water. One large cell, or megamere, remains for some time unseg­mented but is finally segmented and forms the endoderm cells which are invaginated. The gastrula thus formed has a large blastopore, which is at first posterior but afterwards gradually moves towards the anterior end of the ventral surface. The velum is peculiar, being reflected backwards over the body and bearing, besides an apical tuft, three or four rings of cilia. The shell-gland is formed on the dorsal surface, and the mantle arises as two lateral lobes which afterwards unite by their ventral edges to form the tubular mantle of the adult. The anus is not formed till a very late period of the development. The foot arises as a prominence on the ventral sur- face and grows forward, and at the end of five or six days the velum atrophies and the foot becomes the organ of locomo­tion; the animal then ceases to swim and

sinks to the bottom.

*Habits and Distribution.—*Scaphopoda

feed on the lowest marine organisms such as Diatoms, Protozoa, &c. There are 150

' living and about 275 known fossil species. - The former occur in all seas from the shore to a depth of 2500 fathoms. Fossil remains are first found in the Silurian, but become most abundant from the Cretaceous

onwards.

*Classification.—* Fam. 1. Dentaliidae. Foot conical with a laterally expanded and dorsally interrupted circular fold. Shell curved with greatest diameter at anterior aperture and diminishing gradually to posterior. *Dentalium:* posterior aperture of shell entire, without incision. *Antalis:* posterior aperture with short incision. *Fissi- dentalium:* posterior aperture with long fissure on ventral side; abyssal. *Fustiaria. Schizodentalium:* ventral border of posterior aperture with a series of small holes in a straight line. *Heterochisma.*

Fam. 2. Siphonopodiidae. Foot expanded distally into a sym­metrical disk with a crenate edge or simple and vermiform without well-developed lateral processes; shell often contracted towards the anterior aperture. *Siphonodentalium* : foot ending in a median disk without a median appendage. *Cadulus. Dischides. Pulsellum:*

terminal disk of foot with a median appendage. *Entalina.*

See F. J. H. Lacaze-Duthicrs, “ Histoire de l'organisation et du

développement du Dentale,” *Ann. Sci. Nat. Zool.* (4), vi., vii. (1856-1857); A. Kowalewsky, “Étude sur l’embryogénie du Dentale,” *Ann. Musée d’Histoire Natur.* (Marseille, Zool. I. 1883); Boissevain, “ Beiträge zur Anatomie und Histologie von Dentalium,” *Jenaische Zeitschr.* xxxviii. (1904); Paul Pelseneer, *Mollusca\*,* Lankester’s *Treatise on Zoology,* pt. v. (1906). (J. T. C.)

SCAPOLITE (Gr. σ∕cατror, rod, λι0or, stone), a group of rock-forming minerals composed of aluminium, calcium and sodium silicate with chlorine. The variations in composition of the different members of the group may be expressed by the isomorphous mixture of the molecules Ca4Al6Si6O25 and Na4Al3Si9O24Cl, which are referred to as the meionite (Me) and marialite (Ma) molecules respectively, since they predominate in these two end-members of the series. Wernerite, or common scapolite (Me3Ma1 to Me1Ma2)and mizzonite (Me1Ma2 to Me1Ma3) are intermediate members. The tetragonal crystals are hemihedral with parallel ' faces (like scheelite), and usually have the form of square columns, sometimes of considerable size. There are distinct cleavages parallel to the prism-faces. Crystals are usually white or greyish-white and opaque, though meionite is found as colourless glassy crystals in the ejected limestone blocks of Monte Somma, Vesuvius. The hardness is 5-6, and the specific gravity varies with the chemical com­position between 2∙74 (meionite) and 2∙56

(marialite). The scapolites are especially liable to alteration by weathering processes, with the development of mica, kaolin, &c., and this is the cause of the usual opacity of the crystals. Owing to this alteration, and to the variations in composition, numerous varieties have been distinguished by special names. Scapolite is commonly a mineral of metamorphic origin, occur­ring usually in crystalline limestones, but also with pyroxene in schists and gneisses. The long slender prisms abundant in the crystalline limestones and schists in the Pyrenees are known as “ dipyre" or “ couzeranite.” Large crystals of common scapolite

(wernerite) are found in the apatite deposits in the neighbourhood of Bamle near Brevik in Norway, and have resulted from the alteration of the plagioclase felspar of a gabbro. (L. J. S.)

