NATURAL HISTORY NOTES.

Automatic Movements of a Fern.—Dr. Asa Gray, in *Coulter's Gazette*, says: "Mr. E. J. Loomis, of the Nautical Almanac Office, Washington, recently showed me a phenomenon which, I suppose, has never before been noticed, and which is commended to the attention of botanists. A tuft of *Asplenium trichomanes*, gathered last autumn in the mountains of Virginia, is growing in his house, in a glass dish. About two months ago he noticed that one of the fronds—a rather short and erect one which is now showing fructification—made quick movements alternately back and forth, in the plane of the frond, through from 20° to 40°, whenever the vessel was brought from its shaded situation into sunlight or bright daylight. The movement was more extensive and rapid when the frond was younger. When I saw it on the 23d of January, its compass was within 15°, and was about as rapid as that of the leaflets of *Desmodium gyrans*. It was more rapid than the second hand of a watch, but with occasional stops in the course of each half vibration. This was in full daylight next a window, but not in sunshine. No movement had been observed in the other fronds, which were all sterile and reclining, with the exception of a single one which was just unfolding, in which Mr. Loomis thinks he has detected incipient motion of the same kind." This little fern is very common, and it is easy to obtain it and set it growing. The matter is worthy of further investigation.

Vitality of Mollusks.—Very extraordinary statements are found in the books regarding the vitality of shell fish. Dr. Woodward states that in June, 1850, a living pond mussel was sent to Mr. Gray, of the British Museum, from Australia, which had been more than a year out of water. The pond snails (*Ampullariæ*) have been found alive in logs of mahogany from Honduras; and M. Cailland carried some alive from Egypt to Paris packed in sawdust. Indeed, it is not easy to ascertain the limit of their endurance; for Mr. Laidlay, having placed a number in a drawer for this purpose, found them alive after five years, although in the warm climate of Calcutta. In the ordinary land snails such cases are still more remarkable. Some of the large tropical species of *Bulimus*, brought from Valparaiso by Lieut. Graves, revived after being packed, some for thirteen, others for twenty months. Mr. Wollaston had informed Dr. Woodward that specimens of two Madeira snails (*Helix papilio* and *tectiformis*) survived a fast and imprisonment in pill boxes of two years and a half, and that a large number of the small *H. turricola*, brought to England at the same time, were all living after having been inclosed in a dry bag for a year and a half. But the most interesting example of resuscitation occurred to a specimen of the Desert snail from Egypt, chronicled by Dr. Baird in the "Annals of Natural History." This snail was fixed to a tablet in the British Museum on the 25th of March, 1846; and on the 7th of March, 1850, it was observed that he must have come out of his shell in the interval (as the paper had been discolored apparently in his attempt to get away); but finding escape impossible, had again retired, closing his aperture with the usual glistening film. This led to his immersion in tepid water and marvelous recovery. Dr. S. Lockwood, in the *American Naturalist*, for March, adds another remarkable instance of vitality in the case of *Helix aspera*. He says: "August 24, 1878, I ascended an old castle, or square tower, near Queenstown, Ireland, and found between the stones a number of the common garden snail of Europe (*H. aspera*). I secured three specimens, and having wrapped them in paper, put them in my trunk. On my arrival home, October 28, on looking for my treasures, I found that one was crushed. The other two I dipped in water a few seconds, then put them in the fernery, and was delighted to see them crawl about. I could not get them to feed. One died in the following May, having been in confinement nine months. The other died in November, 1879, having lived thirteen months without food.

Recent Botanical Discoveries in America.—Prof. Eaton reports in the *Bulletin of the Torrey Botanical Club*, the discovery in Nova Scotia, by Miss Elizabeth G. Knight, of this city, of *Schizæa pusilla* and *Littorella lacustris*. The rare and interesting little fern, *Schizæa*, was only known before to occur in the pines of New Jersey, although Prof. Gray states that he has seen specimens of it in La Pylaie's herbarium at Paris, collected sixty years ago, and which are ticketed as having been detected in Newfoundland. The *Littorella* was found for the first time in America by Mr. Macoun, in 1869, on an island in Gulf Lake, Canada. It was found again by Mr. Pringle at the northern end of Lake Champlain, a short time only before Miss Knight found it in Nova Scotia; but these are the only records thus far of its discovery in America. Until these discoveries the plant, unlike most aquatics, had apparently a very restricted range of distribution, being confined chiefly to Central and Northern Europe, although not uncommon in many of the lakes and streams of Scotland, and occurring, though rarely, in England.

