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## A PRIMARY STUDY OF FOSSIL HILL FLORA FROM FILDES PENINSULA OF KING GEORGE ISLAND, ANTARCTICA

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### Summary

The fossil plants studied in this paper were collected by the Chinese Antarctic Expeditions (1986—1987 and 1987—1988) from the locality Fossil Hill on the Fildes Peninsula southwest of the King George Island of the South Shetland Islands.

The Exposed sequence can be recognized in descending order as follows:

6. Dark grey thin- to medium-bedded tuffaceous fine sandstone and siltstone with the top unobserved, containing fossil plants. >1m
5. Grey thin-bedded fine sandstone, becoming greyish-yellow when weathered, interbedded with two seams of bright lignite: lower seam about 6—7 cm in thickness, unstable horizontally; upper seam thin-bedded in continuous occurrence, sandstone containing plant fragments. 1.5 m
4. Interbeddings of greyish-brown thin- to medium-bedded andesitic breccia bearing subangular gravels, and purplish grey tuffaceous siltstone bearing level microstratifications with alternating purplish grey and greyish green stripes observable. Siltstone is rich in fossil plants. 2.5 m
3. Dark grey tuffaceous fine sandstone and siltstone, becoming greyish yellow when weathered, containing fragments of stems. 1 m
2. Greyish brown tuffaceous coarse sandstone and conglomerate, with thin-bedded to medium-bedded stratifications. 2.5 m
1. Greyish brown thick-bedded andesitic breccia and tuffaceous coarse sandstone. Breccia.

small to medium in size, subangular, mainly composed of purplish red andesite and greyish black basalt-andesite with cement matrix in porphyritic texture, and occurring alternately with coarse sandstone to form level- and cross-stratification.

----- disconformity -----

Underlying strata: Agate Beach Formation composed of greenish grey basalt-andesite.

To sum up, the strata of the Fossil Hill Formation are represented by a suite of volcano-clastic sediments, basically from coarse to fine in ascending order; the fossil plants are mainly yielded from Beds 4—6, with altogether 180 specimens, while stem and leaf fragments are contained in Beds 3 and 5 respectively. Most of the fossil plants are leaves, belonging to ferns, gymnosperms and angiosperms. They are all imprint fossils, fairly well-preserved, except for the 3rd and higher order venations which are not so well-preserved because the matrix of the fossils are rather coarse in lithological characters.

The primary study of the Fossil Hill flora has resulted in the discovery of the following taxa: *Asplenium antarcticum* Dusén, *Gleichenia* sp., *Osmunda* sp., *Thyrsopteris* sp., *Podocarpus* spp., *Araucaria* sp., *Cupressaceae* gen. et sp., *Nothofagus subferruginea* (Dusén) Tanai, *Nothofagus* sp., *Sterculia washburnii* Berry, *Proteaceae* gen. et sp., *Rhoophyllum* sp., *Miconiiphyllum australe* Dusén, *Caldcluvia* sp., *Lomatia* sp., *Brachychyton* sp., *Dicotylophyllum corifolium* Li and *Dicotylophyllum* spp..

The four fern plants are all genera of wet and warm habitats. One specimen of *Thyrsopteris* sp. (pl. I, figs. 3, 3a) is part of a fertile pinna, showing the indusia formed on slender axes, and the others are sterile pinnae. *Thyrsopteris* is a genus with a long history and is now endemic to the Juan Fernandez Islands (33°S, 80°W) ca. 600 km west of Chile.

The fossil leaves of *Nothofagus subferruginea* (pl. II, figs. 1, 2) are similar in general morphology to those from the Oligocene to Miocene strata of Chile (Dusén, 1899; Tanai, 1986). The latter ones are a little smaller than ours, but very similar to our specimens in the length to width ratio.

The leaves of *Miconiiphyllum australe* Dusén (pl. II, figs. 5, 5a) are similar to those of this species reported by Dusén (1908) and Czajkowski *et al.* (1986).

The form genus *Miconiiphyllum* is similar to the leaves of *Miconia* from the family Melastomataceae.

The family Melastomataceae are mainly distributed in tropical and subtropical areas. Their leaves are characterized by the unique venation and therefore can be very easily distinguished from those of other families.

The genus *Miconia* comprises 700 spp., which are mostly dispersed in the tropics of South America and West Indies, with one species scattered in Senegal and Nigeria of West Africa.

