

N. B. After the discharge of the whole *fœtus*, the patient had milk in her breasts, as upon a natural delivery.

Debenham, Jan. 18.
1750-51.

Tho. Debenham.

XIV. *New Discoveries relating to the History of Coral, by Dr. Vitaliano Donati. Translated from the French, by Tho. Stack, M. D. F. R. S.*

Read Feb. 7. § I **C**ORAL is known to be a marine
1750. vegetation, which in shape nearly resembles a shrub stripped of its leaves.

§ 2. It has no roots, but is supported on a broad foot, or basis, which adapts itself, as wax well-press'd, and sticks to any body in all its parts, with such firmness, that it is utterly impossible to disengage it. The shape of this foot is not always the same; but, for the most part, it approaches to roundness (Tab. III. Fig. 1. *n, n*). The only use of this part is to hold the coral fixed, and support it; not to nourish it: since there are found pieces of coral, with their feet broken off, and separated from the place that supported them; which pieces nevertheless continue to live, to grow, and to propagate, at the bottom of the sea.

§ 3. From this foot arises a trunk, generally single, the greatest thickness of which seldom exceeds an inch Paris measure, as I have been assured by old coral-fishers.

§ 4.

§ 4. Out of this trunk the branches shoot, which commonly are few in number ; and they afterwards divide into several smaller and slenderer branches. For the most part, the branches are disjoined, and stand separate ; but yet it is sometimes observed, that two or more branches spring from the foot united and parallel, and, as it were, clung together so intimately, that the place of their union cannot be distinguished. We frequently see two branches adhere and unite in the same manner, in whatever place they happen to touch : and I have likewise observed, that, from two branches thus united, there arose afterwards but a single branch.

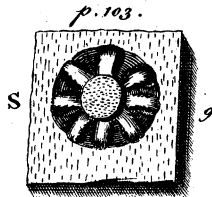
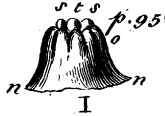
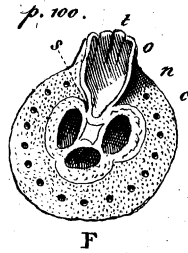
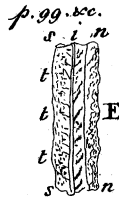
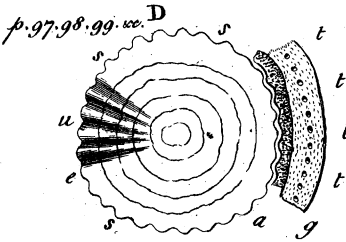
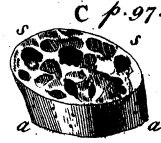
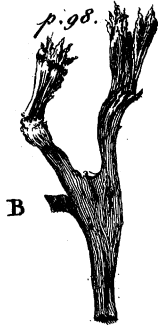
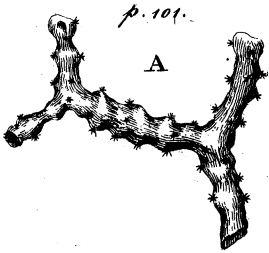
§ 5. One thing seems to me worthy of notice ; which is, that, if a shell happens to stick to the trunk or branches of the coral, it is in time surrounded and covered, either in part, or in the whole, with the same coralline matter, to which it stuck.

§ 6. The greatest height, to which I have seen coral rise in the Adriatic, is a Paris foot, or some little matter more. And even this height is very rare in that sea.

§ 7. The trunks, as well as the branches, are commonly round ; and yet we frequently find, that some are flatted and broad, of which I have some specimens in my collection.

§ 8. The foot, trunk, and branches of this sea-production are of one uniform matter ; that is, they are formed of a substance homogeneous in all its parts, and of a bark or coat.

§ 9. The substance forms the inward part of the coral ; and this, even at the bottom of the sea, is of an hardness little inferior to that of marble. At the
ends



ends of the branches it is not so hard as the bark; in some places near the ends it is of equal hardness with it; but in the thick branches and trunk it is harder.

§ 10. This substance, being observed by a microscope, in corals of one colour, as the red, and those which are not corroded by worms, appears uniform, smooth, without spots of other colours, without holes or pits, but quite even, hard, and capable of a perfect polish.

