

TERTIARY FOSSIL PLANTS FROM THE ARGENTINE REPUBLIC

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INTRODUCTION

There are in the United States National Museum several small lots of rather indifferently preserved fossil plants collected by Chester W. Washburne in the Territories of Rio Negro and Santa Cruz during the explorations of the Hydrological Survey made for the Government of Argentina under the direction of Bailey Willis in 1911-1913. All are impressions of foliage, for the most part fragmentary, and preserved in clayey or sandy tuffs. The character of the material and its small amount render it impossible to deduce any far-reaching conclusions; nevertheless, considerable that is of interest has resulted from its study.

In striking contrast with the wealth of information regarding the Tertiary terrestrial faunas of Patagonia, very little is known about the contemporaneous terrestrial floras. In 1899 Dusén described¹ a small and rather poor collection of plants of Tertiary age from what he called the *Fagus* and *Araucaria* zones from several localities on both sides of the Strait of Magellan, and in 1925 I described² a rather well preserved collection from Chubut Territory which appeared to have come from the so-called Santa Cruz formation.

LOCALITIES

The present collections came from the following five localities—three in Rio Negro Territory and two in Santa Cruz Territory—and the only information I have regarding them is contained on the labels accompanying them. The Rio Negro localities are all in the vicinity of Lago Nahuel Huapi, and with the collectors numbers are:

176. Folded tuffs 4 km. west southwest of Bernal (4 leagues southeast of Barriloché);

¹ Dusén, P., Svenska Exped. Magellansländerna. vol. 1, No. 4, 1899.

² Berry, Edward W., Johns Hopkins University Studies in Geology, No. 6, 1925.

196. Tuff (thin bedded SS) on axis of anticline, $2\frac{1}{2}$ leagues above embouchure of canyon of Rio Nirihuao into basin of Lago Nahuel Huapi; and

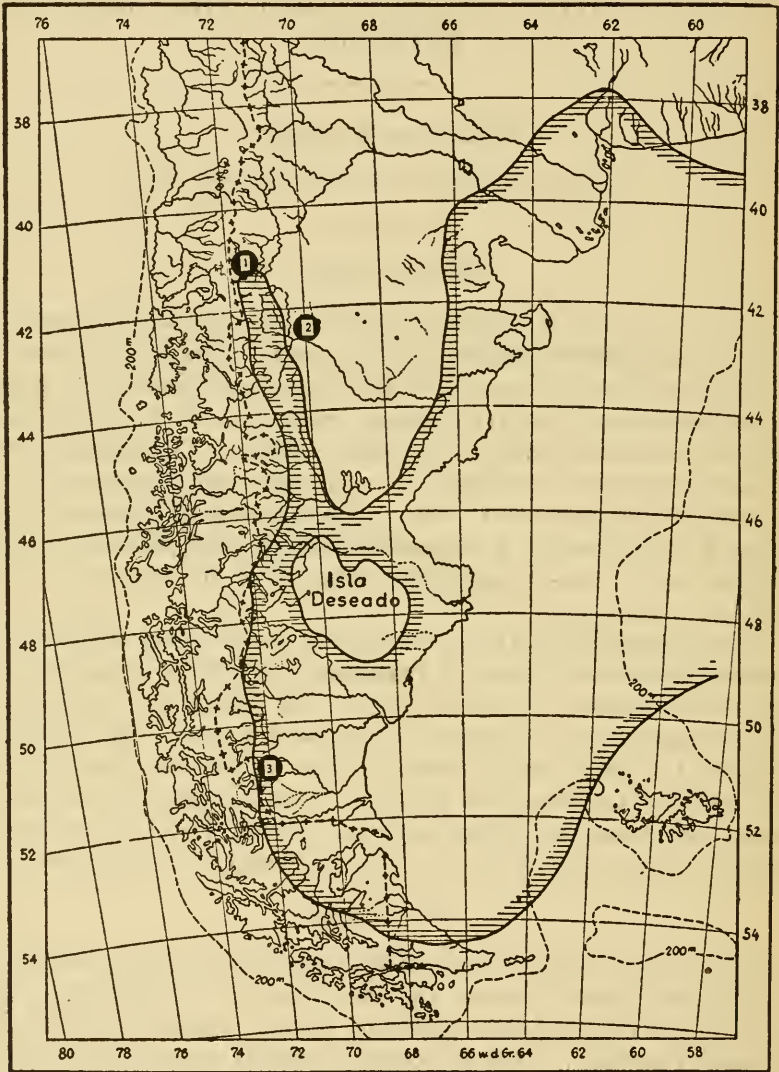


FIG. 1.—LOCALITIES IN LAGO NAHUEL HUAPI REGION, RIO NEGRO TERRITORY; 2. LOCALITY OF MIRHOJA, CHUBUT TERRITORY; 3. LOCALITIES IN RIO CHALIA REGION, SANTA CRUZ TERRITORY

198. Southeast side of Rio Nirihuao, $1\frac{1}{2}$ leagues above foot of canyon, 150 yards southwest of Casa Piedra (4 leagues south of Lago Nahuel Huapi).

The two Santa Cruz localities are:

112. (One league north of Estancia Chalia) (Bob. Lively's place in lot 77), Rio Chalia; and

116. (Bluff $\frac{1}{2}$ league south of Mata Amarilla, upper Rio Chalia.)
The age of the last is given as Santa Cruzian?

FLORA

A total of 27 different forms are more or less satisfactorily identified and 19 of these appear to be new. They comprise 22 genera in 17 families and 14 orders, and represent 4 ferns, 1 cycad, 2 conifers, 1 monocotyledon, and 19 dicotyledons. None except form genera have furnished more than a single species and no families except the Polypodiaceae and Monimiaceae are represented by more than a single species.

The largest number of forms identified from any single locality is but 9. There are 16 species recorded from the Rio Negro localities and 11 from the Rio Chalia localities. None are common to the two; even the genera are all different, and they appear to be different in age as well as in the environmental conditions which they indicate.

The three Rio Negro localities have but one species common to two of them, so that they may not be of exactly the same age, but the data are insufficient to affirm or deny this, and I am considering them collectively as affording certain contrasts with the two Rio Chalia localities.

These three localities in Rio Negro Territory are all in the vicinity of Lago Nahuel Huapi and apparently from what Roth called the Piso de Nahuel Huapi. They have yielded the following florule:

Alsophila antarctica.

Pteris nirihuaensis.

Filicites sp. 1.

Filicites sp. 2.

Zamia australis.

Araucaria nathorsti.

Scirpites sp.

Fagus (?) *subferruginea.*

Nothofagus simplicidens.

Leguminosites calliandraformis.

Leguminosites sp.

Anacardites (?) *patagonicus.*

Myrcia nitens.

Phyllites nirihuaensis.

Phyllites mollinediaformis.

Phyllites sp. (cf. *Schinopsis*).

This florule is too small for any accurate ecologic estimate; nevertheless the *Zamia* is the only form that is far removed from its present-day range, and *Zamia* occurs abundantly in the lower Miocene coal measures of the Arauco district in Chile, where, however, it is associated with much warmer types. A comparison with the flora described from Mirhoja, Chubut Territory, nearly 2° farther south, shows no common species between the two and none of the mesophytic warm types of the latter, so that the present florule must be considered to be a distinctly cooler temperate flora. Compared with

the existing flora of the Lago Nahuel Huapi district, it shows no certain indications of different temperature conditions but does seem to indicate considerable more humidity and an environment more like that found at the present time west of the Andes in Chile. If this conclusion is valid, it would mean less extremes of temperature throughout the year as compared with present conditions in Rio Negro Territory.

The florule from the two localities in the Rio Chalia district of western Santa Cruz Territory includes the following 11 species:

Adiantum patagonicum.

Fitzroya tertiaria.

Rollinia (?) *patagonica.*

Hydrangea (?) *incerta.*

Sterculia washburnii.

Peumus clarki.

Laurelia amarillana.

Laurophyllum chalianum.

Apocynophyllum chalianum.

Bignonites chalianus.

Phyllites sp. 6 (?).

Although occurring about 8° farther south, it comprises a much more northern and warmer climate assemblage than the previous florule, *Fitzroya* being the only species that seems distinctly at home in this latitude at the present time and then only in the wet environment of the Chilean side of the Andes. One species, *Peumus clarki*, and several genera are common to the flora described from Mirhoja, Chubut Territory, and point to the present flora as having lived in a humid warm temperate environment.

INDICATIONS OF AGE

From what has been said in the preceding paragraphs, both the genera represented and the environment which they indicate point to these florules being of different ages. So much seems perfectly clear. Whether either or both should be considered Oligocene or Miocene is not so clear. The whole general question of the age of the Patagonian sedimentaries has given rise to a remarkable diversity of opinion, the principal contributors having been Ameghino, Roth, Gaudry, Scott, Hatcher, Ortmann, von Ihering, Wilckens, Cossmann, Wiman, Windhausen, and Matthew. The statement by the last-named author³ is one of the most recent and the most useful summary.

In a recent paper Schiller⁴ mentions well-preserved dicotyledonous leaves near Barriloché overlain by tuffs partly silicified, from which he enumerates 25 species of marine mollusca representing the Patagonian stage. From this there is some reason for supposing that

³ Matthew, W. D., in *Climate and Evolution*. *Annals N. Y. Acad. Sci.*, vol. 24, pp. 171-318, 1915.

