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DAPHNOGENE, Ung. (emend.).

The leaves referred to this genus are similar in form to those of the narrow-leaved Cinnamomum. They are described as entire or trilobate, triplinerved, with the lateral nerves sub- or suprabasilar and the branches distant, camptodrome or brachiodrome.

**Daphnogene anglica**, ? Heer.

Plate XXXVII, Fig. 9.


*Daphnogene anglica?*, Lesq., Annual Report, 1873, p. 401.

Leaf lanceolate-acuminate; lateral veins subbasilar, acrodrome, distant from the borders, and distantly ramose; nervilles close, in right angle to the nerves, distinct.

Prof. Heer briefly describes the leaves of this species, not figured, as ovato-lanceolate, long-acuminate, triple-nerved; middle nerve and secondary ones branching. Our leaf is only lanceolate; the midrib is not branching, though another fragment has some branches, and even, in the one figured here, some thin branchlets appear, cutting obliquely the nervilles in the upper part of the leaf. The evidently acrodrome nervation of the specimen of fig. 9 is not seen upon any of the species of *Daphnogene* described and figured by European authors except in *D. Kanii*, Heer (Fl. Foss. Arcet., p. 112, pl. xiv, xvi, fig. 1), whose reference to this genus is doubtful. It is therefore probable that, as Saporta supposes, this leaf may represent a *Zizyphus* or a *Ceanothus*; but I do not find in any of these generic divisions a species to which it is seemingly related.

**Habitat.**—Golden, Colorado (*Capt. Ed. Berthoud*).

**GAMOPETALÆ**

**LONICERÆÆ.**

**VIBURNUM, Linn.**

This genus, which counts at our epoch more than fifty species, has its origin marked in the Eocene; at least, no *Viburnum* leaves have been described until now from the Cretaceous.* The largest number of its living species belongs to Asia, twenty-four; North America has twelve; Japan, five; Europe, only three: a remarkable difference with the Tertiary flora of the same country, from which at least ten species have been described.

* Count Saporta finds, however, a remarkable affinity between a species of the Dakota group, *Amelopetalum attenuatum*, Lesq. (Annual Report, 1874, p. 354, pl. ii, fig. 3), and some leaves, described by himself as *Viburnum ciliolium*, from the Lower Eocene of Gelinden. This relation is pointed out in a letter of the celebrated author, his work, a second volume of the Flora of Gelinden, being now in course of publication.
The oldest type of *Viburnum* is that of the *Lantanoideae*, represented in the North American flora by *V. lentocnoides*, *V. molle*, and *V. dentatum*. The species here described are related to it, as is also the one described in the Eocene Sézanne Flora by Saporta, *V. giganteum*, whose affinity with the plants from Black Buttes is marked. Dr. Newberry has described, from the Tertiary of the Union group, two species with small leaves. Their relation to this section is less positive; they rather seem allied to *V. nudum*, var. *purijolium*, of the present North American flora.

**Viburnum marginatum**, L. exq.

Plate XXXVII, Fig. 11; Plate XXXVIII, Figs. 1-5.


Leaves of large size, petiolated, broadly obovate, generally enlarged upward from the base and round, subtruncate, short-pointed at the top, equally dentate from above the middle; basilar veins opposite, oblique, ramified, as also their divisions, craspedodrome.

