FISHES OF THE MALAY ARCHIPELAGO.

Although New Guinea and the Moluccas are the countries of natural wonders, the seas which surround and separate them contain the strangest and most interesting forms. In the lower depths of these coral seas, the most beautiful fishes sport in the blue yet transparent water, and cause their lace-trimmed, diapered robes to shine and sparkle, and their scales to glitter under the ardent rays of the sun.

Among other points in New Guinea, the harbor of Dorey seemed at the time of my first voyage, in 1877, peculiarly favored in this respect. There did not a day pass in which my little squad of youthful fishermen (all the children of the village, excited by the bait of glass trinkets) did not bring me some fish that was new to me; and I soon collected a large number. Being at this time disabled, through fourteen wounds on my right leg, that condemned me to keep to a forest house for more than six months, while Mr. Raffray was successfully exploring the W. Schonten and Amberbak islands, I found it a diversion to direct this little maritime station. Not satisfied with collecting the fishes, I applied myself to keeping them alive (if only for a few hours), in order to make rough colored models, ~~capable of~~ recalling those brilliant colors that cannot be preserved after the death of the animal.

Dr. Vaillant, professor at the Museum and custodian of these models, has recently had the goodness to send them to me; and, thanks to him, I have been enabled to have Mr. Clement figure two of the inhabitants of the seas of Papua, one of which is more remarkable than all the others, by reason of its odd form.

In 1767, Commerson founded the genus *Zanclus* (a word of Greek origin, meaning pruning knife) for the singular fish shown in the lower part of the engraving, and gave a description and very accurate colored representation of it. Seba had already figured it, and there are few authors who have not reproduced the image of it.

This fish is none the less remarkable by reason of its color than by that of the round and compressed form of its body, and of the little snout, at whose end the mouth opens, and of the long appendage to the dorsal fin.

The ground of its livery is yellow and white, with three wide black bands. The first of these latter extends from the back to ~~the ventral fin~~ (which also is black), and is provided with a white line over the eye and two parallel white ones near the ventral fin.

The second black band extends from the center of the last ray of the dorsal fin up to the anal, which it almost entirely covers, and is traversed longitudinally behind by a fine white line that continues more or less uninterruptedly up to the external edge of the anal fin. From the tail detaches itself the third of these black bands, and the white extremity of this forms a crescent, which is externally bordered by gray.

Between these black bands there are large yellow areas. Between the first black band and the yellow there is a long white stripe that covers a portion of the dorsal fin, and that joins or blends with the white tint of the belly. A white band also is to be seen near the last black one, or, more properly, the tail is white and is traversed by a wide black band.

The entire front portion of the fish, the snout included, is white; but the lower jaw is black, and upon the upper one there extends on each side an orange-colored triangle, circumscribed with black—the black border running to the orbital horns. The eye is of a sepia brown, with a black pupil.

Such were the colors of the specimen that I painted at Dorey in April, 1877. The colors as given by Cuvier, from a painting of Commerson's, and from quite fresh alcoholic specimens collected by Lesson and Garnot, are about the same as those noted above, and show that this fish has always been well known. Mr. Vaillant has had the goodness to send me likewise a model made in the Sandwich Islands in 1874 by Mr. Ballieu, the French consul, and in which may be quite well seen the fundamental tints of this fish. The specimen that I painted in New Guinea wanted the long filament that terminates the dorsal fin. Mr. Ballieu represents this appendage as yellow fringed with black.

The scales, which are vertical, narrow, and short, lie very close to each other, and are so small that they give the body a rough appearance, somewhat like that of shagreen.

The little points or horns that project above the orbits have given this fish the specific name of *cornutus*. But in its native country the fish has many other names. The Mafors call it *inn acis*, "comb fish," on account of the arrangement of its dorsal fin, which is high and narrow, and somewhat resembles the wooden fork with which these Papuans comb their bristling hair. The Dutch colonists of the Moluccas know it under the name of *besant*, since the discoidal form of its body makes it resemble the piece of arms known under that appellation in the heraldic art; and the same Dutch call it also by names signifying "the pikeman," "trumpet," and "ensign bearer."

Renard calls the *Zanclus*, *Moorse afgodt*, "idol of the Moors," and *apropos* of this says that the Malays have a great fear of the fish, based upon a superstitious veneration. So they make haste to throw into the sea every fish of this species that happens to be taken in their nets, and this, too, with many marks of respect and many genuflexions.

