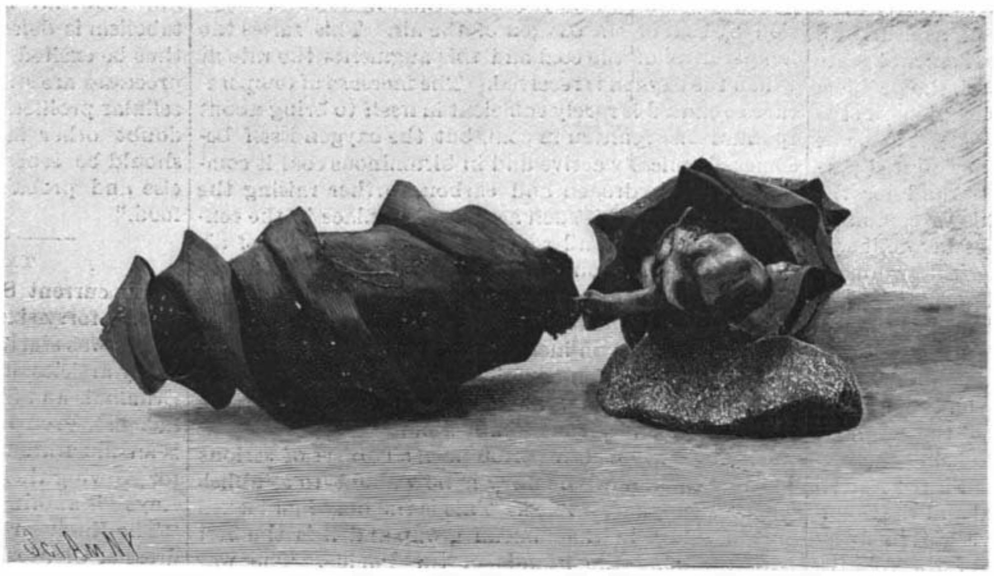
MIMICRY IN THE EGGS OF FISHES.

BY CHARLES F. HOLDER.

The study of the protective resemblances among animals is a field of no little interest, well illustrating the marvelous devices of Nature for the protection and perpetuation of life.

This is well shown in the eggs of fishes, which seem, in some instances, to be almost endowed with a special sense, enabling them to avoid their enemies and reach the seclusion necessary to their safety.

The accomplishment of this is attained by a remarkable imitation on the part of the egg, or egg-case, to plants of their various parts. An interesting, indeed striking, example of this is seen in the accompanying illustration, which shows the egg-case of a peculiar shark and an egg-case broken, the young shark being in the act of escaping. The shark which produces the egg is a member of the Castracionidæ; about twenty-five genera being known, of which twenty-two possess a special interest to geologists as having lived previous to the oolite. But a few years ago the fish was only known by fossil forms, but finally a living specimen was caught at Port Jackson, Australia, showing that this "ancient and fish-like form" had endured until to-day. Another specimen was soon discovered in the waters of California and described as Gyropleurodus francisci, the singular shark whose egg-case is figured. It is a small fish, rarely over three feet in length, beautifully marked, having a horny spine in front of each dorsal fin.



EGG OF THE SHARK, SHOWING THE YOUNG EMERGING.

The shark is a sluggish creature, often seen lying asleep or dormant in crevices in the rocks, and occasionally caught in seines.

The eggs are deposited in a black or dark case which takes the form of a perfect spiral, and looks exactly like a leaf of kelp or weed folded up, imitating the weed not only in form and shape, but in color. This is deposited by the shark amid the kelp beds, where it clings to the leaves by the edges of the spirals, and is thus prevented from washing ashore. A more perfect mimicry it would be impossible to imagine. When the young shark attains its maximum size within the egg, it bursts open or forces the end of the pseudo leaf and swims away to become the victim in many cases of predatory fishes. Another shark on the Pacific coast has an equally remarkable egg. It is dark, barrow-shaped, with four long tentacle like handles which grasp the surrounding weed, and cling to it; not merely preventing the egg from floating ashore, but presenting a perfect case of mimicry, the egg resembling a leaf so perfectly that it is often passed by by the closest observer.

