grain *Crucisaccites monoletus*. In the Paraná Basin, this species is exclusive to the Pennsylvanian palynozone Cm (Kasimovian-Gzhelian), appearing exclusively in this palynozone. In India it appears in the Permian, becoming another example of paleogeographical provincialism. The coals referred in this communication are from Barakar Formation, apparently of different age than those in Brazil, where they are radiometrically dated and correspond to the Itararé Group.

The ninth contribution is about phytoclast records highlighting the fact that Juro-Cretaceous phytoclast cuticles can be used for identifying different groups of plants. Potentially they could be used in identifying late Paleozoic plants of the supercontinent of Gondwana.

The tenth paper deals with the presence of common dinoflagellate cysts species in various basins of South Atlantic and Indian proto-oceans from the Late Cretaceous to Paleocene. This work highlights the importance of these palynomorphs for long distance marine correlations during Late Cretaceous and Paleocene.

This volume comprises exclusively research articles focused on Gondwana Paleofloristic correlations between Brazil and India. Although it is a preliminary attempt it has unravelled a depth of details yet to be explored, thus enhancing the scope of intercontinental correlative studies in the upcoming years.

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Prof. Dr. Setembrino Petri