

FROM EARLIEST TIMES MEN HAVE LOOKED ON THE SEA WITH FEELINGS OF AWE. ITS VAST EXTENT AND ITS RESISTANCE TO THE WORKS OF HUMAN HANDS SEEMED SO WEAK AND FRAGILE—MADE IT A TYPE OF THE INFINITE AND THE ETERNAL, WITHOUT BEGINNING OR END. ACROSS ITS TRACKLESS WATERS LAY SAVAGE TRIBES, WHILE IN ITS WATERS LIVED BEINGS UNLIKE THOSE OF LAND OR RIVER; VAST, MISHAPED MONSTERS, THAT HAD NOTHING IN COMMON WITH THINGS OF EARTH, BUT SEEMED TO BELONG TO ANOTHER WORLD.

Long before the Christian era the Psalmist had voiced this feeling when he said: "They that go down to the sea in ships, that do business in great waters, these see the works of the Lord, and His wonders in the deep." And doubtless the wonders lost nothing in their narrative by those who saw them. The seafaring folk magnified the terrors of their calling, possibly to detour the competitors, as well as the natural features of the ocean became personified by the poets until its gods and goddesses, mermaids and sirens, demons and monsters were as familiar as the fabled deities of the land. When the Olympian mythology was abandoned, and nymphs and satyrs no longer haunted the forest or stream, the sea remained a home for the "powers" of the deep, and the credulous sailors, and probably delayed the discovery of America.

The vessels of the middle ages made voyages to Britain and the Canary islands; they crept along the coasts of Africa and Asia while the Norsemen skirted the Arctic ice sheet and reached the Western continent, but in general these were the exploits of hardy adventurers who found few followers. Beyond the limits of the known world was still an unknown region filled with terrors, a forbidding waste, accursed of God, on which it was almost impious to trespass.

The voyages of Columbus and his successors destroyed most of these old-world notions, so that the most superstitious old sailor would laugh at them, and yet there are some of these sailors' tales that, when divested of obvious absurdities, are accepted fully or rejected totally in the present state of knowledge. There is a sort of "survival of the fittest" in these stories, and the duty of science is to cull the true from the false, and to discard the rest as the result of ignorance or careless observation may have erected a marvelous structure.

A Long-Lived Belief in Sea Serpents. Among the stories that are still current are those relating to the sea serpents, great monsters of snake-like shape that are said to have been seen in various parts of the world. Belief in the existence of such beings goes back to the early Norse writers, and in his "History of the Northern Races," published in Rome in 1846, the learned and pious Olaus Magnus, archbishop of Upsala, devotes a chapter to them. According to the worthy archbishop, one of these serpents was 200 feet long, twenty feet thick, and appeared "like a pillar" when it raised its head in mid-air. This was truly a formidable animal, but one that modern naturalists would have been unable to identify—a difficulty that is shared by many others that have been described since the days of Pallas.

The accounts of strange monsters that have been encountered from time to time are usually so distorted and exaggerated as to have invested the whole subject with an atmosphere of doubt, and serious observers are unwilling to report things that they may see, because of the ridicule that is apt to follow "seeing the sea serpent."

As long as the only accounts of the wonderful creatures came from ignorant sailors and credulous landmen, there was good reason for rejecting them. The effects of light and shade on the heaving waters give rise to optical delusions that may deceive the most experienced observer. There are many things, animals and plants, that may resemble a vast serpentine shape when viewed from a distance. These appearances, joined to a prejudice in favor of the serpent that may exist unconsciously in the mind of the spectator may produce false statements, in spite of the most honest intentions. A natural love of publicity and notoriety doubtless underlies many of these stories and produces exaggeration, even where the whole account is not fabricated, but numerous reports have been made that cannot be dismissed in such light fashion. Experienced seamen, such as captains of ocean liners and naval officers, men of education, familiar with all the changing aspects of the waters, have made detailed statements that are as worthy of credence as would be official reports on any other subject, and it is unscientific in the extreme to refuse to believe them because they tell of unfamiliar things.