Most of the leaves representing this species are large, some still larger than that of fig. 1, all recognizable by a black border, not inflated, surrounding them; their consistence is rather thick, but not coriaceous. Broadly cuneate to the petiole, and widely enlarged toward the middle or higher above it, they are either nearly truncate and short-pointed, or rounded to a point. The borders are equally dentate, with short, regular teeth, turned outside, separated by shallow sinuses, and each entered by the points of the nerves or of their divisions. The nervation is strong and very distinct, generally blackened like the borders; the basilar veins, opposite from quite near the base, very oblique, 25° to 30°, branch three or four times outside, the branches dividing once or twice, as also the other lateral nerves, and thus all the divisions enter one of the teeth. The principal nerves are joined by strong nervelles at right angles, and generally simple; the details of arculation are obsolete. Fig. 11 of pl. xxxxvii is nearly entire, merely denticulate at the rounded top, and thus the branches of the lower nerves are camptodrome. This is evidently a mere deviation from the general type, as we see in figs. 1 and 2 of pl. xxxviii the same character marked by the tertiary nerves along the base as far up as it is entire. This leaf has been described in the Annual Report, 1872, p. 396, as *V. contortum*. A deviation of another kind is marked in fig. 3, where the lower pair of nerves do not branch, but which has the teeth entered by divisions of the nervelles. Fig. 4 represents a leaf with a comparatively long petiole. The connection, where it is broken below the base of the leaf, is not clearly seen; the petiole
of fig. 1 is broken; those of figs. 2 and 3 are short, though apparently preserved in their whole length. The longest petioles of the leaves of the present *V. dentatum*, L., are not more than half that of fig. 4. As seen in comparing fig. 5 and fig. 1, the size of the leaves is extremely variable.

By the mode of division of the borders or of the teeth, this species resembles *V. dentatum*; but its nervation is like that of *V. lantanoides*, Michx., the veins and the borders being apparently covered by a thick coating of vellosity, which by fossilization gives them the black color as remarked above. The cuneate base is, however, a character not remarked upon any of the allied living American species, except in a less degree in *V. ellipticum* of Oregon. It is quite distinct in *V. erosum*, Thb., of Japan, whose leaves, as large as those of the fossil species, are ovate, lanceolate-acuminate, and have the border teeth of a different character.

Habitat.—Black Buttes, Wyoming, very abundant; found also at Point of Rocks, Wyoming (*Wm. Cleburn*); Golden, Colorado, where it is very rare.

*Viburnum platanoïdes*, Lesq.

Plate XXXVIII, Figs. 8, 9.


Leaves large, angular, tapering upward from the enlarged middle, rounded or truncate to the petiole; borders equally dentate; nervation coarse and thick, craspedodrome.

The facies of these leaves is Platanoid; the middle vein is thick, the lateral veins proportionally so, joining the midrib at or quite near the border base of the leaves, at an angle of divergence of 40° to 50°, nearly all parallel, the lowest ones slightly more prolonged to the borders into an indistinctly marked lobe; all branching more or less, and entering the points of the teeth, either directly or by their divisions. Though somewhat similar to those of *Platanus aceroides*, Heer, these leaves are of the same type as those of the former species, differing by the obtuse or truncate base, the thick, less numerous, secondary nerves, and the broadly cuneate points. The borders are not blackened, the consistence still thicker, and the surface very coarsely furrowed by the veins and strong, distant nervilles, which are more generally divided in the middle.

Habitat.—Black Buttes, Wyoming, in the burned bed where the remains of the Saurian *Agathoumas sylvestris*, Cope, were found, fragments of these leaves being glued to the bones. I considered the first found as referable to *Platanus aceroides*, their borders and outline being destroyed and the nervation only discernible.
Viburnum rotundifolium, Lesq.

Plate XXXVII, Fig. 12; Plate XXXVIII, Fig. 10; Plate LXI, Fig. 22.

Viburnum rotundifolium, Lesq., Annual Report, 1874, p. 305.

Leaves small, nearly round, surrounded by a black border, dentate, rounded-subcordate at the base; nervation thin, camptodrome.

Except that the leaves are all small, nearly round, subcordate or truncate at the base, and the nerves thin, the characters of these leaves are the same as those of V. marginatum. They are generally unequal at the base, and the basilar secondary veins emerge from the top of the petiole; the teeth are, comparatively to the size of the leaves, quite as distinctly marked as in the former species. Saporta considers this and the following as referable either to V. marginatum or to V. platanoïdes.

