II.—*On the Raphides of British Plants.* By GEORGE GULLIVER, F.R.S., Professor of Comparative Anatomy and Physiology to the Royal College of Surgeons.

IT appears to me that these Raphides are deserving of more attention than they have yet received, both in relation to the structure and economy of vegetables, and as affording a wide, interesting, and scarcely cultivated field of research for the chemical phytologist. The raphides may also be often useful as diagnostic characters in systematic botany when others are not available; for example, a mere fragment of one of the Onagraceæ or of the Lemnaceæ may be so surely distinguished, simply by its raphides, from some of its near allies in other orders, that this fact ought henceforth to be added to the description of the orders just mentioned, independently of its value in other respects. At present, I believe, the raphides have not thus been used; nor, indeed, do I know that they have been described in the majority of the British plants in which they occur, or even mentioned in Lemnaceæ and *Epilobium* before my notice of them *. Though common in some orders, it is remarkable that the raphides are so rare where they might be most expected, that I have not a single note of their presence in young parts of the stem, leaves, and flowers of British Oxalidaceæ, Umbelliferæ, Labiatæ, Euphorbiaceæ, or Polygonaceæ; and even among Crassulaceæ, no crystals were found in *Sedum Telephium* and *S. acre*. In old decaying or diseased portions of Polygonaceæ, and in many other orders, crystals are frequent; but on the present occasion they are only noticed in young growing or healthy structures.

That raphides are part of the regular structure, useful in the economy of certain plants, and by no means only a result of chemical changes connected with decay, would appear from the present observations. The remarkably constant abundance and situation of the raphides in some species supports this view. Thus, in *Lemna trisulca* the bundles of crystals are contained within the cells of the parenchyma, but are so much longer in *L. minor* as to extend beyond the cell-wall, and are very abundant in both species; while in *L. polyrrhiza* and in *L. gibba* the raphides are comparatively scanty. They occur, too, in growing parts of other plants, either in the cells or intervening spaces of young leaves and of the pistils. In some orders, as Compositæ, the crystals are chiefly confined to the ovary and testa; while they occur indiscriminately in all parts of the plant in other orders, as Onagraceæ and Orchidaceæ. Further research is much required as to their precise office in the vegetable economy, though no

* Ann. Nat. Hist. May 1861.

doubt they are of use both for food and manure. In such plants as *Lemna minor* there is a store of phosphate of lime and starch, just the kind of nutriment that young growing animals would want; and the abundance of crystals in the ovary and testa of Compositæ seems to be connected with the nutritious properties of the seeds. Thus we perceive one of the means by which such humble plants are important in nature. It has long been known how greedily water-fowl feed on the common duck-weed; and, making sure of the identity of this plant by the raphides, I have found it in the stomach of young water-rats.

Though the term 'raphides' has been used indiscriminately for all kinds of crystals in the tissues of plants, it will be confined below, in accordance with its etymological import, to the acicular or needle-like forms, and all the others will be noted simply as "crystals." The former are known to be composed chiefly of phosphate of lime, and some of the latter of oxalate of lime; but we are still ignorant of the composition of a great number of these crystals.

From my notes, extending over six years, of dissections of several hundred plants, I find that raphides or crystals were seen in the following Phanerogamia, but not in a much larger number; so that they were not detected, though often looked for, in many other orders which are not mentioned here. The names of the plants are taken from the fourth edition of Prof. Babington's excellent 'Manual of British Botany.'

Caryophyllaceæ.—*Silene Armeria.* Square or cubic crystals, in clumps $\frac{1}{1333}$ inch diameter, in the ovary. The only plant of the order in which I have seen crystals.

Onagraceæ.—True raphides occur in such abundance as to be quite characteristic of this order among the net-veined class. All parts of the plant abound in them; so that by these alone a minute fragment of it may be easily distinguished from Lythraceæ and Haloragaceæ. There were examined seven species of *Epilobium,* three garden ones of *Œnothera,* and *Circæa lutetiana.* The willow-herbs should be useful and often easily available for manure.

Rubiaceæ.—Raphides common in this order, but less plentiful than in Onagraceæ. They may be generally seen in the ovary, and occur in the corolla, leaves, and other parts; and were found in *Sherardia, Asperula,* and in six species of *Galium,* which include all that were examined. It is remarkable that raphides are common in the corolla and young fruit and scanty in other parts of *Galium Mollugo,* though plentiful also in the leaves of its variety *β scabrum.*

Compositæ.—Raphides are less common in this order than other crystals, and I have only found them in the ovary or

fruit. They were seen in Corymbiferæ, Cynarocephaleæ, and Cichoriaceæ. In *Pulicaria dysenterica*, single oblong crystals with angular pointed ends; in *Senecio Jacobæa* and *S. aquaticus*, short acicular crystals; in *Arctium intermedium* and two other species, cubical crystals $\frac{1}{3000}$ inch diameter; in *Centaurea nigra*, single and double crystals shaped like those of *Pulicaria*; in *Carduus lanceolatus*, *C. palustris*, and *C. acaulis*, some acicular forms and a greater number like those of *Pulicaria* and *Centaurea*; in *Hypochœris radicata*, *Apargia autumnalis*, and *Crepis virens*, minute square or cubical crystals.

Dioscoreaceæ.—*Tamus communis*. Raphides plentiful in the stem and leaves, and still more so in the perianth and stamens.

Orchidaceæ.—The only species examined were *Orchis Morio*, *O. mascula*, *O. maculata*, and *Habenaria chlorantha*, in every one of which raphides were abundant in all parts of the plant.

Iridaceæ.—*Iris Pseud-acorus*. Long, prismatic, slender, and blunt crystals, generally occurring singly, in the leaves.

Liliaceæ.—*Endymion nutans*. Raphides abundant in all parts of this plant, from the perianth to the bulb; though not found at all in *Allium ursinum*.

Typhaceæ.—*Sparganium ramosum* and *S. simplex*. Raphides abundant in the perianth, fruit, stem, and leaves, though not found at all in *Typha latifolia* and *T. angustifolia*.

Araceæ.—*Arum maculatum*. Raphides throughout the plant.

Lemnaceæ.—Raphides (as described in Ann. Nat. Hist. for May 1861) in all our plants, most abundant in *Lemna trisulca* and *L. minor*, and comparatively scanty in *L. polyrrhiza* and *L. gibba*. In *L. minor* the raphides (phosphate of lime) are plentifully associated with starch-granules—thus indicating the valuable fertilizing and nutritious properties of this most common, abject, and despised weed.

III.—*On the proposed Change in Name of* Gracula pectoralis.

By Alfred R. Wallace.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,

May I be permitted to make a few remarks on Mr. G. R. Gray's proposal (in the 'Annals' for December 1862, p. 472) to change the name of my *Gracula pectoralis*, described and figured in the 'Proceedings of the Zoological Society' for June last, into *Gracula Anais*, that name having been given by Lesson to a bird which Mr. Gray believes to be the same species.

I am far from denying, or even doubting, that Lesson's bird

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