

XXIX.—*Observations on Raphides and other Crystals.*

By GEORGE GULLIVER, F.R.S.

[Continued from p. 56.]

*Quillajææ*.—The crystals in the wood or bark of *Quillaja saponaria*, which were long ago well described by Edwin Quekett, are very characteristic of the genuine article. In a sample from Messrs. Butler and M'Culloch, I find these crystals lying in great numbers along the liber and mesophlœum. They are commonly about  $\frac{1}{160}$ th of an inch long and  $\frac{1}{1600}$ th thick, four-sided rectangular prisms, each of the faces equal, and the ends tipped with short pyramids. But they vary in form. Their ends may be like the edge of a chisel or wedge, and occasionally as if the shaft of the crystal had been cut through obliquely from one angle or face to the opposite one; besides, the prisms may be triangular. Though they are so very plentiful, they occur for the most part singly, sometimes two or three partially fused together, and never in bundles, in which characters they further differ from true raphides, and closely resemble many of the crystal prisms of Iridacææ and some other Monocotyledones ('Annals,' Sept. 1863 and April and May 1864). Quekett describes each separate prism of *Quillaja* as having a close investment or cell, but no loose one, of cellulose.

*Melastomacææ*.—A species of *Melastoma*, at Redleaf, affords an abundance of sphæraphides in the endophlœum and mesophlœum, but no raphides either in the bark or leaves.

*Crassulacææ*, *Ficoideæ*, and *Cactacææ*.—A complete examination of these orders would be interesting and useful. Among the few species formerly examined ('Annals,' May 1864) raphides were always found abundantly in *Mesembryanthemum*, and never at all in Crassulacææ and Cactacææ, although sphæraphides and short four-sided prisms were seen to abound in the last-named order. These prisms sometimes appeared either abruptly truncated, tipped with low pyramids, or with the ends as described in Quillajææ, &c., the tips commonly forming a part and projecting on the surface of the sphæraphides. Lately I have again examined the plants already specified, and a few others, to wit, *Sedum speciosum*, *S. Fabaria*, *Epiphyllum Russellianum*, *Cereus crenatus*, and two species of *Mesembryanthemum*. The result was still the same—a profusion of raphides in Mesembryææ, and none in Crassulacææ and Cactacææ. Raphides were seen abundantly in the corolla, style, and ovary, but not in the stamens and ovules, of *Mesembryanthemum tricolor*, and in the petals and filaments of *M. tortuosum*. In these last two parts, and in the ovary and pistil, the raphides were smaller and more fragile than in the leaves and stem; and, as I have described in other spe-



cies, bundles of these minute raphides swarmed in the seed-leaves, plumule, and caulicle of *M. tricolor*.

*Tetragoniæ* and *Sesuvieæ*.—Having, thus far, always found a profusion of raphides in the section Mesembryeæ, the question arises whether this character also be possessed by the other two sections of the order Ficoideæ. Accordingly specimens, either fresh or dried, were examined of the leaves and stalks of four species of *Tetragonia*, three of *Aizoon*, and three of *Sesuvium*; and the result was a negative answer to the question. No raphides were found in any of these ten plants, though in several of them sphæraphides were observed in more or less abundance—a character in which *Tetragoniæ* and *Sesuvieæ* resemble *Chenopodiaceæ*. In the leaves, calyx, and ovary of *Tetragonia expansa* the sphæraphides are about  $\frac{1}{800}$ th of an inch in diameter, and commonly double that size in the pith.

*Plantaginaceæ*, *Nyctaginaceæ*, and *Amaranthaceæ*.—These orders are numbered 143, 144, and 145 in Prof. Balfour's 'Manual of Botany.' I have only examined three species belonging to the central order, and they all abound in raphides, which were seen in the flower and swarming in the leaves and stem of *Oxybaphus violaceus*, and in the stem, bracts, and different parts of the flower of *Bougainvillea glabra*. And I have never failed to find raphides equally abundant in the root-stock, leaves, calyx, and corolla, and also, but smaller and more tender, in the stamens, pistil, ovary, ovule, spermoderm, and seed-leaves of *Mirabilis*. On the contrary, in the few species examined belonging to the neighbouring orders, *Plantaginaceæ* and *Amaranthaceæ*, no raphides were found.

*Chenopodiaceæ*, *Phytolaccaceæ*, and *Polygonaceæ*.—Here again arises the question, how far an order may be distinguished by raphides from its allies. Does this small central order differ as a raphis-bearer from the two larger neighbouring orders? Of *Phytolaccaceæ* I have only examined the leaves, red petioles, and midribs of *Phytolacca icosandra*, and the leaves, young flowers and buds, spike and bracts of *P. esculenta*, var. *venosa*, in all of which raphides occur profusely. But this character was found entirely wanting in every one of the few species or varieties of *Chenopodium*, *Atriplex*, *Beta*, *Rheum*, *Rumex*, and *Polygonum*, which were examined at the same time for comparison. Sphæraphides, indeed, are very common in *Chenopodiaceæ*, as may be well seen in the leaves, stem, pith, and mesophloeum of common garden weeds of the Goosefoot family, and, as is well known, in some parts of certain *Polygonaceæ*. In *Chenopodium* and *Atriplex* most of the sphæraphides are about  $\frac{1}{600}$ th of an inch in diameter, and others are much larger.

I am indebted to the kindness of Mr. De Carle Sowerby,



Mr. W. H. Baxter, and Mr. Cox for the names of, and opportunities of examining, many of the exotic plants mentioned in this paper.

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[To be continued.]

XXX.—*On the Menispermaceæ.*  
By JOHN MIERS, F.R.S., F.L.S. &c.

[Continued from p. 103.]

15. *TILIACORA.*

THIS genus was first proposed by Colebrook, in 1819, for the *Menispermum polycarpon*, Roxb.; but, as he was unacquainted with its carpological features, the genus was not adopted by subsequent botanists. DeCandolle, in his 'Prodromus' (1824), did not recognize it; for he named the same plant *Cocculus acuminatus*: from that time it continued unnoticed until 1851 (Ann. Nat. Hist. ser. 2. vii. 36), when I first pointed out the identity of the two plants, and described the structure of the seed; and this at once established the validity of *Tiliacora*. This genus, peculiar to Asia, is represented in the New World by *Abuta*, *Batschia*, and *Anelasma*: all nearly correspond in their floral structure, and resemble one another in the remarkable development of the seed—features which entitle them to rank in a distinct tribe, the *Tiliacoreæ*. It is surprising that the authors of the 'Flora Indica' and of the 'Genera Plantarum' have refused to acknowledge the validity of this very natural group, and have placed these genera in the same tribe with *Cocculus*, thus mingling in confusion genera with a very ruminated albumen and a very slender embryo having incumbent cotyledons as much attenuated as their very slender radicle, with other genera having a simple albumen and an embryo with accumbent, broad, foliaceous cotyledons—characters perfectly irreconcilable in any arrangement that lays claim to consistency.

The flowers in this genus, though usually dioecious, are sometimes polygamous; they have nine to twelve sepals in ternate series, the three internal ones being much larger, and valvate in æstivation; they have six minute petals appearing like nectarial scales, and six stamens placed opposite to them, all inserted together upon a short columnar receptacle, on which three punctiform rudimentary ovaries are placed. In the numerous specimens of *Tiliacora* that I have seen, I have not yet found a female flower; I have, however, met with two species in which they are polygamous: in one case there are six petals, only three stamens,





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