

Correspondence.

The Strangest Insect in the World.

To the Editor of the SCIENTIFIC AMERICAN:

Referring to my contribution, page 375 of the SCIENTIFIC AMERICAN, December 14, 1895, vol. lxxiii., No. 24, I am now enabled to afford further information on the above subject, viz.: The fungus *Sphaeria Robertsii*, Hook., is believed to attack *rubriviridians*, another species of the genus *Charagia*, as well as *Hepialus virescens*, besides other members of the *Hepialidæ* family, such as *Porina* and *Pielus*, chiefly the larger brown moths of these genera, with variously checkered markings according to sex. They are root feeders as a rule on the *Rata*, *Metrosideros robusta*, fern trees, etc. The popular names of *S. Robertsii* are bulrush caterpillar, New Zealand vegetable caterpillar, fungoid caterpillar and the additional Maori names *Weri* and *Anuhi* (Taylor). They are considered by entomologists to be the true subterranean root-eating insects of the genera *Porina* and *Pielus*, well defined groups of the family *Hepialidæ*. I was fortunate enough to discover on my land at Paraparaumu, near Wellington, New Zealand, a larva of *Porina signata* evidently attacked by this fungus, and in grubbing up roots and stumps in clearing the same land I obtained several larvæ of *signata*. The larva of this insect is about $2\frac{1}{4}$ inches in length, chocolate colored, with black head and dirty bluish white segmental rings; altogether a fragile, thin skinned, glabrous looking creature, seemingly unfitted for an underground life. The inclosed very interesting paper from Mr. Fitton, of Fielding, North Island, N. Z., would appear to set at rest any doubt as to wood-boring larvæ being exempt from attack by *S. Robertsii*. The subject of parasitic fungi has engaged the attention of many scientific men, notably that of Dr. M. C. Cooke, M.A., LL.D. See his valuable treatise on *Entomophytes or Entomogenous Fungi and their insect hosts*, 354 pages, four plates and woodcuts, 1892, London, published under the auspices of the Society for Promoting Christian Knowledge, and entitled "Vegetable Wasps and Plant Worms." Fungi parasitic on insects appear to have been first noticed as far back as 1763 in the "Philosophical Transactions of the Royal Society," and *Hepialus virescens*, formerly *Corcyceps Carvarum*, Westw., has been long considered, though open to doubt, as attacked by *S. Robertsii*. Much is known as to the ground larvæ attacked, but little as to the "modus operandi" of the fungus. The matter is now still further complicated by wood-borers being also attacked, making it inconceivable how the spores of the fungus obtain access to boring larvæ, converting their tissues into woody fiber; especially when it is considered that borers live in the hearts of the trees and secure themselves in their burrows from intrusion internally by ingeniously constructed diaphragm-like impediments, and externally by spinning thickish web coverings interwoven with frass and fragments of bark to close and disguise the entrance to the borers. Mr. Fitton's paper is evidently the result of years of careful observation, and as it probably contains the latest information on this important subject, you may be pleased, in the interests of science, to give it space in your widespread and valuable journal.

GEORGE J. GRAPES.

5 Terrace Road, St. John's, Newport Isle of Wight, England, December 30, 1898.

THE VEGETABLE CATERPILLAR.

The grub is the larva of a large moth, which, from its nocturnal habit, is commonly called "the night butterfly." The grubs (which are 2 to 3 inches long) are subject to attacks from a vegetable parasite, or fungi, called *Sphaeria Robertsii*, the spores of which, germinating in the body of the grub, absorb or assimilate the whole of the animal substance, the fungus growth being an exact replica of the living caterpillar. As to how the spores of the fungi are taken into the body of the grub, it is idle, in the absence of more knowledge of the organisms, to speculate. The fungi, having killed the grub and absorbed the animal substance, sends up a shoot or seed stem, the length of which varies from 6 to about 11 inches. A remarkable feature about the seed stem is that it always breaks through the skin of the grub at the back of the head. Those caterpillars found are in a vertical position, with the head uppermost; but this does not seem to account for the stem breaking through at the head, as among the hundreds I have dug up I found two with the position reversed, the head downward, and in both these cases the stem had, as usual, broken through at the back of the head. The ground caterpillar is found at a depth of 2 to 8 inches below the surface of the ground; the stem below the surface being generally twisted and bent through coming in contact with roots or other hard matter. Above the ground the stem is straight, about 2 inches of the upper end being covered with the seed spores. It is accepted opinion that the fungi, after producing its spores, dies and decays, but this is incorrect, as only that part of the