§ 11. But it is otherwise, in corals of more colours than one; as, sometimes, in those of a yellowish rose-colour, and those of a rose-colour. For I have some branches of these, the transverse sections of which exhibit different lines, or annular bands (Fig. *D. s, s, s, s,*) whereof one part is a rose-colour, and the other yellowish, others white, and others more or less charged with colour, which form concentric circles, *D. a,* like the coats of an onion.

§ 12. The same sort of annular lines is observable in red coral a little burnt, but they are of a grey colour, and parted asunder by a line of a deep-brown grey (*s, s, s,* Fig. *D.*).

§ 13. When this substance, tho' very hard, happens to be stripped of its bark, either by age, or some other accident, it is liable to a sort of *teredo*, or worm; which is a small animal, that enters into the body of the coral by very small holes, (Fig. *C. a, a,*) gnaws its inside, and makes itself roundish cells therein, (*C. s, s,*). These cells have a communication with each other, (*C. a, a,*) and are separated by very thin partitions, which weakens the coral extremely, and makes it brittle and improper for any sort of work.

§ 14. There is also another worm, which passes thro' the coral transversely from side to side, and in right lines, by strait cylindrical holes.

It may not be improper to take notice here, that the hardest marbles, lying in the sea, are liable to be corroded in the same manner.

§ 15. The surface of the substance of coral is furrowed and wrinkled (Fig. B. Fig. D. e, u.). The wrinkles begin from the foot, and ascend, always nearly parallel, to the trunk and branches. However, these wrinkles are not so deep in the slender branches, and sometimes are not visible there: but they are always more elevated, and more considerable, in the thick branches and trunk: they are not smooth, but uneven, with knobs or bumps on them, and the surface, as it were, composed of very little hemispheres.

§ 16. This substance of the coral, being exposed to a strong fire, is reduced to a very fine ash-colour'd powder. As common ashes, when taken clean from burning charcoal, and examined by a microscope, exhibit a sort of skeleton, composed of the fibres and vessels of the wood; so the ashes of the substance of coral sufficiently point out, of what sort of parts it is composed. The microscope discovers therein ashes, formed of very small white corpuscles, united in clusters; each one of which is nearly spherical. The ashes of the bark of the coral are of the same shape and colour; so that the substance of coral agrees with its bark in the primitive and constituent parts (if I may be allow'd the expression) which seem to be the same in both.

§ 17. In pieces of coral broken transversely, I have often observed some prominent wrinkles, which, disengaging

disengaging themselves from the exterior wrinkles above-mentioned, ran towards the center (Fig. *D. u.*), Hence it plainly appeared, that there is an affinity or connexion between the interior and exterior wrinkles.

§ 18. To the exterior wrinkles, and to the whole outward surface of the hard part of the coral (Fig. *D. a, s, e, s.*) there is closely attached a white or pale pellicle (Fig. *D. g, E. n. n.*) which is pretty soft, and composed of vascular and follicular minute membranes, which, by their interlacing, form a reticular body. The whole is accompanied with small vessels, which contain a whitish juice, that is diffused thro' all the *folliculi* or *membranulae*; which have also attached to them certain very small red corpuscles, united together by means of other *membranulae*.

§ 19. These corpuscles are nearly of a spherical figure, and, in size and shape exactly like those of the ashes of the coralline substance, and of the bark: so that we may properly say, that these little bodies constantly remain intire, even after the action of the fire; having undergone no other change but in their colour.

§ 20. In this pellicle (*E. n, n.*) the globular corpuscles are not numerous, but the greatest part of the said pellicle is occupied by very white membranes, from which it takes its colour, and not from the red globular corpuscles.

§ 21. This pellicle, lying immediately on the coral, deposits the red corpuscles, and adapts them to it: and thence it is, that the wrinkles are cover'd, as it were, by extremely little hemispheres; and these infallibly shew the formation of the coralline substance. If any one should ask, whence can these

little spheres derive their origin? my answer would be, without hesitation, from the *polypi* of the coral. And the reason is, that, if these *polypi* produce their eggs, as will be shewn in the sequel, covered with such corpuscles, we may justly infer, that corpuscles of the same nature, where-ever they are found, are formed by the same *polypi*.