DUST FIGURES.

BY BURR NOBLE.

I was very much interested in reading the letters in Nos. 5 and 6 of the current volume, SCIENTIFIC AMERICAN, on crystallizations found in telescopic objectives, and was reminded that during ten years' use of surveying instruments I have always noticed this phenomenon in all old instruments which were exposed to very cold weather; I therefore attributed it entirely to freezing.

CURIOUS DUST FIGURES.

This subject has brought to my mind a very peculiar arrangement of dust particles found in a common water pitcher. This vessel was filled with water, and had stood near a window, unused, for about three months, during a portion of the spring and summer, in Kansas. In pouring the water out, my brother noticed the crystallized appearance of the dirt in the bottom, and carefully preserved the sediment and afterward photographed it. At that time (about eight or nine years ago) it attracted a good deal of attention, but none were able to explain the peculiar formation in a satisfactory manner, as no freezing weather occurred during the time the pitcher was standing.

A Many-Named Cereal.

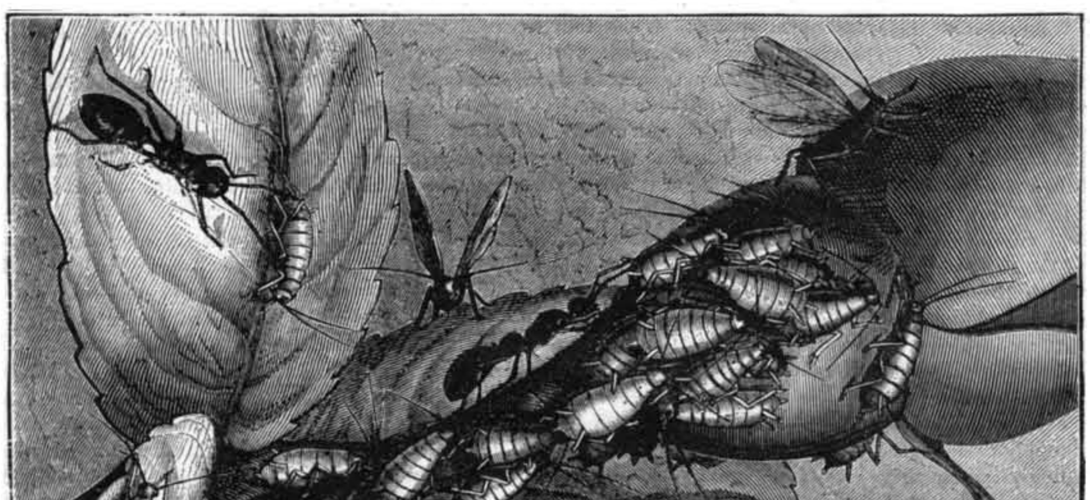
Considerable attention has been called of late to an alleged new cereal, chiefly on account of the notice taken of it by the Kansas Board of Agriculture. Lately the Produce Exchange of this city received from California a specimen of the grain, with a communication with regard to it from an expert in cereals. The letter pronounced the grain no novelty, since it was cultivated in Europe as early as 1596.

It has been in the habit of coming forward every few years under a new name, having already been known successively as Egyptian corn, ivory wheat, Guinea corn, and Indian millet. Each attempt to foist it upon the public has been a clear case of false pretenses. It is really no other than the drooping sorghum (*Sorghum cernuum*), and differs from common sorghum principally in the fact that the stock bearing the head or ear droops. This is not caused by the weight of the ear, as the stalk begins to turn almost from the moment the ear begins to form. It is not rice or anything akin to it, and is not a native of South America. It has been repeatedly tried in all sections of the country, but has never succeeded in obtaining a foothold, because the American farmer will not be induced to accept it as a substitute for wheat, to which it is vastly inferior. Among the semi-barbarous peoples of the East Indies and Africa it forms a staple article of food, owing to the facility with which it can be prepared for the table. Unripe, it is cooked and eaten like green corn. Ripe, it can be boiled the same as rice. Flour is also made from it by crushing. It has abundant foliage of a grayish-green color, and grows to a height of seven feet, and a field of it consequently presents an odd appearance. The writer has nothing to say on the question of its adaptability to dry, arid sections where other cereals cannot grow. The specimen at the Exchange consists of an oblong bunch of grains about six inches long and three to four in diameter. The grains are about the shape of barley, but twice as large, ivory white with a black speck, and almost as hard as corn.

