WHAT IS A NAUTILUS?

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FEW readers are unacquainted with the name which heads this paper. From its frequent employment as the name of ships and boats of all sizes and descriptions, to its application as the name of the real animal itself, the term "nautilus" has acquired a degree of fame and notoriety seldom attaching to any purely technical appellation. Despite, however, the familiar nature of the name, there are very few persons outside the natural history world who would care to profess their ability to give a succinct reply to the query, "What is a nautilus?" True, Pope long ago advised us in his "Essay on Man" to—

> "Learn of the little nautilus to sail,
> Spread the thin oar and catch the driving gale"—

a description which, if correct, would tend to show that the nautilus in question is a veritable sailor, provided with oars and sail, and thus adapted for a free life on the wave. It is Byron who similarly speaks of—

> "The tender nautilus who steers his prow,
> The sea-born sailor of his shell canoe,
> The ocean Mab, the fairy of the sea."

And Montgomery, the poet of the sea, has placed on record a description of the nautilus which will bear quotation, by way of illustrating our subsequent remarks:—

> "Light as a flake of foam upon the wind,
> Keel upward from the deep emerged a shell,
> Shaped like the moon ere half her horn is filled.
> Fraught with young life, it righted as it rose,
> And moved at will along the yielding water.
> The native pilot of this little bark
> Put out a tier of oars on either side,
> Spread to the wafting breeze a twofold sail,
> And mounted up and glided down the billow
> In happy freedom, pleased to feel the air,
> And wander in the luxury of light."

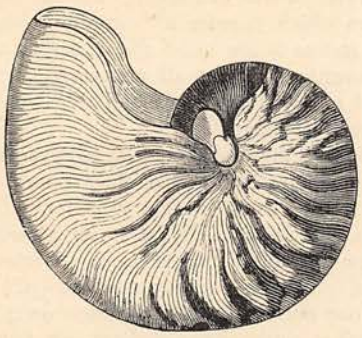
Nor were the classic poets behind in their notice of the nautilus. Oppian tells us that this—

> "Ship-like fish the future seaman taught.
> Then mortals tried the shelving hull to slope,
> To raise the mast and twist the stronger rope."

And Aristotle and Pliny agree in describing this creature as possessing the habit of floating on the surface of the sea, and of paddling along by means of its "oars," or, in easier fashion, being carried by the favouring gales.

Modern science is at no loss to indicate the animal which thus secured a large measure of attention from the poets and naturalists of the past, as well as from modern singers. In the Mediterranean Sea, and in still warmer regions, certain curious "shell-fish" occur, the heads of these animals being provided with eight "arms" or "feet," two of which are greatly broadened at their tips, and are clasped around the shell. This latter structure is of delicate nature, readily broken, and highly fragile. Opening just below the head, we find a curious tube called the "funnel," from which the water used in breathing is forcibly ejected, and thus drives the animal swiftly backwards in the sea. Such is the animal called scientifically the Paper Nautilus, the *Argonauta Argo* of the zoologist, and the most typical member of its family. But our description of the nautilus has left us almost as ignorant as before of the nature and rank of the animal in the zoological scale. We called it a "shell-fish," it is true, but this term is very wide in its application and significance, and might include animals so varied in

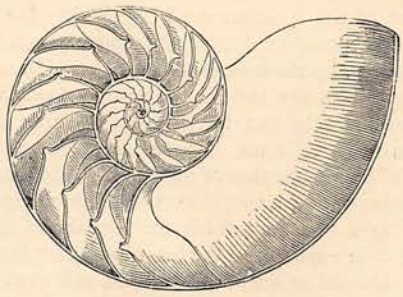
their nature as a "sea-squirt" on the one hand, or an oyster or snail on the other. Suppose, however, we were to pull the argonaut out of his shell. We might then gain a clearer idea of its exact likeness to other "shell-fish." The arms or feet surrounding the head are provided with suckers; its body is soft; it breathes by a couple of gills; and it has the habit, already mentioned, of ejecting water from the gills through a funnel. These are characters you could verify at the first aquarium you cared to visit. Halt in front of the cuttle-fish tank, wherein disport the real representatives of Victor Hugo's "devil-fish." In the familiar octopus you will see all the family characters of the argonaut, save the shell, which, by the way, the octopus carries inside his body, instead of bearing it on the outside, as does the nautilus. The octopus, as you know, shoots backwards in his tank by means of the hydraulic engine with which nature has furnished him. His head is encircled by the same crown of arms or tentacles that you have seen in the nautilus, and even the number of these appendages—eight—is similar, al-