Habitat.—Black Buttes, Wyoming, where it is rare; Point of Rocks, Wyoming (Dr. F. V. Hayden).

Viburnum dichotomum, Lesq.

Plate XXXVIII, Fig. 6.


Leaf subcoriaceous, oval, obtuse, rounded to the petiole; borders dentate; secondary nerves alternate.

The consistence of this leaf is somewhat thicker than that of the above-described congeners. The distribution of the secondary veins is quite different, as they come out alternately, and are like dichotomous divisions from a series of flexures of the midrib. Except this, there is no marked difference in the nervation. The oval form of the leaf, rounded at the base, is also peculiar to this leaf, which may be a variety of V. marginatum. Its borders, however, are not black-marginated, and the surface is smooth. It closely resembles, by its characters, V. ellipticum, Hook., of Oregon.

Habitat.—Black Buttes, Wyoming, baked shale.

Viburnum Whymperi!, Heer.

Plate XXXVIII, Fig. 7; Plate LXI, Fig. 23.

Viburnum Whymperi, Heer, Fl. Foss. Aret., ii, p. 475, pl. xlvii, fig. 1; Spitz. Fl., p. 60, pl. xiii, figs. 3-23.—Lesq., Annual Report, 1872, p. 305.

Leaf oblong, obtuse, or subtruncate, rounded to the base; borders denticulate; secondary veins thin, numerous, irregularly divided, eraspodrome.

This reference is doubtful. These leaves differ especially from those of the former species by the more numerous, close, smaller teeth, and by
the multiplied, irregular disposition and divisions of the lower lateral veins. By these characters, they are similar to that described by Heer from North Greenland (fig. 1 b, loc. cit.). This analogy is, however, not sufficiently definite. The secondary nerves, not blackened, are thinner and more irregularly divided than in *V. marginatum*, and the shape is quite different. The relation to the species of Greenland is therefore closer or more defined than to *V. marginatum* and its varieties.

**Habitat.**—Black Buttes, Wyoming, with *V. marginatum*; Point of Rocks, Wyoming (*Dr. F. V. Hayden*).

**Viburnum Lakesii, Lesq.**

Plate XXXVII, Fig. 13.

*Viburnum Lakesii, Lesq.*, Annual Report, 1873, p. 401.

Leaf coriaceous, round in outline, and apparently trilobate, round-truncate to the petiole, dentate, palmately three-nerved.

The only leaf which represents the species is broken in such a way that its outlines cannot be positively defined. From the character of the nervation toward the point, and also from the obtuse sinus at the right side of the upper border, it is evidently trilobate, the lobes being probably short and obtuse. The substance of the leaf is truly coriaceous, the teeth sharp, turned upward, and not outside, as in the former species, cartilaginous or membranaceous at the point. The primary lateral nerves are thick and much divided outside, and their divisions, branching also, are straight, at an open angle of divergence, and in the same relation to the border teeth as in the former species; the secondary veins, a little more distant from the primary ones, are nearly parallel to it, and also divide and enter the teeth by their branches. In comparing this fragment to those of pl. xxxviii, figs. 8 and 9, described as *V. platanoides*, the same type of nervation is at once recognizable, for these also have a subtrilobate form and a corresponding distribution of the primary and secondary nerves and of the veinlets. The difference is, however, clearly marked in the more distinctly trilobate shape, the coriaceous substance, and the direction upward of the small cartilaginous teeth. The Platanoidal character is still more evident in this species.

**Habitat.**—Golden, Colorado (*Rev. A. Lakes*).
DESCRIPTION OF SPECIES—**Lonicerae**.

**Viburnum aniceps**, sp. nov.

Plate XXXVIII, Fig. 11.

Leaf coriaceous, rounded and acuminate at the top, gradually narrowed downward, palmately three-nerved, coarsely obtusely dentate upward.

