

ART. L.—*Descriptions of Tertiary Plants, II*; by T. D. A.
COCKERELL.

THE plants discussed below are all from the North American Miocene. They represent a flora containing many genera at that time widely spread over the Holarctic Region, but in later times driven southward, and to-day existing in much

FIG. 1.



FIG. 1. *Geaster florissantensis*.

FIG. 2.

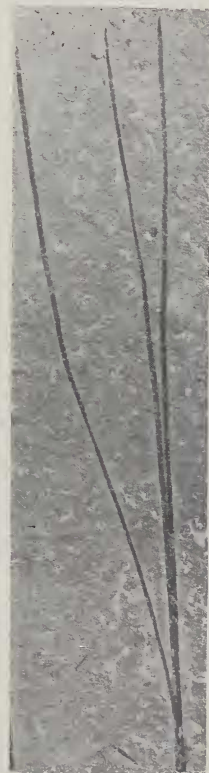


FIG. 2. *Pinus sturgisi*.

more limited areas; some in Asia, others in various parts of America. They show very clearly that many of the ostensibly endemic genera of various regions may well have originated elsewhere, and are merely making their last stand where we now find them.

FUNGI.

Geaster florissantensis sp. nov. Fig. 1.

Diameter of "star" about 56^{mm}, the segments about eight in number, five being visible, variable in form, the largest 20^{mm} long and about 11½ broad at base, but one next to it only about 7 broad; color dark brown, texture apparently leathery, without any sign of venation.

Florissant, at a new station on the hillside not far from 20 (*W. P. Cockerell*, 1908). It occurs on a slab with numerous remains of *Typha lesquereuxi* Ckll., *Ulmus hilliae* Lx., and other plants. The appearance is exactly that of a modern *Geaster* in the expanded condition, and the irregularity of the segments is unlike that of any calyx known to me. *Geaster* is, of course, common in Colorado to-day.

GYMNOSPERMS.

Pinus sturgisi sp. nov. Fig. 2.

Leaves in bundles of threes, apparently entire-margined, about 175^{mm} long and 1½^{mm} broad, very straight, sharp-pointed. Two fibrovascular bundles are very distinct, being preserved as white lines. In all respects, the plant agrees very closely with the living *P. tæda* L., of the Eastern and Southern States.

Florissant; the type from Station 13 B (*Miss Gertrude Darling*, 1908), but the species was also found, less well preserved, at various stations in 1907. The species is dedicated to Dr. W. C. Sturgis, of the School of Forestry at Colorado College, in recognition of his contributions to Colorado botany. The fossil species of *Pinus* from Florissant must now be considered to be three in number at least, separable as follows:

- Leaves in bundles of five *P. wheeleri* Ckll. (doubtfully recorded as *P. palæostrobis* (Ett.) Heer, by Lesquereux).
 Leaves in bunches of three 1.
 1. Leaves about 175^{mm} long *P. sturgisi* Ckll.
 Leaves about 70^{mm} long *P. hambachi* Kirchner.

I formerly sunk *P. hambachi* under *P. florissantis* Lx., which was based on a cone, but it must be restored, at least provisionally.

Heyderia C. Koch.

This genus, once widespread, is restricted to the Pacific coast region of North America (*Heyderia decurrens* (Torrey) C. Koch) and China (*H. macrolepis* = *Libocedrus macrolepis* Benth. and Hook. = *Calocedrus macrolepis* Kurz). At

Florissant, Colorado, it is represented in the Miocene by *H. coloradensis* Ckll., while in the Miocene of Europe, at Radoboj, *Heyderia salicornioides* (*Libocedrus salicornioides* Heer) is very well preserved. Other species, supposed to belong here, are from the Upper Cretaceous of Greenland and the Miocene of Spitzbergen.

ANGIOSPERMS.

Ailanthus americana sp. nov. Fig. 3.

Samara about 38^{mm} long, 9 broad; seed 6^{mm} long and a little over 4 broad, placed with its long axis about 15 degrees from

FIG. 3.



FIG. 3. *Ailanthus americana*.

FIG. 4.



FIG. 4. *Quercus knowltoniana*.

axis of samara; venation of wings well preserved, agreeing with that of *A. glandulosa* L.; apical part with a thickening along one side, as in Lesquereux, Cret. and Tert. Floras, Pl. xl, f. 7.

Florissant, Station 13 B, 1903. Type at University of Colorado.