⁴ Schiller, W., *El Cerro "Ottoshöhe" de Bariloché*. *Bol. Acad. Nac. d. Ciencias Argentina*, vol. 30, pp. 335-339, 1927.

the three plant localities in the Lago Nahuel Huapi region are older than the Patagonian marine beds. This coincides with my former and present conclusions based upon a study of all available evidence, although, as has been frequently pointed out, this evidence is far from complete.

In former contributions⁵ I have considered Dusén's *Fagus* zone to be upper Eocene or lower Oligocene, since it occurs below the marine Magellanian, and his *Araucaria* zone to be upper Oligocene, since it occurs above the Magellanian and below the Patagonian.⁶ The second might be lower Miocene, but since its flora is so unlike the lower Miocene floras of Chile I have thought it to be older.

Table of distribution

	Rio Negro Territory			Santa Cruz Territory		Mirhoja, Chubut Territory	Arauco District, Chile	Straits of Magellan	Seymour Island, Antarctica
	Locality 176	Locality 196	Locality 198	Locality 112	Locality 116				
<i>Alsophila antarctica</i>		×							×
<i>Adiantum patagonicum</i>				×					
<i>Pteris nirihuaensis</i>	×		×						
<i>Filicites</i> species 1.....	×								
<i>Filicites</i> species 2.....	×								
<i>Zamia australis</i>			×						
<i>Araucaria nathorstii</i>	×							×	
<i>Fitzroya tertiaris</i>				×					
<i>Scirpites</i> species.....			×						×
<i>Fagus subferrunginea</i>	×							×	
<i>Nothofagus simplicidens</i>			×					×	
<i>Rollinia</i> (?) <i>patagonica</i>					×				
<i>Hydrangea</i> (?) <i>incerta</i>					×				
<i>Leguminosites calliandraformis</i>		×							
<i>Leguminosites</i> species.....			×						
<i>Anacardites</i> (?) <i>patagonicus</i>			×						
<i>Sterculia washburnii</i>					×				
<i>Peumus clarki</i>					×	×			
<i>Laurelia amarillana</i>					×				
<i>Laurophyllum chalianum</i>				×			×	×	?
<i>Myrcia nitens</i>	×								
<i>Apocynophyllum chalianum</i>				×					
<i>Bignonites chalianus</i>				×					
<i>Phyllites nirihuaensis</i>			×						
<i>Phyllites mollinediaformis</i>			×						
<i>Phyllites</i> species (cf. <i>Schinopsis</i>).....			×						
<i>Phyllites</i> species 6.....					?				×

If the *Araucaria* and *Fagus* zones of Dusén have any stratigraphic validity, then the florule from the Lago Nahuel Huapi region is to be correlated with these zones, since as the accompanying table of

⁵ In First Pan Pacific Congress Proc., pt. 3, pp. 845-865, 1921.

⁶ According to the sections given by Hatcher and Nordenskiöld.

distribution shows 4 of the 16 species are identical with forms described by Dusén from these zones in the Straits of Magellan region and two additional are identical with forms described by this author from the Seymour Island Tertiary, the present occurrence representing their most northern known range. This may be stated in another way by saying that in the time immediately preceding the Patagonian transgression a humid and fairly cool temperature flora extended between 41° and 54° south latitude. Since I regard the Patagonian transgression as corresponding approximately to the Burdigalian stage of the European Miocene, it would mean that the Lago Nahuel Huapi fossil flora should be correlated with the lowest Miocene or the Oligocene of the Northern Hemisphere. Although denominated cool temperate, it is clear from its great north and south range and its possible extension to Antarctica that the climate at that time differed from that of the present in its greater uniformity and relative greater mildness in the far south.

The florule found at two localities on the upper Rio Chalia is markedly distinct from the other, not only in representing entirely different genera but in lacking any species common to the *Araucaria* or *Fagus* zones. It has, moreover, a species common to the Santa Cruz (?) flora of Mirhoja in Chubut Territory. As already mentioned, the plants have their modern relatives far to the northward of their fossil occurrence, and the leaves are individually much larger than any in the Rio Negro florule. They thus represent an occurrence of warm temperate types in latitude 49° south. Hatcher describes lower Patagonian marine beds from the upper Rio Chalia, and, so far as chronologic terms are concerned, there is little choice between the terms Patagonian and Santa Cruz, since I believe the latter, although partly contemporaneous with the Patagonian, extends upward to a somewhat later time.

Although the evidence is far from conclusive, it points to this florule being considerably younger than the other, and to its early Miocene age. The location of both this and the earlier florule are shown on the accompanying sketch map, the base of which is Windhausen's map, showing the marine transgression of the Patagonian. I have also indicated the location of the Santa Cruz (?) plant locality at Mirhoja in Chubut Territory.

It will be noted that the localities in the vicinity of Lago Nahuel Huapi, which I regard as belonging to the pre-Patagonian *Araucaria* and *Fagus* zones, lie in an area which was transgressed by the marine waters of the long gulf depicted by Windhausen, that the localities on the upper Rio Chalia are interbedded in its marginal deposits, and that the Mirhoja locality, which I referred to the Santa Cruz, lies to the eastward of the Patagonian Gulf and was presumably a low-lying

country. If the map is correct the geography would favor warm currents from the Atlantic and the land barrier would temper Antarctic influences. We know that there was a corresponding submergence of the Chilean littoral at this time, and there is no evidence of high mountains on the site of the Andes, which is also negated by the floral evidence of equability and humidity.

DESCRIPTIONS OF SPECIES

Order POLYPODIALES

Family CYATHEACEAE

Genus ALSOPHILA R. Browne

ALSOPHILA ANTARCTICA Christ (?)

Alsophila antarctica CHRIST in DUSÉN, Schwed. Südpolar-Exp., vol. 3, Lief. 3, p. 14, pl. 3, fig. 11, 1908.

This species was described for Dusén's account of the Tertiary plants from Seymour Island, Antarctica, by Professor Christ of Basel, who considered it most like the existing *Alsophila fééana* and *A. corcovadensis* of southern Brazil. A single fragment in the present collection is identical with the illustration of the Seymour Island type except that it is slightly smaller, and as it is sterile it might as well be considered to represent the genus *Polypodium*.

Occurrence.—Two and one-half leagues above emboucheur of the canyon of Rio Nirihuaio into the basin of Lago Nahuel Huapi, Territory of Rio Negro.

Plesiotype.—Cat. No. 37851, U.S.N.M.

Family POLYPODIACEAE

Genus ADIANTUM Linnaeus

ADIANTUM PATAGONICUM, new species

Plate 1, Figures 5-7

There are more or less complete specimens of four pinnules in the collection, the largest and most complete being the one shown in Figure 5; a second is only about half the size of the former. Pinnules stipitate, nearly orbicular in outline, divided nearly symmetrically by narrow pointed sinuses into four principal (two terminal and two lateral) lobes and the lateral lobes more or less bisected. The distal margins are undulate. Terminal sinus widest and deepest, extending three-fourths of the distance to the base of the lamina,

the adjacent lobes being inequilaterally cuneate. Lateral sinuses similar but only about half as deep. The small sinuses dividing the lateral lobes into two unequal lobules narrow, acutely pointed, and shallow. Stipe flat, with broad band of aggregated vascular bundles down the middle; length, 1.3 centimeters. Lamina ranging in length from 1.25 to 2 centimeters in length and from 1.75 to 3 centimeters in maximum width. Texture subcoriaceous. Venation dichotomous, diverging as a double dichotomy in the decurrent base of the lamina, forking successively as shown in Figure 6. The veins are relatively stout but have the appearance of being immersed in the substance of the lamina. None of the specimens are distinctly fertile, but in places the distal margin shows a decidedly thickened carbonized border, as shown in Figure 7, which may represent fructifications. Some probability is furnished this interpretation, since no such thickening is shown along the distal margin of the upper right-hand lateral lobe. In most of the specimens the distal margins are more or less frayed and do not permit any checking of these features, which, while not exactly as in living *Adiantums*, are suggestively similar.

The genus contains upwards of 100 widely distributed existing species in the warmer parts of the world and extending southward to Chile, Paraguay, and Argentina, in some cases (*A. concinnum* Humboldt, Bonpland, and Kunth) over nearly 40° of latitude, so that they can not be said to be especially influenced by temperature differences. In general, the existing species are less lobate and less equilateral than the fossil, but in the absence of more representative material showing pinnules from different parts of a frond the validity of these apparent differences can not be evaluated. About a score of Cretaceous and Tertiary species have been referred to *Adiantum*, including the quite dissimilar *Adiantites borgoniana* Engelhardt⁷ from the Miocene of Lota, Chile. Among somewhat similar existing species the following may be mentioned: *Adiantum chilense* Kaulfuss of Chile, *A. pensile* Kunze of Brazil, *A. tenerum* Swartz of Mexico and the Antilles to Peru, and *A. concinnum* Humboldt, Bonpland, and Kunth which ranges from Central America to Chile. Perhaps as similar a recent form as any is the old world *Adiantum capillus-veneris* of Linnaeus.

Occurrence.—About 3 miles north of Estancia Chalia, Rio Chalia, Territory of Santa Cruz.

