VIII. Memoir on the anatomy of vegetables. Read before the Physical Class of the Institute

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stone that it seems to form one body with it, no mineralogist can with certainty explain.

The hypothesis which I have ventured to form of this singular and certainly uncommon subterranean mixture is, that the charcoal was burnt in the neighbourhood either in the usual manner or by natural fire, and that some fragments of it, by some convulsion of nature, were thrown to the above depth, where they united with the ferruginous matter, and by these means produced the above remarkable phenomenon. On many fragments one can observe the transition of the not completely burnt wood into iron-stone; even the bark of the wood, actually converted into iron-stone, may be clearly distinguished; and the perfectly black natural or artificial charcoal, possessing all the properties of the charcoal of burnt wood, lies undecomposed in it: but it would be worth while to subject it to a more accurate chemical research, in order to examine its component parts. I hope to obtain, by one of my friends, a more detailed account of this subterranean phenomenon; and therefore I shall only add at present, that this iron-stone is exceedingly easy of fusion, and so much so, that it is used as a flux for other kinds, and, in some measure, indispensably necessary at the forges, especially when cast articles are to be manufactured with advantage.

VIII. *Memoir on the Anatomy of Vegetables. Read before the Physical Class of the Institute by C. MIRBEL*.*

Of the Elementary Organs.

AFTER studying the works of Duhamel, Senebier, De Saussure, and several other philosophers, without being able to form any fixed opinion of the internal anatomy of vegetables, it appeared to me that it would be more advantageous to study nature in her own works. I endeavoured to banish from my mind every thing systematic, in order that my observations might be free from every kind of bias. All vegetables have too much relation in the mode of the development of their organization not to exhibit great similitude. This reflection, which naturally presents itself to the mind, induced me to direct my first observations to one species. I made choice of the elder, as having a looser texture, and easier to be observed, than that of many other vegetables. During six months, I employed all the known processes for

* From the *Journal de Physique*, Germinal, an. 10.

acquiring

acquiring a knowledge of the organs of that plant. I used comparatively four or five different microscopes; and, when I supposed that I had got the whole series of facts, I tried the same observations on a great number of other vegetables. The comparisons I then made greatly contributed to give me information respecting the nature and form of the organs; and to obviate, by every mean possible, the illusions which might lead me into a false path, I begged C. Masséy, my friend and fellow-labourer, to revise my observations, and to examine them with the severest criticism. His observations compared with mine have either confirmed or rectified them.

I shall now give a description of the parts which I call elementary organs, because all the other organs are composed of them.

CHAP. I.

Of those Parts which are distinguished by the naked Eye.

Vegetables in general are composed, as every body may have observed, of soft and hard parts. Some, indeed, such as mushrooms and fungi, seem to be formed entirely of a homogeneous substance, pretty soft; but this class is not very numerous.

The stem of the most perfect plants presents at its surface a coloured substance of greater or less thickness, which is the bark. It adheres strongly to the interior parts in a great many of the monocotyledons, and sometimes even is confounded and connected with them in such a manner that it is impossible to distinguish them. It may in this case be said that no bark exists. This phenomenon is observed in the palms, gramineous plants, &c. But in the dicotyledons and some monocotyledons the bark, very distinct from the rest of the tissue, forms an exterior stratum, which may be easily detached.

Below the bark is found the wood more compact, harder, and more connected in all its parts, and which seems to be formed of longitudinal fibres strongly cemented to each other. In the monocotyledons without bark there is found, immediately below the epidermis, a fine transparent membrane, which is the exterior part of the vegetable.

The wood, as the learned Desfontaines has said in his excellent memoir on the Comparative Anatomy of Vegetables, is distributed lengthwise in the stem and branches of the monocotyledons in delicate threads: these threads are often parallel, and sometimes convergent one towards the other; they unite one and one, two and two, or divide themselves, and become ramified in threads of still greater fineness. All

these threads are surrounded with a soft, elastic, spongy substance, easily torn, and generally whitish, which is called the pith, and to which I shall give the name of *parenchyme*, that it may not be confounded with the pith of the dicotyledon plants. The wood of the latter, lying always under the bark, is not divided into distinct threads; it generally forms a cylinder, in the centre of which is placed the pith, as in a case. Some plants, however, evidently furnished with two cotyledons, exhibit ligneous filaments similar to those of the monocotyledons, running along the whole length of the medullary canal: but these are exceptions which do not destroy the general rule.

In trees or shrubs with two cotyledons there are almost always observed distinct lines of the wood, which proceed from the pith, traverse the ligneous cylinder, and end at the bark. They appear on the transversal section of the trunk, stem, branches, and twigs, like the hour-lines of a dial. They are called the medullary radii. They seldom show themselves in the stems of the dicotyledon herbs, and do not exist in the monocotyledons either herbaceous or ligneous.

In the leaves, flowers, pericarpia, &c. there are found also parts of greater or less softness, and greater or less hardness, the substance of which appears to be similar to the bark, pith, or wood.

