passed round its body. The Chinese say that it is not rare in the adjoining sea. They call it *Tay-siun Ho*. They eat the skin, and describe it as crumbling in the mouth like biscuit; but the fleshy portions boil away to nothing, and are not worth the trouble of putting in the pot. The specimen measured in length 5 feet 6 inches; across from tip to tip of fins 6 feet; length of fin 18 inches. It weighed 187 lbs. The intestine was thick and fleshy, and measured 21 feet long, the duodenum being $3\frac{1}{2}$ inches and the gut about $1\frac{1}{2}$ inch broad. It had one thick fleshy cæcum about 9 inches from the anus, $3\frac{1}{2}$ inches long by 2 broad. The urethra has an opening distinct from the anus, and squirted out water when the animal was stepped upon. Its stomach was empty; but in the cavity between it and the flesh was a long yellow tapeworm, with numerous small parasitic grubs like the larvæ of the lady-bird (*Coccinella*), yellow and black, attached to different parts of it. Outside the skin about the gills were sticking several large fish-lice. When first caught, several sucking-fish were found fastened to its skin; these had been torn off, and left bare and raw patches. Unfortunately they were thrown away before I saw them. I observe Cuvier says that this order of fish has no cæca. Has this genus ordinarily none?

XXIII.—*On Raphides and Sphæraphides of Phanerogamia; with a Notice of the Crystal Prisms of* Iridaceæ. By George Gulliver, F.R.S.

[Plate IV. fig. 13.]

Of the terms Raphides and Sphæraphides.—I have commonly used the term Raphides according to its etymological import (*ῥαφὶς, acus, subula*; fr. *ῥάπτω, suo, consuo*), as proposed by DeCandolle, for the needle-like forms, though it has generally been applied to all microscopic crystals, of what shape soever, occurring in plants—thus causing such inconvenience that the word should either be discarded or others used for crystals and their aggregations of totally different shapes. Whenever either the figure or chemical composition of them can be clearly defined, a satisfactory designation follows as a matter of course; but this often cannot be done, especially with those very minute crystals which occur most frequently. These, however, are so commonly grouped in a particular manner, and are so widely diffused throughout the phænogamous class, that a particular word seems to be required to distinguish them, for the present, from the typical raphides. As this last term has been so generally adopted, we might retain it generically, and add some

prefix or affix for other forms of crystals. Among Phanerogamia they occur most commonly in a more or less globular congeries, either naked or within a cell; and these I shall in future call Sphæraphides (*σφαῖρα, sphæra,* and *ῥαφὶς,* ἀ *ῥάπτω,* as above).

Size and Form of the Sphæraphides.—Common sizes of the sphæraphides are $\frac{1}{4570}$th and $\frac{1}{2066}$th; but they often vary from $\frac{1}{6000}$th to $\frac{1}{1000}$th of an inch in diameter, and are occasionally still larger. They are of a round form, and often appear as the nucleus of a cell, and sometimes without any visible cell-wall. The diameter of the individual crystals is frequently about $\frac{1}{20000}$th, varying from $\frac{1}{35000}$th to $\frac{1}{4000}$th of an inch. Of these it is usually impossible to define the forms exactly, on account both of their minuteness and of the difficulty there is in getting them detached so as to roll about and display their shapes in the microscopic field of vision. We can generally see that they are more or less crystalline, and sometimes that they belong either to the octahedral or prismatic system. But whether the forms are primitive or secondary is not easy to determine; and, indeed, the angles and edges are often more or less rounded off, or otherwise so far modified as to make it difficult, without a careful examination, to recognize them as crystals.

Distribution of Sphæraphides.—For the above reasons the sphæraphides may often escape detection, as was the case in my first examination of plants belonging to the order Caryophyllaceæ, in which the individual crystals are commonly minute or obscure, and yet are regularly present in more or less abundance, either separately or aggregated into sphæraphides. In some species of this order (*Silene Armeria* for instance) the crystals are larger, and compose such very distinct sphæraphides as to afford good subjects for preliminary examinations; for though these sphæraphides vary much in size, numbers of them are about $\frac{1}{1000}$th of an inch in diameter. They are most irregularly scattered through the tissues of the plant. The diffusion of sphæraphides throughout Phanerogamia, especially in the leaves, and parts which are modifications of leaves, is so extensive that I have never failed to find them in a single species of of the orders Caryophyllaceæ, Geraniaceæ, Paronychiaceæ, Lythraceæ, Saxifragaceæ, and Urticaceæ, and believe that few, if any, orders could be named in which sphæraphides do not exist as part and parcel of the healthy and growing structure of the plant. Hence it would require a very extended series of observations to determine how far the sphæraphides might be available as botanical characters.