Holotype and paratypes.—Cat. No. 37852, USNM.

⁷ Engelhardt, H., Abh. Senck. Naturf. Gesell., vol. 16, Heft 4, p. 644, pl. 2, figs. 6-9, 1891.

Genus *PTERIS* Linnaeus*PTERIS NIRIHUAOENSIS*, new species

Plate 1, Figures 3, 4

Based upon small fragments of pinnae, habit of frond consequently unknown. Pinnae linear-lanceolate, divided nearly to the rachis into relatively long linear, ultimately pointed segments. The sinuses are usually nearly symmetrically rounded and narrower than the segments, but in some instances in maximum-sized fragments the proximal lower margin of the segment is decurrent for a considerable distance, subtending a space wider than the width of the segments. The rachis is stout, prominent, and somewhat flexuous. Margins entire, but faintly undulate. Texture subcoriaceous. Midveins of the segments diverge from the rachis alternately at wide angles and continue to the tips of the segments. They give off at acute angles numerous laterals, the distal of which are simple subtended by once forked laterals and these in turn by twice forked laterals. This typical venation is not constant, however, for in a great many instances there are cross connections resulting in a reticulate venation, as shown in the accompanying figure.

The largest fragment seen is that shown in Figure 3 and is of a sterile pinnule. All of the specimens are much broken and distorted, but what I have considered to represent a piece of a fertile pinna is shown in Figure 4. This is slightly smaller than the sterile, but agrees with it in form and venation. What I take to represent a marginal indusium with its contained sori is a thick crust of carbonaceous matter along the margins of the segments. I could not develop any spores or structural features in this thickened mass, and it may simply represent revolute margins. However, its appearance is significantly like fertile fragments of *Pteris*, and I have given this feature considerable weight in the identification of the fossils.

The vegetative habit, as incompletely determinable from the present fossils, is shared among a large number of fern genera, among which I might mention *Phegopteris*, *Goniopteris*, *Dryopteris*, *Cyathea*, and *Gleichenia* as genera likely to occur in the Patagonian Tertiary. All of these differ in having inframarginal sori and the venation is not reticulate in *Dryopteris* (restricted), *Cyathea* or *Gleichenia* (used in a supergeneric sense). *Phegopteris* sometimes shows a similar reticulate venation, but it is more regular, as it is also in those species of *Goniopteris* which are reticulate.

Many species of *Pteris* have the form of the fossil, and a similarly reticulate venation occurs in widely scattered forms in Asia and New

Zealand, as well as in Central and South America. This in combination with the supposed fertile specimens agree in pointing to *Pteris* as the genus to which the fossil should be referred. A large and rather questionable *Pteris* has been recorded by Engelhardt from the Arauco coal measures (Miocene) of Chile.⁸

Occurrence.—Folded tuffs 4 km. west southwest of Bernal, about 12 miles southeast of Barriloche, Lago Nahuel Huapi, and southeast side of Rio Nirihuao near Casa Piedra, about 12 miles south of Lago Nahuel Huapi, Territory of Rio Negro.

Cotypes.—Cat. Nos. 37853, 37854, U.S.N.M.

Genus FILICITES Schlotheim

FILICITES species 1

Plate 1, Figure 1

Represented by the single fragment figured, showing a linear pinnule with central midvein and numerous thin subparallel laterals diverging from the midvein at wide angles. The material is too incomplete and poorly preserved to admit of its identification. The margin appears simple, but it may have been finely toothed. The laterals appear simple, but they may have occasionally been dichotomous. Naturally, resemblances could be pointed out to numerous unrelated fern genera. The fossil is perhaps most like the pinnules of the existing and wide-ranging *Gleichenia* (*Dicranopteris*) of South America.

Occurrence.—Four km. west southwest of Bernal, 12 miles southeast of Barriloche, Lago Nahuel Huapi, Territory of Rio Negro.

Cat. No. 37855, U.S.N.M.

FILICITES species 2

Plate 1, Figure 2

A poorly preserved fragment of a fern pinna with short pinnulate lobes, rather coriaceous texture, and faint venation. The tips of the segments are frayed and may have been more elongate than they are depicted.

This fern is undeterminable. It resembles a fragment from the Tertiary of Seymour Island, Graham Land, which Dusén⁹ called *Pecopteris* species 1. It might well be a *Dryopteris*.

Occurrence.—Four km. west-southwest of Bernal, 12 miles southeast of Barriloche, Lago Nahuel Huapi, Territory of Rio Negro.

Cat. No. 37856, U.S.N.M.

⁸ Engelhardt, H., Abh. Senck. Naturf. Gesell., vol. 16, Heft 4, p. 643, pl. 2, figs. 1-4, 1891.

⁹ Dusén, P., Schwed. Südpolar-Exped., vol. 3, Lief. 3, p. 19, pl. 4, fig. 5, 1908.

Order CYCADALES

Family CYCADACEAE

Genus ZAMIA Linnaeus

ZAMIA AUSTRALIS, new species

Plate 2, Figure 1

Frond tiny, ovate lanceolate in outline, about 5.5 centimeters long and 1.4 centimeters in maximum width, consisting of about 32 pairs of subopposite to alternate pinnules. Pinnules oriented at angles of about 65° to the rachis, to the top surface of which they are united by the whole width of their bases. They are entire, strictly linear in outline, and conspicuously truncate at their tips. Their texture is coriaceous and their few veined longitudinally parallel venation is very faint, possibly because the specimens show only the upper surface of the frond. That it is the upper surface seen and that the pinnules are attached to the upper surface of the rachis is shown by the fact that the bases of the pinnules nearly meet and the outline of the broader rachis can be made out beneath their proximal edges.

This characteristic little form is one of the most interesting in the whole collection. It is based upon two nearly complete specimens and represents the southernmost known extent of the genus in either the past or the present.

The genus *Zamia*, whose species are not at all genetically related to numerous fossil forms that have been described as species of *Zamites*, contains about 35 existing species, ranging from peninsular Florida, Mexico, and the Antilles through northern South America and along the eastern and in that region wetter Andean slopes to eastern Bolivia and northwestern Argentina.

Zamia is the dominant existing cycad genus of the Western Hemisphere, and its range in the Tertiary was greater than at present, extending to latitude $36^\circ 30'$ north in the Eocene.¹⁰ A South American Pliocene species was recorded by Krasser¹¹ from Bahia, Brazil, but was not represented in the collections which I obtained from the same locality. A splendid species occurs in the Arauco coal fields (Miocene) of Chile.¹² This last is much larger and quite different from the present form, which is very similar to the small species of Florida with underground stem.

¹⁰ Berry, Edward W., *Torreyia*, vol. 16, pp. 177-179, figs. 1-3, 1916.

¹¹ Krasser, F., *Sitz. k. Akad. Wiss. Wien*, vol. 112, ab. 1, p. 853, 1903.

¹² Berry, Edward W., *Johns Hopkins Studies in Geology*, No. 4, p. 120, pl. 1, fig. 4; pl. 2, figs. 1-3, 1922.

The existing southern limit of *Zamia* is about 25° south latitude, the Chilean Miocene occurrence is about 38° south, and the present is in about latitude 41° 30' south, thus over 6½° south of the existing range.

Occurrence.—Southeast side of Rio Nirihuaio, near Casa Piedra, about 12 miles south of Lago Nahuel Huapi, Territory of Rio Negro.

Holotype.—Cat. No. 37857, U.S.N.M.

Order ARAUCARIALES

Family ARAUCACEAE

Genus ARAUCARIA Jussieu

ARAUCARIA NATHORSTI Dusén

Plate 2. Figures 5, 6

Araucaria nathorsti DUSÉN, Svensk. Exped. till Magellansländerna, vol. 1, No. 4, p. 105, pl. 12, figs. 1–13, 1899.

This species was described by Dusén from the lignitic shales near Punta Arenas, where it is so abundant that this horizon was christened the Araucaria stage. Dusén distinguishes between the leaves of sterile and fertile twigs, the latter being usually larger, broader, and more ovate (triangular of Dusén), with a broader decurrent base.

The smaller leaf figured is identical with Dusén's, Figures 5 or 11, but the larger, which predominate in the present collection, are larger and more produced pointed than any he has figured and have more veins than the smaller leaf. The smaller have 12 to 13 veins and the larger about twice as many. While inclining to doubt the possibility of assigning the detached fossil leaves to sterile or fertile shoots, I see no reason to doubt that the present collection represents the same species as that described from the Straits of Magellan.

Dusén compared the fossil with the existing Chilean pine, *Araucaria imbricata* Pavon, and the similarity is as close as might be expected. If the two occurrences are identical in representing *Araucaria nathorsti*, this species ranges from about 53° south to nearly 41° south, or over nearly 12° of latitude, and this is in accord with the numerous occurrences of petrified wood of the Araucarioxylon type which has been reported by many explorers in various parts of this region. The fossil differs from the existing *Araucaria brasiliana* in its more coriaceous texture, in which respect it is much more similar to *Araucaria imbricata*, differing from both in the less contracted base.

Although both belong to the *Colymbea* section of the genus, it differs from *Araucaria araucoensis* Berry¹³ in its much larger and inferentially more crowded leaves, which also differ in outline and in the width at the basal flexure.