Such are the different parts which vegetables exhibit to the naked eye. We must now examine the elementary organs which enter into their composition.

CHAP. II.

Of the Membranous Tissue.

Vegetables are composed of a membranous tissue, which varies in its form and consistence, not only in the different species, but even in the same individual. I shall not here examine whether the membranes are composed of organic fibres, ranged close to each other and united by a gluten, as some authors assert. This supposition is susceptible neither of strict demonstration, nor a formal refutation; it is one of those systems which amuse the mind when research becomes fruitless. I shall content myself with stating, that, whatever may have been the perseverance of my observations, I never observed real fibres in vegetables; the filaments to which that name has been given are only membranes, which tear into longitudinal stripes: such were the delicate filaments which Duhamel separated from a bit of wood which he observed through the microscope.

The membranous tissue, though continued in all its parts,
forms

forms two kinds of different organs; the cellular tissue, and the tubular tissue.

CHAP. III.

Of the Cellular Tissue.

This tissue presents to the observer a series of membranous bags, which on the first view seem to have no communication with each other. They are not small bladders or utriculi, as most authors assert; they are a membrane, which bends itself, in some measure, to form vacuities contiguous to each other. In the parts where these cells experience no foreign pressure, they are all equally dilated, their transversal and vertical sections present hexagons similar to the alveolæ of bee-hives; each side of these geometrical figures is common to two cells, and the whole tissue is wonderfully regular: but, when the tissue is compressed, the hexagons lose their shape, and are converted sometimes into parallelograms more or less elongated. The membranous sides of the cells are exceedingly thin and colourless: they are transparent like glass, and their organization is so delicate, that it cannot be perceived even with the help of the most powerful microscopes. They are generally filled with pores, the apertures of which do not certainly exceed the 300th part of a line; these pores are bordered with small unequal and glandulous rolls, which intercept the light, and refract it with force when they receive its rays. The cellular tissue is spongy, elastic, and without consistence; when immersed in water it becomes altered, and, in a little time, is even destroyed: it is then reduced to a kind of mucilage. These pores establish a communication between one cell and another, and serve for the transfusion of the juices in that tissue, which is exceedingly slow. I must also observe, that it is not a *conductor* of the fluids diffused throughout the vegetable, and that it produces nothing of itself.

I have said that the membranes are transparent and colourless: when the tissue is disengaged from every foreign body, this is true; but it is often marked by colouring substances, which tarnish its transparency. This tissue exists in all vegetables, but not in the same proportion. Mushrooms and fungi appeared to me to be composed only of cellular tissue. The bark of monocotyledons and dicotyledons is almost entirely formed of it: in these, it is generally somewhat compressed between the epidermis and the wood; it is filled with resinous juices, commonly coloured green, but sometimes red or yellow, according to the nature of the vegetable. This gives different tints to the epidermis, which is nothing

else than the exterior side of the first row of cells, as the illustrious Malpighi supposed. The pith in all plants is composed of hexagonal cells. In herbaceous plants, and particularly those which are highly succulent, these cells are often filled with juices more or less thick or coloured. In ligneous plants, naturally drier, they are, on the other hand, almost entirely empty, and transparent. The cellular tissue in bulbous roots is pulpy and succulent; in the cotyledons it is hard and brittle; and in the albumen and seeds it is dry and arid. The parenchyme of the leaves, of the bractææ, stipulæ, and calyces, is formed by cells filled with a juice almost always coloured, and green. The rich corollæ, which display to the light the elegance of their forms and the splendour of their colours, but of which the beauty and freshness vanish in a moment, are not so thin as the delicate membranes of the cellular tissue: the juices which swell the transparent utriculi of which they are formed give them these colours; the one sometimes diffused into the other by imperceptible tints, sometimes abruptly opposed, and heightening their splendour by the contrast. Here the cellular tissue is so delicate, that the slightest touch is sufficient to alter and tarnish it: the least pressure reduces it to mucilage, and it appears to be the momentaneous product of the air and water. This tissue is observed also in the stamina and the pistils. The pollen, that fine dust which contains the subtle fluid necessary for fecundation, appears to be only an accumulation of small bags formed of the cellular tissue: in a word, it is this tissue which, by dilating itself, produces succulent fruits.

The cells are proportionally more abundant in herbs than in trees, and in young shoots than in old timber. The embryo is composed almost entirely of cellular tissue. The medullary radii, which extend from the centre to the circumference in the trunks and branches of trees with two cotyledons, are sometimes also nothing but a thin membrane of cells.

[To be continued.]

IX. Method of whitening the Gray Marine Salt to fit it for domestic Purposes instantaneously, and without the Aid of Heat. By PAJOT DESCHARMES.*

GRAY or unrefined marine salt, as every body knows, is covered with a thin earthy crust which alters more or less its whiteness; and it is a matter of some consequence, both in

* From the same.