ANTS AND THEIR MILCH CATTLE.

The instincts of the ant are, indisputably, more extraordinary than those of any other in the whole range of animated nature. The ancients magnified them into fabulous miracles. Pliny talks of an Indian ant as big as an Egyptian wolf, of the color of a cat, which entered the bowels of the earth in search of gold, of which they are said to have been plundered during the winter by the human inhabitants of those regions. But exaggeration and credulity apart, the real habits and proceedings of these insects are so extraordinary that they would stagger our belief if not confirmed by the past observations of such naturalists as Huber and Latreille, and those of Sir John Lubbock and others of our own day. One of the most singular traits in their manners and customs is that of keeping and feeding certain other insects, from which they extract a sweet and nutritious liquid, in the same way as we obtain milk from cows. There are two kinds of insects from which the ant tribe abstract this juice—the aphides, or plant lice, and the gall insects Linnæus, and after him other naturalists, have called these insects the milch cattle of the ants; and the term is not inapplicable. In the proper season, any person who may choose to take the trouble to watch their proceedings may see, as Linnæus says, the ants ascending trees that they may milk their cows, the aphides. The substance which is here called milk is a saccharine fluid, which these insects secrete, it is scarcely inferior to honey in sweetness, and issues in limpid drops from the body of the insect, by two little tubes placed one on each side just above the abdomen. (See engraving.) The aphides insert their suckers into the tender bark of a plant, and employ themselves incessantly in absorbing its sap, which, having passed through the digestive system of the insect, is discharged by the organs just mentioned. When no ants happen to be at hand to receive this treasure, the insects eject it to a distance by a jerking motion which at regular intervals they give their bodies. When the ants, however, are in attendance, they carefully watch the emission of the precious liquid, and immediately suck it down. The ants not only consume this fluid when voluntarily ejected by the aphides, but what is still more surprising, they know how to make them yield it at pleasure, or in other words, to milk them. On this occasion the antennæ of the ants discharge the same functions as the fingers of a milkmaid; with these organs, moved very rapidly, they stroke the abdomen of an aphis first on one side and then on the other, and immediately a little drop of the much coveted juice issues forth, which the ant eagerly conveys to its mouth. A single aphis has been known to give it drop by drop successively to a number of ants that were waiting anxiously to receive it. The milk of one aphis having been exhausted, the ant proceeds to treat others in the same manner, until at length perfectly satiated, and with belly swelled almost to bursting, it lazily descends the plant and seeks its nest. A still more singular fact connected with this branch of the natural economy of these insects remains to be stated.

These cows are not always considered the common property of a whole tribe, but, on the contrary, some of them are appropriated to the exclusive use of the inhabitants of a particular hill or nest; and to keep these cows to themselves they exert all their skill and industry. Sometimes the aphides inhabiting the branches of a particular tree, or the stalks of a particular plant, are thus appropriated; and if any vagrant



ANTS AND THEIR MILCH CATTLE.

foreigners attempt to share this treasure with its true owners, the latter, exhibiting every symptom of uneasiness and anger, employ all their efforts to drive them away. Some species of ants go in search of these aphides on the vegetables where they feed; but there are others, such as the yellow ant, which collect a large herd of a kind of aphis, which derives its nutriment from the roots of grass and other plants.