§ 22. To this white pellicle is attached the bark of the coral (Fig. *D. t, t, E, s, s,*) which is soft, of a vermillion-colour, or of a brighter colour than the coralline substance. It is formed of very fine *membranulæ*, or net-work; to which are annexed, and reciprocally fastened, the red globular corpuscles, which cause its deeper colour. It is along this bark, that cylindrical vessels (Fig. *D. t, t, t, t, Fig. E. i, Fig. F. n,*) are observed to run lengthwise of the coral; which appear by the microscope to be parallel to each other, and out of which issue laterally other vessels infinitely small, (*E. t, t, t,*) which have a communication with the above-mention'd *membranulæ*. The use of these vessels is to give nutriment to the coral, by means of a milky juice, which they contain.

§ 23. The surface of this bark is slippery and uneven, when the coral has been just fished out of the sea; somewhat raised in some places, in others more depressed and flatted.

§ 24. Moreover, there are observed in several parts of the said bark little tubercles or prominences, (Fig. *A. s,*) which may be seen even without a microscope. These tubercles are pretty large at their bottom or basis, and round (Fig. *I, n, n,*) grow somewhat narrower towards their upper part (*o*), and terminate in a lip of some thickness, regularly divided into

into eight parts (*I. s, s,*) (*G. s, s,*) more or less even; which form the mouth (Fig. *I. t, G. t, H. a,*) of each tubercle, or, to speak more properly, of each cellule. The bark of the coral ends at the extremity of these parts: and thus it is, that all the inward part of each cellule of the white pellicle is formed.

§ 25. The white pellicle (*D. g, E. n, n,*) is doubled in some places, and forms a little bag (Fig. *F. s, c,*) which lines the inside of each cellule (*F. t,*) that is, to the beginning of the lip, or, we may say, to about the middle of the cellule.

§ 26. The substance of the coral (*F. o,*) gives way to the cellule by small cavities: yet these are not very visible in the old thick branches, but they are pretty easily seen in the young and slender (*B. a, c,*). Thus the cellule does not end at the coralline substance; since the white pellicle (*F. s,*) is between it and the said substance. The hollow of the cellule grows narrow into a sort of cone, (*F. t,*) with an obtuse apex; the belly of which is greater in diameter than the basis.

§ 27. The bottom of such a cellule faces the foot of the coral, and its mouth the branchy or most distant part from the foot. In this cellule is lodged the *polypus*, which is visible to the naked eye, (Fig. *A. s,*) but its exact shape is only to be seen by the microscope; and it was by this means, that I have been enabled to make a drawing of it.

§ 28. Wherefore it is from each cellule (*F. t, c,*) that a white, soft, and somewhat transparent *polypus* (Fig. *M.*) comes forth, or extends itself; which, in shape, resembles a star with eight equal rays, nearly conical, (Fig. *P.*) and furnished with other conical appendices

appendices (*P. a, a, M. a, a,*) which issue out of it on both sides. The two rows of these have their direction nearly on the same plane. The rays are somewhat flattened, (*M. a, a,*) and a trough (*N. c, M. n, o,*) rises out of their center, somewhat widen'd at its beginning, with an opening or great mouth at top (*M. n,*). In its sides there are eight upright ridges, broad and elevated, and as many wrinkles, or furrows; and each ray is inserted between every two wrinkles (*M. a, a,*).

§ 29. This trough is placed upon a smooth part, (Fig. *N. g,*) which we may call the belly of the animal; and this part, while the animal lives, and has not been hurt, is always erect in the cellule; tho' it be intirely disengaged, and separated all sides, from the said cellule; as may be plainly seen in some positions of the *polypus*.

§ 30. All these particularities are to be seen only when the coral is just drawn out of the sea, and suffer'd to stand in some of the sea-water: for, if you take the coral out of this water; or even if you do but touch it in the water, the *polypus* immediately retires into his cellule. In retiring, it contracts itself, the trough is closed up (Fig. *M, n, o,*) and each ray, (*Q. c,*) as also each appendix (*Q. a, a, a, a,*) shrinks, and enters into itself, just as snails pull in their horns: each ray pulls in about half its length, and with their ends they adapt themselves to the edges of the trough (Fig. *T. R.*).

§ 31. It is in this posture, that the *polypus* is seen the moment the coral is drawn out of the sea. The *polypus*, in this contracted state, seen without a microscope, resembles a drop of milk; and this is what

all the good coral-fishers take for the real milk of the coral; the rather, because, by pressing the bark of the coral with the fingers, the *polypus* is forced out, and, in coming forth, it always retains the appearance of milk. And this makes me believe likewise, that the accurate Andreas Cæsalpinus, who was the first observer of milk in coral, in reality saw nothing but the *polypi* in the likeness of milk.