stem above the ground dies, the lower portion retaining its vitality and sending up another shoot the following year, the new shoot sprouting from the old just a little below the surface of the ground. Among the many specimens dug up I have found two with the wings and legs of the moth showing beneath the outer integument, thus showing that the transformation to the winged moth was in operation before the grub was attacked by the fungi. There is a tree-boring grub exactly like the ground one, but whether the two are identical has yet to be determined; however, the tree-boring one is also subject to attacks of *S. Robertsii*, as I have found one with the seed stem growing from the head, the stem projecting out of the bore the grub had made, the end of the stem standing out about 3 inches beyond the bark of the tree. A friend of mine has also found two others in trees. It is believed the ground grub only enters the ground at the time when about to go through its transformation to the moth; but this belief is open to question, and may well be doubted. The strongest reason for doubting it is the fact, established beyond all question, that the tree-boring grub changes to the moth without leaving the tree. When about to enter on the winged stage of its existence, it crawls to the outer end of its bore, slips its outer membrane and emerges a fully developed moth. Hundreds of the empty membranes may be observed during the early weeks of summer. Another reason for doubting the accepted belief is that live grubs can be found in the ground at all seasons of the year. Those grubs which escape being attacked by the fungi appear as winged moths about the middle of October. Their existence in the winged stage seems to be very brief, limited to two or three weeks. In about three weeks after their first appearance none can be seen, but dead ones may be found on roads or in open places in the woods. Some of the moths are of large size, and beautifully marked. There is such a variety of color among them that scarcely two can be found of exactly the same shade. The caterpillars are scattered over a large area of country, but are only found in bush covered land, the stems sticking up through the decayed leaves and looking like a miniature bulrush. Such is the "vegetable caterpillar," an organism calculated to arrest the attention of anyone, and furnishing another example that the animal and vegetable life on the globe is so intertwined as to be inseparable.

[Signed] C. FITTON.

Rangiwahia, Pemberton, Fielding, New Zealand.

The Nernst Electric Lamp.

The Nernst electric lamp is now creating considerable interest abroad. At a meeting of the Society of Arts on February 8, Profs. Swinburne and Ayrton put themselves on record as saying it was the greatest discovery in many years. The invention created great interest among the members of the Society who were present at the meeting. In the invention of Prof. Walter Nernst, of Goettingen University, the light is emitted by a rod composed of oxides of rare earths similar to those which are used in the manufacture of incandescent gas mantles. The light is mild and yellowish and works equally well at considerable variations of voltage. Magnesium oxide is largely used in the manufacture of rods, and like the other material it is incombustible. The materials used are, under ordinary circumstances, non-conductors of electricity, and Prof. Nernst's discovery is that when they are heated they become conductors. In experiments with a hollow magnesium tube he obtained results which showed an expenditure of 0.96 watt of electrical energy per candle power against 3 watts per candle power for the ordinary glow lamp. Up to the present time Prof. Nernst has not settled upon a commercial form for his lamp. In his experimental lamp he accomplishes the initial heating of the magnesium filament by placing it in the focus of a reflector under which is also a spiral coil of platinum wire. The current is first passed through the platinum, which furnishes heat enough to the focus of the reflector to render the magnesium conductive. The current is then turned on, and the magnesium becoming incandescent gives out light and also enough heat to maintain its own conductivity.

A Curious Bridge at Mans, France.

There has recently been completed at Mans a bridge which is most curious, from a technical point of view, and remarkable from an artistic point of view. In the town of Mans, an electric tramway had been constructed which was to run across the river at a certain point. The steam railway of Saint-Denis-d'Arques, in operation since 1888, crossed the river at the same point. If the two roads crossed on land, two bridges would be required. The old railway bridge could not be used, as it was already worn out by long service. It was therefore decided to build a single bridge with two branches, thus leaving passages for the railway and the tramway. The structure, as a result, is X-shaped, and the two roads cross each other in mid-stream. By reason of this peculiar structure a saving of 12,000 francs was effected—a very considerable sum, when it is considered that two bridges would have cost 45,000 francs.