Araucaria imponens described by Dusén¹⁴ from the Tertiary of Seymour Island, Antarctica, has much the general form of the larger leaves from Rio Negro Territory with a wide base, but is more distinctly lanceolate and has fewer veins—not very constant or important features. Its describer considers the Antarctic species to be closer to *Araucaria brasiliana* than to *Araucaria imbricata*; but as it is represented by very meager material, there is little basis for an opinion.

Occurrence.—Four km. west southwest of Bernal, about 12 miles southeast of Barriloche, Territory of Rio Negro.

Plesiotypes.—Cat. No. 37858, U. S. N. M.

Order PINALES

Family CUPRESSINACEAE

Genus FITZROYA Hooker f.

FITZROYA TERTIARIA, new species

Plate 2, Figures 2-4

Leafy twigs, slender, branching; covered with ovate, pointed, appressed, imbricated leaves, with broadly decurrent bases. The phyllotaxy can not be determined, but as the leaf points usually rise to different levels the effect is of a spiral phyllotaxis, whatever the arrangement at their insertion may have been. (*F. patagonica* is said to have the leaves in alternate trimerous whorls.) These leaves are flat or convex with the contour of the twigs and not keeled; some are slightly divergent, and perhaps a majority have recurved tips, but the habit is much more appressed than in the single specimen of *Fitzroya patagonica* that has been available for comparison. In some fragments where the plant substance is preserved it is seen to be coriaceous and shows traces of a wide but not prominent midvein as in the recent species.

Although only sterile twigs have been seen and no microscopical preparations have been made there is little doubt but that these

¹³ Berry, Edward W., Johns Hopkins Studies in Geology, No. 4, p. 122, pl. 3, figs. 1-4, 1922.

¹⁴ Dusén, P., Wiss. Ergeb. Schwed. Südpolar-Exped. 1901-1903, vol. 3, Lief. 3, p. 11, pl. 1, figs. 16, 17, 1908.

twigs represent the genus *Fitzroya*. Their place of occurrence and associates point to this conclusion, as do the correspondence in size of leaves, in their broad decurrent bases and general form and midvein. They are commonly somewhat more pointed than the leaves of the small amount of recent material seen and are also more appressed. The species is said to show considerable variability in the degree of crowding or spreading of the leaves.

The genus is an interesting one, the modern distribution of which has suggested that it was a relict genus, but no fossil species have heretofore been described, to my knowledge. There is also some difference of opinion regarding its position among the Coniferales. It has usually been associated with the Actinostrobinæ—all of whose members have a unique disconnected range—but it is by some authors¹⁵ removed from association with *Actinostrobus*, *Callitris*, and *Widdringtonia* and referred to the Cupressinaceæ. *Fitzroya patagonica* is a mesophytic type of the Chilean temperate rain forest, reaching its northern limit at about latitude 40° near Valdivia and extending southward nearly to the end of South America, overlapping slightly the western frontier of Argentina and southern Patagonia, where the environment is suitable. It is a large tree and reaches its largest size in palustrine environments.

A second species confined to Tasmania was described by Hooker in the monotypic genus *Diselma*. It has usually been considered to belong to the same genus as the Chilean tree, but recently it has been proposed to revive the genus *Diselma* for its reception. The question is one involving a great deal of personal equation, and whichever view finally prevails, there can be no doubt of the similarity and probable relationship between the two.

Occurrence.—About 3 miles north of Estancia Chalia, Rio Chalia, Territory of Santa Cruz.

Holotype.—Cat. No. 37859 U.S.N.M.

Class MONOCOTYLEDONAE

MONOCOTYLEDONAE INCERTAE SEDIS

SCIRPITIS species Dusén (?)

Plate 3, Figure 15

Scirpitis species DUSÉN, Schwed. Südpolar-Exped., vol. 3, Lief. 3, p. 16, pl. 2, fig. 6, 1908.

The coarseness of the parallel veins and the lack of a midvein stamp these remains as stem fragments. They vary considerably in size, the fragment figured being the largest seen. As far as one may

¹⁵ Seward, A. C., Fossil Plants, vol. 4, p. 124, 1919.

judge from figures, this is identical with what Dusén considered to represent a *Scirpus*-like sedge from the Tertiary of Seymour Island, Antarctica.

Obviously, little reliance can be placed upon this similarity, since both occurrences represent a type which might have been present in this region at any time from the Upper Cretaceous to the present and which could scarcely be expected to show differential characters.

Occurrence.—Southeast side of Rio Nirihuaio near Casa Piedra, 12 miles south of Lago Nahuel Huapi, Territory of Rio Negro.

Cat. No. 37860 U.S.N.M.

Class DICOTYLEDONAE

Order FAGALES

Family FAGACEAE

Genus FAGUS Linnaeus (?)

FAGUS SUBFERRUGINEA Dusén

Fagus subferruginea DUSÉN, Svenske Exped. Magellansländerna, vol. 1, No. 4, p. 94, pl. 8, figs. 1-8, 1899.

This species was described by Dusén from near Punta Arenas and Barancas de Carmen Sylva in the Magellan Strait region. It is represented by a number of specimens in the present collection. I can see no valid reason for referring it to *Fagus* instead of *Nothofagus*. It is larger than the majority of leaves of *Nothofagus* and does resemble the leaves of the European beech; but occurring as it does in a profuse occurrence of *Nothofagus*, it is most unlikely to represent the northern genus.

Occurrence.—Four kilometers west southwest of Bernal, 12 miles southeast of Barriloche, Lago Nahuel Huapi, Territory of Rio Negro.
Cat. No. 37861, U.S.N.M.

Genus NOTHOFAGUS Blume

NOTHOFAGUS SIMPLICIDENS Dusén

Plate 2, Figures 7-9

Nothofagus simplicidens DUSÉN, Svenske Exped. till Magellansländerna, vol. 1, No. 4, p. 100, pl. 9, figs. 20-25, 1899.

This species was named—it can hardly be said to have been described—by Dusén in 1899. His material was abundant and came from the following localities in the vicinity of the Strait of Magellan: Barancas de Carmen Sylva, Rio Beta, Rio Condor, Bagnales, and near Punta Arenas.

Leaves, small, subcoriaceous, ovate in general outline, with an acute apex and a slightly inequilateral cuneate base. Margin with somewhat variable but invariably simple and relatively large teeth, one to each secondary. These teeth are prevailingly dentate, from which they grade into serrate, and some specimens approach what might be called crenate-serrate. Length ranging from 1.75 to 3.5 centimeters. Maximum width ranging from 0.75 to 1.5 centimeters. Petiole stout, usually missing, but preserved in one specimen to a length of 3.5 millimeters. Secondaries 10 to 12 pairs, opposite to alternate, thin, straight, subparallel or slightly divergent, craspedodrome, usually ascending at angles of about 45° , but subtending somewhat greater angles in the smaller and relatively wider forms. Tertiaries percurrent. Aerolation obsolete.

The genus *Nothofagus* comprises about 17 existing austral species, confined to southern Chile, Patagonia, and Tierra del Fuego in the Western Hemisphere and to southern Australia, Tasmania, and New Zealand in the Eastern Hemisphere. According to Skottsberg (1915), the recent species are distributed as follows: 6 in New Zealand, 1 in Tasmania, 1 in Tasmania and Victoria, 1 in New South Wales, and 8 in South America. The genus is divided into evergreen and deciduous sections. The deciduous species comprise 1 in Tasmania and 5 in South America. The evergreen section contains 3 in South America, all 6 of the New Zealand species, 1 in Tasmania and Victoria, and 1 in New South Wales. They are obviously related to *Fagus* of the Northern Hemisphere and for a long time were referred to that genus. *Fagus* has been recorded as a fossil associated with *Nothofagus* in South America, Australia, and New Zealand, but it may be questioned if the two can be separated on the basis of leaf form alone. Several forms resembling *Nothofagus* have been found in the Tertiary of Europe, but are equally unreliable. Recently Bandulska¹⁶ has described a *Nothofagus* from the Eocene of southern England, basing her determination upon the cuticular-structure which she claims to be able to differentiate from that of *Fagus*.

A large number of fossil species have been described from the Tertiary of the regions where the living species occur; at least two occur on Seymour Island, Antarctica.¹⁷ In considering the 13 species and varieties which Dusén has described from the Tertiary of Patagonia and Tierra del Fuego, one is impressed with the thought that perhaps the majority of these are the slightly varying leaves of a much fewer number of botanical species.

¹⁶ Bandulska, II., Journ. Linn. Soc. Bot., vol. 46, p. 433, pl. 39, fig. 20, 1924.

¹⁷ Dusén, P., Wiss. Ergeb. Schwed. Südpolar-Exped. 1901-1903, vol. 3, Lief. 3, p. 10, pl. 1, figs. 10, 12, 19; pl. 3, figs. 7-9, 1908.

The present species is not uncommon in the collection studied. In the existing flora *Nothofagus* extends northward on the wetter Chilean side of the Andes to about latitude 33°.

Occurrence.—Southeast side of Rio Nirihuao near Casa Piedra, about 12 miles south of Lago Nahuel Huapi, Territory of Rio Negro.

Plesiotypes.—Cat. No. 37862, U.S.N.M.

