WASPS AND THEIR NESTS.

The common wasp is found all over the globe, and is known by its long slender body, colored yellow and black, and by its four wings, two of which are folded double over the back when in repose.

The true wasp is always social, living together in large numbers. Wasps may be divided into three classes, male, female, and neuter; only the two latter are provided with stings. One radical difference between the bees and the wasps is that the wasps do not secrete wax. They build their nests of a gray or reddish paper, formed of fibrous substances that they tear off with their powerful mandibles, and fasten together with their gluey saliva. The arrangement of the cells is also slightly different. Another peculiarity is the desertion of the wasps' nest at the first frost.

The perfect females pass the winter hidden in the moss, on the ground, or in the holes in walls or trees. In the spring they awaken from their long sleep and start out to seek food. They attack the blossoms of the young fruit trees, and, later, the currant bushes. This is the best time to destroy as many wasps as possible, for each female wasp that is killed prevents the formation of a nest.

The food of wasps and the mixture they feed to their larvæ is much more varied than the nourishment of the bees. Wasps are fond of all kinds of sweet things, especially honey, which they often try to steal from beehives. Their tongues are too short to obtain honey directly from flowers, but they attack the ripe fruit where the skin has been broken by rain or birds; they drink the sweet sap exuded by trees, and from these substances they make a tolerably sweet honey, which they store away or feed to their young. Wasps will also seize living insects, even spiders, and tear them apart to feed to the larvæ. In the autumn they will even come inside the window to seize the housefly, and in the woods, one can often notice the sudden disappearance of all flies at the approach of a hornet. They will voraciously devour the meat exposed on the stalls in the market, and often cause serious loss to the careless butcher.

Wasps are much more nocturnal in their habits than bees; and it must be remembered that in the evening, when it is perfectly safe to handle a beehive, it may be dangerous to attack a wasps' nest, as the wasps may still be flying in and out.

In France, the wasps generally make they broken holes, either in the earth or in trees and walls and under the roofs of houses. Nests have even been found in old barrels and deserted beehives, the remnants of whose honey had probably served to nourish the intruders.

The underground nests are very brittle and easily broken, as they are made of bits of decayed wood and bark glued together. They are the color of fallen leaves. The common wasp and the "*German wasp*" are very similar, and generally build their nests in the abandoned holes of the field mice and moles. They dig out the earth to enlarge the nest, and spread it in little piles about to hide the entrance to the hole.

In the ordinary nest the comb is protected by a concentric covering and divided into three distinct parts: 1st. One or perhaps more combs or layers of hexagonal cells. 2d. Pillars that join and support the different combs. 3d. An outside covering composed of several membranes of paper, which is covered with a sort of gluey varnish that is secreted by the wasps' tongues, and gives the nest a silvery varnish. On account of this varnish and the convex form of the nest, neither the rain nor cold can penetrate into it, consequently the temperature of the nest is higher than that of the atmosphere, sometimes being fourteen or fifteen degrees warmer.

The mother wasp commences her nest in the beginning of summer, and first constructs a foundation of woody fibers, which she builds up in the form of a capsule, forming in the center eight or ten cells, to which she adds new cells when necessary.

The first eggs are always working wasps or neuters, and the mother wasp is forced to leave the nest frequently to obtain nourishment for them. Afterward, when these are grown, they do all the work, enlarging the nest, providing food for the later larvæ; and from this time the working wasps, which can easily be distinguished by their more slender bodies, are the only ones that are found flying.

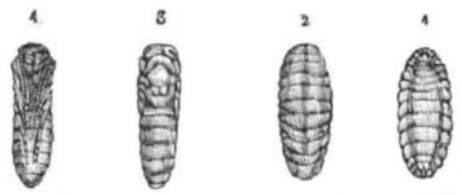

Fig. 1.—Eggs of the Common Wasp: Larva—1, beneath; 2, above. Nympha—3, above; 4, beneath.

From the first of August to November the mother only lays the eggs of males and perfect females.

