particularly adapted for its occupancy. But, no sooner is this done than the individuals along the frontier begin to adapt themselves to an environment but slightly unfavorable, and, as their adaptation changes, so do they slowly advance outward from the territory originally occupied. A series of unfavorable seasons might occasion the occupation of a wide margin of adjoining country, while a series of unfavorable seasons might sweep this tide of advance back to the place of its origin. But, as the receding tide of the ocean leaves many pools of water in the depressions of rock, so will there be left, in especially favorable nooks, a few of the insects which will retain their hold and form small, local colonies, of perhaps not more than a few individuals, and the offspring of these will meet the investigator long distances from the real habitat of the species. There is scarcely a collector who does not know of one or more small, secluded areas, in his neighborhood, that are rich in varieties, and which he seldom visits without satisfaction, and frequently he is astonished at his success. How long this ebb and flow has been going on, and how many species have been brought to us in this way, are problems we are yet unable to solve. Therefore these facts have been brought together, and are here presented, not as a finished, nor, indeed, as an advanced study, but rather as a primary outline, to be revised and modified as our knowledge of the geographical distribution of our species shall be enlarged by additional study and research.

A SKELETON OF STELLER'S SEA-COW.

BY BARTON W. EVERMANN, PH.D., ASSISTANT, DIVISION OF SCIENTIFIC INQUIRY, U S. FISH COMMISSION.

DURING the time from March to September of last year the U. S. Fish Commission steamer "Albatross" was engaged, under the direction of the State and Treasury Departments, in making investigations regarding the habits, distribution, and abundance of the fur seal in Bering Sea and the North Pacific Ocean; and it was my good fortune to accompany the vessel as senior naturalist.

While carrying on these investigations, we had occasion to visit the Commander Islands, situated in Bering Sea, off the coast of Kamchatka about 80 miles. We spent the first week of June on or about these islands, and in this article I wish to call attention to one of the most interesting and valuable results of our visit to Bering Island, the more important one of the group. This was no less than the discovery of a nearly perfect skeleton of the now extinct Steller's sea-cow, *Rytina gigas*.

This remarkable animal was first discovered in the fall of 1741 by Captain Vitus Bering when his ship was wrecked upon the island now bearing his name. Geo. W. Steller was the surgeon and naturalist of Bering's party, and it is to him that we owe about all that we know about the sea cow in life.

At the time of its discovery this large marine mammal was quite abundant about Bering Island, as Steller reports that he saw them in great herds feeding upon the kelp and other sea-weeds that grow in abundance in the shallow water about the island. It was soon discovered that the flesh of the sea-cow was good eating, and the men killed many of them for food.

According to Steller, the sea-cow when fully grown was 24 to 30 feet in length, 20 feet in girth, and weighed 6,000 to 8,000 pounds. It was of a nut-brown color and covered with hair, matted like the outer bark of a tree. The skin was exceedingly thick, and so tough that the hunters had to cut it with an ax. The head was very small when compared with the great size of the body, the jaws were toothless, but were furnished with a thick, horny pad. The anterior limbs were modified into flippers, while the hind limbs were entirely absent, and the tail was widely forked, as in the sperm whale.

This animal was gregarious, stupid, sluggish, and comparatively helpless, being unable to protect itself by diving, and was occasionally washed ashore by breakers.

When, in 1743, the news of the discovery of Bering Island reached Kamchatka, several expeditions were fitted out for the purpose of hunting the sea-cow and the various fur-bearing animals, such as the sea otter, fur seal, and blue fox, which are found there; and very soon many whaling vessels began to stop there to lay in a supply of sea-cow meat for food. So great was the destruction wrought by these whalers and fur-hunters that by 1754, only 13 years after its discovery, the sea cow had become practically exterminated. In 1768, according to the investigations of Dr. L. Stejneger of the National Museum, who has made a most careful study of the question, this large and important marine mammal became wholly extinct, the last individual ever seen alive having been killed in that year; and the fate which overtook Rytina so speedily has almost become that of the buffalo, and will as certainly become that of the fur seal unless it be protected.