Order RANALES

Family ANONACEAE

Genus ROLLINIA St. Hiliare (?)

ROLLINIA (?) PATAGONICA, new species

Plate 2, Figure 11

Leaves of small size, ovate-elliptical in outline, widest medianly, with a narrowly rounded apex and a cuneate base. Margins entire. Texture subcoriaceous. Venation obsolete, due to carbonization of the lamina during fossilization. Length about 4.5 centimeters. Maximum width about 2.25 centimeters. Petiole short and stout, between 5 and 6 millimeters in length. Midvein straight, relatively stout and prominent. Secondary and tertiary venation not visible.

It is rather hazardous to attempt an identification of this leaf as representing the genus *Rollinia*. It agrees rather well with the existing *Rollinia parvifolia* of northeastern Argentina. The genus has about a score of existing species of shrubs and trees in the warmer parts of South America. A single fossil species not very different from the present form has been described from the Pliocene of eastern Brazil.¹⁸

Occurrence.—Bluff about 1½ miles south of Mata Amarilla, Upper Rio Chialia, Territory of Santa Cruz.

Holotype.—Cat. No. 37863, U.S.N.M.

Order ROSALES

Family SAXIFRAGACEAE

Genus HYDRANGEA Linnaeus (?)

HYDRANGEA (?) INCERTA, new species

Plate 5, Figure 2

Leaf oval in general outline, with a rounded apex and a truncate or broadly cuneate base, widest below the middle. Margins somewhat

¹⁸ Hollick and Berry, Johns Hopkins Studies in Geology, No. 5, p. 52, pl. 2, fig. 4, 1924.

irregularly sublobate. Texture coriaceous. Length about 5 centimeters. Maximum width about 3.5 centimeters. Midvein stout. Secondaries 4 or 5 irregularly spaced pairs, diverging from the midvein at varying angles, camptodrome.

The identity of this incomplete leaf is exceedingly problematical, and it may possibly represent some member of the Bignoniaceae. Both alternatives are represented in the existing flora of northern Argentina. *Hydrangea* is an ancient genus, cosmopolitan in existing floras and with several well-defined Tertiary species in the Northern Hemisphere, represented in Patagonia by *Hydrangeiphyllum affine* Dusén.¹⁹

Occurrence.—One and one-half miles south of Mata Amarilla, upper Rio Chalia, Territory of Santa Cruz.

Holotype.—Cat. No. 37864, U.S.N.M.

LEGUMINOSAE INCERTAE SEDIS

Genus LEGUMINOSITES Bowerbank

LEGUMINOSITES CALLIANDRAFORMIS, new species

Plate 3, Figures 13, 14

This species is based upon the single specimen figured, obviously representing a leaflet of some member of the alliance Leguminosae.

Leaflet small, very inequilaterally obovate. Apex broadly rounded, but slightly unsymmetrical. Base sessile, markedly inequilaterally cuneate. Margin entire. Texture subcoriaceous. Length about 11 millimeters. Maximum width about 5 millimeters. Midvein stout, much curved. Secondaries thin, ascending, curved, camptodrome; three from the extreme base, a slender one inside the midvein, and two coarser ones outside the midvein.

This leaflet is much like those of the genus *Calliandra* Benthams, which contains over 100 existing species, the majority in the warmer parts of South America. Two fossil species have been described from the Pliocene of Potosí, Bolivia. Since similarly veined leaflets occur in *Cassia*, *Caesalpinia*, and other genera of this alliance, and since the present material is so limited, it is referred to the form genus Leguminosites.

Occurrence.—Canyon of Rio Nirihua, 2½ leagues above its embouchure in the basin of Lago Nahuel Huapi, Territory of Rio Negro.

Holotype.—Cat. No. 37865, U.S.N.M.

¹⁹ Dusén, P., Svenska Exped. till Magellanslând, vol. 1, No. 4, p. 102, pl. 10, fig. 5, 1899.

LEGUMINOSITES species

Plate 3, Figure 17

Leaflet small, inequilaterally subelliptical, with about equally rounded apex and base. Margins entire. Length about 9.5 millimeters. Maximum width, above the middle, about 3.5 millimeters. Petiolule stout, curved, about 1 millimeter in length. Midvein not prominent. Balance of venation obscure. This obviously represents some member of the Leguminous alliance, but it affords no reliable generic features, and is therefore referred to the form genus Leguminosites.

Occurrence.—Southeast side of Rio Nirihuao, 150 yards southwest of Casa Piedra, about 12 miles south of Lago Nahuel Huapi, Territory of Rio Negro.

Cat. No. 37866, U.S.N.M.

Order SAPINDALES

Family ANACARDIACEAE

Genus ANACARDITES Saporta (?)

ANACARDITES (?) PATAGONICUS, new species

Plate 5, Figure 1

This is one of those leaves that is not especially characteristic. Its sessile base and slightly falcate outline suggest that it may represent a leaflet of a pinnate leaf. I identify it with considerable hesitation as a leaflet of some member of the Anacardiaceae which contains several South American genera similar to the fossil.

Medium-sized, ovate-falcate in outline, widest medianly, with an acute tip and a slightly inequilateral more narrowed, sessile base. Margins entire. Texture subcoriaceous. Length about 5.5 centimeters. Maximum width about 1.75 centimeters. Midvein stout, prominent and curved. Secondaries thin, numerous, subparallel, camptodrome.

The generic name used was proposed by Saporta for leaflets of this family whose generic assignation was uncertain. A score of species have been described from the Tertiary of North America and Europe. Fossil species in South America have been found in Trinidad and Brazil.

Occurrence.—Southeast side of Rio Nirihuao, 150 yards southwest of Casa Piedra, about 12 miles south of Lago Nahuel Huapi, Territory of Rio Negro.

Holotype.—Cat. No. 37867, U.S.N.M.

Order MALVALES

Family STERCULIACEAE

Genus STERCULIA Linnaeus

STERCULIA WASHBURNII, new species

Plate 4, Figures 1-7

Since these leaves are variable and abundant at a single outcrop, I have considered that they represent a single species of *Sterculia*, a genus whose leaves are notoriously variable as to form and lobation. It may be described as follows:

Leaves variable in size and form, palmately three to five lobed. Lobes ovate with rounded tips or conical with acute tips. Sinuses openly rounded, shallow or extending about halfway to the base. Base ranging from decurrent to cuneate to truncate, depending on the number and attitude of the lobes, which may be directed obliquely upward or laterally. Petiole long and exceedingly stout, in one specimen preserved for a length of 3 centimeters. Margins entire. Texture coriaceous. Length ranging from 4 to 8 centimeters. Maximum width ranging from 2.5 to 8 or more centimeters. Primaries three, stout, diverging from the base, or subbasal in some of the forms with a decurrent base, diverging at acute angles. In the five-lobed forms the lateral primaries give off a short distance above their base a stout lateral which runs to the tip of the lower lateral lobe. Secondaries thin, camptodrome. Tertiaries thin, simple and percurrent, or flexed medianly, or sometimes forked medianly.

Named for the collector, Chester W. Washburne. This species has the general features of leaves of this genus, which first appear in considerable abundance in mid-Cretaceous floras of various parts of the world. The genus is common in the warmer parts of South America, at the present time ranging southward to the Argentine Mesopotamia (about latitude 30°). A second fossil Argentine species, not unlike but perfectly distinct from *Sterculia washburnii*, has been described from the supposed Santa Cruz beds of Chubut Territory.²⁰

Occurrence.—Bluff about 1½ miles south of Mata Amarilla, upper Rio Chalia, Territory of Santa Cruz.

Cotypes.—Cat. No. 37868, U.S.N.M.

²⁰ Berry, Edward W., Johns Hopkins Studies in Geology, No. 5, p. 220, pl. 9, figs. 5, 6, 1925.

Order LAURALES

Family MONIMIACEAE

Genus PEUMUS Persoon

PEUMUS CLARKI Berry

Plate 2, Figure 10

Peumus clarki BERRY, Johns Hopkins Studies in Geology, No. 6, p. 204, pl. 5, fig. 2, 1925.

This species was described from the supposed Santa Cruz beds of Mirhoja, Chubut Territory. The specimen from Santa Cruz territory is similar to the type in every respect except that it is slightly narrower, in consequence of which the sessile base is more acute.

The genus is monotypic in the existing flora of Chile, ranging, as an evergreen tree, from about latitude 30° to latitude 42°. The present fossil occurrence carries its range much farther south and extending it over nearly 7° of latitude in Argentina. In this connection it is possible that the leaf from the Tertiary of Seymour Island, Antarctica, described by Dusén²¹ as *Phyllites* species (2), may represent a second fossil species of *Peumus*.

Occurrence.—Bluff about 1½ miles south of Mata Amarilla, upper Rio Chalia, Territory of Santa Cruz.

Holotype.—Cat. No. 37869, U.S.N.M.

Genus LAURELIA Jussieu

LAURELIA AMARILLANA, new species

Plate 5, Figure 3

Leaf broadly lanceolate in outline, widest medianly and about equally pointed at the apex and the base. Base narrowly cuneate and decurrent. Margin entire for its basal third, above which it has somewhat irregularly and widely spaced undulate-crenate teeth. Texture coriaceous. Length about 6 centimeters. Maximum width about 2.5 centimeters. Petiole stout, 7 to 8 millimeters in length. Midvein stout, prominent on the under side of the leaf. Secondaries about 5 alternate pairs, diverging from the midvein at acute angles, thin, long ascending, inclined to be somewhat flexuous, camptodrome, but sending branches into the marginal teeth. Areolation obsolete, a few tertiaries seen, as shown in the illustration.