These milch kine they remove from their native plants and domesticate in their habitations, affording, as Huber observes, an example of almost human industry and sagacity. On turning up the nest of the yellow ant this naturalist one day saw a variety of aphides either wandering about in the different chambers or attached to roots of plants which penetrated into the interior. The ants appeared to be extremely jealous of their stock of cattle; they followed them about and caressed them, whenever they wished for the honeyed juice, which the aphis never refused to yield. On the slightest appearance of danger they took them up in their mouths and gently removed them to a more sheltered and more secure spot. They dispute with other ants for them, and, in short, watch them as keenly as any pastoral people would guard the herds which form their wealth. Other species, which do not gather the aphides together in their own nest, still seem to look on them as private property; and, what is yet more extraordinary, they inclose them, as a farmer does his sheep, to preserve them not only from rival ants, but also from the natural enemies of the aphis. If the branch on which the aphides feed be conveniently situated the ants have recourse to a very effectual expedient to keep off all trespassers: they construct around the branch containing the aphides a tube of earth, or some other material, and in this inclosure, formed near the nest and generally communicating with it, they secure their cattle against all interlopers. The brown ant has been observed by Huber to build a chamber around the stem of a thistle in such a way that the stalk passed through the center, so that from their ant-hill they had only to climb the thistle stalk in order to enter this cattle-fold, which was suspended in mid-air. The interior, smooth and compact, was entirely formed of earth; it contained an extensive family of insect-cows, sheltered from the inclemencies of the weather, and protected from their enemies. These edifices are not always constructed near the bottom of the thistle stalk; Huber once saw one at a height of five feet from the ground. "These proceedings," says he, "are by no means common; we cannot attribute them to a habitual routine." Indeed, the modes of preserving their cattle seem to be as various as those practiced by man.

Some ants receive their food from the aphides which suck the juices of the common plantain, and these at first take their station near the flower of the plant; as soon as the flowers wither these insect-cows take shelter under the radicle leaves; whereupon the ants that before had climbed up to them now surrounded them with a mud wall, and, making a covered gallery by way of communication between their nest and the "paddock," extract food from them at their convenience and pleasure.

During autumn, winter, and spring many species of ants keep aphides. Indeed, in winter they would be exposed to the danger of famine did they not rely for food on their cattle; for though they become torpid when exposed to intense cold, yet, for the most part, the depth of their nests preserves a temperature for them sufficiently high to prevent this contingency. Their milch cows are then kept on the roots of the plants which penetrate the interior of the nest, and furnish an abundant supply of liquid, in which their keepers delight. And not only is the full grown animal kept, but its eggs are watched and guarded with that care which warrant us in supposing that the ant knows their full value. It is of real consequence to the ants that the hatching of the eggs of the aphides should take place as early in the spring as possible, in order to insure an early supply of food for their colony; and with the view of hastening this event they deposit them in the warmest part of their dwelling, and in fine weather bring them to the surface of the nest to give them the advantage of the sun.

Plant lice, or aphides, differ much in form, color, clothing, and in the length of the honey tubes. Some have these tubes quite long, as the rose louse (*Aphis rosæ*) of the accompanying engraving, which is green, and has a little conical projection, or stylet as it is called, at the extremity of the body between the two honey tubes. These insects seem to love society, and often herd together in dense masses, each one remaining fixed to the plant by means of its long tubular beak; and they rarely change their places till they have exhausted the first part attacked. The attitudes and manners of these little creatures are extremely amusing. When disturbed, like restive horses, they begin to kick and sprawl in the most ludicrous manner. They may be seen, at times, suspended by their beaks alone, and throwing up their legs as if in a high frolic, but too much engaged in sucking to withdraw their beaks. As they take in great quantities of sap they would soon become gorged if they did not get rid of it through the little tubes at the extremity of their bodies. When one of them gets running-over full it seems to communicate its uneasy sensations, by a kind of animal magnetism, to the whole flock, upon which they all, with one accord, jerk upward their bodies and eject a shower of the honeyed fluid. The leaves and bark of plants much infested by these insects are often completely sprinkled over with drops of this sticky fluid, and which on drying become dark colored, and greatly disfigure the foliage. This appearance has been styled "honey-dew," but should not be confounded with another similar production observable on plants after very dry weather, which has received the same name, and which consists of an extravasation or oozing of the sap from the leaves.

Snakes Eating Fish.