Mr. Frederic A. Lucas of the National Museum has recently published a most interesting and valuable paper on "Animals Recently Extinct or Threatened with Extermination," in which he gives in readable form about all that is known of the sea-cow. In this paper, of which I have made free use in the present article, Mr. Lucas states that, up to 1883, but two skeletons of the sea-cow were known. One of these is in the Imperial Museum at St. Petersburg, and the other is in the Imperial Academy of Helsingfors. There are two ribs in the British Museum. During Dr. Stejneger's stay of about two years (1882–1883) upon Bering Island, he succeeded in finding a number of skulls, ribs, vertebræ, and other bones. One complete skeleton was found buried in the sand, but the bones were too far decayed to permit handling. From the various individual bones found by Dr. Stejneger a fairly good skeleton was "made up," which is now in the National Museum. This, together with the two skeletons at St. Petersburg and Helsingfors, and the two ribs in the British Museum, constituted the total amount of material pertaining to Rytina found in the museums of the world at the time of my visit to Bering Island.

Being conversant with these facts, imagine my surprise and delight upon learning, soon after landing, that a native had recently found a nearly perfect skeleton in a good state of preservation, and that he would sell it. I took the first opportunity to examine the skeleton, and was not slow in deciding that it should be purchased for our National Museum. This skeleton was found in 1891 by the same native who found the one which was sent to the Czar. It was embedded in the sand to a depth of a few inches, and lay several rods from the present water-line. It is in a good state of preservation and proves to be very nearly complete. The cervical vertebræ are complete and show that the number is seven instead of six a point that was in dispute until settled by the study of this skeleton made by Mr. Lucas of the National Museum.

Unfortunately the anterior limbs are incomplete, and whether Steller's sea-cow had any hand or finger bones must still remain an unsettled question.

PLANT DISEASES, CAUSED BY NEMATOID WORMS OF THE GENUS APHELENCHUS BAST. I.

BY DR. J. RITZEMA BOS, MEMBER OF THE INTERNATIONAL PHYTOPATHOLOGICAL COMMISSION, PROFESSOR OF ZOOLOGY AND ANIMAL PHYSIOLOGY, AGRICULTURAL COLLEGE, WAGENINGEN, NETHERLANDS.

BIS vor kurzer Zeit waren blos aus den Nematoden Gattungen *Heterodera Gruff* und *Tylenchus Bastian* in Pflanzen schmarotzende Arten bekannt; in den letzten drei Jahren gelang es mir drei neue, bisher unbeschriebene Species aus der Gattung *Aphelenchus Bastian* als die Ursache von Pflanzenkrankheiten zu entdecken.

Bekanntlich sind die *Aphelenchen* den *Tylenchen* nächst-verwandt; es sind beide aalförmige Anquilluliden mit schwach geringelter Cuticula und mit einem Mundstachel hinter der Mundöffnung zum Durchbohren von Zellwänden. Während aber bei *Tylenchus* der Darm in der halben Länge des Oesophagus eine kugelförmige oder ovale muskulöse Auschwellung (den "Muskelmagen") besitzt, und nachher am Hinterende des Oesophagus eine nochmalige Auschwellung (den "Magen"), findet sich bei *Aphelenchus* wohl das erst genannte, nicht das zweite Organ, sodass der eigentliche Darm unmittelbar hinter den Muskelmagen anfängt. Es haben weiter die Männchen der *Tylenchus-*

arten eine Bursa, welche den *Aphelenchus*-arten fehlt (Vgl. 2B. Bastian, "Monograph of the Anquillulidæ," in Transactions of the Linnean Society, xxv., S. 122–124; auch de Man, "Die frei in der reinen Erde und im süssen Wasser lebenden Nematoden," S. 137).

Aus dem Genus *Aphelenchus Bastian* waren bisher 10 Arten bekannt; es wird aber wahrscheinlich herausstellen, dass mehrere dieser Arten unter sich identisch sind. Es wurde von diesen 10 *Aphelenchus*-arten *Aphelenchus Avenæ Bastian* zwischen den Blattscheiden und dem Halme von Haferpflanzen, *A. villosus Bast.* in Moosrasen, *A. parielinus Bast.* in Flechtenkrusten gefunden; ich finde aber keine Mitteilung darüber ob die beiden letztgenannten Arten als Schmarotzer in den Moosen resp. Lichenen, oder vielmehr *zwischen* den Blättern resp. den Teilchen des Thallus, lebten. Auch über irgend welche von *A. Avenæ* verursachte Pflanzenkrankheit findet sich bei Bastian gar keine Mitteilung, sodass bis jetzt unentschieden bleibt, ob diese *Aphelenchus*-species als wirklicher Pflanzenschmarotzer angesehen worden muss oder vielleicht blos zufällig in einer Haferpflanze gefünden wurde.

