Correspondence.

Tree Pests.

To the Editor of the SCIENTIFIC AMERICAN:

Will you please have the kindness to answer the following questions through the SCIENTIFIC AMERICAN? Last year a large size "cotton tree" in my yard had millions of worms on, and when they had eaten the leaves all off, they came down the tree and I destroyed them by burning kerosene and sulphur. I thought I had completely annihilated the whole lot. Then before the leaves started this spring I put a large quantity of common cotton batting around the trunk, with the expectation that, if any were in the ground, they could not get up the tree. There were no nests in the tree. Now, to my amazement, I find that there are again millions of little worms about three-sixteenths of an inch long, commencing their destructive business. Can you suggest anything whereby I can destroy these pests without injury to the tree? And how do they get there? GEO. BOXLEY.

Troy, N. Y., June 13, 1895.

[The Agricultural Department could not furnish the information desired from the description of the insect, and stated that the determination could only be made on receipt of some of the worms and leaves of the tree. They also stated that they did not know any such tree in New York State as the "cotton tree." Mr. Boxley sent the samples and wrote again, the substance of which is as follows:

"I have sent you by mail a box in which are some of the grubs spoken of, also a few leaves of the tree and a few yellow grubs that are beginning now to fall out of the tree. Last year I destroyed many of these yellow grubs and live worms by sweeping them up together and put on brimstone and kerosene and setting it on fire. I said cotton tree in my communication to you because I was under the impression that when it blows in the springtime the blossoms seem to shed a material resembling cotton The tree has been out in leaf only a short time, but these grubs have nearly eaten all the leaves up, and it is quite a large tree."]

The Imported Elm Leaf Beetle.

HOW TO PROTECT ELM TREES.

BY PROF. C. V. RILEY.

The insect so injuriously affecting Mr. Boxley's trees at Troy, N. Y., is the imported elm leaf beetle (Galeruca xanthomelæna). He is under a misapprehension in reference to the cotton blowing from the blossoms in springtime, as the leaves show that the tree is the ordinary American elm and not the cottonwood or the silver poplar, which are notorious for shedding an abundance of light cottony seed in the spring of the year. The elm leaf beetle in question confines its attacks to different varieties of the elm, and I have treated it pretty fully in past numbers of the SCIENTIFIC AMERICAN (vide more particularly SCIENTIFIC AMERICAN SUPPLEMENT, No. 431, 1884, p. 6885). The grubs referred to in the box sent are the pupæ of the elm leaf beetle. They do not fall out of the tree, but are produced at the base thereof, or under any rubbish near to hand, or just beneath the surface of the ground, from the larvæ which have done the damage to the leaves, and which, being full grown, have descended the trunk in order to transform into these "grubs" or pupæ. From these pupæ, in due time, come forth the parent beetles, which deposit their eggs in little groups, generally in a double row of five or six to a row, on the under side of the leaves. These eggs are orange-yellow and bottle-shaped, being broader at the base, or attached end, and terminating in a bottle-shaped neck.

The young larvæ hatching from these eggs always remain on the under side of the leaf, eating off the parenchyma and leaving nothing but the epidermis, and thus causing the leaf to become seared and brown. As they increase in size, they frequently eat through the whole substance of the leaf, leaving only the larger veins, so that the leaves become thoroughly skeletonized. The larvæ are darker when first hatched, undergo four moults and become lighter with each moult. The average duration of the egg state is about one week, that of the larva state less than two, and that of the pupa state about a week, so that in the height of the season the whole cycle of development from egg to perfect insect may take place in a month. The beetle assists the larva in its destructive work, eating around holes in the leaves, but does little harm as compared with the larva.

There are two or more broods of this insect in the latitude of Washington each year, but in ordinary seasons apparently but one in the New England States. The last brood of beetles seek shelter in outhouses, barns, holes in posts, or in any other shelter that they can find wherein to pass the winter, and they begin to lay their eggs as soon as the first leaves are fully formed. It is chiefly on the young and tender growth that the larvæ thrive.