For a number of years past it has been my custom, because unable to find any better way to dispose of my summer leisure, to do a good deal of fishing in the Potomac river, sometimes in the immediate front of the city, sometimes at the Little and Big Falls above, and sometimes at the Four Mile Run below. I have generally used live bait, there being minnows in any quantity along the edges of the river. Three summers ago I went to catch minnows at the mouth of a small run called Gravelly Creek, situated on the west bank of the river, just at the foot of the Arlington estate. A short distance north of the run is the once quite celebrated Arlington Springs, which is still a place of resort for large numbers of Sunday visitors from the city. To reach the springs, except by boat, it is necessary to cross Gravelly Creek near its mouth, or go quite a long distance around the creek. To enable parties to cross the creek at the mouth, a passageway has been made by a kind of loose dam of stones. At low water the creek here is some forty feet wide, but at full tide it is fully sixty feet, and four or five feet deep. The loose stones form quite an impediment to the tide, so that, when the tide is rising, the water on the river side of the dam is several inches higher than the water on the other side, and flows through and over the loose stones quite rapidly, and the reverse is the case when the tide is falling. Vast numbers of minnows are to be found at all times in the marsh along the river banks, and as the tide rises they seek the runs to be found here and there to avoid the white and yellow perch which prey upon them, and it is while they are making up the creek that I catch the quantity I want.

One day, while catching minnows as usual, I noticed a number of snakes, the common water moccasin, approaching the dam or footway of stones. The water yet lacked several inches of reaching the top of the stoneway, although it was rushing in quite rapidly and carrying with it many bull-minnows and small white perch that were unable to resist it. Watching the snakes, I saw one after another reach the dam and take their station upon it, submerging themselves all but their heads, which were raised about an inch above the water and pointed in the direction of the incoming tide. In this position I counted seventeen snakes, arranged at uneven intervals, in a space of less than sixty feet. I came to the conclusion at once they were fishing, and watched them with a good deal of interest. Pretty soon I saw one head strike forward, going under the water, reappearing in a moment with a very large bull-minnow in its mouth. The snake immediately loosened its hold upon the rocks and swam for the shore, reaching which it disappeared in the bushes; and this was repeated at intervals by each of the seventeen snakes. When they returned from the bushes, having made short work of their "catch," each snake sought his own particular location on the rocks, there being no clashing of interests there.

Now, how is this for reason or instinct? How do these snakes know where to locate themselves, and the particular stage of the tide at which to start on their fishing excursion? How do they know that a number of minnows will be swept over the miniature falls made by the rocks? These are questions that go beyond my comprehension, and I leave them for others to answer. But the facts remain, and any one who will take the trouble may verify them at any time during the summer by a visit to Gravelly Greek.—*Forest and Stream.*

Uses of the Potato.

In France farina is largely used for culinary purposes. The famed gravies, sauces, and soups of France are largely indebted for their excellence to that source, and its bread and pastry equally so, while a great deal of the so-called cognac, imported into England from France, is the product of the potato. Throughout Germany the same uses are common. In Poland the manufacture of spirits from the potato is a most extensive trade. "Stettin brandy," well known in commerce, is largely imported into England, and is sent from thence to many of her foreign possessions as the produce of the grape, and is placed on many a table of England as the same, while the fair ladies of our country perfume themselves with the spirit of potato, under the designation *eau de Cologne*. But there are other uses which this esculent is turned to abroad. After extracting the farina the pulp is manufactured into ornamental articles, such as picture frames, snuff boxes, and several descriptions of toys, and the water that runs from it in the process of manufacture is a most valuable scourer. For perfectly cleansing woolens and such like articles, it is the housewife's panacea, and if the washerwoman happens to have chilblains she becomes cured by the operation

The Site for the Obelisk.

At a meeting of the New York Department of Parks, April 5, the site for the Egyptian obelisk, soon to be transshipped at Alexandria, was finally decided. It is to stand on a natural knoll in front of the new building of the Metropolitan Museum of Art, on the west side of the main carriage-way. This will add a new attraction to Central Park, and prevent the monolith from being dwarfed by surrounding buildings, as it would have been in any of the smaller parks or squares of the city.

Why is Arsenic a Poison?

The question of how arsenical compounds act as poisons has been discussed by Binz & Schulz as follows: Liebig seems to have been, up to the present time, the only author who had advanced any theory as to the poisonous action of arsenic. In the first edition of his work, that of 1843, on the relation of chemistry to agriculture and physiology, he states his views essentially as follows: Arsenious acid and corrosive sublimate possess in a high degree the power of forming with albumen solid compounds. When these substances are taken internally the albumen of the living tissues thereby loses the power of undergoing those transformations which are necessary to their existence. In this way the life of important parts is destroyed and the death of the whole being is the result.