A mere fragment, referable to the former described species by its coriaceous substance only. The leaf is apparently gradually narrowed to the petiole, in the same way as in fig. 1 of the same plate. It has also, like it, a rounded flat top, with a short acumen; but the consistence is thicker, the nervation tripalmate, and the teeth larger, irregular, and obtuse rather than pointed. It has only one pair of secondary nerves, opposite, placed in the upper part of the leaf, and simple. Though evidently a representative of this genus, it seems specifically different from the congeneres described above.

**Habitat.**—Golden, Colorado.

**Viburnum Goldianum**, sp. nov.

Plate LX, Figs. 2-2c.

Seeds oval, obtuse, flattened, smooth, short-pedicled.

These small fruits, very numerous upon the clay of the same locality of a limited area, are referable by their characters to this genus. They appear to have been surrounded by a fleshy envelope, which, though destroyed in the fossil state, has left its original shape molded in the soft clay. The molds are, therefore, concave inside, and even some of the seeds are inflated on the surface, though always more or less flattened. Figs. 2 b and 2 c represent enlarged the more general forms of these seeds. The size, not very variable, averages four millimeters in width and six to seven in length.

**Habitat.**—Golden, Colorado, in soft plastic clay.

**Viburnum solitarium**, sp. nov.

Plate LX, Fig. 3.

Seed large, ovate, obtusely pointed, short-pedicled, flattened.

This species is closely related to *V. macrospermum*, Heer (Spitzb. Fl., p. 60, pl. xiii, figs. 24–28). It is still somewhat larger and more regularly ovate.

**Habitat.**—Golden, Colorado. Found separate, in connection with the fragment of leaf of pl. xxxviii, fig. 11, in coarse, sandy clay.

This seed represents evidently a species different from that to which the seeds of fig. 2 are referable. It would, therefore, be inadvisable to consider all the leaves of *Viburnum* described here as representing the same species. The living *V. molle*, *V. pubescens*, *V. dentatum*, *V. lantanoides*, and *V. ellipticum*
are quite as closely related by the forms and the nervation of their leaves as are those which have been described and figured here. I therefore consider them as representing different species, though great may be the analogy of their characters.

ASCLEPIADINEÆ.

OLEACEÆ.

FRAXINUS, Tournef.

The impari-pinnate leaves of this genus have ovate-lanceolate, generally acute or acuminate, leaflets, entire or more or less regularly denticulate, with a subcamptodrome nervation, the secondary nerves being joined to the dentate borders by nervilles from their bows, or directly entering them.

The genus has a number of species distributed in Europe, Asia, and especially the North American continent, to which forty-five of them are ascribed in De Candolle’s Prodromus. But the number has been greatly reduced by a more careful determination, especially of the fruits; for of the thirty species described from the United States in that work, we find now only six admitted in Gray’s Flora. This number, still considerable, accords with that of the fossil species known until now from this continent; for two are described and figured here, one of them common to Europe, the Baltic Flora, and Greenland; and two others are described only from specimens received too late for illustration. One from Golden is typically allied to the present F. Americana, by numerous leaves, which, either entire or sparingly dentate, are still larger, and of the same shape and nervation; and another, represented by a single leaf from the Upper Miocene of the Parks, seems also distinctly referable to this genus. The European authors have described seventeen species, all Miocene. The species from Golden relates the origin of Fraxinus to the Eocene.

Fraxinus denticulata, Heer.

Plate XL, Figs. 1, 2.

Fraxinus denticulata, Heer, Fl. Foss. Aret., i, p. 118, pl. xvi, fig. 4; xlvii, fig. 2; Mioc. Balt., Fl., p. 80, pl. xii, fig. 37; xxiv, figs. 26–27.—Lease., Annual Report, 1872, p. 407.

Leaves oblong, obtusely pointed, gradually narrowed to the sessile base.

Our leaves are small, of the same size and form as those described from Greenland, the secondary veins curving near the borders, with nervilles passing to the teeth from the bows, as in fig. 4 of pl. xvi in the Greenland Flora;