This greatly resembles the existing Chilean *Laurelia aromatica* Sprengel in all of its features. The genus contains three species in

²¹ Dusén, P., Wiss. Ergeb. Schwed. Südpolar-Exped., vol. 3, Lief. 3, p. 16, pl. 1, fig. 15, 1908.

the existing flora, one in New Zealand and the other two in Chile in the region between 36° and 42° south latitude. If botanical systematists are correct in their opinion that these belong to the same genus, then we are bound to presuppose that it had a geological history unless we are prepared to subscribe to the once fashionable but now absurd notion that a genus can originate more than once and in different areas. Excluding the highly problematical fossil forms from the Northern Hemisphere which have been referred to *Laurelia*, a fossil species has been described by Dusén²² from the Tertiary of Seymour Island, Antarctica.

This is a somewhat fragmentary specimen of a larger size, with less ascending secondaries and more pointed teeth than *Laurelia amarillana*, and also less similar to the existing *Laurelia aromatica*.

Occurrence.—Bluff one-half league south of Mata Amarilla, upper Rio Chalia, Territory of Santa Cruz.

Holotype.—Cat. No. 37870, U.S.N.M.

Family LAURACEAE

Genus LAUROPHYLLUM Goepfert

LAUROPHYLLUM CHALIANUM, new species

Plate 5, Figure 4

Leaves elongate-lanceolate, widest below the middle, with an extended gradually narrowed tip and a more abruptly acute base. Margins entire. Texture subcoriaceous. Length about 9 to 10 centimeters. Maximum width about 1.5 centimeters. Midvein stout, somewhat flexuous, prominent on the under side of the leaf. Secondaries thin, numerous, diverging from the midvein at acute angles, long ascending, eventually camptodrome. Tertiaries obsolete.

This species is represented by several incomplete specimens and is evidently Lauraceous. As it is impossible to determine its generic position with certainty, it is referred to the form genus *Laurophyllum*. It may represent the genus *Nectandra*, although similar leaves occur in several existing Lauraceous genera of the warmer parts of South America.

A typical species of *Nectandra* is present in the supposed Santa Cruz beds of Chubut Territory,²³ so that this genus is known to have ranged farther south during the Tertiary than it does at the present time.

Occurrence.—Three miles north of Estancia Chalia, Rio Chalia, Territory of Santa Cruz.

Holotype.—Cat. No. 37871, U.S.N.M.

²² Dusén, P., Schwed. Südpolar-Exped., vol. 3, Lief. 3, p. 4, pl. 1, fig. 5, 1908.

²³ Berry, Edward W., Johns Hopkins University Studies in Geology, No. 5, p. 224, pl. 8, fig. 1, 1925.

Order MYRTALES

Family MYRTACEAE

Genus MYRCIA De Candolle

MYRCIA NITENS Engelhardt

Plate 3, Figures 1-9

Myrcia (Cryptomyrcia) nitens ENGELHARDT, Abh. Senck. Naturf. Gesell., vol. 16, Heft 4, p. 679, pl. 10, fig. 7, 1891.

Myrtiphyllum bagualense DUSÉN, Svenska Exped. till Magellanslând., vol. 1, No. 4, p. 103, pl. 11, figs. 7-9, 1899.

This species was described by Engelhardt from the lower Miocene of Coronel, Chile. It is exceedingly abundant in all sizes in the present collection, and the larger leaves (such as those shown in figs. 7-9) are identical in every respect with Engelhardt's Chilean type. With these, and grading to much smaller but otherwise similar leaves, are a series of forms identical with those from southern Patagonia which Dusén described as *Myrtiphyllum bagualense*. Every gradation of size is represented in the present collection, and there can be no doubt but that a single botanical species is represented. It might possibly be argued that Dusén's, which come from over 11° farther south, were normally smaller, because of the possibly more severe climatic conditions. Among the leaves recorded by Dusén²⁴ from the Tertiary of Seymour Island, Antarctica, there is an apical fragment (*Phyllites* species 16) which very probably represents this same species.

Occurrence.—Four km. west southwest of Bernal, 12 miles south-east of Barriloche, Lago Nahuel Huapi, Territory of Rio Negro.

Plesiotypes.—Cat. No. 37872, U.S.N.M.

Order GENTIANALES

Family APOCYNACEAE

Genus APOCYNOPHYLLUM Unger

APOCYNOPHYLLUM CHALIANUM, new species

Plate 5, Figure 5

Leaf oblong, acutely pointed at the apex and base. Margins entire. Texture coriaceous. Length about 11 centimeters. Maximum width about 3.25 centimeters. Petiole stout, about 2.25 centimeters in length. Midvein stout, prominent. Secondaries thin, numerous, diverging from the midvein at wide angles, subparallel, ending in an acrodrome marginal vein parallel with and close to the leaf margins.

²⁴ Dusén, P., Schwed. Südpolar-Exped., vol. 3, Lief. 3, p. 18, pl. 2, fig. 10, 1903.

This form somewhat resembles *Myrcia costatoides* Engelhardt²⁵ of the lower Miocene of Chile, but is much larger and stouter with a much longer petiole. It does not conform to the features of any *Myrcias* with which I am familiar. There are, of course, leaves of this general type in various unrelated existing genera. Some figs have similar leaves, e. g., the existing *Ficus pulehella* Schott, but the venation is not quite the same and the inframarginal vein is usually farther within the margins and arched from secondary to secondary.

Somewhat similar leaves occur in various Myrtaceae and Guttiferae, but the type is especially characteristic of a considerable number of genera of the Apocynaceae and can be exactly matched among existing species of *Plumiera* and *Allamanda*. For these reasons I feel justified in referring it to the form genus *Apocynophyllum*.

Nothing of this kind was found in the supposed Miocene flora from Mirhoja, Territory of Chubut.²⁶ All of the existing genera with leaves like the fossil find their home in the warmer parts of South America, and none extend farther southward than northern Argentina.

Occurrence.—About 3 miles north of Estancia Chalia, Rio Chalia, Territory of Santa Cruz.

Cotypes.—Cat. No. 37873 U.S.N.M.

Order PERSONALES

Family BIGNONIACEAE

Genus BIGNONITES Saporta

BIGNONITES CHALIANUS, new species

Plate 5, Figure 6

Leaflets of medium size, ovate, widest medianly and about equally pointed at the apex and base. Margins entire. Texture subcoriaceous. Length about 7 centimeters. Maximum width about 3.5 centimeters. Midvein stout, prominent. Secondaries about 5, mediumly stout camptodrome pairs; the basal pair are stoutest and opposite and run close to and parallel with the lower lateral margins to the middle of the leaf, simulating lateral primaries. Tertiaries thin, usually forming a double series of meshes between adjacent secondaries.

This form presents features allying it with various existing genera of Bignoniaceae of the existing flora in the warmer parts of South America. Several genera range southward as far as northern Argentina.

²⁵ Engelhardt, H., *Abh. Senck. Naturf. Gesell.*, vol. 16, Heft 4, p. 680, pl. 9, fig. 6, 1894.

²⁶ Berry, Edward W., *Johns Hopkins University Studies in Geology*, No. 5, pp. 185-252, pls. 1-9, 1922.

Occurrence.—Three miles north of Estancia Chalia and $1\frac{1}{2}$ miles south of Mata Amarilla, upper Rio Chalia, Territory of Santa Cruz.

Holotype.—Cat. No. 37874, U.S.N.M.

DICOTYLEDONAE INCERTAE SEDIS

PHYLLITES NIRIHUAOENSIS, new species

Plate 3, Figures 18, 19

Leaf or leaflet tiny, orbicular in outline, with large irregular crenate teeth. Length 6 millimeters. Maximum width 4.5 millimeters. Apparently sessile. Venation relatively enormously stout and prominent. Midvein flexuous, terminating in an apical tooth. Secondaries 3 or 4 on each side, alternate, stout, often forking, recurving as marginal veins in the teeth. Areolation irregular and mostly rectangular, gradually diminishing in strength.

This typical form is based on the single specimen figured. It is somewhat similar to a slightly larger fragment from Barancas de Carmen Sylva, recorded by Dusén as *Escaloniiophyllum* species.²⁷ The venation suggests a relationship with the Cunoniaceous genus *Weinmannia*, but this resemblance does not warrant a decision.

Occurrence.—Southeast side of Rio Nirihua, 150 yards southwest of Casa Piedra and about 12 miles south of Lago Nahuel Huapi, Territory of Rio Negro.

Holotype.—Cat. No. 37876, U.S.N.M.

PHYLLITES MOLLINEDIAFORMIS, new species

Plate 3, Figure 16

Leaf small lanceolate, coriaceous, with toothed margin and craspedodrome secondaries. Based on the single specimen figured and possibly representing a narrow *Nothofagus*. Shows considerable resemblance to *Mollinedia seymourensis* Dusén²⁸ of Tertiary of Seymour Island, Antarctica.

