

while the sluggish air carries it one. Thus, with equal strain on each, the ether carries away a million times the energy that the air could do.

4th. The ether must account for gravitation. For this purpose we are allowed no time whatever to transmit the attraction. As soon as the position of two bodies is altered, just so soon must the line of action from one to the other be in the straight line between them.

If this were not so, the motion of the planets around the sun would be greatly altered. Toward the invention of such an ether, capable of carrying on all these actions at once, the minds of many scientific men are bent. Now and then we are able to give the ether such properties as to explain one or two of the phenomena, but we always come into conflict with other phenomena that equally demand explanation.

There is one trouble about the ether which is rather difficult to explain, and that is the fact that it does not seem to concentrate itself about the heavenly bodies. As far as we are able to test the point, light passes in a straight line through space even when near one of the larger planets, unless the latter possesses an atmosphere. This could hardly happen unless the ether was entirely incompressible or else possessed no weight.

If the ether is the cause of gravitation, however, it is placed outside the category of ordinary matter, and it may thus have no weight although still having inertia—a thing impossible for ordinary matter where the weight is always exactly proportional to inertia.

Ether, then, is not matter, but something on which many of the properties of matter depend.

It is curious to note that Newton conceived of a theory of gravitation based on the ether, which he supposed to be more rare around ordinary matter than in free space. But the above considerations would cause the rejection of such a theory. We have absolutely no adequate theory of gravitation as produced by the ether.

To explain magnetism, physicists usually look to some rotation in the ether. The magnetic rotation of the plane of polarization of light, together with the fact of the mere rotation of ordinary matter, as exemplified by the earth's magnetism, both point to rotation in the ether as the cause of magnetism. A smoke ring gives, to some extent, the modern idea of a magnetic line of force. It is a vortex filament in the ether.

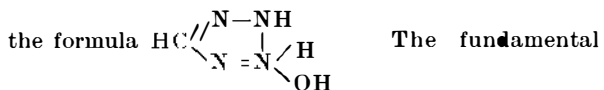
Electrostatic action is more difficult to explain, and we have hardly got further than the vague idea that it is due to some sort of elastic yielding in the ether.

Light and radiation in general are explained when we understand clearly magnetic and electrostatic actions, as the two are linked together with certainty by Maxwell's theory.

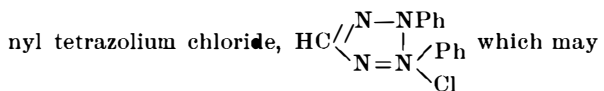
Where is the genius who will give us an ether that will reconcile all these phenomena with one another and show that they all come from the properties of one simple fluid filling all space, the life blood of the universe—the ether?

A NEW SERIES OF NITROGEN COMPOUNDS.

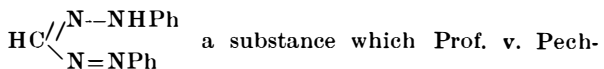
ANOTHER new series of nitrogen compounds, containing four atoms of that element along with one atom of carbon in a closed chain, are described by Prof. v. Pechmann and Herr Runge in the current *Berichte*. They are termed "tetrazolium" compounds, and the parent base of the series is tetrazolium hydroxide, whose constitution is represented by



base itself has not yet been isolated; the compounds prepared comprise the derivative in which the two hydrogen atoms directly attached to the two end nitrogen atoms are replaced by phenyl, together with a large number of salts of this base, formed by replacement of the hydroxyl by halogens or other acid radicals, just as in the case of metallic hydroxides. The hydrogen atom attached to the carbon is likewise capable of replacement by many organic radicals, so that a large number of still more complicated bases have likewise been prepared, together with their corresponding salts. The hydroxides of this new series are characterized by possessing strong basic properties. They may all be prepared most conveniently from their chlorides, by the action upon them of silver oxide. They are extremely soluble in water, but are completely precipitated from their solutions by ether. The aqueous solutions absorb carbon dioxide and behave very much like caustic alkalis. They cannot, however, be crystallized, forming resins upon concentration. The salts, on the other hand, crystallize admirably; they are usually soluble in water, react neutral to litmus, and possess a very bitter taste. Diphe-



be taken as a typical salt of the series, crystallizes in colorless radiating groups of needles very sensitive to light, which renders them yellow. The aqueous solution yields a flesh-colored precipitate of chloroplatinat with platinum chloride, and the double salt may be crystallized from hot water. A crystalline double chloride is likewise produced with gold chloride. The addition of a soluble nitrate or iodide causes the precipitation of the difficultly soluble nitrate or iodide of the base. A solution of iodine in potassium iodide precipitates an iodine addition product, which can be crystallized from alcohol in beautiful brown tabular crystals exhibiting a violet reflection. The parent base is produced in solution upon the addition of silver oxide, silver chloride being likewise formed. The chloride is reduced by ammonium sulphide to a compound of the constitution:



mann has previously described, and which is interesting as forming the starting point for the preparation of the new series. For the chloride may at once be prepared from this latter substance by oxidation with

amyl nitrite and hydrochloric acid. The substance is readily prepared by the action of diazobenzene chloride upon malonic acid, constituting the insoluble product of the reaction. It is of considerable interest to observe that the main product of the dry distillation of diphenyl tetrazolium chloride is azobenzene.—Nature.