The larvæ (Fig. 1), which are white and without legs, are attached to the cell by the extremity of their abdomen, and hang head downward. There are two brilliant spots on their heads, and their mouths are stronger than those of the bee larvæ, as they receive tougher food. When the larvæ are fully grown they turn over and weave a slight tissue of silk around themselves and the cell, then, resuming their old position, they close the opening of the cell with a thicker silk, and remain quiet for several days. At the end of that time the larvæ have become nymphæ, which are the complete wasp, covered with a thin skin, through which can be seen the three divisions of the body, with their developed organs folded under the abdomen. These nymphæ are at first white, and then gradually become colored, commencing always with their black eyes; and for several days after they have broken their coverings the wasps are less yellow than they become afterwards. When fully grown the wasp tears the silk tissue and breaks open its cell with its mandibles and flies out of the nest.

A third species, less known, is the red wasp, which frequents only the woods and builds its nest underground. The nests are small and not populous. These underground nest-builders may be distinguished from the common wasp by their abdomens, which are not all yellow and black, but are either red or striped with red. These wasps have numerous enemies, among whom the volucellis are the most formidable, as they are colored somewhat like the wasp, and consequently can easily penetrate into the nests and eat the larvæ, thus rendering us a great service in those warm dry seasons when the wasps' nests are overflowing with their intolerable brood.

The hornets' nest is much larger than all other varieties, and is usually built in hollow trees or under large roots on the ground, or in old walls, chimneys, etc. These nests, which are composed of a sort of pulp of decomposed wood, are very friable. They have a single envelope, and are always placed in some hole for an additional covering and protection. Hornets are very irritable and will attack in crowds any one who they think will hurt their nest. They seek to attack the places where the body is unprotected by clothes, and as their repeated stings are very dangerous, it is best always to rush to the nearest water and completely submerge one's self.

Strange to say, in spite of the hornet's peculiarities and carnivorous instincts, it has one friend in the insect world. It is a large black coleoptera, the *Velleius dilatatus*, distinguished by the peculiarity that, when disturbed, it drops its body and trains it on the ground like a little lizard. This insect follows the wasp in the evening into the nest, of which it makes itself the protector. It furiously attacks all insects that are hurtful to the young wasps, especially the centipedes, which they continue to shake long after the insect has been torn to death by their powerful mandibles. It is also possible that the strong odor of muck about the *Velleius* may be pleasant to the hornets and agreeably perfumes their nests. In return, the hornets permit it to eat some of the honey, of which it is very fond.

Though this insect is very timid at first, it soon becomes accustomed to any one who will properly nourish it, and can be easily domesticated in order to observe its habits. It can be taught to take honey from the end of a fine brush, and it will cling so tightly to its food that it is difficult to make it let go.

There are a few wasps that build their nests entirely uncovered, simply attached to the branch of a tree. These nests are made of woody fibers, torn from decayed wood or plants, and are very flexible and elastic.

The concentric envelopes on the outside of the nest have such a great resemblance to gray filtering paper, that it would seem as if the wasps had preceded man in the invention of paper. This species is the wood wasp, Fig. 3. It is a little smaller than the common wasp; the female has a more velvety body, and the neuter is quite smooth. This species is spread all over Europe, except perhaps in Lapland.

There is another group of wasps that are distinguished by the inferiority of their nests, which are never provided with an envelope to protect them from the weather. These nests are simply a comb supported on a strong stand; the cells are oblique or recessed, and more or less numerous according to the size of the brood.

These wasps are more slender than the ordinary wasp, fewer in number, less irritable, and much less destructive to fruits and plants. In the month of April this wasp (Fig. 2) can be seen commencing his little nest in some warm spot exposed to the sun

Fig. 3. WOOD WASP AND NEST, SHOWING ARRANGEMENT OF THE LOWER COMBS.

Fig. 2.—WASPS' NEST WITH THE MOTHER WASP.

but well sheltered from the rain. These wasps are so gentle that even if the nest is carried away the mother wasp will not offer to sting, but clings to the nest or flies close to it. If the branch with the nest on it is carried into a house she will still follow and continue to feed her eggs. When these are hatched they readily become accustomed to the presence of man, and it is possible to observe, at home, the habits and development of these curious insects.

Military Ants of the Amazon.

The *Nineteenth Century* has the following: The most astonishing insects, if not the most astonishing animals, in the world, are the so-called "foraging," or, as they might more appropriately be called, the military ants of the Amazon. They belong to several species of the same genus, and have been carefully watched by Bates, Belt, and other naturalists. The following facts must therefore be regarded as fully established.