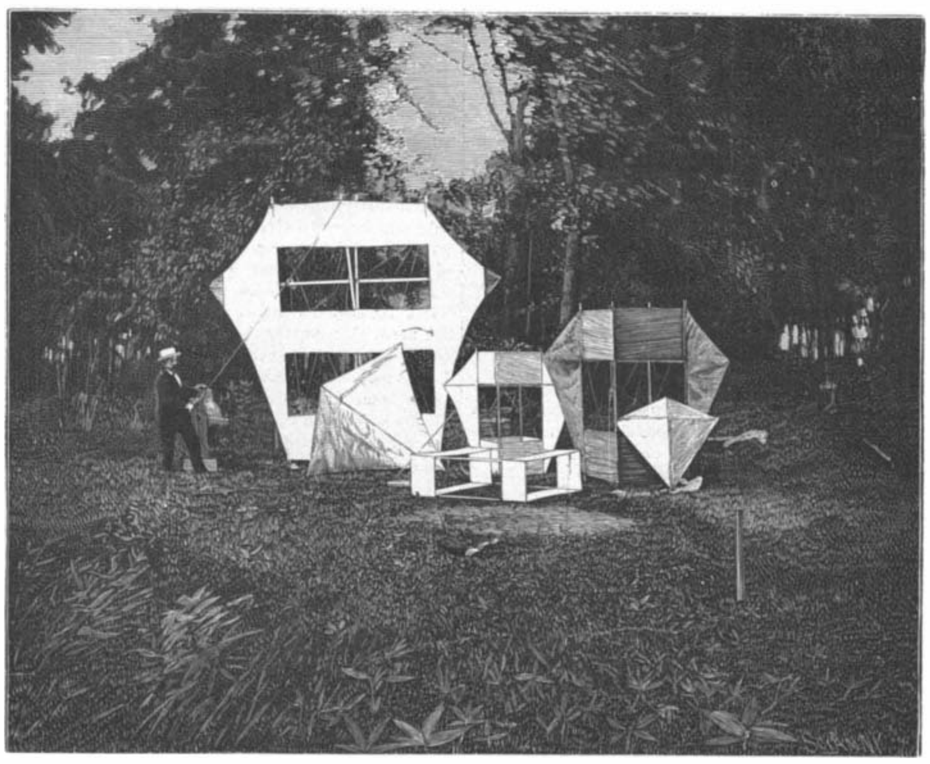
Many of the eggs of fishes are almost invisible, and float upon the surface. Those of the remarkable fish Antennarius dot the leaves of the kelp, minute white balls, which are taken by the novice as some interesting lime-secreting animal. The long, grape-like, conspicuous eggs of the hag fish are found among the kelp in certain localities and bear a remarkable resemblance to the floats of the weed, and in this manner escape detection. Many of the egg-cases of sharks illustrate the efforts of Nature to protect her own. Some are adorned with barbels that resemble the small leaves of the sea weed in which they are deposited, and all have the exact tint and color of the objects about them.

SCIENTIFIC KITE FLYING.

For several years past, the making and flying of kites upon scientific principles has been recognized by many amateurs. We have already on several occasions illustrated the Eddy kites and the experiments of Lieutenant Wise and Mr. Hargraves are also well known. Both the Eddy kite and the box kite have great efficiency, but Mr. Warren H. Smith, of Pontiac, Mich., writes us that he has devised a square box kite which is superior to either. Mr. Smith's box kite has the flying bridle on one corner and has its flying surface greatly increased by a pair of fixed triangular wings, thus making the entire width somewhat greater than the height of the frame. The first kite of this sort was only 30 inches high and 38 inches wide, with the wing piece bent back to a depth of bow equal to one-tenth of its length, the wings presenting a convex surface to the air. The covering was light paper and the frame cover weighed but a few ounces. Experiments showed that even this small kite had good points for either single or tandem flying. Flown in tandem with two moderate sized Eddy kites at an elevation of 1,500 feet, the main line was carried up at an average angle of forty-five degrees, and sometimes as much as seventy degrees. This kite was, of course, too frail for anything but a gentle breeze.

The next kite was built of solid wood sticks, and the cells were covered with manila paper, and the wings had a spread of 4 feet. This kite weighed one pound and did fully as well as the first. It presented 12 feet of flying surface and had a pull varying from 3 to 6 pounds in a moderate wind. Later in the season kites 4, 5, and 6 feet in height were built, and they were covered with paper or cambric, cloth being more suitable for high velocity. The largest two-cell kite was 7 feet high, and weighed 6 pounds. This kite was flown many times singly, and in tandem with lighter ones. In a breeze blowing 12 to 15 miles an hour, the tension was from 20 to 30 pounds. The last kite of the season measured 14 feet from wing to wing.