§ 32. Altho' the *polypi* have their belly (Fig. N. g.) quite disengaged from the cellule, as we have said above; yet they always keep it therein, shortening and widening it so, as to make it bigger than the mouth or opening of the cellule (*S. g.*): and this may be seen very distinctly, by separating the cellule and its *polypus* from the substance of the coral, and then observing it on the back part. In this attitude it is, that we see, not only the belly very much shortened (Fig. *S. g.*) but also the posture, in which the *polypus* keeps itself in its own habitation.

§ 33. At the bottom of the belly (*N. g.*) of some *polypi*, I have observed some roundish *hydatides*, extremely small and soft, transparent, yellowish, or tending to pale. The situation and figure of these *hydatides* induce me to believe, that they are the true eggs of the *polypus*.

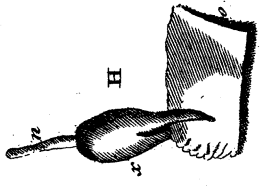
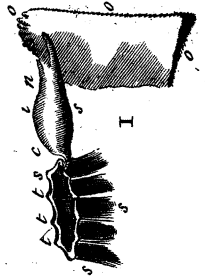
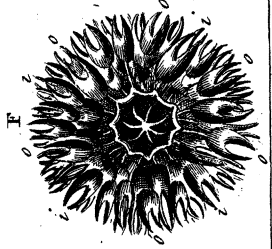
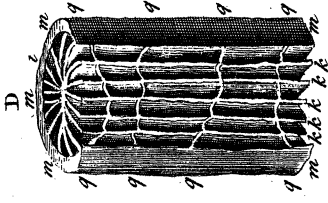
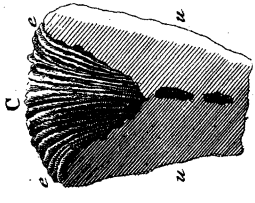
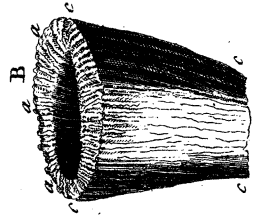
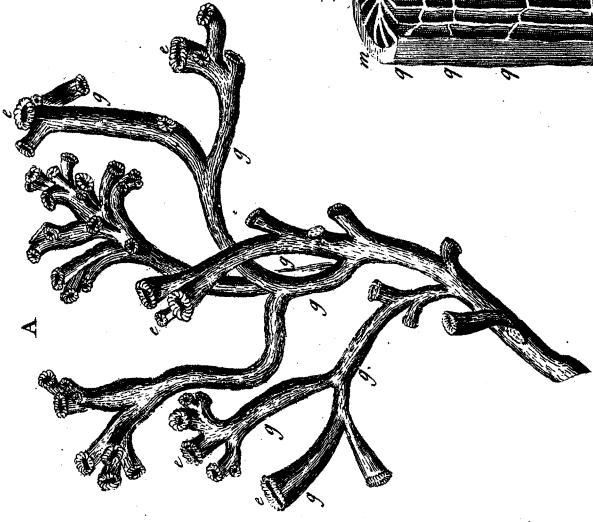
§ 34. Altho' the size of these eggs is not much above the fortieth part of a line, yet, by the assistance of a good microscope, I think I have discover'd therein some vestiges of little grains, like those, which are common on the bark and substance of coral. These eggs are detached from the *polypus*, and, being soft, they adapt themselves, and stick to the hard bodies, on which they fall. Afterwards they spread

at

at the foot, or bottom, and swell up a little (Fig. *K.*) ; and, in this case, we very well discern an inward cavity in them, the upper part of which becomes uneven by eight wrinkles (Fig. *L.*), but is not open as yet. Shut up within this cavity the *fœtus* of the *polypus* remains, contracted within itself, and, as it were, without form. In due time the *polypus* grows ripe, and, as it were, adult ; and then, the upper part (Fig. *I. s, t, s.*) opening, it comes forth properly extended (*N. g.*), and thus furnishes the coral with nutriment.

§ 35. While the first cellule is shut up, (*K.*) or the egg of the coral is in its substance, we do not find any one hard part in it like bone or marble ; it is all soft : but afterwards, when the cellule opens, we begin to observe some hard *lamellæ* ; and when it is grown bigger, and arrived at the height of about a line and half (Fig. *O.*), it widens at bottom, (Fig. *H. n.*) and at the top, (*H. a.*) and grows narrower in the middle, (*H. o.*) assuming the proper consistence and hardness of coral. And as this grows, (*H.*) the *polypi* are multiplied, and new branches of coral are formed.