Sphæraphid-Tissue.—In some cases the sphæraphides, far from being very variable in size, and scattered without order

among the plant-cells, are so nearly uniform in magnitude and regularly and beautifully dotted, in subcuticular cells, as to form what might well be called sphæraphid-tissue. Of this, excellent examples occur in Lythraceæ, Geraniaceæ, and many other orders. Sphæraphid-tissue may generally be best seen in the calyx, while the larger and more irregular-shaped sphæraphides occur abundantly in the leaves. Of the last, *Potentilla reptans* and its allies afford good specimens; the first, or sphæraphid-tissue, is shown in Pl. IV. fig. 13, drawn to a scale of $\frac{1}{4000}$th of an inch, from the calyx of *Lythrum Salicaria*. Observations are yet wanting to determine how far the sphæraphid-tissue may be characteristic of different orders.

Distribution of Raphides.—This is a subject, independently of its physiological interest, well deserving the attention of systematic botanists. Among Dicotyledones, raphides are not so widely distributed as sphæraphides, and certainly occur so regularly and plentifully in some plants, and sparingly or not at all in others, as to afford good characters by which certain orders may be readily distinguished from their allies of other orders, even by a minute fragment of the leaf alone, and at any period of its growth, which we have already exemplified ('Annals,' May 1861; Jan., April, and July 1863) in Onagraceæ and Rubiaceæ. Probably Balsaminaceæ and Cucurbitaceæ may be similarly characterized; but my examination of these orders and their allies is not yet complete. The orders allied to Vitaceæ must also be further examined, as I find that both the Grape-vine and Virginian creeper are true raphis-bearing plants. So are some Monocotyledones, as Asparagaceæ, Araceæ, Orchidaceæ, and part of Liliaceæ. In all the British Typhaceæ raphides also occur,—which is now noted because a remark to a contrary effect was in a former paper ('Annals,' Jan. 1863, p. 15), by my mistake, repeated from the preceding paragraph to the species of *Typha*.

Site of Raphides.—Though raphides are commonly described and depicted as contained within the cells of the leaf, and I have inadvertently so mentioned them in *Onagraceæ* ('Annals,' July 1863, p. 53), they are often not so situated. It was shown, in the 'Annals' for May 1861, that raphides are clearly distinguishable within the cells of *Lemna trisulca*, and that they are longer than the cells of *L. minor*. In many other plants it is certain that the raphides do not lie within the leaf-cells, such is the disproportion between them; for instance, in *Circæa lutetiana* the length of a bundle of raphides is often at least fifteen times the diameter of the leaf-cell. As to a special raphid-cell and cystolith, the article in the 'Micrographic Dictionary' should be consulted.

Crystal Prisms of Iridaceæ.—As is well known, the raphides

usually occur in bundles, each crystal, like a thin needle, being very slender, long, and pointed at the ends. Unlike sphæraphides, the bundles of raphides are easily broken up, so that these crystals are most readily seen swimming freely and separately in the field of vision, though it is often difficult, if not impossible, to see on them any sharp edges or flat faces. But sometimes the crystals are larger and their shape very obvious, of which instances occur in some Liliaceæ (as *Yucca*) and in most Iridaceæ. These crystals are regular prisms, that is to say, with three parallel angles and faces, so that a transverse section thereof would be an equilateral triangle. They are also very long in proportion to their thickness, yet comparatively thicker than the acicular forms; and their ends are either abrupt or sharply pointed. Besides, these crystal prisms generally, if not regularly, appear either singly or in pairs, and are with difficulty detached from the tissue of the leaf in which they are imbedded, thus differing remarkably from the more slender fasciculated raphides. When we do succeed in getting the crystal prisms to float freely in the field of vision, they are seen to be beautiful objects; and it is probable that they might prove useful in experiments on the refraction, polarization, and decomposition of light. I have chiefly examined them in Iridaceæ, in which order they occur abundantly, as may be well seen in different species of *Iris*, *Trichonema*, *Crocus*, and *Gladiolus*. In the leaves of the common and showy cottage favourite with large blue or purple flowers (*Iris germanica*?), the crystal prisms are quite as distinct as in any of the British plants; so that even humble town gardens may afford subjects for observations on these prisms when the more fugitive leaves of other genera of the order have disappeared.

Edenbridge, August 6, 1863.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

Jan. 13, 1863.—George Busk, Esq., F.R.S., in the Chair.

CONTRIBUTIONS TO THE KNOWLEDGE OF THE BRITISH CHARRS. PART II. BY ALBERT GÜNTHER, M.A., PH.D., M.D., F.Z.S.

Since the publication of my first paper on this peculiar group of *Salmonidæ**, I have received very valuable materials for prosecuting my researches. The additional specimens show that I have been correct in distinguishing the three British species from those of the Continent and from one another, and that the differences between

* 'Annals,' Sept. 1862, p. 228.