*ambulacra,* from a resemblance his rich fancy traced in them to the walks between the parterres of a garden laid out after the olden fashion. The *arete* are thickly studded with tubercles of different sizes ; and when more narrowly examined, it will be seen that each *area* is divided down the middle, by a zigzag line, into two equal halves, com­posed of numerous small pentagons set in cross rows, and dove-tailed into each other with the most perfect adapta­tion, the projecting angle of one series being fitted into the concave angles of the other. Their tubercles support the spines, which move on a pearly globular pivot that sinks into a corresponding cup in the base of the spine, and where they are retained by the soft epidermis or skin that covers the entire shell in its fresh condition. The spines are calcareous, columnar, very often large in proportion to the shell ; but with these primary spines smaller ones of three kinds are numerously intermixed, viz. one of the same form, differing only in size ; another slender as a hair, but dilated into a club at each end ; and another on a flexible stalk supporting three moveable prongs placed in a triangle, not very unlike the trident of Neptune. These Müller mistook for parasitical polypes ; and we still find them in many systems forming the genus *Pedieellaria* among these animals. Their function is unknown ; for Monro’s conjecture that they supply the place of the or­gans of the senses in the more perfect animals, is a very loose one, and improbable.@@1 The *ambulacra* are joined to the areæ by a plain or even suture, and instead of being tu- bercled, they are perforated from top to bottom with holes, always disposed after a regular pattern, which probably varies in every species. These holes give exit to numerous fleshy tubular pedicles, whose apex forms a circular testaceous shield, serrulated round the rim, concave and perforated in the centre, and formed of six distinct pieces, united by a plain elevated suture. If we now examine the top of the shell, we find it occupied by a small circular tuberculated plate, with a hole in its centre (the *vent*)*,* and the plate surround­ed by five triangular scales, and five less ones of a lunate figure placed exterior to and between them. The trian­gular scales, called the *ovarial* by Mr Gray, are each of them perforated with a hole leading to the ovaries, and they stand opposite the large *areæ,* into an emargination of which the point of the triangle dips, while the lunate scales, the *interovarial pieces* of Mr Gray, embrace the points of the small *areæ* and the *ambulacra,* and are like­wise perforated with a hole scarcely visible to the unaided eye, and the use of which is quite unknown. “ One of the *ovarial* plates is considerably larger than the rest, convex externally, and perforated like a sieve with numerous mi­nute foramina, and internally thick and rugose. This plate is somewhat similar, both in form and perhaps in use, to the orbicular spot on the back of the Stellerida, called *cor­pus spongiosum* by Spix.” @@2

This description of the crust or shell of the Echinides, it will be remembered, is in a great degree specifical, and will not apply universally even to the globose species, from which it is especially drawn ; and it must less accurately apply to those which are greatly depressed, or oval, or heart-shaped, or cranial, or which rise up in the form of a conical penta­gon. In all these the *ambulacra* are often only half of the typical number, and often only partial in their extent ; while the *areæ* become coalescent, amalgamating more or less completely, with a consequent loss in the distinctness of their radiation. In many of these, also, the oral aper­ture loses its central position, and gradually, through a succession of genera, approaches the margin, which in some it occupies ; the vent being subjected in its position to the like variations, and drawing with these, alterations of equal extent in the other exterior apertures. Nor in shape and armature does the mouth vary less. It is circular in the true Echinus, and armed within with a most complex apparatus of calcareous jaws, arches, and teeth, consisting of twenty-five separate pieces ; while other genera, nearly allied, present the strange contrast of having no trace of these parts, being wholly toothless, with the outer aperture transformed into a narrow transverse labiated slit. To fill up the interval between these extremes, there are genera which have an oral apparatus less complicated than that of the Echinus; for in natural orders or families there are no abrupt transitions in structural organization. Amid all their varieties there reigns an evident connection and harmony, indicating a design or plan after which they have been called into existence ; and in contemplating that unity of purpose, and the beauty and intricacy of the work­manship bestowed on the individuals created to fulfil that purpose, we endow them with our superior intelligence, and give utterance to their evidence of the existence and attri­butes of the Deity.

From the differences just indicated in the structure of the mouth, we naturally and correctly infer that there will be a corresponding diversity of the food on which the Echinides subsist. The jawless Spatangi burrow in the sand, and, swallowing the earth around them, extract a hard nutriment from the decayed animal and vegetable matter intermixed ; but the Echini live amid rocks near low water, trace their crevices, and there seek the small crustaceous and testaceous Mollusca, whose shells they are enabled to break by the power and hardness of their teeth. Cavolini indeed asserts that the Echini live upon sea-weed; but the testimony of Dr Monro to the contrary is equally po­sitive, and more consistent with the anatomical structure. That great anatomist tells us that they prey upon living Buccini, “as I had found particles of shells in their alimen­tary canal ;” and they seize and secure their prey by means of the suctorial tubes which garnish the ambulacra. “ I therefore directed the fishermen to bring me, along with the Echini, some living Buccina ; to which, as I had supposed they would do, they attached themselves so effectually, that when I lifted the Echinus out of the water, I found it could support with ease a Buccinum which weighed nearly a quarter of a pound.”@@3 “ The Echinidans,” says Mr Kirby, “ whose station appears to be often near the shore, upon submerged ledges of rocks, feed upon whatever ani­mal they can seize. We have seen that they sometimes turn upon their back and sides, as well as move horizon­tally. This enables them more readily to secure their food, with the aid of the numerous suckers in the vicinity of their mouth, which, when once they are fixed, never let go their hold till the animal is brought within the action of their powerful jaws. Lamarck thinks they do not masticate, but only lacerate their food ; but as two faces of each of their pyramidal organs answer those of the two adjoining ones, and these faces are finely and trans­versely furrowed, this looks like masticating surfaces. Bosc, who appears to have seen them take their food, says it consists principally of young shell-fish and small crusta­ceous animals. As the latter are very alert in their mo­tions, it is difficult for the sea-urchins to lay hold of them ; but when once one of these animals suffers itself to be touched by one or two of the tentacles of its enemy, it is

@@@, It has been recently stated, that the animal uses them as grapnels to attach itself to sea-weeds. Our native species covers itself, when residing between tide-marks, with fragments of sea-weeds, evidently as a means of concealment ; and we believe they are held on the shell by means of these organs, which are a sort of self-acting forceps.

@@@\* Gray in *Annals of Philosophy,* n. s. X. p. 425. On the structure of the shell, see also Grant's *Outl. of Comp. Anatomy,* p. 18-21.

@@@5 *The Struct. and. Physiol, of Fishes,* p. 71.