Ailanthus (wrongfully called *Alianthus* in Knowlton's Cat. Cret. and Tert. Pl.) is at present confined to Asia, with three species. It is well represented in the Tertiary beds of Europe, and is credited with two American Tertiary species, one from the Miocene of Oregon, the other from the Green River beds of Wyoming. The Oregon species is very distinct from ours; that from Wyoming is based on a supposed leaflet with a remarkably long petiole, which seems to be doubtfully of this

genus. However, Lesquereux figures with his *A. longepetiolata* a samara, which he says "may not represent the fruit of the same species," but which is evidently very much like that from Florissant. The seed is more transverse, however; the venation is not shown.

Quercus knowltoniana sp. nov. Fig. 4.

Acorn-cup 30^{mm} diameter; scales in about 10 rows, triangular, from about the fifth row sharp-pointed, but the more basal ones broad and angled rather than pointed; no visible marginal fringe.

Florissant (*Mrs. Charlotte Hill*). Holotype at Yale University, Cat. No. 1005. I had retained this curious fossil for months, hoping to be able to determine it, but failing to recognize its relationships. Dr. F. H. Knowlton recently visited my laboratory, and upon showing the fossil to him, he at once recognized what it was. Now that the fact has been pointed out it is so evident that the specimen is an acorn-cup that I do not understand my obtuseness on the subject. The species recalls the recent *Q. macrocarpa* Michx., the cups of which grow to an even larger size. I have no leaf from the shale that I can refer to it. The cup was evidently widely open and shallow, not partially closed as it is in *Q. lyrata*. Fossil acorn-cups have been found in the Miocene of Europe (*Q. palaeocerris* Sap., *Q. subcrenata* Sap.).

Rosa ruskiniqna sp. nov. Fig. 5.

Represented by a bud about 16^{mm} long, and six in diameter. Hypanthium subglobose, no doubt producing a practically spherical fruit, covered with minute spines; sepals with very large and thick-stalked glands or gland hairs on the basal half, these very much larger than the spines of the hypanthium; apical portion of sepals long, with three or four large lobes on each side.

Florissant, Station 13 B (*W. P. Cockerell*, 1908). By the character of the hypanthium this is evidently related to *Rosa cherokeeensis* Donn., but the sepals are strongly lobed. Such a rose would have trifoliate leaves, and these should resemble those of *R. hilliae* Lx., at least to a considerable degree. As, however, it is impossible definitely to connect the bud with the leaves of *R. hilliae* (we have not found the latter), I give the former a distinctive name; dedicating it to John Ruskin, whose copy of Lindley's "Rosarum Monographia," with many marginal notes, is in my library.

Hydrangea florissantia Ckll.

Rhus rotundifolia Kirchner, Trans. St. Louis Acad., viii, p. 184, is the same thing. The name *rotundifolia* was much earlier used in *Hydrangea* by Rafinesque. Kirchner's type is, I believe, in the U. S. National Museum.

Sambucus newtoni sp. nov. Fig. 6.

Leaflet (doubtless a lateral one) about 132^{mm} long and 26 broad; texture thin, this and the venation exactly as in living

FIG. 5.

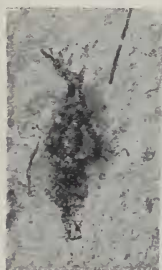


FIG. 5. *Rosa ruskiniana*.

FIG. 6.



FIG. 6. *Sambucus newtoni*.

species of *Sambucus*; form parallel-sided, rapidly narrowing apically to a sharp point, very much as in *S. arborescens* Nuttall; margin with exceedingly minute denticulations, 4 to 5 in 5^{mm}, and even these evanescent on the basal half.

Florissant, Station 13 B (*George Newton Rohwer*, 1908). The best side shows all but the base; the reverse lacks the apex, but shows nearly all of the base, which is substantially as in *S. arborescens*. This is the first American fossil *Sambucus*; in Europe the genus is represented by flowers in amber.

Lomatia acutiloba Lx. is on the same slab as *Sambucus newtoni*.

Anona spoliata sp. nov. Fig. 7.

Leaf apparently thick, oblong, entire, the blade 40^{mm} broad, and probably over 80 long (apex missing), the base broadly rounded, the midrib and petiole stout, the latter short, only about 9^{mm} long. Venation pinnate, the secondaries arising from the midrib at an angle mostly little less than a right angle, but varying in this respect, and gently curving upwards, terminating in submarginal arches connecting their tips, and variously enclosing areas of different shapes. Between the principal lateral veins are small and hardly noticeable ones, not

FIG. 7.

FIG. 7. *Anona spoliata*.

proceeding far from the midrib. In the shape of the leaf, the short petiole, and the venation, this is almost exactly like the living *Anona glabra* L., of Florida. In one place two of the principal secondaries unite, as they sometimes do in *A. glabra*.