§ 36. Here then we see the vegetation of a plant, and the propagation of an animal. It is submitted to the learned to decide at present, whether the coral belongs to one of these kingdoms rather than to the other ; or whether, with greater justice, it deserves an intermediate place.



J. Waller, Sculp.

*Description of the Madrepora.*See Tab. III. Fig. *A.*

This is intirely like the coral, as to its hardness, which is equal to bone or marble. Its colour is white, when polished. Its surface is lightly wrinkled, and the wrinkles run lengthwise of the branches. Its infide is of a particular organization; having in the center a fort of cylinder, (Fig. *D. i.*) which is often pierced thro' its whole length by two or three holes.

From this cylinder are detached about 17 *laminæ*, (Fig. *D. k, k.*) which run to the circumference in strait lines (Fig. *D. m, m, m, m.*).

These *laminæ* are transversely intersected by other *laminæ*, (Fig. *D. q, q.*) which form many irregular cavities throughout the whole plant. The branches (Fig. *A. g, g.*) are conical; and the basis of the cone is formed by the summit of the branch (Fig. *A. e, e.*). Every one of these summits has wrinkles on its outside, which run in the longitudinal direction of the branches (Fig. *B. c, c.*); and each wrinkle answers to a *lamina*, (Fig. *C. e, u, e, u.*) and each *lamina* is of the shape of a prism, (Fig. *E.*) the basis of which is warty, and faces the outside, (Fig. *C. e, u.*) and its point is cut into teeth, (Fig. *E. n, n, n.*) and belongs to the infide. The cellule, (Fig. *B. a, a, a, c, c.* Fig. *C. e, e, u, u.*) which is of the shape of a chalice, is composed of these *laminæ* ranged into a circle.

In every one of these cellules is found a little *polypus*, represented in Fig. *F.* but considerably magnified; the mechanism of which is this :

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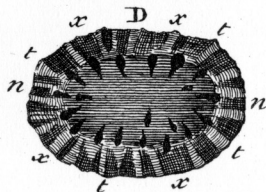
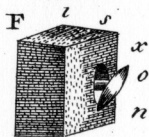
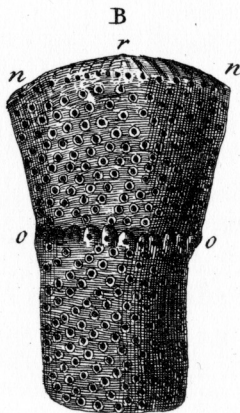
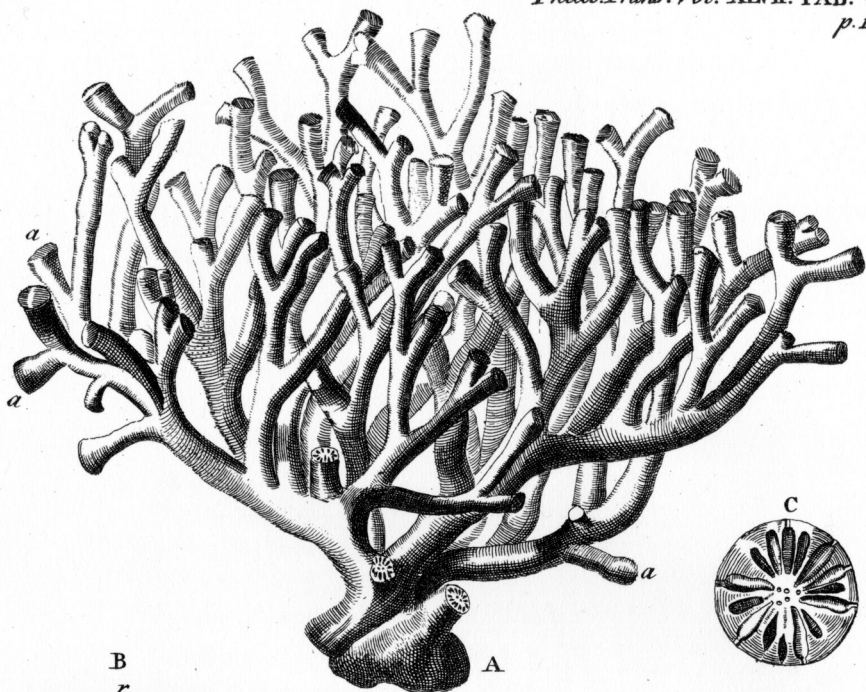
Three