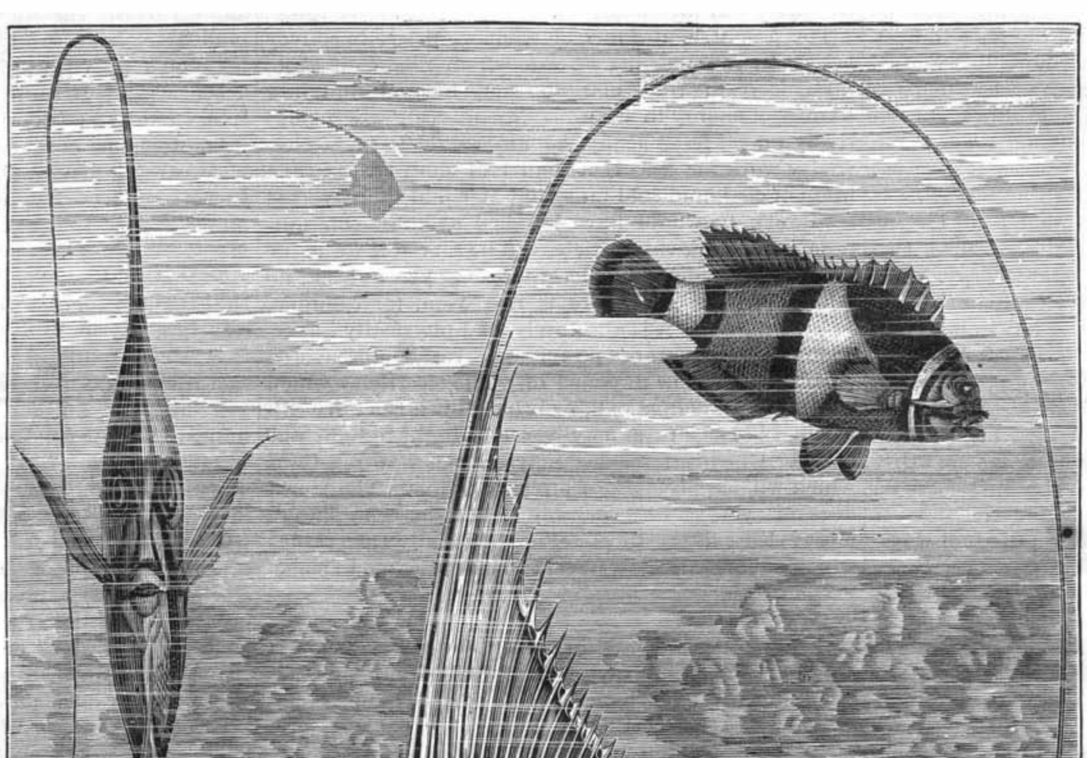
On another hand, the flesh of this fish appears to be much esteemed, and in taste approaches that of the best pleuronectes. Ruysch even says that in Amboyna no banquet or fine meal is given at which these fish are not served. We have here a sea divinity that is variously appreciated.

The *Zanclus*, without ever reaching a very large size, weighs at times as many as 18 pounds. It is met with from Mascareignes up to the Pacific islands of Tonga-tabou, Vanicoro, and Sandwich.

Two other species of it are known, that inhabit the same regions; and one fossil form has been described by Agassiz.

The small fish figured at the top of the engraving belongs to the genus *Amphiprion*. Cuvier and Valenciennes have given it the specific name of *tunicatus*, and in their great work we find a faithful image of it taken from specimens collected by Lesson and Garnot at Vanicoro. The individual that I painted at Dorey was of a beautiful red-lead color, with black bands circumscribing three areas of light blue. The first blue band formed a half circle on a level with the gills, and the second, or central one, was larger and triangular, and ran point-wise toward the pectoral fin. A wide black blotch occupied the back and extended from the first blue band to the first half of the dorsal fin. The third blue band, which also was bordered with black, was situated behind the dorsal and anal fins. These latter, as well as the caudal ones, terminated in a rose-colored band.

The genus *Amphiprion* is represented in New Guinea by numerous species, that vie with each other in brilliancy. In size, they are always small. These pretty little fishes live amid corals and in holes in madreporic rocks. Sporting or pursuing each other with vivacity, they are often surprised by the falling tide, and have to continue their frolic in small puddles of water until the rising tide carries them away.—*M. Maindron, in La Nature.*



THE PRUNING KNIFE FISH (ZANCLUS) AND OTHER FISHES.

To Tell the Age of Eggs.