Ich habe bis jetzt drei *Aphelenchus*-species entdeckt, die zweifelsahm wahre Pflanzenschmarotzer sind, und von denen die eigentümliche von ihnen hervorgerufene Pflanzenkrankheit von mir studiert wurde. Es sind die folgenden Arten: *Aphelenchus Fragariæ nov. spec.*, *A. Ormerodis nov. spec.* und *A. olesistus nov. spec.* Eine Beschreibung dieser drei Arten will ich hier nicht geben; die ersten zwei Arten wurden schon von mir in Sorasier's "Zeitschrift für Pflanzenkrankheiten" (Bd. I.. S. 7, 1891) beschrieben und abgebildet; die letztgenannte Art wird bald im dritten Bande derselben Zeitschrift ihre Beschreibung finden.

Aphelenchus Fragariæ fand ich in eigentümlich erkrankten, aus St. Paul's Cray, Kent (England), herkömmlichen Erdbeerpflanzen; es erkrankten auf einem Felde von 14 Acres etwa die Hälfte der dort wachsenden Pflanzen. *Aphelenchus ormerodis* wurde von mir in kranken Erdbeerpflanzen gefunden, die mir aus Erith (Kent, England) zugingen. Für diese beiden Arten verdanke ich das Untersuchungsmaterial der freundlichen Bemittlung Miss Ormerod's aus St. Albans, England, der zu ehren ich die eine Species benannt habe. *Aphelenchus olesistus* erkannte ich als die Ursache einen sehr typischen Erkrankung von Begonien-blättern, die mir Herr Dr. Masters (London) zugehen liess, sowie einer dergleichen Erkrankung von *Asplenium bulbiferum* und *diversifolium*, welche mir Herr Dr. Klebahn in Bremen zusandte.

A. Die von Aphelenchus Fragariæ verursachte Erdbeerpflanzenkrankheit. Dieser Nematode lässt im allgemeinen dieselben Abnormitäten bei der Erdbeerpflanze auftreten, welche die anderen Nematodenarten verursachen, wenn sie in Pflanzengeweben schmarotzen, nämlich eine Einschränkung resp. ein Stillstehen der Längenwachstums der Gefässbündel, gewöhnlich eine ungemein starke Verästelung derselben,— Hypertraphie der Parenchymzellen der Stengel, Aeste und Blätter,—starke Teilung, zuletzt Absterben dieser Zellen. Es versteht sich, dass dem Habitus nach sehr verschiedene Missbildungen entstehen, je nachdem eine Pflanze oder irgend welcher Pflanzenteil früher oder später von Parasiten heimgesucht wird; und je nachdem sich in demselben eine grössere oder geringere Anzahl von Anquilluliden befindet.