Authentic Cases of Marine Monsters. In the London Times of October 10, 1848, appears a communication, dated Plymouth October 7, stating that the Daedalus, frigate, Capt. Patrick McQuhar, had just reached that port from the East Indies. The correspondent went on to say that while the vessel was between the Cape of Good Hope and St. Helena the captain and most of his officers saw a great sea serpent that passed under the quarter and remained in sight for twenty minutes. The animal held its head about four feet out of the water and about sixty feet of its length stretched along the surface, while a portion seemed estimated to be thirty or forty feet long was under water. Its jaws were full of teeth and opened widely enough for a man to stand erect between them. At the time this was seen the ship was sailing north at eight knots. On the day following the publication of this letter, the admiral called upon Capt. McQuhar for an official report, and this formal statement appeared in the Times on October 14. By the report it seems that on August 6, 1848, at 5 p. m., the Daedalus was in latitude 33 degrees 41 minutes south and longitude 2 degrees 22 minutes east, when the serpent, as reported by Mr. Sartoris, a midshipman, and by him was reported to Lieut. Edgar Drummond, officer of the watch, who was walking on the deck with the captain, master, and the admiral's permit to be published in the Illustrated London News of October 22, 1848.

given corresponded closely with that of the monster seen by Capt. McQuhar, and it may have been the same.

A Huge Monster. The Graphic of June 20, 1877, contains a report of a monster seen by Lieut. W. P. Hayes, of H. M. S. Osborne, off the northern coast of Sicily on June 2 of that year. It was first seen as a row of fins of irregular heights, and in a line some thirty or forty feet long. It was discovered from the ship about 200 yards, "away on our beam," when first seen, and then turned and made off. It had a broad back, fifteen or twenty feet across, a "bullet-shaped" head, probably rounded through supported on a narrow neck. Broad flappers, fifteen feet long, paddled it along by a rotating movement, and it made about ten and a half knots per hour. "It was partly out of the water, and from the top of the head to the line of immersion measured some fifty feet; that was estimated to be a third of its length. The report was illustrated by drawings made at the time. It is needless to multiply instances, and those cited are not specimens of the reports that should carry some degree of conviction. These men saw something uncommon. What it was is a matter for further research. When Bruce published his work on Abyssinia it was greeted with incredulity and its author denounced in terms of unmeasured abuse, but the calculations have been made ridiculous by further exploration in Africa, and their ignorant pedantry should be a warning against refusing to believe what is not a common experience. True as this is in general, it is particularly true where the fauna of the sea is concerned, for so little is known of it.

Difficulties of Oceanic Research. The practical difficulties of oceanic research are such that our knowledge of the abyssal depths can increase but slowly, and despite the efforts of the past half century the specimens in our museums are "like the few stray bodies of strange red men that tradition reports to have been washed on the shores of the Old World before the discovery of the New, and which served to indicate the existence of unexplored realms, inhabited by unknown races, but not to supply information about their characters, habits and history" (Edward Forbes). At least one-half of the deep sea forms known at present are represented by single specimens, and of these some are in such condition as to make careful study of them almost impossible. The pressure of deep water is tremendous, and many of the beings that live in it have soft bones and loose, flabby tissues that are apt to be torn or badly mutilated by being dragged in a rough sea through, perhaps, miles of water. If this danger is escaped the lessening of the pressure as the surface is approached produces great changes as the soft tissues expand so as to distort the animal out of semblance to its original form. At least one-third of the specimens are in such a condition as to make careful study of them almost impossible. The pressure of deep water is tremendous, and many of the beings that live in it have soft bones and loose, flabby tissues that are apt to be torn or badly mutilated by being dragged in a rough sea through, perhaps, miles of water. If this danger is escaped the lessening of the pressure as the surface is approached produces great changes as the soft tissues expand so as to distort the animal out of semblance to its original form. At least one-third of the specimens are in such a condition as to make careful study of them almost impossible.