*Rhoophyllum*, a fossil genus belonging to dicotyledons, was determined by Dusén (1899) from the Oligocene Strata near Punta Arenas in Chile. In the Fossil Hill flora there is a well-preserved leaf of this genus with a long drip point, brochidodromous venation and coriaceous texture.

The Fossil Hill flora consists mainly of *Podocarpus*, *Araucaria* and *Nothofagus*, with a number of ferns and representatives from the families Proteaceae, Sterculiaceae, Melastomataceae, Anacardiaceae, Cunoniaceae and probably Lauraceae. By comparing the distribution of the fossil components with that of the present corresponding plants, it can be seen that the Fossil Hill flora was probably growing in a subtropical or warm temperate area. Judging from the leaf physiognomy analysis, most of the dicotyledonous leaves in this flora belong to notophylls, with some of them being coriaceous in leaf texture, such as *Rhoophyllum*, *Miconiiphyllum*, *Dicotylophyllum corifolium*, etc., and some others bearing long drip points, such as *Rhoophyllum*, *Sterculia washburnii* and certain undetermined

ed taxa. All these show that this flora was growing in a warm and moist environment.

The flora from the Seymour Island described by Dusén (1908) is similar to the Fossil Hill flora; its age was determined by Cranwell (1959) as Early Tertiary. During recent years the US scientists (Case, 1988) discovered some leaf fossils from three localities on the Seymour Island, ranging from Paleocene to Late Eocene in age. Case (1988) pointed out that the material described by Dusén (1908) was equivalent to the Paleocene fossil plants collected from the locality Cross Valley, and the Middle Eocene La Meseta flora, one of the two other Eocene floras, was dominated by a large-leaved species of *Nothofagus* of a significantly larger size, probably indicating the situation of an ameliorating climatic condition. So far as we have known, the La Meseta flora is most similar to our Fossil Hill flora in appearance and components.

According to Zastawniak's study, the Point Hennequin flora belongs to Oligocene in age. The Fossil Hill Flora differs not only in having much more diverse components, but also in leaf physiognomy. The leaves from the former flora almost all belong to microphylls, while those from the latter flora, as stated above, are mainly notophylls. Other physiognomical characters of these two floras are obviously different from each other, and most probably the latter flora was growing in a much more favorable environment than the former.

The fossil flora from the Dufayel Island reported by Birkenmajer and Zastawniak (1986) resembles ours in its components and physiognomical appearance. The age of the Dufayel flora is Early Eocene, or Late Paleocene to Early Eocene.

According to the plant components and physiognomy analysis, the Fossil Hill flora most likely represents a subtropical or warm temperate rain forest and is probably of Eocene in age.

## 图 版 说 明

除注明者外,所有图片均系原大。标本保存在中国科学院南京地质古生物所。图片系宋之耀所摄,特致谢意。

### 图 版

- 1,4,4a. *Gleichenia* sp. 4a. ×3。野外号: GWP-39-40-5, GWP-39-40-15; 登记号: PB15447, 15448。
2. *Osmunda* sp. 野外号: GWP-39-40-03; 登记号: PB15449。
3. 3a. *Thyrsopteris* sp. 3a. ×3。野外号: GWP-39-40-01; 登记号: PB15450。
5. *Sterculia washburnii* Berry 野外号: N<sub>3</sub>-23; 登记号: PB15451
- 6,6a. *Rhoophyllum* sp. 6a. ×3。野外号: N<sub>3</sub>-29; 登记号: PB15452。

### 图 版 II

- 1,2. *Nothofagus subferruginea* (Dusén) Tanai 野外号: GWP-39-40-04, GWP-39-40-18; 登记号: PB15453, PB15454。
3. *Nothofagus* sp. 野外号: GWP-39-40-6; 登记号: PB15455。
- 4,6,6a. *Podocarpus* sp. 1 4,6a. ×3。野外号: GWP-39-3, GWP-39-16; 登记号: PB15456, PB15457。
- 5,5a. *Miconiophyllum australe* Dusén 5a. ×3。野外号: N<sub>3</sub>-1; 登记号: PB15458。
7. *Podocarpus* sp. 2 野外号: N<sub>3</sub>-14; 登记号: PB15459。
8. *Cupressaceae* gen. et sp. indet. ×5。野外号: N<sub>3</sub>-50; 登记号: PB15460。