SHELL OF NAUTILUS POMPILIUS.

though the octopus wants the two expanded arms of his shell-bearing friend. In short, you can entertain no doubt whatever that the nautilus is simply a curious cuttle-fish—a kind of far-off cousin to the octopus in fact, and a being which was famed in classic and poetic lore long before Victor Hugo and the aquarium came to make the terms octopus and cuttle-fish "familiar in our mouths as household words."

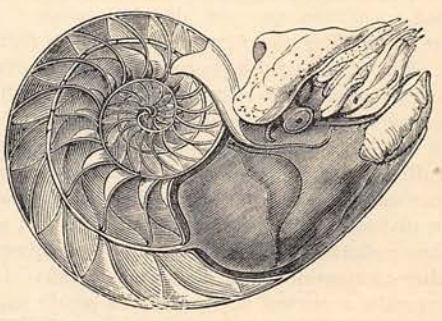
The nautilus—the paper nautilus as we may more properly term it, from the delicate nature of its shell—may, however, be said to have been the unconscious victim of much misconception at the hand of the poet. It was no doubt a pretty and poetic thought that the boat-like shell should have first suggested to man the idea of venturing upon the waves. And some classic naturalist, viewing the two expanded arms, doubtless felt fully justified in assigning to them the function of sails in propelling the living barge over the sea. Equally justifiable would seem the idea that the remaining six arms of slender make should serve as oars; and thus provided, in the eyes of the early interpreter of nature, the sailing powers of the paper nautilus might well be regarded as beyond a doubt. It has long been a grave complaint that science tends to modify and to destroy the poetic sentiment. If by this accusation is meant



NAUTILUS POMPILIUS, SHOWING THE LOWER CELL AND THE PARTITION GIVING PASSAGE TO THE SIPHON.

the destruction of what is erroneous and untrue to nature in the conception of the poet, science must plead guilty to the charge. But it remains a question whether poetry which is untrue to nature is best calculated to enhance and ennoble life; and whether in ridding the world of a false notion, science is not in reality discharging a high and important office as a censor of knowledge. Be this as it may, the fact remains that the popular and poetic ideas which saw in the nautilus a "sea-born sailor" are utterly erroneous and misconceived. Let us begin with the "sails" of the animal—the two expanded arms of the eight it possesses. These appendages, the zoologist tells us, are never separated from the shell, but are kept, on the contrary, closely applied to that structure. But for this support the shell would part company with its possessor, and tumble to the bottom of the sea. Unlike the shell of oyster, snail, or mussel, that of the nautilus is not organically or permanently—that is, for life—fastened to the animal's body by strong attachments, muscular and otherwise. Hence the idea of the arms being detached from the shell is simply a poetic fiction; and so far from the shell serving as a decided protection to the animal, its chief use is that of serving as a kind of "nursery," in which the young nautili in their early development and in their egg-state are sheltered.

Moreover, whatever veil of fiction poetry has woven around the nautilus, it should be noticed that it is the lady argonauts which could alone be entitled to the credit of performing the experiment of navigation just alluded to, since the male nautili are insignificant little creatures, not more than an inch in length, and destitute of the slightest trace of a shell. The repre-



NAUTILUS POMPILIUS, SHOWING THE INTERIOR OF THE LOWER CELL, TO WHICH THE ANIMAL IS FIXED.