We recommend the following process (which has been known for some time, but has been forgotten) for finding out the age of eggs and distinguishing those that are fresh from those that are not. This method is based upon the decrease in the density of eggs as they grow old.

Dissolve two ounces of kitchen salt in a pint of water. When a fresh laid egg is placed in this solution it will descend to the bottom of the vessel, while one that has been laid on the day previous will not quite reach the bottom.

If the egg be three days old it will swim in the liquid, and if it is more than three days old it will float on the surface, and project above the latter more and more in proportion as it is older.—*La Nature.*

Simple Millinery.

The Audubon Society and individuals interested in the protection of birds have for some time protested against the slaughter that is going on to supply the demand created by the fashion in ladies' hats. It was thought to be an easy matter to at least lessen the practice of shooting singing birds for the market, as it is in clear violation of the statute. But it seems that singing birds are not wanted at all for ladies' hats; that the many varieties of snipe are most in demand, gray being the fashionable color; and that neither for export nor for home use are song birds now shot. This puts a different aspect on the matter, for snipe being game birds, it is not illegal to shoot them in season; and so far as cruelty is concerned, of which so much has been said, it is not more cruel to shoot birds for decorating hats than it is for the table. There are over fifty varieties of snipe that visit the Long Island shores,

Sources of Power.

In the older treatises on mechanics we find the sources of power classified under the heads "Wind, Water, Steam, Animals;" and, broadly speaking, these are still the only sources of power we possess. But when we deal more in detail with the subject, we find that wind, in all probability, owes its capacity for performing work to the sun, while water is absolutely inert save as actuated by gravity, and steam is, of course, merely an agent by which heat is converted into work. Concerning the methods by which animals perform work, we are entirely ignorant, no physiologist having as yet succeeded in tracing the sequence of processes by which food is converted into mechanical energy. Enough is known, however, to show that the process has nothing in common with that by which work is performed by heat engines. So that the analogy sometimes drawn between a man and a machine must be rejected as far-fetched, permissible to the poet, indeed, but not to the philosopher. Furthermore, it is known that the work got out of food by men and animals is much greater, on the whole, than can be obtained from fuel consumed in the best steam engines. That is to say, a man or a horse may be more economical sources of energy, in one sense, than any machine. Be this as it may, it is sufficiently evident that we depend for the performance of all the work done in the world on two main sources of power—heat and vital energy. The action of gravity, it is true, causes the falling of water, and so gives out power; but the water has to be raised before it can fall, and this raising is effected by the heat of the sun, which evaporates moisture, and so indirectly gives us clouds and rain.

It appears to be not unreasonable that men should ask themselves now and then if there are no other sources from which power may be derived—is there no other force of nature that can be made the slave of man? The question has been put in hundreds of ways, and remains unanswered.

In dealing with this question of sources of energy, it seems to be not impossible that a misapprehension of the nature and bearing of the laws of the conservation of energy may do a great deal of harm. It may be said, for example, that it is quite useless to search for a source of energy which can be better or more economical than we have now, and much more to the same effect. But let us ask ourselves what is this law of the conservation of energy, on what is it based, and what would be the consequences to the universe if it did not exist? Such questions are very seldom asked, because the number of men who are at the pains to think for themselves is small. But when they are asked, the answer is remarkable. There is really no reason at all why energy should be conserved, and so far as our senses supply evidence, far from being conserved, it is being profusely wasted every day. Of course, if we go a little behind the evidence of our senses, we find that the waste is only apparent, not real. It is much easier, however, to form an idea of a universe in which the law of the conservation of energy has no existence than it is to realize a fourth dimension in space, or even the life of the inhabitants of Flatland. As a help to the realization of such a universe, we may point to the fact that the sun has been giving out energy for millions of years, and that there is no reason whatever to think that he has lost any portion of his original heat. In other words, it is simply impossible to prove that what we call energy is not created in the sun.