The cheapest and most effective remedy, and one that can be easily applied to all trees of moderate or medium size, is to spray the under side of the leaves with Paris green, mixed at the rate of one pound to a barrel of water, four or five pounds of dextrine, molasses, or flour, or lime being added to increase the adhesiveness of the mixture and also to facilitate the suspension of the Paris green, which does not dissolve in the water. Another arsenical preparation, known as London purple, may also be used at the rate of about three-fourths of a pound of the purple to a barrel of water. It is important that in either case the powder should be pure, and, on the whole, it is easier to obtain a reliable article of Paris green, perhaps, than of the London purple. Of the different substances to be added, lime is, perhaps, preferable to the others, as it serves to neutralize any injury to the foliage from an excess of the poison. The main object of the spraying should be to cause a uniform amount of the spray to adhere to the surface of the leaves, and all nozzles which simply drench the tree and cause the liquid to run down in a shower to the ground should be avoided as far as possible. There is nothing better than the Vermorel modification of the Riley or Cyclone nozzle for this purpose, at the end of some extension rod. This will answer for trees from 30 to 40 feet in height, without ladder assistance; but trees that are taller than this can only be sprayed successfully by means of a ladder. Any good force pump attached to a barrel and mounted on a cart or wagon will answer the purpose, being manipulated by one man, while the other manages the nozzle. There are a number of different contrivances offered and advertised by various manufacturers, as the spraying of fruit trees, especially apples, with arsenical poisons has become a recognized part of successful apple culture. The same apparatus will prove equally effective against this elm leaf beetle. If one has a single tree to deal with, perhaps the least expensive method of spraying the foliage will be by means of a knapsack pump, which can be carried on the back, and which, with the assistance of a ladder, will suffice.

Should the correspondent desire further information, I advise him to send to the Department of Agriculture for Bulletin No. 10 of the Division of Entomology, a bulletin prepared by the writer and devoted to the subject.

The Papaya.

To the Editor of the SCIENTIFIC AMERICAN:

After exploring the many wonders of the Hawaiian Islands and their varied forms of tropical vegetation for more than six months, I have concluded that the marvelous and little known papaya, papaw, or Asiatic paw-paw tree and its fruit are fit to rank among the vegetable wonders of the world. Their effect on animal tissues is marvelous, and there is no excuse for tough meats where the papaya grows. The word is pronounced pap-pie-yae.

When I left the haunts of the white man and wandered out among the natives, I heard so many stories about the incredible pranks which the papaya juice performs on old fowls, the meat of bulls, and other tough animals, that I concluded to make a thorough test of it. As a result of my experiments I am able to report that the stories one hears are correct. It is simply marvelous the way the papaya juice transforms the toughest animal tissues into choice bits that would make a gourmet rejoice.

In company with Lieutenant John F. Bowler, late of the ex-queen's dragoons, I sought a noble papaya grove along the sandy beach of the famous Waikiki watering place. We gathered a bunch of stems and leaves from a lusty tree which had grown from seed planted only six months before. It was a noble specimen, about 20 feet high, and its seven-lobed leaves were about 2 feet in diameter. At so young an age the luscious yellow melon-like fruit hung in golden clusters from the tree's long and crooked branches. Before we expressed the juice of the leaves and stems we sat beneath the inviting shade and each ate one of the melons, which were delicious and not unlike cantelopes in appearance and consistency, though there was little similarity in taste. The fruit has a peachy flavor and is said to be a fine remedy for dyspepsia.

We readily secured about two ounces of the acrid, milky juice from our harvest. Taking it home, we put a few drops into a kettle of boiling water with a very old, tough fowl, which had been gathered in for the experiment. It had been boiling for more than an hour without becoming tender. The result of the papaya juice was magical. The papain, or active principle of it, dissolved the tissues at once and made the meat tender and palatable. A piece of very tough beefsteak was then wrapped in the leaves overnight, and it was a tender morsel for breakfast. The natives here say that the same results are obtained by hanging the meat in a tree among the saponaceous leaves. The mysterious juice differs from animal pepsin, in that its proteolytic action is not arrested or even delayed in neutral or alkaline solutions, as is the case with so many substances that enter the stomach. Its active principle is technically known as papayin, papayotin, or caracin, and there is no doubt that the Hawaiians have long known its value. LEIGH H. IRVINE.

Honolulu, H. I., May 15, 1895.

The Physical Phenomena of the Atmosphere.