Bei den von vielen *Aphelenchen* bewohnten Erdbeerpflanzen findet sich eine starke Verdirbung aller Stengelteile und eine starke Verästelung sowie die Bildung einer grossen Anzahl neuer Knospen. In den Achseln der niedern, normal entwickelten Blätter finden sich zahlreiche, sehr dickschuppige Knospen, welche eine grosse Uebereinstimmung haben mit den kleinen Brutzwiebeln, welche sich innerhalb der ausgewachsenen Zwiebeln bilden; diese abnorm dicken Knospen bilden niemals Stolonen. Der Hauptstengel ist bei einigen Exemplaren anfänglich ziemlich regelmässig ausgewachsen (wahrscheinlich weil die Pflanze nicht sogleich von einer grossen Anzahl von *Aphelenchen* bewohnt wurde); aber in einer gewissen Höhe verästelt er sich stark; die Aeste find nicht nur dick und breit, sondern bleiben während ihres weiteren Wachstums auf eine grosse Strecke ihrer Oberfläche hin vereinigt, sodass wahre *Verbänderungen* ("*Fasciationen*") entstehen. Es bilder sich aber gewöhnlich keine bandförmige Stengelform, sondern eine Verdickung, welche sic am besten mit einem Stücke Blumenkohl vergleichen lässt, weshal ich — in Uebereinstimmung mit Miss Ormerod — die von *Aphe lenchus Fragariæ* verursachte Krankheit "die *Blumenkohlkrankhei* der Erdbeerpflanze" ("*Cauliflower disease*") genannt habe. I einigen Fällen aber bildet sich eine einfache, bandförmige Ver breiterung, also eine wahre Verbänderung des Stengels resp. de Astes, während die an derselben befindlichen, immer sehr zahlreichen Blumen, oder Blattknospen, mehr oder weniger norma zür Entwickelung kommen.

Bisweilen auch ist das Wachstum auf der einen Seite des Stengels oder des Astes, welcher eine Verbänderung bildet, kräftiger als auf der anderen Seite; es entsteht infolge dessen eine Biegung des betreffenden Teiles, welche sich so sehr steigern kann, dass letzterer sich ganz zusammenkrümmt. Oft teilt der Gipfel des Fasciation sich wieder in eine grosse Anzahl verschiedener Aeste, welche mehr oder weniger normal entwickelte Blüten und Blätter tragen.

Allein am meisten kommt es vor, dass der Stengel oder der Ast sich nicht nur in die Breite sondern auch in die Dicke vergrössert; die Seitenäste verwachsen entweder zum grössten Teile oder gänzlich mit einander, und die Knospen kommen nur ausnahmsweise zu vollkommener Entwickelung. In diesem Falle ähnelt ein grosser Teil der kranken Pflanze sehr dem Blumenkohle oder dem Broccoli, je nachdem die Knospen entweder gar nicht oder doch noch teilweise zur Entwickelung gelangen und normale oder abnorme Blüten entstehen lassen.

Bisweilen bleibt der Stengel sehr verbreitert und kurz, und sind die Knospen an seinem Gipfel, oder vielmehr an seinem Kamme, zusammengedrängt, wie beim Hahnenkamme (*Celosia cristata*); bisweilen zeigen letztere sich auch an den Seiten des Achsenteiles, und zwar infolge des unregelmässigen Wachstums, sehr unregelmässig verbreitet, oft in grosser Anzahl dicht zusammengedrängt, eine bedeutende Oberfläche einnehmend. Gewöhnlich aber finden sich die Knospen, ganz wie beim Blumenkohl, auf dem grössten Teile der Oberfläche der zu einer dichtgedrängten Masse veränderten Achsenteile. Die Aehnlichkeit mit Blumenkohl kann wirklich eine sehr grosse sein.

Von den Blättern der von *Aphelenchus Fragariæ* heimgesuchten Pflanzen sind gewöhnlich zwar einige normal; viele aber bleiben immer klein, wobei die Blattfläche verhältnismässig kleiner bleibt als der Stiel; bisweilen ist die Blattfläche nicht mehr dreizählig sondern aus einen Stücke bestehend; auch ist sie oftmals gefaltet.

Die Blütendeckblätter sind gewöhnlich klein, oder sie sind zwar kürz, aber dick und unregelmässig gefaltet.

In Betreff der Blütenknospen bemerke ich folgendes: Bisweilen ist der Achsenteil sehr dick und bleiben die Blatteile sehr-dünn, schuppenförmig. Bisweilen werden die Blatteile zwar dicker, bleiben aber nichtsdestoweniger kurz und behalten den Habitus von Schuppen. Oft sind dann die beiden Blätterreihen des Kelches ("Calyx duplex") vollkommener als die anderen Reihen von Blütenblättern entwickelt. Oefter bleibt die Knospe ganz oder fast ganz geschlossen; in anderen Fällen aber öffnet die Blütenknospe sich.