Liebig did not afterward uphold this theory, although it is still to be found in some chemical handbooks. It has been abandoned for this reason, that a solution of arsenious acid, or of one of its salts, does not form the solid compounds (albuminates) as Liebig at first supposed, while this is undoubtedly the case with corrosive sublimate among others. There is, in fact, no single case known where arsenious acid produces any stronger precipitation of the constituents of the body than does carbonic acid for example.

This non-existence of an arsenical albuminate is also proven by the fact that an animal can be poisoned by the introduction of an arsenical solution without the spot where it was introduced, even if it is the extremely sensitive conjunctiva of the eye, showing anything more than a slight redness. In the interior of the body, on the other hand, the changes are very clearly seen. The stomach is the central point of all these, even in cases where no trace of the poison has come into direct contact with it. Anatomical investigations show us that those very tissues of the body which are especially capable of taking up the oxygen of the blood are the furnaces of disturbances.

The neutral salts of arsenic acid are just as poisonous as those of the arsenious acid, and some say more so. Arsenious acid can readily be converted into arsenic acid, and the latter passes still more easily into the former. The latter process is aided by albumen in general; the former only by the *living* albumen of plants and animals.

The experiments were first made outside of the organism with single parts. White of egg and fibrin from warm-blooded animals were digested with arsenic acid at the temperature of the body, and were found to reduce it to arsenious acid; fresh brains do the same. The tissues of the digestive organs as well as the liver and the undecomposed protoplasm of plants not only reduced arsenic acid to arsenious acid, but also oxidized arsenious acid to arsenic acid. If the tissues which are able to oxidize the lower to the higher acid are previously heated in boiling water, they lose this property. Blood, hæmoglobin, and fresh fat, do not possess either one or the other action.

This double property can be proven in living animals. The two different oxides of arsenic are converted, the one into the other, by the lining of the intestines, which, in cases of poisoning, belong to those parts which are first and most violently affected. On the other hand, those parts which, in life, are touched, or only later and secondarily, are not able to start these changes, especially to oxidize arsenious acid.

Careful and accurate consideration of all the details of our experiments lead to the conclusion that the conversion and reconversion of these acids into one another in the animal body, as first proven by us, causes a violent vibration of the oxygen atoms in the molecules of living albumen, whereby the tissues are corroded until totally destroyed.

In this respect there is a perfect parallelism between nitrogen and phosphorus. Nitric oxide is excessively poisonous. By taking up oxygen it is converted into the violently oxidizing hyponitric acid. It destroys the tissues, while it is in part reconverted with absorption of water into nitric oxide. In the whole reaction the nitrogen takes no direct part. It is merely the inert carrier and distributer of the powerfully aggressive active oxygen atom. Arsenic plays the same rôle here, where it appears as the carrier of active oxygen, that is, it is every instant passing from arsenious acid to arsenic acid, and back again to arsenious acid.

The distinctions between arsenic and nitrogen are only gradual. The oxides of nitrogen attack the parts where they enter the organism; the oxides of arsenic at first envelop their activity within themselves, and it is only by long activity that they are recognized as corrosive without. The active oxygen of nitric oxide instantly tears itself loose, but that of arsenic acid requires some time, and that is the reason why the latter first shows its destructive effects within the organism. That such oxygen atoms possess poisonous properties is evident from the well-known poisonous action of ozone when it passes into the organism except in an exceedingly dilute form. This has recently been shown, too, in the case of chlorates. They give up their three atoms of oxygen to certain constituents of the body, being reduced to chlorides, and thereby act corrosive and destructive to the cells and the blood.

The other members of the nitrogen group show a remarkable coincidence both in their chemical and poisonous properties. Antimony, bismuth, and vanadium pass readily from one degree of oxidation to another. Phosphorus generates ozone in the body as well as in the air, and thus destroys the living albumen. The good effects of these as remedies can also be traced to the action of their active oxygen.—*B. d. d. Ch. Ges.*