Again, let us take gravity. We have here the most stupendous force in nature. There is no reason to imagine that it is capable of degradation. If all the planets fell into the sun, gravity would of necessity have performed an enormous amount of work; but no one can say that after it was done gravity would be any weaker. It may indeed be said that the law of the conservation of energy has only just missed being disproved, if the words "conservation of energy" be used in one sense. So far as can be seen, there is no reason why the line of magnetic force should not behave like lines of electric force or heat force, and admit of being intercepted or stopped. It would then suffice to put a permanent magnet under one end of a beam, the other end of which should be connected in the usual way with a crank and flywheel. Then by interposing and withdrawing a thin intercepting plate at the proper intervals, we should have a machine which should work steadily until it was worn out, without the expenditure of one farthing for fuel. In the popular sense of the word, we should create power; and the perpetual motion men would spend their lives in patenting details, while the principle would be public property. Has any one the least idea why magnetic force lines should traverse every known material? Can any one assert that if this was not the case the existence of the universe would be impossible or even difficult? Can any one assert with certainty that no means will ever be found for intercepting or dissipating magnetic rays, without expending energy in doing so? Finally, is it not possible to obtain some idea of the cause of magnetic force from this very peculiarity of its behavior? To put an extreme case, it may be urged that the law of the conservation of energy being true, it is impossible to intercept a magnetic force line. What, then, is the nature of the force which will comply with this condition? On the other hand, it is possible to intercept a heat, light, or electrical line, and yet the law of the conservation of energy is not interfered with—*ergo*, magnetic force must possess features which distinguish it from the other forces we have named; from all other forces, indeed, save gravity. One deduction seems to be consistent with facts, namely, that magnetism and gravity are original or primal forces, and that the remaining forces—such as light, heat, and electricity—are derived, built up, or composite forces. That, in a word, gravity and magnetism are elements, while light, heat, and electricity are compounds. We speak of light, heat, and electricity as "forces;" perhaps it would be more strictly correct to speak of them as manifestations of force. But what we have written will serve sufficiently well to convey our meaning.

The sum and substance of what we desire to convey is that there is nothing known which renders it absolutely certain that mankind may not yet find new sources of energy in nature. No one can assert positively that it must always be impossible to make electricity work for us. If a man had shown Socrates a lump of coal, and told him that it could be converted into work, he would have laughed at him. Our purpose in writing this article will be served if we make our readers understand that there is as yet, at least, no finality in science. There is no reason, for example, to conclude that it is absolutely and physically impossible that sources of power may yet be discovered which are not now dreamed of. The electricity which now rends the forest oak, or brings down the lofty edifice in a hideous ruin, may yet be taught to light our towns. Chemical science may give us new reactions which will supply large sources of power. The world does not yet know everything; and he who knows most is least likely to assert dogmatically that things which do not exist now never can exist in time to come.—*The Engineer.*

Steel Pipes for Water Mains.

The Works Committee of the Dundee Water Commission recently instructed their engineer, Mr. James Watson, M. Inst. C. E., to test the suitability of steel pipes for conveying water under high pressure. He received from Messrs. Duncan Brothers, London, four pipes, 12 inches diameter, and the following is from his report:

"The pipes are made from plates of mild steel, manufactured by the Steel Company of Scotland. The plates forming the body of the pipes have a tensile strength of 30 tons per square inch, and those forming the sockets and spigots 26 tons per square inch. The pipes are in lengths of 10 feet 1¾ inches, and ⅛ inch thick, made of two plates, coated outside and inside with black varnish, and weigh 18¼ pounds per foot, or 1 cwt. 2 qr. 17 pounds per length. The body plates and junctions with sockets and spigots are lap jointed and riveted with mild steel rivets, the sockets and spigots being welded and turned on a shaping machine to the usual forms. Three lengths were tested, but only one of the four pipes sent to Dundee was operated on. The Dundee length, when filled with water and subjected to less than 100 feet of pressure, leaked at the riveted joints. The pipe was consequently removed and calked on the ground, after which it was again put under pressure up to 700 feet, when the joint leakage was still observable, but trifling in extent or quantity, and might be more fairly described as weeping at three or four parts of the longitudinal seam.

This pipe was subjected to a net compressive strain of 40½ tons upon the end of the socket, or equal to 8¼ tons per square inch of sectional area, without starting any of the rivets, but with the result of doubling back the steel socket. The socket so altered in shape was found to be without fracture of any kind. The second pipe tested was sent direct from the maker's works, and was uncoated, but in other respects similar to No. 1, and its behavior in the proving machine was not, so far as the tests were carried out, quite up to No. 1. It is, however, only right to observe that the pipe was hurriedly put together during the night previous to the day on which it was tested. The third pipe was also 12 inches diameter, ⅛ inch thick, 8 feet 7 inches long, made of one steel plate, having a double riveted longitudinal lap joint, 1⅜ inches wide, riveted together by ¼ inch rivets at 1⅛ inch pitch, and had angle iron flanges fitted at the ends, each flange being 2½ inches by 2½ inches by ¼ inch. This pipe was subjected to a pressure of 760 pounds per square inch, or 1,775 feet head, when a portion of the calking yielded, and a slight leaking took place at two or three of the rivets.

