covers a superficial area of 266 square meters. It was made during the reign of Septimius Severus, between 203 and 211 A. D., and was attached to a wall of the Templum Sacræ Urbis, the present church of SS. Cosma e Damiano. The most curious feature of this map is that some sections or divisions of the city are represented upon a much larger scale than the other parts. This is notably the case respecting the Palatine and Roman Forum. The reason for this distinction antiquarians and archæologists have failed to adduce. and the peculiarity rendered it a difficult matter to piece the fragments of the map together correctly. It is also evident that the relic is the product of several different hands, since some portions are very skillfully and diligently prepared, while others are very negligently made. The map was also permitted to fall into disrepair, and fell to pieces in the course of time. The first fragments were found in 1562 and roughly placed together by Antonio Cosio, but the work of building up the map has been diligently continued ever since, until now 1,049 pieces have been found and joined together. That the map was originally of a tremendous size is testified by the fact that according to Prof. Lanciani, the present portion of the plan is but a fifteenth of the whole. This Forma Urbis is of immense value to archæologists, since by its aid several parts of ancient Rome, hitherto unknown, have been found.

A MUD-PUDDLE COMMUNE; OR, THE BEGINNINGS OF MIND.

The varied and multitudinous forms of life which are to be found in a road-side mud-puddle are as wonderful as they are diversified and numerous. Although I have chosen to entitle this paper "A Mud-Puddle Commune," it must be confessed that these organisms hold nothing in common save the water in which they dwell. For theirs is not the peaceful and quiet existence of the ideal commune; many a terrible tragedy of violence and murder, aye! of infanticide, filicide, fratricide, patricide, and insensate cannibalism takes place beneath the calm surfaces of these turbid pools during each second of time.

Several years ago in my work on mental traits in the lower animals ("The Dawn of Reason," The Macmillan Company, 1899) I advanced and demonstrated (so I believe) the proposition that notwithstanding the fact that the nerve-*cell* is not differentiated in these primal forms, nerve-elements are, nevertheless, present in these, and serve to direct and control life. In a letter to me the late Dr. Elliott Coues wrote as follows: "It seems to me that you express a *great fact* when you speak of neuroplasmic as well as nerve action proper; for otherwise we cannot account for the amount of nerve an amœba certainly possesses."

Mind acts in two ways—consciously and unconsciously; and the conscious mind is, unquestionably, the offspring, the true and logical descendant of the unconscious mind. Consciousness is the result of sensual perception, and there can be no question but that the unconscious, vegetative mind was in existence long before the first sense was evolved. Yet these lowly creatures, whose life cycles are almost purely vegetative in character, every now and then give evidences of sense perception (although no sense-organ can be made out) which fact clearly leads up to the conclusion that the nerve-plasma itself must necessarily contain the elements of consciousness to a certain extent.

In all probability, the lowest forms of animal life are to be found in the sub-kingdom, Protozoa, and every mud-puddle is rich in protozoan specimens.

Under a lens of high magnification a protozoan appears as a little mass of animal matter or protoplasm, cell-like in shape when it is quiescent. Suddenly, while it is under observation, a small, teat-like protuberance will make its appearance on its surface. This protuberance will prolong itself into a narrow arm or foot (*pseudopod*) along the surface of the glass slide. The body-substance of this queer creature can then be seen flowing toward the distal end of the out-reaching arm or foot, until finally, all of the protoplasm has gone into it, and the protozoan has progressed just the length of this pseudopod.

In its wanderings over the stems of grasses and stalks of algae in the waters of its turbid home, every now and then it will find a starch-cell which has escaped from some over-ripe spore, and it immediately begins to avail itself of its welcome "find." It drags itself close to the starch-grain; a little pouch infolds on its surface; this pouch rapidly surrounds the starch, until the latter soon finds itself on the inside of the hungry animalcule; there is a charming movement of the protoplasm of the protozoan and the starch-grain is soon disintegrated and its nourishing elements absorbed. And its indigestible portions—what becomes of them? The little animal simply reverses the *infolding* process, and puts itself *outside* of all the substances it can not digest.