Die äusserste Blätterreihe des Kelches besteht oft aus dünnen, schmalen, sogar nadelförmigen Blättchen. Die Blätter der inneren Reihe kommen gewöhnlich.weit mehr zur Entwickelung; sie sind oft mehr oder weniger gefaltet und bisweilen an der Unterseite blasenförmig augeschwollen. Oft sind sie mehr oder weniger gelappt, gespalten oder eingeschnitten ; sie können auch dreizählig sein und also die Form der gewöhnlichen grünen Blätter nachahmen.

Die Kronenblätter bleiben oft ganz rudimentär. Bisweilen kommen sie zwar zu weiterer Entwickelung, bleiben aber kleiner als die Kelchblätter, biegen sich hin und her und falten sich ; sie sind dann aber nicht weiss, wie die gesunden Kronenblätter, sondern grünlich weiss bis hellgrün, allein dünn und zart wie die gewöhnlichen Kronenblätter.

In vielen Blüten fehlen die Staubblätter oder sie sind rudimentär; bei anderen Staubblättern ist der Staubbeutel normal, der Faden aber dick und kurz.

Der Blütenboden, d. h. der Achsenteil der Blüte, mit den auf demselben eingepflanzten Pistillen, bleibt in vielen Fällen sehr

klein; letztere können auch gänzlich fehlen. Bisweilen entsteht eine anilläre Prolification der Blüten, und zwar immer in der Weise, dass in den Achseln von zwei bis drei Kelchblättern sich neue Knospen bilden, aus denen aber wohl niemals normale Blüten entstehen.

Uebrigens versteht es sich von selbst, dass an den weniger heimgesuchten Pflanzen auch ziemlich normal entwickelte Aeste, Blätter und Blüten vorkommen.

Die von *Aphelenchus ormerodis nov. spec.* und *A. olesistus nov. spec.* verursachten Pflanzenkrankheiten werden in der zweiten Abteilung dieses Aufsatzes beschrieben werden.

BURIED ALIVE, — ONE'S SENSATIONS AND THOUGHTS.

BY WARREN K. MOOREHEAD, 5215 WASHINGTON AVE., HYDE PARK, CHICAGO.

THE title of a paper written for *Science* — "Buried Alive" — seems rather sensational, and, so far as the title goes, the article might be more properly published in one of the daily newspapers. I have made bold to write upon an unpleasant experience of the year 1888 at the suggestion of several friends interested in studying suspended respiration. They have told me that cases of complete burial in earth (the subject being conscious meanwhile) where the person "interred" escaped with his life and was able to give a satisfactory or intelligent account of his feelings, are extremely rare. They suggested that, as my accident would furnish material for consideration among medical men interested in kindred studies with themselves, it had better be described.

A mound was being excavated near Frankfort, Ross County, Ohio, in August. At the centre the wall (from the base-line upwards) was fifteen feet high. It was undermined by the workmen, and, as I bent down to examine a small bone uncovered in the process of undermining, a mass of earth equal to several cartloads suddenly dropped from above.

There was no one in the excavation, the men having gone on top preparatory to cutting down the undermined wall. As the earth cracked loudly, I looked up and started to rise. The falling mass knocked me back about five feet, so that I fell with my head and shoulders resting upon a heap of loose earth. The falling wall was, of course, seen only for an instant. It looked black, and the rush of wind it caused I well remember. My head and shoulders were somewhat higher than my legs, possibly a foot. The feet were spread apart. There was little pain, only pressure, *intense pressure*. It forced the buttons of my light field costume partly inside the flesh; my watch-chain left a bright-red mark along my left side. I could feel the watch strongly pressed against two ribs (these were broken). The skin over my forehead seemed being cut, but it was the pressure of my hat forcing the flesh between the laced straws. A knife in my pocket seemed burningly hot. Just under the small of my back lay a large clod. The pain at the point of contact was considerable at times, and my spinal column seemed slowly breaking. Then the pain stopped and I could feel nothing.