Occurrence.—Southeast side of Rio Nirihua, 150 yards southwest of Casa Piedra, about 12 miles south of Lago Nahuel Huapi, Territory of Rio Negro.

Holotype.—Cat. No. 37877, U.S.N.M.

PHYLLITES species (cf. SCHINOPSIS)

Plate 3, Figures 10 to 12

More or less complete specimens of small linear-lanceolate leaves or leaflets are not uncommon at this locality. They do not show suf-

²⁷ Dusén, P., Svenska Exped. Magellansländerna, vol. 1, No. 4, p. 102, pl. 11, fig. 5, 1899

²⁸ Dusén, P., Schwed. Südpolar-Exped., vol. 3, Lief. 3, p. 4, pl. 1, fig. 18, 1908.

ficiently characteristic features to warrant even a surmise as to their botanical affinity. They may be briefly characterized as follows: Outline linear lanceolate, widest medianly, acutely and about equally pointed at the apex and base. Margins entire. Texture relatively coriaceous. Length 4 to 5 centimeters. Maximum width 2.75 to 7 millimeters. Petiole stout, about 3 millimeters in length. Midvein mediumly stout. Balance of the venation obscure; a few thin oblique camptodrome secondaries can be made out, thus ruling out comparisons with members of the family Myrtaceae, which are represented in most South American Tertiary floras, including that described from the supposed Santa Cruz beds of the Territory of Chubut.²⁹ They might represent the leaflets of some Sapindaceous genus, and they are also not unlike those of the Anacardiaceous genus *Schinopsis*, which is represented by good material from the Miocene of Chubut.³⁰

Occurrence.—Southeast side of Rio Nirihuaio, 150 yards southwest of Casa Piedra, about 12 miles south of Lago Nahuel Huapi, Territory of Rio Negro.

Cat. No. 37878, U.S.N.M.

PHYLLITES species 6 Dusén (?)

Phyllites, sp. 6. DUSÉN, Schwed. Südpolar Exped., vol. 3, lief. 3, p. 18, pl. 1, fig. 3, 1908.

A specimen indistinguishable from the one recorded by Dusén from the Tertiary of Seymour Island, Antarctica, but too fragmentary to be reliable, is present in the collection from near Mata Amarilla, upper Rio Chalia, Territory of Santa Cruz. Cat. No. 37879, U.S.N.M.)

²⁹ Berry, Edward W., Johns Hopkins University Studies in Geology, No. 3, p. 225, pl. 2, fig. 6, 1925.

³⁰ Idem, p. 208, pl. 1, fig. 2.

EXPLANATION OF PLATES

PLATE 1

- FIG. 1. *Filicites* species 1.
 2. *Filicites* species 2.
 3. Sterile, and Fig. 4. Fertile pinna of *Pteris nirihuaensis*, new species $\times 3$.
 5-7. *Adiantum patagonicum*, new species.
 5. The most nearly complete specimen found.
 6. Same, slightly restored, $\times 4$.
 7. Enlarged segment of distal margin showing supposed sori.

PLATE 2

- FIG. 1. *Zamia australis*, new species.
 2-4. *Fitzroya tertiaria*, new species.
 2. Natural size.
 3 and 4. Enlarged $\times 5$.
 5, 6. *Araucaria nathorsti* Dusén.
 7-9. *Nothofagus simplicidens* Dusén.
 10. *Peumus clarki* Berry.
 11. *Rollinia* (?) *patagonica*, new species.

PLATE 3

- FIGS. 1-9. *Myrcia nitens* Engelhardt.
 10-12. *Phyllites* species (cf. *Schinopsis*).
 13, 14. *Leguminosites calliandraformis*, new species 14 enlarged $\times 4$.
 15. *Scirpites* species Dusén (?)
 16. *Phyllites mollinediaformis*, new species.
 17. *Leguminosites* species.
 18, 19. *Phyllites nirihuaensis*, new species 19 enlarged $\times 10$.

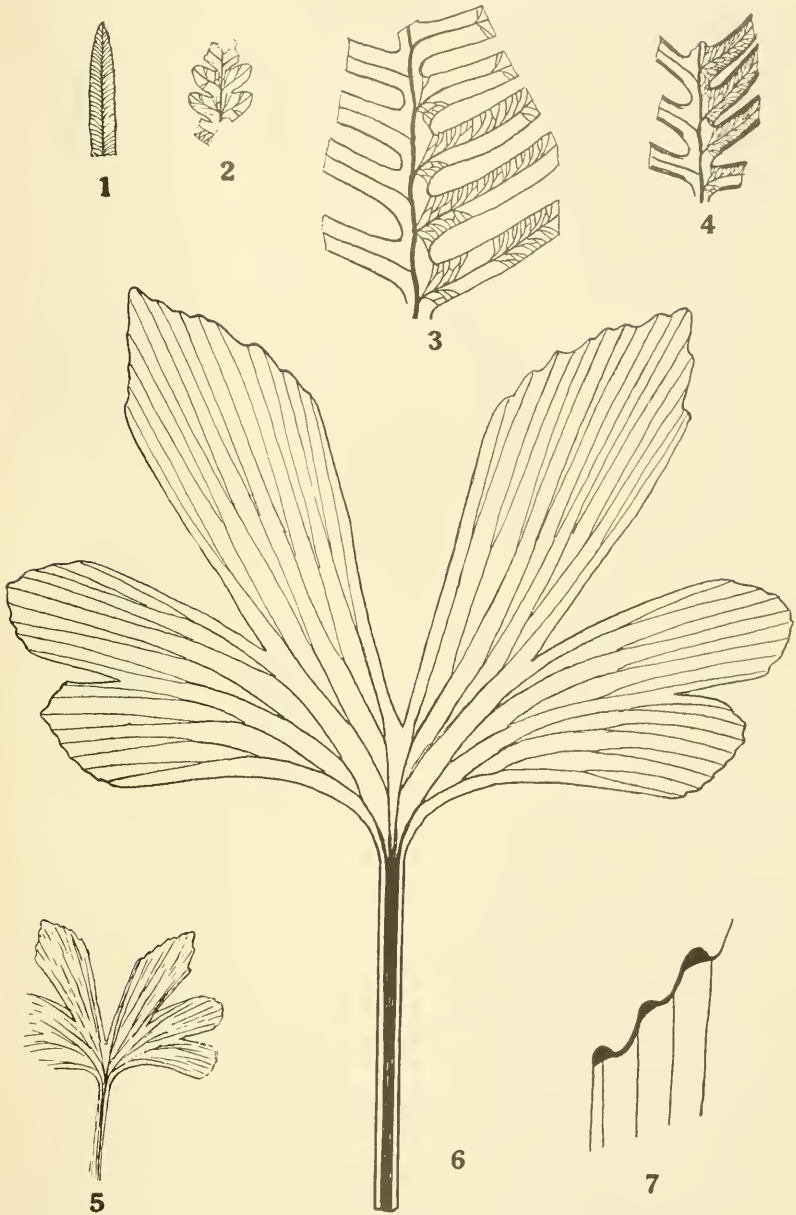
PLATE 4

- FIGS. 1-7. *Sterculia washburnii*, new species.

PLATE 5

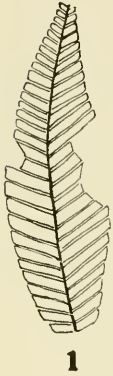
- FIG. 1. *Anacardites* (?) *patagonicus*, new species.
 2. *Hydrangea* (?) *incerta*, new species.
 3. *Laurelia amarillana*, new species.
 4. *Laurophyllum chalianum*, new species.
 5. *Apocynophyllum chalianum*, new species.
 6. *Bignonites chalianus*, new species.





ARGENTINE TERTIARY PLANTS

FOR DESCRIPTION OF PLATE SEE PAGE 27



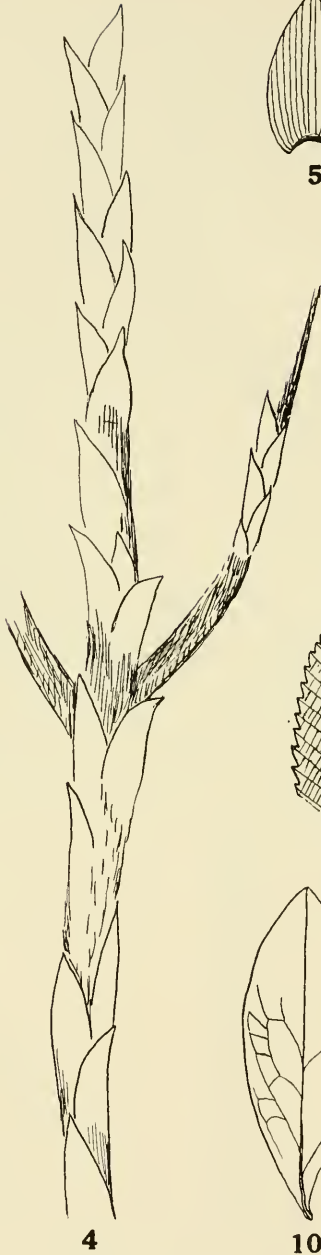
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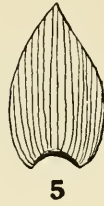
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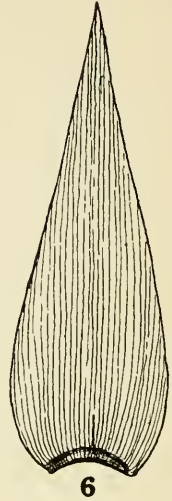
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7