If microscopic crystals of uric acid be placed upon a slide which has an amœba on it, the protozoan will pass them by; or, if it does ingest a crystal, it will immediately proceed to get rid of it. On the contrary, if grains of sand be sprinkled on the slide, the amœba will take them in and will retain them some time before eliminating them. Each grain of sand, in all probability, has upon its surface colonies of microbia, too small to be made out by the microscope, yet large enough for the amœba to recognize them as a source of sustenance. The crystals of uric acid contain no microbia, hence the amœba readily recognizes the fact that they are not good for food. Again, if starch grains, sand, and uric acid crystals be placed upon the slide, the protozoan will show conscious choice by giving the starch grains preference.

On one occasion while examining a bit of alga there suddenly appeared in the field a colony of delicate, tulip-like, or bell-like organisms which appeared to grow upon stalks. I moved the slide slightly when, immediately, every creature disappeared as if by magic. In a few moments, however, these queer "jumping jacks" again popped into view and I then recognized them; they were *vorticellæ*, "bell animalcules," belonging to *Infusoria*. When I moved the slide, currents were set up in the water which spelt danger to the *vorticellæ* and they, therefore, coiled themselves on their stalks and sank down upon the bit of alga, feigning death! I discovered, after experimenting, that they soon became accustomed to the sudden currents in the water of this miniature sea made by moving the slide, and that such cause would no longer occasion them to "play 'possum."

Still more wonderful is the action of the rotifer, *Brachionus urceolaris*, in the presence of the giant water-beetle, *Dyticus marginalis*. This little animal recognizes its enemy, through some unknown sense, stops the movement of every cilia, and sinks as though smitten by sudden death! Some of the nematoids or threadworms will also feign death when they encounter *Dyticus*, and will hang motionless in the water like bits of thread or bleached and dead algæ. The water louse, familiar to everyone, gives evidence that it possesses, comparatively speaking, a high degree of mental development. On one occasion, while observing the action of one of these active little beings, I saw it approach a ruptured starch cell, seize a grain of starch, and then hide behind a bit of mud until it had devoured its delicate morsel. It then came back to the ruptured cell, procured another grain and again retired to its hiding place. This it did several times, thereby evincing memory, conscious choice, and conscious determination. JAMES WEIR, JR., M.D.

HIGHEST WIND RECORD.

Point Reyes, an important United States weather bureau and storm signal station, located on the California coast some 35 miles north of San Francisco, holds the world's record for high, strong, continuous winds.

Last year Point Reyes captured this honor from the weather stations of the earth, and again this month (May) has gone several notches higher on the meteorological scale.

On May 18, 1902, the wind at Point Reyes attained a velocity of 102 miles an hour, and, for several minutes was rushing along at the furious rate of 120 miles per hour.

A fearful gale lasted for three whole days, and at one time the winds in a playful mood ripped the cups from the anemometer. The number of miles recorded during the 72 consecutive hours, was 4,701, which would be equivalent to nearly one fifth the distance around the earth in three days.

This year on May 14 the winds commenced to blow again with the greatest violence. For four days the velocity registered averaged more than 60 miles an hour. For nine days the average velocity was 52 miles an hour. The total number of miles recorded on the anemometer was 11,223 miles.

This is the highest velocity of wind for the time on record in the world.

These automatically marked records will be photographed by Prof. McAdie, who is in charge of the main weather bureau office in San Francisco, and sent to Washington.

FAILURE OF THE MONOLITH LATHE.

