

\$5 95 for the first ten words, and forty-eight cents for each subsequent word, the difference being the present charges between New York and St. Louis. As yet, through rates are exacted upon all despatches to Salt Lake City, Carson City, and other intermediate stations on the route, no way rates having so far been determined on. This irregularity will, however, it is said, be of only short duration, as at a meeting of the company, soon to be held in New York, a way schedule will be agreed upon. The impression that the present rates are too high, either for the accommodation of the public or the interests of the company, is one which time may confirm. Such is the opinion of some of the corporators.

The President's message of December, 1861, was telegraphed from New York to San Francisco in thirty-six hours. The cost of this was about one hundred and fifty-six dollars. The difference in time between these two places is about three hours. The ordinary time occupied in the transmission of a short message is about three hours, so that a short message, leaving New York at 9 A. M., will reach San Francisco at 9 A. M., their time.

### THE GROWTH OF CORAL REEFS.

A LECTURE BY PROFESSOR AGASSIZ.\*

A question which excited the greatest interest a few years since, was in relation to the time at which animals first made their appearance on earth. It was formerly supposed that we knew exactly how many years had elapsed since all animals were created, but on examination it is found that the chronology of Genesis relates only to man, and we now know that the lower orders of animals existed long before man was created. I will give you an account this evening of the animals that build the coral reefs, and will present some facts indicating the periods during which they have been at work.

Coral is not the shell of an animal, but it forms the hard part of his body, just as much as our bones are parts of our bodies. If any of you have seen the jelly-like animal that floats about the docks of our harbors—the Sea Anemone—you can form a very good idea of the coral animal.

The carbonate of lime which forms the durable part of the animal—the part with which we are all familiar—is drawn in by the animal with its food, and is secreted by its organs and deposited on the outer wall of its body and on the radiating divisions thickening them. The soft parts of the polyp are capable of such variations in volume that they may be expanded or contracted so as to be contained in a cavity in the upper portion of the cylinder.

Coral reefs are built in this form. A horizontal line represents the surface of the water, and a lower line the bottom of the sea sloping downward from the shore. The reef is nearly vertical on the sea side, and considerably inclined on the side next the land. They are always commenced in water from 10 to 12 fathoms in depth, never more than 72 feet, never less than 60.

This statement may seem to conflict with that of Capt. Cook, that he brought up corals in the Pacific Ocean from a depth of 2,000 feet. But, though I

have no doubt of the truth of Capt. Cook's statement, and though I know that mine is correct, there is no conflict between them. It is ascertained that the bottom of the Pacific Ocean is subsiding, and we know the direction of the subsidence. The corals that Capt. Cook recovered from so great a depth were the limestone remains of animals that had long been dead. They grew at the usual proximity to the surface, and were carried down with the settling of the ocean bed.

There are several species of corals, and each lives at a certain depth beneath the surface; being unable to exist either above or below the zone for which it is adapted. This is not strange when we consider the very soft character of its body, and the rapidity with which the pressure of water increases with the depth. At the surface there is a pressure of one atmosphere, at a depth of 32 feet, a pressure of two atmospheres, and at the depth of 64 feet a pressure of three atmospheres, and this is as great a pressure as any of these animals can bear.

Each coral reef is built by four species of polyps; the bottom being constructed by the species which lives at the greatest depth, and the several parts above by species inhabiting corresponding strata of water. The reef builder lays the foundation at the base of the outer wall; and the growth is more rapid there than it is in the parts nearer the land. For this polyp is adapted to clean sea water, and will not live in the foul water inside the reef. The reef, therefore, soon assumes a form similar to that which it has in its finished state. When the species of polyp that lives in water of 10 or 12 fathoms in depth has carried the structure up through the zone which it inhabits, his labors cease, and the work is continued by a second species. As the species does not require water so pure as the first he extends his growth towards the shore. Having grown upward through his stratum of water, his growth ceases, and a third and fourth species complete the reef.

It was at one time a mystery to us that one species could thus apparently grow out of another. But in examining the mode of reproduction of these polyps, I discovered facts which explained the mystery. Though the mature animal is attached immovably to the rock, when first hatched he swims through the water, and is confined to the same stratum of depth as in the matured state. When swimming about in this undeveloped state, if he encounters the upper surface of a coral reef which has grown up to his stratum of water he attaches himself to it and then begins to grow; thus continuing the structure.

These polyps multiply and grow by a process of budding. A protuberance appears upon one side of the body, which finally develops into a perfect animal; but is not separated from the parent, making a compound animal of numerous individuals united together. However strange this process may seem to us in the animal kingdom we are familiar with it in the vegetable. Each bud of a tree is a complete individual in itself, but they all unite to form a common plant.

The peninsula of Florida has been formed by these little animals, and they are still extending it southward toward the island of Cuba. In connection with the operation of the Coast Survey I visited the southern part of Florida and I made some ef-

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