Thoughts coursed like lightning,— past life, future, and home. I did not think much of the situation, except to wonder if I could breathe when I got out. One singular thought occurred. I remembered reading of women who, in war times, buried their husbands in ash piles or sand-heaps to prevent their being drafted into the army. I had often wondered if it were possible for one so placed to breathe through a tube, as described in the stories. I remember trying to move a hand, even a finger. One could not have been more firmly held in a mould. My arms and hands were perfectly motionless. The chest could not be inflated or moved the slightest distance. On the contrary, the downward pressure forced all the air out of my lungs. I remember how hot the earth against my face became as the last breath was forced from me. Just in front of my mouth and chin was a slight hollow, formed by the arching of two good-sized lumps of clay. I could move my chin and open and shut my mouth. That was the only part of my entire body that could be moved. I remember trying to keep my mouth shut to keep out the dirt. But after a few seconds my mouth instinctively opened, and, the arch having broken down, earth filled it. I remember the horrible sensation of trying to dislodge the earth and the fear of strangling that suddenly seized upon me. I then felt that I was doomed to perish, but had no fear and did not particularly care.

It was sixty seconds, so the surveyor says, when the men reached my head. The laborers think it was over a minute, but I am inclined to believe the surveyor. I felt the earth move slightly above my head. That gave me hope. I had not thought much of rescue, but I gathered my remaining strength. A shovel passed across the top of my head, cutting the scalp; I remember feeling it as if a hot iron had struck me. Then they uncovered my head and removed the earth from my mouth and eyes. For some unaccountable reason they stopped for an instant. The surveyor says the pressure was so great upon the imprisoned portions of my body that the blood was forced to the head, and the veins stood out so strongly he feared they would burst. Even with the head uncovered I could not breathe. They soon had me laid outside upon some wheat sheaves. I remember, just as they carried me out, seeing a little yellow "wild canary" perch upon a tall thistle near at hand. I heard it sing a sweet song. As the bird flew away, I seemed to follow it, dancing about the fields, perching upon this and that shrub, just as it did. The sky seemed to have a different color from that usually noticed, I was impressed with its grandeur,— the scenery of the surrounding country was remarkably beautiful, and as I observed all these things they affected me, and I cried.

They rubbed my limbs, I could see the men at work, but could feel nothing. The partial paralysis of my limbs continued for some days. To some extent the accident has affected my mind. I cannot now enter an underground cave, or mine, or stand under an overhanging bank without an effort; it requires all my will to go in them. I also often dream of caving banks and experience precisely the same feelings as I did in reality. I neglected to state that the earth above my head was about three feet thick, that over my legs was much deeper. Many persons buried in gravel pits and in earth not nearly so deep have been taken out dead.

NOTES AND NEWS.

IN a letter to Dr. Charles S. Minot the method used by Dr. M. von Lenhossék to obtain his remarkable results on the nerves of earth-worm, is described as follows: The method cited by me corresponds to Golgi processo rapido: Pieces of an earth-worm, each three-quarters millimeters long are placed for three to five days in about ten cubic centimeters of the following mixture: Bichromate of potasssium, 3.5 per cent, four parts; perosmic acid, 1 per cent, one part. The pieces are then dried off with filter paper, and placed for about forty-eight hours in the second solution of 0.75 per cent nitrate of silver, to every two hundred cubic centimeters of which one drop of formic acid is added. As soon as the pieces are placed in the second solution a reddish brown silver precipitate is thrown down upon their surfaces; the success of the method depends upon this precipitate being formed in the interior of the tissues also. The pieces after this treatment must be hardened rapidly in absolute alcohol (probably a large quantity of 96 per cent alcohol will act equally well), and are then imbedded in elder pith and cut with the microtome. If the reaction has been successful, the nerve-fibres and the cells from which they spring will show the well-known and characteristic Golgi coloration (almost black owing to the silver deposit). If the first attempt at the reaction fails, the coloration may be often obtained by repeating the sojourn in the two liquids as above directed. But even after double treatment the reaction is often not accomplished, but when it succeeds it amply repays all the trouble and vexation it causes. The sections must be mounted at once in Canada Balsam dissolved in xylol (or benzole), and left without a cover-glass. (In the second volume of the "Anatomische Hefte" a method is described by which Golgi preparations may be made so permanent that they may be mounted with a cover glass.) It is by means of this method that Lenhossék made the discovery that the sensory nerve-fibres arise from the sensory cells of the epidermis and branch in the same manner as in vertebrates, forming within the central nervous system a branch running tailward and another running headward.