Seen but Never Captured. Many of the inhabitants of the depths are too large, too swift, too wary or too cunning to be taken by our nets or dredges, but from time to time specimens of these are cast ashore by storms or are found dead on the surface. One of these has never been captured by an exploring ship in the Regalecus, or oar fish, usually from eighteen to twenty feet long. Prof. Gunther, of the British museum, gives a list of forty-four that have been seen by naturalists, but this number that have been actually stranded. It is widely distributed and has been sighted in every part of the world. In color the Regalecus is silver gray with spots or streaks of darker tint. Its head is oblong and the mouth is vertical, not horizontal, as usual. The fin on the back makes an elevated crest that is sometimes divided into two parts, and the two vertical fins expand into blade-like tips at the extremities. It can be seen at once that this fish when swimming at the surface will present most of the features ascribed to the "serpent" when allowance is made for exaggeration. One of these animals came ashore at Hungry bay, in Bermuda, in 1880, and although but seventeen feet long, it was described as much longer by those who saw it before its capture. They also said that it had a head that was an immense horse, and a mane that was flaming red. This latter feature was the dorsal fin and doubtless the vertical fins that had been "tappers" seen by Lieut. Hayes from the Osborne.

An Absurd Mistake. Not all of the tales of the sea serpent are so well sustained as those based on the Regalecus, and absurd mistakes have been made by enthusiasts. In 1831 an alleged sea serpent was seen off Gloucester, Mass., and an investigation was set on foot by the Linnaean Society of New England. After a while a curiously shaped reptile was taken that the committee proposed to be the young of the monster that had been seen, and gave it the name of "Sceloporus atlanticus." The report was prepared by Amos Story, and was published by the society, but it subsequently developed that the young sea serpent was a common blacksnake with a ratchet spine. The society could not survive the derision with which this report was greeted, and soon found an ignominious death.

It is notoriously difficult to prove a negative, and it is especially so when little is known of the real facts. For this reason it is impossible to assert positively that no such animal as the sea serpent exists, although no specimens are to be had. Its existence is far from convincing. The mere fact that it has not been captured is no sign that it may not be found, as there are other aquatic animals that are known, although no specimens are to be had. Its existence is far from convincing. The mere fact that it has not been captured is no sign that it may not be found, as there are other aquatic animals that are known, although no specimens are to be had.

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There is a vast amount of material that has been left nothing but their footprints. The Connecticut valley is rich in the footprints of some great organisms of which no other trace remains. If such was the fate of organisms in remote geological eras, it may be the same with those of today. From what has been definitely ascertained about the fauna of the sea the probabilities are against the existence of any such monster as the sea serpent, but further than this it is unsafe to go without more light than can be had at present. It is true that rolls of sea weed, logs and other bits of the fotsam of the sea have been mistaken for a vast serpent until investigated. It is also true that a school of dolphins plunging and diving in single file will stimulate a reputation for sea serpents, but these do not explain all of the reported phenomena. In other cases a single gigantic cuttlefish or squid was the basis for the reported monster, and some of the highest authorities deny the possibility of there being a sea serpent at all. It has been suggested that some huge animal, partly serpent and partly fish, such as the Ichthyosaurus, may linger in the depths of the ocean, but this is more supposition. This ocean mystery still needs many clues before it can be solved. Lava Beds of the Great Northwest. A wide waste of gray and black denudation would best describe these lava beds as seen from the crests of any one of the myriad waves, hummocks, or ridges which everywhere project in the

JUPITER'S RED SPOT A GREAT MYSTERY. Peculiar Markings on the Surface of the Big Planet.

NO ONE UNDERSTANDS THEM. Some Observers Say It Shifts Its Position—Others Think It Due to a Rift in the Clouds.