*Scapolite Rocks.*

According to their genesis the scapolite rocks fall naturally into four groups.

1. The scapolite limestones and contact rocks. As silicates rich in lime, it is to be expected that these minerals will be found where impure limestones have been crystallized by contact with an igneous magma. Even meionite (the variety richest in soda) occurs in this association, being principally obtained in small crystals lining cavities in ejected blocks of crystalline limestone at Vesuvius and the craters of the Eifel in Germany. Scapolite and wernerite are far more common at the contacts of limestone with intrusive masses. The minerals which accompany them are calcite, epidote, vesuvianite, garnet, wollastonite, diopside and amphibole. The scapolites are colourless, flesh-coloured, grey or greenish; occasionally they are nearly black from the presence of very small enclosures of graphitic material. They are not in very perfect crystals, though sometimes incomplete octagonal sections are visible; the tetragonal cleavage, strong double refraction and uniaxial interference figure distinguish them readily from other minerals. Commonly they weather to micaceous aggregates, but sometimes an isotropic substance of unknown nature is seen replacing them. In crystalline limestones and calc-silicate rocks they occur in small and usually inconspicuous grains mingled with the other components of the rock. Large, nearly idiomorphic crystals are sometimes found in argillaceous rocks (altered calcareous shales) which have suffered thermal metamorphism. In the Pyrenees there are extensive outcrops of limestone which are penetrated by igneous rocks described as ophites (varieties of diabase) and lherzolites (peridotites). At the contacts scapolite occurs in a great number of places, both in the limestones and in the calcareous shales which accompany them. In some of these rocks large crystals of one of the scapolite minerals (an inch or two in length) occur, usually as octagonal prisms with imperfect terminations. In others the mineral is found in small irregular grains. It is sometimes clear, but often crowded with minute en- closures of augite, tourmaline, biotite and other minerals, such as constitute the surrounding matrix. From these districts also a black variety is well known, filled with minute graphitic enclosures, often exceedingly small and rendering the mineral nearly opaque. The names couzeranite and dipyre are often given to this kind of scapolite. Apparently the presence of chlorine in small quantities, which may often be detected in limestones, to some extent deter­mines the formation of the mineral.

2. In many basic igneous rocks, such as gabbro and diabase, scapolite replaces felspar by a secondary or metasomatic process. Some Norwegian scapolite-gabbros (or diorites) examined micro­scopically furnish examples of every stage of the process. The chemical changes involved are really small, one of the most important being the assumption of a small amount of chlorine in the new mole- cule. Often the scapolite is seen spreading through the felspar, portions being completely replaced, while others are still fresh and unaltered. The felspar does not weather, but remains fresh, and the transformation resembles metamorphism rather than weathering. It is not a superficial process, but apparently takes place at some depth under pressure, and probably through the operation of solutions or vapours containing chlorides. The basic soda-lime felspars (labradorite to anorthite) are those which undergo this type of alteration. Many instances of scapolitization have been described from the ophites (diabases) of the Pyrenees. In the un- altered state these are ophitic and consist of pyroxene enclosing lath-shaped plagioclase felspars; the pyroxene is often changed to uralite. When the felspar is replaced by scapolite the new mineral is fresh and clear, enclosing often small grains of hornblende. Extensive recrystallization often goes on, and the ultimate product is a spotted rock with white rounded patches of scapolite surrounded by granular aggregates of clear green hornblende : in fact the original structure disappears.

3. In Norway scapolitc-hornblende rocks have long been known at Oedegården and other localities. They have been called spotted gabbros, but usually do not contain felspar, the white spots being entirely scapolite while the dark matrix enveloping them is an aggregate of green or brownish hornblende. In many features they bear a close resemblance to the scapolitized ophites of the Pyrenees. It has been suggested that the conversion of their original felspar (for there can be no doubt that they were once gabbros, consisting of plagioclase and pyroxene) into scapolite is due to the percolation of chloride solutions along lines of weakness, or planes of solubility, filling cavities etched in the substance of the mineral. Subsequently the chlorides were absorbed, and *pari passu* the felspar was transformed into scapolite. But it is found that in these gabbros there are veins of a chlorine-bearing apatite, which must have been de­posited by gases or fluids ascending from below. This suggests that a pneumatolytic process has been at work, similar to that by which, around intrusions of granite, veins rich in tourmaline have been