Florissant, Station 13 B (*Geo. N. Rohwer*, 1908). *Sabina linguifolia* (Lx.) Ckll. occurs on the same slab. *Anona robusta* Lx., from the Laramie (?) at Golden, Colorado, is a similar species, differing, however, in the character of the submarginal venation, which does not show the large enclosed areas. The resemblance of *A. spoliata* to *A. robusta* is, therefore, not nearly so close as to *A. glabra*. The European *A.*

elliptica Unger, from the Miocene of Radoboj, is close to *A. spoliata* in respect to the submarginal venation, but very different in the cuneate base, the leaf being very like that of *Crescentia latifolia*.

Juglans leonis n.n.

Juglans californica Lx., Mem. Mus. Comp. Zool. vi, 34, pl. ix, x (1878). Miocene of California. (Not *J. californica* S. Watson, Proc. Am. Acad., x, 349 (1875).)

Rhus mense n.n.

Rhus metopioides Lx., Mem. Mus. Comp. Zool. vi, 31 (1878). Miocene of California. (Not *R. metopioides* Turcz., Bull. Soc. Nat. Mosc., xxxi, 1, 468 (1858).)

Salix merriami n.n.

Salix elliptica Lx., Mem. Mus. Comp. Zool. vi, 10 (1878). Miocene of California. (Not *S. elliptica* Sleich., Ser., Ess. Saul., 44; cf. Steud., nom. (1841).)

Zizyphus microphyllus Lx., and *Magnolia lanceolata* Lx., of the California Miocene, also bear preoccupied names.

Weinmannia dubiosa Ckll.

We found this at Stations 13 B and 14, at Florissant. The leaflets vary from five to seven.

Robinia brittoni sp. nov. Fig. 8.

Represented by a leaf, scarcely at all different from the living *R. pseudacacia* L. Five leaflets are preserved. Leaflets about 22^{mm} long and 9½ broad, very briefly mucronate at apex, and with short petiolules about 2^{mm} long, which are as usual opposite, the pairs about 14^{mm} apart. From the first pair of leaflets to the insertion of the leaf is only 12^{mm}. The shortness of the petioles agrees best with *R. viscosa* Vent., but the shape of the leaflets accords better with *R. pseudocacia*. Florissant, Station 13 B (*Melford Smith*, 1908). Dedicated to Dr. N. L. Britton, who has contributed so much to our knowledge of American trees.

Robinia is to-day confined to America, but it is found fossil at Eningen and other European localities.

Menyanthes coloradensis sp. nov. Fig. 9.

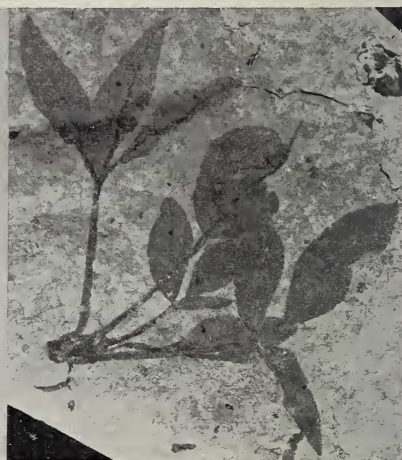
Represented by a crown bearing five leaves, in form and appearance exceedingly like the living *M. trifoliata* L., but

two of the leaves are entire. One of the basal leaf-sheaths, curled backwards, is well preserved, and exactly as in *M. trifoliata*. The whole plant is much smaller than *M. trifoliata*; the petioles of the better-developed leaves only about 28^{mm} long, with leaflets about 30^{mm} long, and 9 to 10 broad. The prominent lateral or secondary veins are irregular, less numerous than in *M. trifoliata*, and more or less strongly arched, with the concave side upwards. The entire leaves are broad-lanceolate to ovate, the largest being over 15^{mm} broad.

FIG. 8.

FIG. 8. *Robinia brittoni*.

FIG. 9.

FIG. 9. *Menyanthes coloradensis*.

Florissant, Station 13 B (*Geo. N. Rohrer*, 1098): also one found at the same place by Miss Gertrude Darling. *Menyanthes* is to-day a monotypical genus of Holarctic distribution. In the fossil state it is known, principally from capsules and seeds, from Greenland, Spitzbergen, and Central Europe. The occurrence of entire leaves on the fossil is of interest in view of the fact that the allies of *Menyanthes* are entire-leaved. I asked Dr. L. N. Britton whether he had ever seen entire leaves on the living species: he replied that no such had ever come under his observation. The seedling of *Menyanthes* seems not to have been described.