sentative of the "sterner sex" is in reality the weaker vessel in argonaut existence, and appears to a decided disadvantage by the side of his partner. The manner of formation of the shell in the argonaut was for long a matter of doubt and uncertainty. A true shell, it may be well to note, is invariably formed by the "mantle" or general skin of the body. And though the limy "bones" of the cuttlefishes—so frequently placed in the cages of canary birds for the sake of the lime they contain—are not in the least like the "shells" we are accustomed to see and recognise, still such is their true nature. They are formed by the "mantles" of the octopus, sepia, and their neighbours, and are thus true representatives of the oyster's covering and of the snail's house. In the case of the nautilus, however, the "shell" assumes a different aspect. It was a lady—Madame Power—who, from observations made upon these cuttlefishes in the port of Messina, settled the vexed question of the nature of the shell. She showed that upon the two expanded arms devolved the work of forming the shell. When broken, it was the arms which repaired it; and thus the shell appears before us as a mere secretion of the arms, and one in the formation of which the body proper takes no part. Nor was this the only debateable point which the shell of the nautilus presented to view. Long ago, it was a burning question in natural history whether the nautilus made its own shell, or whether, like the hermit crab, it crept into the cast-off abode of some other animal. But this question was duly settled by the observation of the nautilus in all stages of its existence and development; and the direct appeal to nature solved this difficulty, as it has elucidated many other and more important problems.

Any further details of nautilus history which might be alluded to in the present instance in reality resolve themselves into a description of its internal anatomy. But for such a digression there exists no need, and we may therefore turn our attention to the history of a second "nautilus," which appears as a candidate for notice in a paper devoted to the brief chronicle of the race.

Besides the nautilus just described, there exists another animal similarly designated, but distinguished from the paper nautilus by the prefix "pearly"—a term likewise applied from considerations connected with the polished and prepared appearance of the shell. The latter is by no means uncommon in its polished condition in our drawing-rooms. Very elegant in truth is the form of the shell, a flattened spiral, with an enlarged body-cavity or mouth wherein reposed its inhabitant—hardly a "tenant at will" as in the case of the paper nautilus. If you press your fingers into this shell, you will find that, instead of being all in one piece so to speak, as in the case of the whelk or snail's abode, your hand will be arrested within a short distance from the mouth by a partition, which completely shuts off this front-room body-chamber from the other compartments of this curious abode. If you were to make a vertical section of the pearly nautilus shell, you would then see that it was divided into numerous chambers coiled in a spiral fashion; each compartment being shut off from its neighbours by a permanent partition. What is the history of such a shell? Simply that of a house which had to be successively and periodically enlarged to suit the growing dimensions of its tenant. Thus in early life, the nautilus inhabited the central and smallest chamber of the spiral. As its infancy progressed, it had to leave the first room of this house, building a second compartment, and likewise making a partition-wall between the disused room and its new apartment. As time passed, this process was repeated again and again; the new chambers which were formed being built in a spiral fashion. If you feel carefully in the centre of the first partition which your fingers alone can reach, you will be able to detect the presence of a small aperture. Through this latter a tube named the *siphuncle* passed in the living nautilus, from the body itself, through the entire series of partitions. The exact function of this tube is still unknown to us. Some naturalists elect to believe that it acts in some way as a hydrostatic apparatus, and enables the nautilus to rise or sink in the sea, after the fashion of those fishes which possess a "swimming bladder;" but others incline to the belief that it serves to maintain a connection—not at all unnecessary—between the disused rooms of the house and the living tenant of its largest apartment.

If the shell of the pearly nautilus is thus essentially a different structure from that of the argonaut—being, moreover, a true shell, in that it is formed by the mantle—no less widely different is its possessor, not merely from the argonaut, but from all other living cuttlefishes. Thus the pearly nautilus—still a rare animal in our museums—has numerous arms, but no suckers; other cuttles have suckers, but never more than ten arms, as one may see by counting the arms of the common squid, so often cast up on our coasts, and which every fisherman prizes as a bait. Then, also, the pearly nautilus possesses no ink sac, wherewith the other cuttles darken the water and make their escape from impending danger and threatening foes. And in respect of its gills it exhibits a superiority in number, in that it possesses four of these organs, whilst its neighbours have but two. Like "the last of the Mohicans," the pearly nautilus remains as the sole representative of a cuttlefish family once widely diffused in the seas and oceans of this world. The shells, not merely of the nautilus itself, but of its extinct companions—of which the best known are the ammonites—are found plentifully in a fossil state in many of the oldest rocks as well as in more recent formations. But of these latter matters, connected with the past history of the cuttlefish race, it is the geologist's business to speak. For the present, we may close this record of cuttlefish character in some of its less familiar aspects; but those of our readers who may be tempted to stray further into such pastures zoological, may be certain that there are few more interesting questions, and few which contain more important considerations in the answer, than that with which we began our recital—"What is a nautilus?"