Eciton legionis moves in enormous armies, and everything that these insects do is done with the most perfect instinct of military organization. The army marches in the form of a rather broad and regular column, hundreds of yards in length. The object of the march is to capture and plunder other insects, etc., for food, and as the well organized host advances, its devastating legions set all other terrestrial life at defiance. From the main column there are sent out smaller lateral columns, the composing individuals of which play the part of scouts—branching off in various directions, and searching about with the utmost activity for insects, grubs, etc., over every log and under every fallen leaf. If prey is found in sufficiently small quantities for them to manage alone, it is immediately seized and carried to the main column; but if the amount is too large for the scouts themselves to deal with, messengers are sent back to the main column, whence there is immediately dispatched a detachment large enough to cope with the requirements. Insects or other prey which, when killed, are too large for single ants to carry, are torn in pieces, and the pieces conveyed back to the main army by different individuals. Many insects in trying to escape run up bushes and shrubs, where they are pursued from twig to twig by their remorseless enemies, till on arriving at some terminal ramification they must either submit to immediate capture by their pursuers, or drop down amid the murderous hosts below.

As already stated, all the spoils which are taken by the scouts, or by the detachments sent out in answer to their demands for distance, are immediately taken back to the main army or column by two smaller columns of carriers, which are constantly running in two double rows (one of each being laden and the other not) on either side of the main column. On either side of the main column there are constantly running up and down a few individuals of smaller size, lighter color, and having larger heads than the other ants. These appear to perform the duty of officers, for they never leave their stations, and while actively running up and down the outsides of the column, they seem intent only on maintaining order in the march, stopping every now and then to touch some member of the rank and file with their antennæ, as if giving directions.

When the scouts discover a wasps' nest in a tree, a strong force is sent out from the main army, the nest is pulled to pieces, and all the larvæ in the nest are carried by the carrier columns to the rear of the army, while the wasps fly around defenseless against the invading multitudes. Or, if the nest of any other species of ant is found, a similarly strong force is sent out, or even the whole army may be deflected toward it, when with the utmost energy the innumerable insects set to work to sink shafts and dig mines till the whole nest is rifled of its contents. In these mining operations the Ecitons work with an extraordinary display of organized co-operation; for those low down in the shafts do not lose time by carrying up the earth which they excavate, but pass on the pellets to those above, and the ants on the surface, when they receive the pellets, carry them only just far enough to insure that they shall not roll back again into the shaft, and, after having deposited them at a safe distance, immediately hurry back for more.

The Ecitons have no fixed nest themselves, but live, as it were, on a perpetual campaign. At night, however, they call a halt, and pitch a camp. For this purpose they usually select a piece of broken ground, in the interstices of which they temporarily store their plunder.

Transparencies Produced by Luminous Paint.

BY ROBERT VINCENT.

In May last I forwarded a brief account of a plan that I had employed for some time past for producing transparencies. The method is at once so simple and satisfactory that I do not hesitate again to call attention to it, and to recommend it particularly for making transparencies of large dimensions.

To give some idea of the sensitiveness of the gelatine plates that I employ, I may mention that an ordinary fish-tail burner at six feet distance will produce an excellent transparency in ten seconds, or, if the negative be dense, then fifteen seconds are required. In these circumstances, it may be asked, why resort to any other means of illumination?—there is nothing more handy than a gas jet, or less costly; while if the flame varies a little with the pressure, the difference in practice is scarcely observable.

I will try to explain the advantage of luminous paint over a gas-burner in the production of transparencies. In the first place, there are few dark rooms in which a suitable jet is to be found, or, if a suitable jet exists, it is not always in a convenient position for making exposures. Again, besides the vitiated atmosphere that results when a number of exposures are made in a close room, with the gas burning some time, there is the inconvenience of turning the light on and off continually during the operation; with a luminous paint screen, on the other hand, no clear intervening space of several feet is required, and its employment does not necessitate increased ventilation.