There were three cells, one at the top, one at the bottom and one midway between the other two, each cell being covered with a strip of cambric two feet wide. The whole structure was stiffened by many diagonals of heavy twine, and it weighed 15 pounds, and presented a flying surface of 170 square feet. This kite was flown with a 3-16-inch rope, running from a windlass. The kite rose steadily, flying at a high angle until over three-quarters of a mile of rope was reeled out. It was in the air continuously for six hours, and reached an altitude of nearly 2,000 feet, and proved very efficient. The only difficulty in handling resulted from the great tension of from 100 to 150 pounds, and the inefficiency of the reel to withstand a heavy strain. Mr. Smith's conclusions are that, in general, it is better for each kite to be attached to the main line by its own string, 100 feet or more in length, as it will then fly at the most effective angle. Kite flying is an interesting and exciting sport, and doubtless many amateurs will make kites this winter for use during the spring and summer.



VARIOUS TYPES OF MODERN KITES.

Elevator Air Cushions in a High Office Building.

Even with all the experience and skill which have been devoted to the study of elevator safety appliances, with the best material and workmanship, with the most rigorous and continuous systems of inspection, and with competent persons in charge, yet passenger elevators sometimes fall and cause more or less serious accidents. The manufacturer of elevators uses the best and most efficient safety devices he can obtain to control the movement of the car and to surely arrest it if a certain speed should be exceeded. The very nature of his business compels him to do this, because the result is financial embarrassment to him if his elevators drop occasionally. This applies with equal force to owners of buildings, who would have difficulty in securing tenants if the elevator apparatus were suspected of being dangerous. Many even go beyond the purely mechanical device and introduce a pneumatic arrangement as a last resort, only to be brought into action when all else fails.

The air cushion, located at the bottom of an elevator shaft, possesses peculiar inherent advantages which cannot be gainsaid. First, and most essential, it is always ready to perform its work instantly, and to do it successfully, under all conditions. Of itself, it cannot get out of order, since, practically, it is only a hole into which something may drop, some time. Whether the car dropped one or twenty stories, its movement would cease, not suddenly, but gradually, and without shock. The first cost of the air cushion is small and the outlay for its maintenance nil. It occupies space not otherwise valuable. All things considered, it is difficult to understand why it is not more widely employed.

One of the most extensive and elaborate applications of the elevator air cushion is to be found in the Empire building, New York. The building is a twenty-story office building, recently completed, and provided with all the most modern appliances and conveniences. There are ten elevators, of the high speed hydraulic type, arranged in two groups of five each. While nine of the elevators are distinctly for passenger service, one is more powerful and is capable of lifting safes weighing 8,000 pounds. Each shaft is entirely independent from the floor of the third story to the bottom, and is inclosed by walls which are not perforated except by the door openings. This forms the air cushion proper, which is about 50 feet in depth. The doors of the main floor and of the second floor are in two parts, which slide in recesses in the wall. These are of bronze and of ample strength to resist the air pressure that would come upon them if a car should fall. The usual open iron work is entirely absent on these two floors, solid masonry replacing it. The cars have also been strengthened with the view of resisting this pressure. The shaft walls are battered for a short distance below the third-story floor. The shaft at this point is 10 inches wider than the bottom, the batter extending just below the second floor. This provides a graduated air escape and adapts the cushion to any fall which the car may make. The car fits more closely in the lower portion of the shaft, the walls of which are vertical. It has been estimated that the air cushion should be in proportion of 1 to 6 of the travel; in the present instance the cushion is 50 feet and the travel 287 feet. In the bottom of each shaft is a suction valve which opens inwardly as the car ascends, thus preventing the vacuum which would result from the car leaving the cushion. There is also an escape valve, which opens outwardly into the atmosphere. It is so adjusted as to sustain the weight of a car under ordinary conditions, but will, in case of accident, relieve the cushion of undue pressure when the car falls. It has been calculated that the pressure in the air cushion, if a car should fall from the top, would be 3½ pounds to the square inch.

On July 18, a car weighing 2,000 pounds was dropped from the twentieth story. The efficiency of the cushion was shown by the fact that the eggs and incandescent lamps carried upon the floor of the car were uninjured.—Iron Age.