BY far the largest and most perplexing marking on Jupiter is the "great red spot." It is roughly estimated to be thirty thousand miles long and several thousand miles wide, is pointed at both ends, and lies parallel with and just south of the southern equatorial dark belt. Its mysterious power of repulsion, it has created a deep indentation in the margin of the belt, so that a wide boundary of brightness is interposed between the edge of the cavity and the spot. When the great red spot was discovered, in 1672, it had a fairly well defined outline and a salmon pink hue. During the next two years it gained in distinctness, and its color deepened to a rich red. Then it began to fade, and at that time to present its visibility and tint have undergone many fluctuations. At times the spot has almost entirely disappeared, and then it grows in distinctness. When near the minimum of visibility it appears only as a very faint ring of pink, the central portion being white or gray. There are perceptible differences, too, in the ease with which the two ends can be distinguished. In 1887 the spot almost completely disappeared. Stanley Williams, a well-known English amateur, reports in "The Observatory" for July that within the last few months there has been a distinct revival. Its color is now a more intense pink and is almost uniformly distributed, although the front end seems to be a little paler than the rear. Mr. Williams adds that, whereas in 1888 the spot appeared to have gained on the adjacent cavity in the southern belt, and to have fallen behind in 1890, it is now in about the normal position. Two or three years ago observers called attention to the fact that the equatorial bright zone possessed a rich orange yellow color. Mr. Williams says the zone is now white. In 1899 the southern dark belt had a deeper reddish hue than the northern, but now the conditions are said to be reversed. The color of both is that of iron rust, and differences between the two dark belts in the plenitude of small dark or white spots, protuberances from the edges, diagonal rifts and other minutiae are observed from year to year, and it has been suggested that there is a temporary revival in the rotational velocity of certain regions, but on this point there is no agreement among the authorities. It has also been asserted that in these manifestations of activity there is a periodicity like that in the abundance and size of sun spots.

The nature of the great red spot, which is just now increasing in visibility, is yet a mystery. Jupiter is believed to be in a state of half way between that of the earth and the sun. Since it was detached from the latter in the formative period of its history it has cooled down a great deal, of course, yet it is probably a molten state. Partly because it is so hot, and partly because it appears to be pretty well clothed in clouds, it is thought that it has ceased to shine by its own light. Mr. Mauser expressed the opinion a few years ago that the vapors that envelop Jupiter would exhibit a surface of uniform redness like that of the big spot. And Mr. Barnard remarked in 1892, just after a temporary revival in distinctness, that the phenomenon seemed to him to be a shifting of an overlying but very thin veil. There was a disposition fifteen or twenty years ago to suppose that the spot was a new-born continent, lifted above the level of the adjacent territory by some internal force. But if, as Mr. Williams thinks, the spot shifts its position, that theory would be untenable. On the other hand, if one imagines that he is merely looking down through a hole in the clouds, it will be necessary, as Mr. Mauser has pointed out, to explain why that framework remains so nearly stationary, and so unchangeable in form. For the present the problem is insoluble.

The markings on the surface of Jupiter, which undergo more or less change from time to time, are unique in many respects. When we look at Mars we probably see the solid material composing that ruddy little orb, whereas Venus and Jupiter are supposed to be clothed in cloud shells which cannot easily be penetrated by the human gaze. But the markings on Venus are irregular in their distribution and exceedingly faint. Those on Jupiter are more systematic and striking, although their significance is far from being fully revealed. In the first place, there is a general arrangement of bands at right angles to the axis; a broad equatorial bright zone, a darker belt on each side of it, and then in still higher latitudes the northern and southern sub-tropical bright belts, bounded more or less distinctly by an extension of the darker polar regions.

The tendency of Jupiter's envelope to arrange itself in stripes is readily explainable by the inequalities in the planet's rotation. A patch near the equator goes around once in about nine hours and fifty minutes, whereas in higher latitudes more than five minutes additional are required. A difference in speed of one in 120 is enough to draw out any plastic material like the planet's cloud-filled atmosphere into belts in a very short time. Even the much smaller inequalities which are observed further away from the equator operate in the same manner, though more slowly.

The broad general features just referred to can be discerned with small glasses, but in stripes are readily explainable by the inequalities in the planet's rotation. A patch near the equator goes around once in about nine hours and fifty minutes, whereas in higher latitudes more than five minutes additional are required. A difference in speed of one in 120 is enough to draw out any plastic material like the planet's cloud-filled atmosphere into belts in a very short time. Even the much smaller inequalities which are observed further away from the equator operate in the same manner, though more slowly.

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