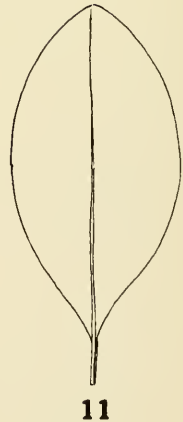
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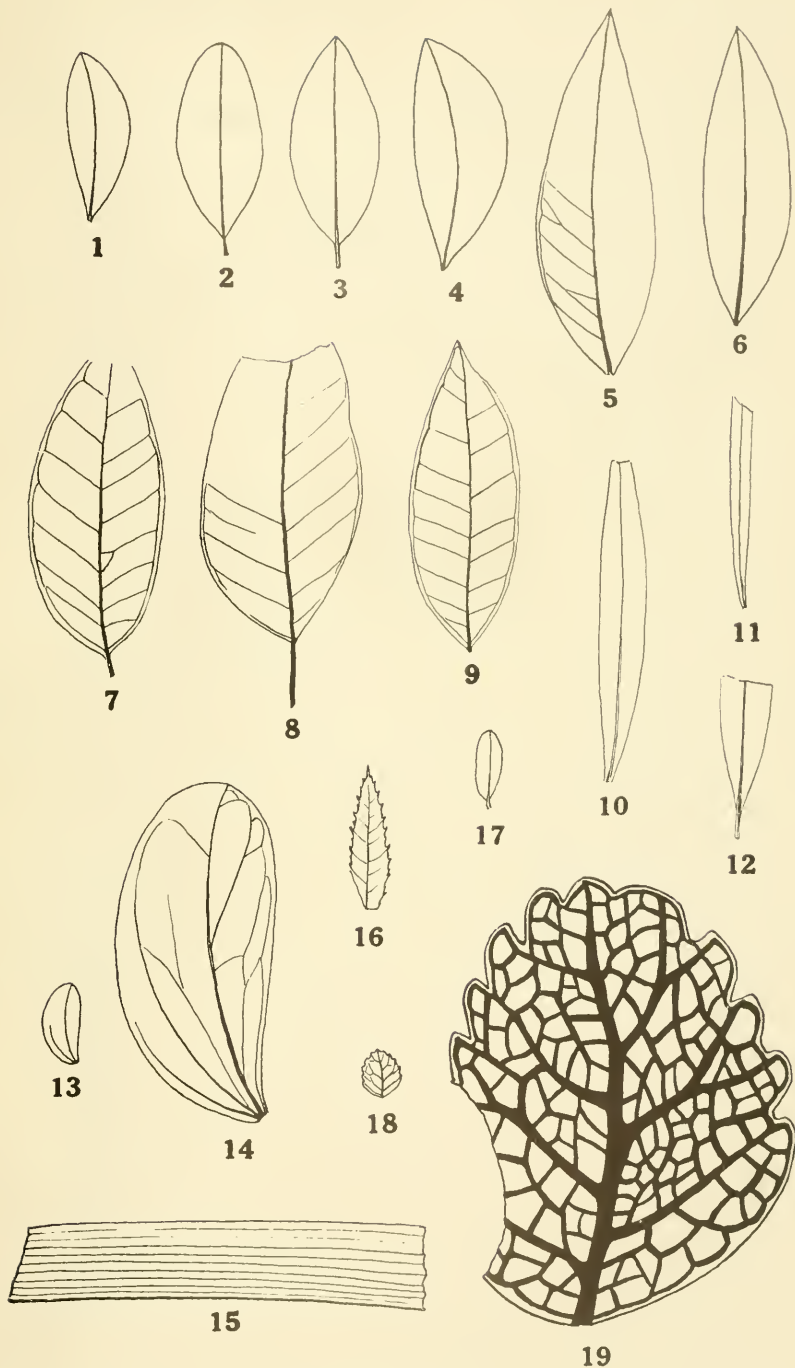
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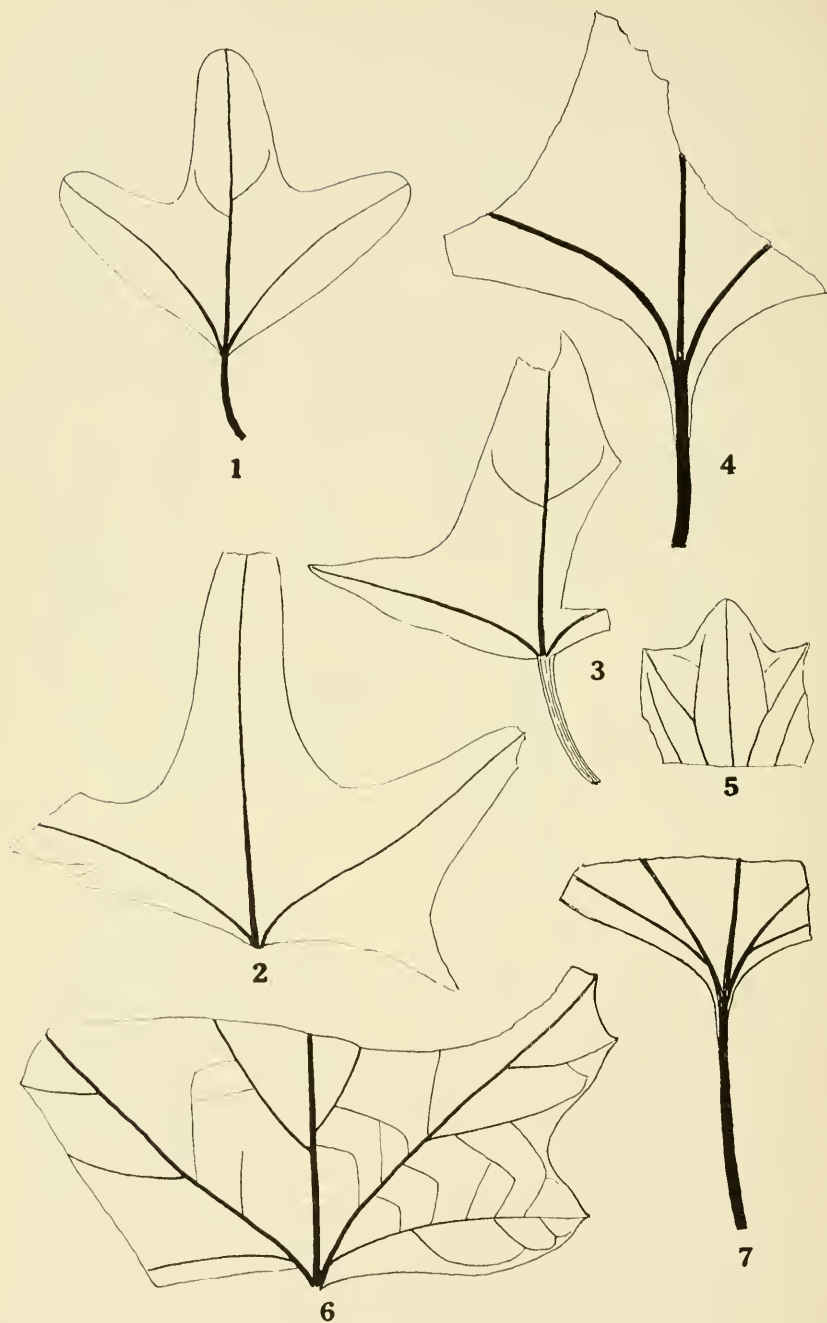
ARGENTINE TERTIARY PLANTS

FOR DESCRIPTION OF PLATE SEE PAGE 27



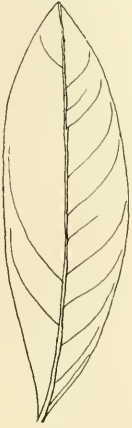
ARGENTINE TERTIARY PLANTS

FOR DESCRIPTION OF PLATE SEE PAGE 27



ARGENTINE TERTIARY PLANTS

FOR DESCRIPTION OF PLATE SEE PAGE 27



1



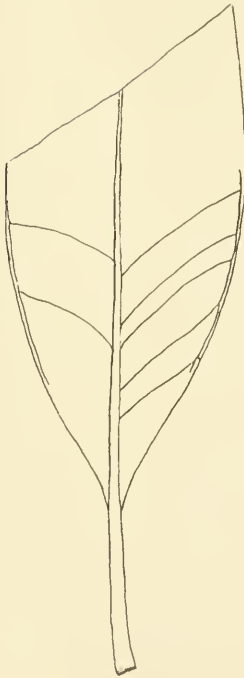
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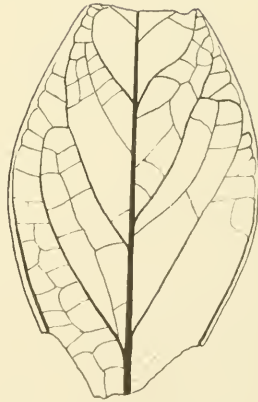
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6

ARGENTINE TERTIARY PLANTS

FOR DESCRIPTION OF PLATE SEE PAGE 27