The intention was to destroy the pipe; but as the machine in which it was placed was not constructed for such high strains, it was thought better not to further increase the pressure. As before noted, the weight of the pipe was 18¼ pounds per foot, and by way of comparison it may be mentioned that our cast iron mains, 12 inches diameter, ⅝ inch thick—tested to proof pressure of 600 feet, or a little over one-third of the pressure applied to the steel pipe—weigh 88 pounds per foot, or about four and three-quarter times heavier than those made of steel. For works such as we require in crossing the Tay Bridge, where the railway traffic sets up considerable oscillation and vibration, or in crossing some parts of Strathmore—say Meigle Moss, where cast iron, to be safe, should be laid on an artificial bed of stone or timber—steel has many obvious advantages over cast iron.

But having said this much, two questions still remain, the first and less important being the length of time and the character of labor and tools necessary to repair any accident to the body or riveted joints of the pipes *in situ;* and the second and all-important, Will steel withstand the action of soft water and equal or approach the durability or working life of cast iron? Practical experience and time can alone furnish the answer to these questions. That malleable iron cannot be safely or profitably used for such a purpose we know from the experience of actual work. In order so far to anticipate the solution of this question, laboratory experiments have been made by a number of eminent chemists, and very careful observations were made last month in London by Dr. Dupre on the action of samples of Monikie and Lintrathen waters on four samples of metal, viz., cast iron, wrought iron, and two samples of steel; and the conclusion at which he arrived was that the loss on cast iron if called 1, the loss on steel was 1·020 in the first plate and 1·098 in the second—that steel would lose in about ten years as much as cast iron would in eleven years.

If this be so, and assuming Dr. Dupre's tests to fairly indicate what would obtain in actual work, then it seems to me that, in the event of your deciding to lay down seven and a half miles of pipes through Strathmore, it might be of advantage—although a departure from the existing practice of this country—to lay down half a mile of this length with pipes made of steel, and also to lay down on the Tay Bridge four or five hundred yards of the two miles required for that work. Twelve or fifteen years hence—probably sooner—the Lintrathen main, twenty miles in length, will require a duplication throughout, and the experience of the working of a short section of steel pipes, if laid now, would enable the commissioners of that time to satisfactorily ascertain the advantage or disadvantage attaching to steel for water works purposes."

Afloat in a Crater.

Captain C. E. Dutton, of the U. S. Geological Survey, has been recently engaged in making a study of Crater Lake, in Oregon, and the latest advices received from him show that he has discovered probably the deepest body of fresh water in the country. Leaving Ashland, Oregon, on the 7th of July, his party, escorted by ten soldiers, provided through the courtesy of the general commanding the military department of the Columbia, reached the brink of the wall of the lake on the 13th, having brought with them boats so mounted on the running gear of wagons as to bear transportation over a hundred miles of mountain road without injury. The boats bore the transportation without strain or damage, and preparations were at once begun for lowering them 900 feet to the water. The steepness of the wall was very great, being at the place selected about 41 degrees or 42 degrees, and the descent partly over talus, above covered with snow, and rocky, broken ledges lower down. The boats entered the water quite unharmed. The process of sheathing them, rigging the tackle, and lowering them occupied four days. A couple of days were occupied in making journeys around the walls of the lake by boat—the only possible way—and in examining the rocks and structures of the wall in its various parts. Next followed a series of soundings. The depth of the lake considerably exceeded the captain's anticipations, though the absence of anything like a talus near the water line already indicated deep water around the entire shore. The depths range from 853 feet to 1,996 feet, so far as the soundings show, and it is quite possible and probable that depths both greater and shallower may be found. The average depth is about 1,490 feet. The descent from the water's edge is precipitous; at 400 or 500 yards from shore, depths of 1,500 to 1,800 feet are found all around the margin. The greatest depths will probably exceed 2,000 feet, for it is not probable that the lowest point has been touched. The soundings already made indicate it as being the deepest body of fresh water in the country.—*Science.*

The Hell Gate Light to be Stopped.

Acting Secretary Fairchild has given orders for the extinguishment of the electric light in the tower at Hell Gate, New York harbor, from and after December 1 next. This action was based on the recommendation of the Lighthouse Board, and because of constant complaints from mariners that the dazzling character of the light made it a detriment, instead of an aid, to navigation.