But the advantage of luminous point for transparencies is best seen when large negatives have to be copied. I have an "Aladdin's lamp," which I purchased of Ihlee and Horne, of Aldermanbury, and for which I paid eight or ten shillings—I forget exactly. This is nothing more than a big surface of luminous paint, framed, and glazed. With it I can produce transparencies up to 15 by 12. To do this with a gas-jet is of course quite possible, if you are at a considerable distance, but it is ten chances to one the whole surface of the negative is not uniformly impressed with the rays, which, under any circumstances, are not parallel. In the case of the luminous paint-screen, however, it is merely necessary to clap the printing-frame (containing the negative and the gelatine plate) face downward upon the "Aladdin's lamp," which has been previously exposed to daylight, and in a few seconds the exposure is complete.

It is a mistake to suppose that the exposure must needs take place the instant the "Aladdin's lamp" is removed from the daylight. If you use the "lamp" fresh, the chances are you will over-expose. Employed within one minute of its withdrawal from light—I am speaking of ordinary diffused daylight—an exposure of one second will often be too much; taking such plates of the sensitiveness I have mentioned, and the normal oxalate development (Dr. Eder's formula), which, for transparencies, at any rate, I much prefer to pyrogallic development. On the other hand, if, instead of using the "Aladdin's lamp" immediately, you wait five, ten, fifteen minutes, after withdrawal from daylight, you will find the light much more under control. I have made a dozen transparencies without re-exposure of the "lamp" to daylight. I find that, with my lamp, an exposure of three or four seconds is required after five minutes' withdrawal, an exposure of fifteen seconds after ten minutes, and an exposure of twenty five seconds after fifteen minutes—this with a negative of normal density. The delicate detail in the shadows so soon gets lost that over-exposure should always be avoided if you want a bright and vigorous transparency.

If your dark-room is not well lit, as soon as you have poured over your developer, you may turn the "Aladdin's lamp" round and use its light to develop by; I have never found any ill effects from its light, if only the development has begun before the "lamp" is made use of.

It is only since I have taken to the production of large transparencies that I purchased an "Aladdin's lamp." For many months I used nothing but a piece of cardboard, coated myself simply with the luminous paint, and protected from dirt by a piece of glass. This answers admirably for whole plates or any smaller pictures, and those who can obtain a small amount of the paint can perfect for themselves an "Aladdin's lamp" up to any size. The paint, when I inquired the price, was 28s. a pound, but a tiny sample I obtained was quite sufficient for the making of my first screen. I do not think there can be half an ounce of paint on the 15 by 12 "Aladdin's lamp" that I have, and therefore, if photographers could only purchase it in small quantities, the cost of a screen would be but nominal. Some of our apparatus dealers would find it worth their while to sell the paint retail, I should think, for any photographer who tries this plan of printing cannot fail to be satisfied with it.

To sum up the advantages of the "Aladdin's lamp" for making transparencies I would say:

The exposure can be more accurately timed than with a gas jet.

The rays being parallel, the transparency is more likely to be uniform in depth and tone.

There is no necessity for a space of several feet to intervene between the source of light and the frame; and finally, the "Aladdin's lamp" is not only more convenient and handy to use, but it does not, like a gas-flame, add further to the vitiation of the dark room.—*Photo. News.*

United States Fisheries of the Great Lakes.

The following statistics of the work of United States fishermen are taken from the report of G. Brown Goode, special agent of the fishery division of the United States Census Bureau, for the year 1879:

In the eight States bordering on the great northern lakes, including Pennsylvania, which has a comparatively limited lake frontage, there were 5,050 fishermen and 1,656 vessels, boats, and steam tugs engaged in taking fish. The value of these vessels, etc., was $266,000, and the total value of all apparatus and accessories was $1,345,975.

Of the eight States Michigan stands at the head as regards number of men, and Ohio in the value of investments, the latter being $233,600; the total fishing properties of the eight being valued at $497,400 in 1879.

Michigan, notwithstanding the less value of her investments, stands far ahead in the value of fish taken. Of the total, which was $1,652,900, her share was $711,695; the next being Ohio, at $355,000.

Whitefish, the kind taken in the largest quantity from the Michigan lakes, amounted to nearly 13,000,000 pounds, valued at $461,800, while the value of Ohio whitefish was only $39,500, or about one-twelfth as much.