Further details of the failure of the great monolith lathe are now available. It will be remembered that the Cathedral of St. John in New York is to have thirty-two granite columns in the choir each 54 feet high and 6 feet in diameter, their weight being 160 tons each. It was intended that these columns should be monoliths, but it was found impossible to turn such huge blanks even in the great lathe which was built to receive them. In the SCIENTIFIC AMERICAN for January 12, 1901, we illustrated the lathe and the turning of one of the columns. The blanks weighed 310 tons, and they were placed on the lathe, whose bed is 86 feet long, which weighs 135 tons and swings 6 feet 6 inches. Eight tools were used, each taking a 3-inch cut. The turning operation proceeded smoothly, the lathe was operated day and night and the column lacked only a few hours of completion, when late one night it broke in two, entailing the loss of a year's time, to say nothing of the valuable piece of stone. The second monolith never reached the polishing stage, for it gave way while being rounded into shape. It is perhaps not fair to say that the lathe failed, although the result was the same. The accident should undoubtedly be attributed to the great torsion which deformed the block beyond the modulus of elasticity. The third attempt was also a failure, and the company deemed it inexpedient to risk any more columns of the monolithic type, so they are now being made in two sections. They will be towed to New York from Vinalhaven, Maine, on a barge, four sections at a time, and will be landed at the foot of West 32d Street, and they will then be rolled to the cathedral. Had it been possible to produce the monoliths, they would only have been exceeded in size by those of St. Isaac's Cathedral, in St. Petersburg.

SCIENCE NOTES.

The municipal authorities of London and other large provincial cities in England are experiencing a peculiar difficulty in connection with the wood paving of the thoroughfares. The wood blocks after they have been laid down are susceptible to a species of fungus which attacks the wood vigorously and rapidly deteriorates it. The authorities are strenuously endeavoring to check this malignant fungus, since the damage wrought by it amounts to several thousand dollars annually, but the only reliable means of checking it, however, is to closely examine the wood blocks before they are laid down. Should a contaminated block be put down the fungus will immediately spread to the surrounding paving, with the result that the whole is soon destroyed.

An expedition has been sent out under Dr. George Shattuck, for a scientific survey of the Bahama Islands. In the party are members of the faculty of Johns Hopkins University and officials of the United States Museum, including Bashford Bean, chief of staff for marine zoology, and J. H. Riley, chief for land zoology; also Dr. Oliver F. Fossig, of the Weather Bureau. Bernard N. Baker has given the party a glass-bottomed boat through which to study life in tropical waters. Dr. Fossig will use several huge kites with registering apparatus to study the trade winds and magnetic conditions. The windlass about which the wire rope to govern these kites will be wound weighs 500 pounds. T. H. Coffin, of Johns Hopkins, will make a special study of the mosquitoes, particularly as to their capacity for carrying disease germs.

In a recent lecture M. Charles Rolland inquires if it be true that human beings expend, in general, far less energy of motion than do the other animals, and he answers the question in the affirmative. To demonstrate the assertion rigorously it would be necessary to perform exact mensurations not yet accomplished, to measure the mechanical energy corresponding to equal nutritive action, both in men and in animals. But if we consider the production of motions in the animal and in the human kingdom it is easy to see that men are inferior, especially in respect of locomotion. The inferiority begins at birth, since it is necessary to teach painfully our children to walk, And it continues throughout our lives, during which we are subject to a thousand affections of the motor apparatus, and on the threshold of old age to senile impotence. This latter is invariable for men but the rarest thing in animals. The variety of animal locomotion is remarkable. Animals fly, swim, crawl, jump, etc., all without the painful apprenticeship of men; and the force they expend, relative to the weight of their bodies, is immensely greater than is the case with us. The beetle is a hundred times as strong as a horse, weight for weight, and the horse is stronger than a man. If men were, relatively, as strong as beetles they could juggle with weights of several tons. These and other like facts lead to the obvious conclusion that the motor functions occupy in the totality of physiological activities a far less important place with men than they do with animals. As an organism rises in the scale and as its nervous system increases in complexity the nervous energies have less and less power to express themselves in exterior reactions, in motor reactions for example. There is, in this point of view, the same difference between men and animals that is found between men of thought and peasants. The former are quiet, but expend their forces in intellectual effort: the latter spend their energies in movements which are for the most part automatic. Animals move less the more they think and the more they comprehend. As Anatole France says in "Clopinet": "I have always sought to comprehend and in the effort I have wasted precious energies. I discover too late that not-to-comprehend is a great power. If Napoleon had been as intelligent as Spinoza he would have written four quarto volumes in a garret"—and that would have been the end.