Three different parts, unlike each other, compose this animal; *viz.* the feet, (Fig. *F. o, i,*) a trough, (Fig. *F. g, H. t,*) and an head, (Fig. *G. n.*) Each foot begins by two conical appendices (Fig. *H. o, o, o,* Fig. *I. o,*). By the union of these appendices a rounded part is formed, which, in some degree, resembles the belly of a muscle, (Fig. *H. i,* Fig. *I. x*) by means of which the foot is shortened and lengthened. To this part (Fig. *I. x,*) is annexed a little cylinder, (Fig. *I. n,* Fig. *H. c,*) the length of which is indeterminate.

These feet are ranged all around in great number, and annexed to the *laminæ*, (Fig. *B. a, a, c, c,*) and are all united to the trough, (Fig. *H. c,*) on the outside of which are seen ten cavities, with an equal number of prominences (Fig. *H. t, t, t, s, s, c,*) and in these is lodged the animal's head (Fig. *G.*) which has prickly rays, the precise number of which I could not determine, on account of the extreme velocity of the continual oscillatory motion of the head from right to left, and from left to right: yet I thought I could perceive the number of these rays to be eight: and the use of them may be for the animal to catch and hold its food. This part is not always to be observed, because it sometimes hides itself, by closing up the trough (Fig. *H. s, s, t, c,*) about it; and, by thus covering itself, it is safe in its habitation.

As the figure of this animal bears no resemblance to the *urtica marina*, I cannot see, how one could class the *polypus* of the *madrepora* with the *urtica*.

This animal is extremely tender, and generally transparent, and very beautiful for its variety of colours. I have observed it in spring and autumn in the



the neighbourhood of Rovigno and Orsera, where it is often fished up.

A Description of the Miriozoon, or Pseudo-foralium album fungosum of Aldrovandus.

As the size and shape of this polypary is sufficiently seen in Fig. *A*. I shall describe only what the microscope has enabled me to observ'd therein; and what Count Marfigli, tho' peculiarly diligent, has either overlook'd, or examin'd with too little attention. And this I do the more willingly, as the mechanism of this body to me appears very wonderful.

Its substance is rather like that of bone than of marble, but brittle withal: and its brittleness proceeds from the great number of cellules, with which it is hollowed.

These cellules are ranged all around in the branches, (Fig. *C. n, m,*) and disposed in the manner of a quincunx; (Fig. *B. n, o,*) and I don't know to what better to compare the form of each cellule, than to one of those cinerary urns, which are frequently found in Italy (Fig. *E. i*).

In each of these cellules lodges an oblong *polypus*, (Fig. *G.*) slender at the tail, (Fig. *G. t,*) thick at the belly, (Fig. *G. e,*) and again slender at the neck, (Fig. *G. e,*) to which is attached a little cover, (Fig. *G. o,* and *F. o,*) round, concavo-convex, and of a bony substance. This cover is attached by its lower part (Fig. *F. n,* and *H. e,*) to the entry of the cellule (Fig. *F. x*).

When the *polypus* chuses to spread itself out, it opens the cover, and out of its neck (Fig. *H. s, s,*) thrusts an ample proboscis, (Fig. *H. g,*) which is in the shape of a cup; and with this it probably takes its food. There are two little muscles (Fig. *H. a, a,*) at the lower part of this proboscis, which are attached to the cover.

When the animal returns into its nich, the proboscis sinks into itself; and the animal, by contracting itself, draws back the cover; and thus the cellule is perfectly closed, and the creature secure in its retreat.

However, all the *polypi* of this plant do not enjoy this conveniency and security, but only the adults; that is, those, which dwell about the branches. As for the others, that are not as yet adult, and live and lodge on the tops of the branches, (Fig. *B. r, n, n,* and *D. n, x,*) they have no covers; and a considerable number of them dwell in imperfect cells, or in such as are finished but in part, (Fig. *D. t, t,*) and made of a sort of cartilaginous and membranaceous materials. The imperfection of these cellules, and the weak consistence of the paste, which forms them, afforded me a plain proof, that the cellules are the work of the *polypi*, as the niches, wherein they lodge, are made by some shell-fish.