The other States stand in the following order in total value of their fish products: Ohio second, $355,000; Wisconsin third, $276,605; New York fourth, $175,100; Illinois fifth, $53,000; Pennsylvania sixth, $42,480; Indiana seventh, $33,820; Minnesota eighth, $5,200. The whole of the fish taken by fishermen of the last named State are sold in fresh condition, while 11,000,000 pounds of the Michigan and Ohio fish, valued at about $300,000, are salted for market.

Of the salted fish nearly 600,000 pounds are pike taken by New York fishermen, which were sold for $12,000, barely two cents per pound.

Michigan, Ohio, Pennsylvania, and New York together sent 2,821,600 pounds of frozen fish to market, which brought $126,100.

The smoked fish came mostly from Ohio and Illinois, being largely whitefish and sturgeon. The total of smoked fish from the eight States was 1,721,770 pounds, valued at $109,970.

The report has also a grouping of the investments and products by lakes as well as by States, which shows that about 80 per centum of the investments in fish catching are on Lakes Michigan and Erie, 10 per cent on Huron and St. Clair, 6 per cent on Superior, and 4 per cent on Lake Ontario.

Under this grouping the values present different proportions as follows:

Lake.	Value.	Proportion.
Michigan	$668,400	about 40 per cent.
Erie	412,880	" 25 " "
Huron and St. Clair	293,550	" 18 " "
Ontario	159,700	" 10 " "
Superior	118,370	" 7 " "
Total	$1,652,900	100

There are other tables showing the quantities and values of caviare, isinglass, and oil made from the fish taken on the lakes. They show that all the caviare and most of the oil come from the sturgeon, and that from three-fourths to four-fifths of these three products come from Ohio.

Oil Painting on Woven Fabrics.

Canvas, indeed, is often employed by artists for oil paintings, but then the canvas is stretched tightly on a frame. To paint on loose cloth without entirely destroying its flexibility has hitherto been impossible. Besides this many colors lost their brilliancy, and hence are less effective upon woven fabrics.

Gutmann of Florence, after many years of experimenting, believes that he has overcome all difficulties, and that with his process the goods will retain their freshness and pliability. The colors shall be as effective as those on the finest printed goods, and even surpass them. If the painting is done on silk or satin the colors have the appearance of enamel, and the shade varies with the gloss of the silk. As neither varnish nor gum is employed the colors preserve their freshness, which is heightened by exposure to the air and light. The colors cannot blacken in time, as is the case with oil colors; and, above all, the goods retain their softness.

A composition made of distilled water, molasses, benzole, turpentine, alcohol, and nitro-benzole, is poured into a vessel containing twice as much boiling water. During the whole operation it is kept at as high a temperature as possible, so that the greatest amount of vapor will be given off. If the mixture gets cold it cannot be used again. As soon as vapors are given off from it the wrong side of the goods is held over it for a few minutes, so that the vapor shall pass through the fabric. After drying for several hours it is ready for use, and may be stretched on a frame or over a piece of wood or cardboard.

In regard to the painting itself, the design is first sketched with an ivory stylus, and using impression paper—red for black or dark stuff and white for light colored. The little oil cans which always belong to the palette, and are generally filled with linseed oil, are now filled with a mixture of benzine, turpentine, alcohol, and nitro-benzole. When the pigment has been put on the palette, one or more drops of this mixture is dropped upon it, in order to dilute the color which is to be used. The pencils and brushes must also be soaked in the same peculiar composition every time before using them. The first coating is put on thick as a ground, so as to cover the stuff well. Everything that is to be pink, blue, or violet must have a white ground, which is allowed to dry one or two days. Little precautions about touching colors not yet dry are to be learned by experience.

P. N.

The Light of the Stars.

For a number of years the special work carried on at the Harvard Observatory, under the direction of Professor Pickering, has been the measurement of the intensity of the light of the heavenly bodies. Some of the results presented at a recent meeting of the Society of Arts, at the Institute of Technology, Boston, indicate measurements almost incredibly fine. The light which falls upon the earth from the satellites of Mars, for example, is about equivalent to what a man's hand on which the sun shone at Washington would reflect to Boston. The labor of measuring the brightness of all the visible stars was begun two years ago. It has since gone on at the rate of about 40,000 a year, and will be completed next fall.