A lecture on the phenomena of the high regions of the atmosphere was delivered recently at the Royal Institution by Prof. A. Cornu, F.R.S. Mons. Cornu began by comparing the atmosphere to an immense thermodynamic engine, the sun being the source of heat and the interplanetary space the condenser. The most interesting phenomena took place in the almost inaccessible parts of the atmosphere, and, though the difficulties of getting information about those elevated regions were great, yet he hoped to show that the physicist was beginning to know much of the real explanation of natural phenomena, and was even able to reproduce them in his laboratory. Among the unexpected static phenomena discovered by ballooning and in mountain observatories, M. Cornu instanced three—namely, the facts that many clouds which had generally been regarded as consisting of vapor were composed of minute crystals of ice; that at different heights the direction of the wind was different; and that the temperature did not get steadily lower as the earth became more distant, but that alternate layers of hot and cold air were encountered. The first and last of these facts might have been ascertained by indirect means from consideration of certain optical phenomena. From the solar halo might be inferred the presence of ice crystals in cirrus cloud; they had the power of refracting light, and refraction of the sun's light by passing through cloud would fully explain the halo. It could be reproduced artificially by passing a beam of light through a strong solution of alum, with a little alcohol added. The alternations of heat and cold in the atmosphere were deducible from the various forms of mirage, which depended on the reflection of light from the surface of the different layers. M. Cornu gave an ingenious reproduction of the "Alpine glow," sometimes seen in the Bernese Oberland, for an example. A valley between two peaks would become filled with hot air under the influence of the sun, and the path of the rays of light reflected from the surface of the hot layer would be convex as regarded from the earth. After sunset the hot air would rise and the cool take its place, thus producing a hot layer of air above a cooler one. The light from the sun would now be reflected into a concave ray, which would bend down and illuminate the mountain, though the sun was in fact below the horizon. M. Cornu then proceeded to speak of the dynamic phenomena of the air. He said that the solar energy was of three kinds—mechanical energy (appearing as winds, cyclones, etc.), calorific energy (shown by the change of the state of matter, as of water into vapor), and electrical. He only proposed to deal with the first of these. The wind was the most simple mechanical manifestation, and had its origin in the difference of atmospheric pressure in two distant places. It never blew in the direction of the line joining the points of greatest and least pressure, but always obliquely to the isobarometric lines, and usually with a circular movement round the points of highest and lowest pressure. When from any cause the equilibrium of the atmosphere was broken down, circular movements of enormous force, such as tornadoes and cyclones, were set up. The lecture concluded with the exhibition of an artificial waterspout.

The Acids of Fruits.

The grateful acid of the rhubarb leaf arises from the malic acid and binoxalate of potash which it contains; the acidity of the lemon, orange, and other species of the genus Citrus is caused by the abundance of citric acid which their juice contains; that of the cherry, plum, apple, and pear from the malic acid in their pulp; that of gooseberries and currants, black, red, and white, from a mixture of malic and citric acids; that of the grape from a mixture of malic and tartaric acids; that of the mango from citric acid and a very fugitive essential oil; that of the tamarind from a mixture of citric, malic, and tartaric acids; the flavor of asparagus from aspartic acid, found also in the root of the marshmallow, and that of the cucumber from a peculiar poisonous ingredient called fungin, which is found in all fungi, and is the cause of the cucumber being offensive to some stomachs.

It will be observed that rhubarb is the only fruit which contains binoxalate of potash in conjunction with an acid. Beet root owes its nutritious quality to about nine per cent of sugar which it contains, and its flavor is a peculiar substance containing nitrogen mixed with pectic acid.

The carrot owes its fattening powers also to sugar, and its flavor to a peculiar fatty oil; the horseradish derives its flavor and blistering power from a volatile acrid oil. The Jerusalem artichoke contains fourteen and a half per cent of sugar and three per cent of inulin (a variety of starch), besides gum and a peculiar substance to which its flavor is owing; and, lastly, garlic and the rest of the onion family derive their peculiar odor from a yellowish, volatile acrid oil, but they are nutritious from containing nearly half their weight of gummy and glutinous substances not yet clearly defined.—G. W. Johnson, in the Chemistry of the World.