166. *Discovery of Liriodendron Leaves from the Neogene of Japan.*

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Liriodendron is one of the genera of the most interesting dicotyledonous plants; it is ancient race, extending back into the Cretaceous period like *Sequoia*, *Ginkgo*, *Sassafras*, *Liquidambar*, *Platanus* and several others, and now having only two closely allied existing species, one, *Liriodendron tulipifera* Linné, in southeastern North America¹⁾ and the other, *Liriodendron chinensis* Sargent, in southwestern China.²⁾

Liriodendron remains are common in the Cretaceous deposits of North America and Greenland; they are also well represented in the Tertiary floras of Europe, especially being rich in Pliocene deposits and extending to its topmost beds.³⁾ On the other hand, curious enough their remains have not yet been found in Tertiary rocks of North America; but they are common in the Pleistocene sediments of the southeastern states.⁴⁾ From Asia, we have only one recorded case of the occurrence of fossil *Liriodendron*, namely *Liriodendron tulipifera* reported by J. Schmalhausen⁵⁾ from a deposit of the Altai region, Central Asia, probably Pliocene in age.

Tertiary floras of Japan have many elements foreign to the existing

1) Livingston, B. E. and F. Shreve: The Distribution of Vegetation in the United States, as related to Climatic Conditions, 1921, p. 60, pl. 9.

2) Wilson, E. H.: A Naturalist in Western China, 1913, pp. 31, 54.

3) Heer, O.: Die tertiäre Flora der Schweiz, III, 1859, pp. 29, 30, pl. 108, figs. 6, 6 b. Saporta, G. de and A. F. Marion: Recherches sur les Végétaux Fossiles de Meximieux 1876, p. 208, pl. 33 fig. 1-6. Massalongo, A. and G. Scarabelli: Studii sulla Flora Fossile e Geologia Stratigraphica del Senigalliese, 1858, p. 311, pl. 39, figs. 3-5. Reid, C and E. M. Reid: Pliocene Floras of the Dutch-Prussian Border. Med. Rijksopsporing van Delfstoffen, No. 6, 1915, p. 93, pl. 3, fig. 1-5. Berry, E. W.: Tree Ancestors, 1923, pp. 171-180 fig. 38. Reid, E. M. and M. E. J. Chandler: The Bembridge Flora, 1926, pp. 23, 24.

4) Berry, E. W.: Pleistocene Plants from North Carolina. U. S. Geol. Surv. Prof. P. 140-C, 1926, p. 112, pl. 54, figs. 6-8; Am. Nat. 41, 1907, p. 695; Torreya, 1909, 9. p. 71; Torreya, 15, 1915, p. 208, fig. 1; Am. Jour. Sci. (VI) 29, 1910, p. 396.

5) Schmalhausen, J.: Über tertiäre Pflanzen aus dem Thale des Flusses Buchtorma am Fusse des Altaigebirges. Palaeontographica, 33, 1887, p. 211, pl. 21, figs. 20, 21.

one of the islands and showing on the contrary affinities to North American plants; we have thus already *Sequoia*, *Taxodium*, *Platanus*, *Planera* among others and long looked for *Liriodendron* remains some-day to be found in our Tertiary rocks,—an anticipation which was finally fulfilled by the two recent discoveries cited below.

This summer there were two finds of *Liriodendron* leaves in impression from two districts quite apart from one another, one by me from the Miocene Hiramaki plant beds of Kukuri-mura, Kani-gun, Gifu prefecture, and the other by Mr. H. Okutsu from the Miocene (?) Nisizawa plant beds of Akiu-mura, Natori-gun, Miyagi prefecture. The two specimens are similar and no doubt belong to one and the same species which is hardly distinguishable from the living North American form so far as we can judge on foliage only, and it is only for the sake of convenience that a new specific name is here given to our fossil form. Of the two specimens at hand, that from the Nisizawa plant beds is better preserved and taken for the holotype.

Liriodendron honsyûensis Endô, sp. nov.

Leaves relatively large, 9 centimeters long and broad, nearly circular in general outline, with two apical and two to four lateral lobes, truncated or deeply emarginated at top, lateral sinuses rounded, base truncated or somewhat pointed, midrib stout and straight, slightly projecting at the top of lamina to a pointed apex, secondaries pinnate, four to seven in number, comptodrome, brachiodrome. Petiole stout about 4 centimeters long. Nervilles traversing large areas percurrent, straight or curved, simple or forking and inosculating in the middle region. Texture subcoriaceous.

All the features exhibited by the fossil leaves in size, outline and venation are those characteristic of living *Liriodendron* leaves. The holotype (fig. 1) from the Nisizawa plant beds near Sendai is quite similar to *Liriodendron tulipifera* of southeastern North America on one side and to some of the Tertiary forms such as *Liriodendron helveticum* Fisch.¹⁾ from the Miocene of Switzerland and *Liriodendron procaccinii* Unger²⁾ from the Upper Pliocene of France and Italy on the other. The other specimen (fig. 2) from the Hiramaki plant beds is fragmental and incomplete, but it is ovate in outline and otherwise agrees with the former in detail.

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1) Heer, O.: Op. cit., pp. 29, 30, pl. 108, fig. 6, 6 b.

2) Saporta, G. de and A. F. Marion: Op. cit., p. 208, pl. 33, figs. 1-6.

The discovery of *Liriodendron* remains in the Neogene of Japan is palaeobotanically significant as it probably links together the two existing species of China and North America.

Liriodendron honsyûensis Endô sp. nov. xl.

The specimens are stored in the Institute of Geology and Palaeontology, Tohoku Imperial University, the register number for the holotype and paratype being 51769 and 51770 respectively.

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