Science Notes.

A fossil dinosaur that must have been 130 feet in length has been found near Laramie, Col. The remains were found by Prof. W. H. Reed in the Jurassic strata near Laramie.

The Indian government has been offered by Mr. Jamestsji Tata the sum of \$1,250,000, for the establishment in India of a university for research on the model of the Johns Hopkins University.

Mr. H. Holswaldt has devised an improved mercury interrupter. It consists of a three-rayed star wheel made of silver. The arms are narrow, and flattened so they enter and leave the mercury without noise.

A Chicago concern building automobile vehicles has closed a contract to supply several Bombay princesses with them. They will be actuated by electricity. The same company is now estimating the cost of a line of automobile coaches for Fifth Avenue, New York city.

Oil to calm the waves was used on an unusually large scale during the recent gales in the English Channel. The waves broke over Folkestone pier, making it difficult for steamers to enter the port until a considerable quantity of the oil was poured into the harbor, when the seas immediately became smooth.

Dr. Negro, of Turin, has succeeded in curing one hundred out of one hundred and thirteen cases of sciatica by digital pressure over the painful part. The pressure is applied with all possible force for fifteen or twenty seconds and is repeated for the same length of time after an interval of a few minutes. In many cases six treatments are all that is necessary.

On January 21, W. A. Eddy, of Bayonne, N. J., sent up an electrical collector to a great height by means of four kites, each 7 feet in height. The collector had four 6-inch cardboard points covered with tin-foil. Thin bare copper wire ran down the kite cord and into Eddy's house. The sparks which were obtained were much smaller than Eddy had expected from a collector raised to such an elevation.

We have already spoken of the extirpation of a woman's stomach, the very clever operation being performed by Dr. Schlatter, of Zurich. It is interesting to note that two operations of a similar nature have since taken place in this country, and both were successful. One was performed in San Francisco by Dr. Brigham and one by Dr. Maurice Richardson, of Boston. In the latter case the patient was an elderly lady who had a cancerous growth which involved the whole stomach, so that the only remedy was the removal of the organ. The patient recovered and is now quite well.

A German chemist, named Liebermann, calls attention to the fact that a certain class of factories which manufacture chemical apparatus have, for some time, been putting on the market test tubes, etc., of a glass so strongly alkaline that if red litmus tincture or other delicate testing solutions are put into them, the reagents at once take on a color reaction as intense as though an alkaline solution had been poured into them. Such vessels might readily be the source of enormous errors; but for this great defect, the author says that the vessels are brilliant and well made. There is nothing which calls for higher excellence than chemical apparatus and chemicals.

The grounds and buildings of the Exposition of 1898, at Omaha, have been purchased by a company formed to hold an exposition this year to be known as "The Greater American Exposition of 1899." The exposition is to consist of exhibits from the new possessions of the United States. Resolutions have been presented to Congress to gain recognition for the project, and to request the admission of the exhibits duty free. It is proposed to open the exhibition on July 1 and close it on November 1. It hardly seems as if the time has arrived for an exposition which deals with our newly acquired territory. Everything is at present in a chaotic state, and we doubt very much if an adequate display can be made.

We recently examined what is thought to be one of the largest studio cameras ever built in this country, made by Folmer & Schwing, of this city. The bed of the camera measures seven feet, but the focus can be extended three feet more by the addition of a bus extension front. The rear moving section is supported on roller bearings to permit of easy focusing. It takes a plate forty inches square. The plate holder is of special construction, having a sectional flexible roller blind slide, made of half inch strips of wood, tongued and grooved together, and passes through one edge of the holder from the front to the rear. When an exposure is made, the end of the slide is pulled downward until it completely covers the back of the holder and at the same time uncovers the plate in the camera. Pushing it upward covers the plate again. The weight of such a shutter is thus somewhat balanced, except when it is first started, one part being on one side of the holder and the other part on the other side. Usually a small test plate is tried first to secure the correct exposure before using the large plate, which costs about \$10.