SPOTS AND STRIPES IN MAMMALS.

By R. LYDEKKER, B.A. Cantab., F.R.S.

THOSE of our readers who have considered the subject at all are probably aware that, in those animals whose fur is ornamented with dark or light markings, these markings generally take the form either of longitudinal or transverse bands or of spots; the latter being frequently arranged in more or less distinctly defined longitudinal lines, but never in transverse bands. Moreover, these markings, especially in the case of stripes and bands, are generally most developed on the upper surface of the body, although spots may be equally present on both the upper and the lower surfaces of the body. Many mammals, again, whether they be spotted or whether they be striped, have their tails marked by dark rings on a light ground; but this feature is also present in others in which the color of the body is of a uniform tint. It must not, however, be supposed that there is any sharply defined distinction between spotted and striped mammals, many of the civets, as well as some of the cats, having markings intermediate between true spots and stripes. Spots, again, are somewhat variable in configuration, some animals, like the hunting leopard, having solid circular dark spots, while in others, such as the leopard and jaguar, they assume the form of dark rings inclosing a light center. In other cases, as in the giraffe, the spots are enlarged, so as to form large and more or less quadrangular blotches.

A survey of a museum or a menagerie will likewise show that spots and stripes are by no means equally prevalent in all groups of mammals. In the apes, monkeys, marmosets and lemurs, for instance, they never occur; and when these animals are diversely colored, the coloration takes the form of patches symmetrically disposed on the two sides of the body, but otherwise not following any very clearly defined mode of arrangement. Then, again, in the hoofed mammals or ungulates, many species are more or less uniformly colored; although the zebras are notable instances of transversely striped animals, while the giraffe is an equally marked example of the blotched type of coloration. Among the even-toed (Artiodactyle) subdivision of this order it may be also noticed that while in the more specialized forms, such as wild cattle and sheep, the coloration is more or less uniform, many of the antelopes show white transverse stripes on a dark ground.

Dark transverse stripes are, however, known only in the case of the little zebra-antelope (*Cephalophus dorsalis*) of western Africa and the gnus; while, although a lateral dark flank stripe is present in some antelopes, and in the gazelles, none of these animals have the whole body marked by longitudinal dark stripes. In the case of the deer, it may be observed that a few species, like the fallow deer and the Indian spotted deer, are marked with longitudinal rows of white spots at all ages; while, if the former be examined, it will be found that in many instances the young are similarly marked, whereas the adults are uniformly colored. A similar state of things occurs among wild pigs and also in the tapirs, from which we are naturally led to infer that in this group of mammals, at least, a spotted or striped type of coloration is the original or generalized condition, while a uniformly colored coat is an acquired or specialized feature. And we shall find that this will hold good for other groups.

Turning to the carnivorous mammals, we shall find that in many families, more especially the cats, hyenas, and civets, stripes and spots are far more generally present than a uniform coloration; although some groups, such as the bears, form a marked exception to this rule, the majority of the species being uniformly colored, while none are striped or spotted. In some species of the weasel family—notably the badgers—it may be also noticed that while the sides of the head are marked by longitudinal dark and light stripes, the remainder of the body is uniformly colored. And it may be mentioned here that many animals, such as donkeys and dun-colored horses, retain a longitudinal dark stripe down the back, frequently accompanied by dark transverse bars on the limbs, while a uniform coloration prevails elsewhere.

In the gnawing mammals, or rodents, although many species are uniformly colored, stripes and spots are prevalent; and a survey of the collection of these animals in a good museum will show that, whether the pattern take the form of stripes or spots, the arrangement is invariably longitudinal and never transverse; and it may be observed that when spots are present, these are invariably light colored on a darker ground. Although in many cases the longitudinal stripes occupy the whole or a considerable portion of the upper surface, in some of the squirrels they are reduced to a dark and light stripe or even a single light stripe on each flank, this remarkable type of coloration recalling the "speculum" on the wing of a duck.

We might extend our survey to other orders of mammals, but sufficient has been said to indicate the variability of the prevalent type of coloration in different groups, and we may accordingly now proceed to give a list of some more or less well-known mammals arranged according to the plan of their markings.

1. Mammals with dark longitudinal stripes.—Striped mongooses (*Galictis*), of Madagascar, in one of which the stripes are very narrow and close, while in the other they are broader and more widely separated; these animals belonging to the civet family. The three-striped palm civet (*Arctogale*). The genet, the markings here tending to break up into spots. The three-striped opossum. The palm squirrel and chipmunks (*Tamias*).

In all the above the stripes are dark upon a grayish ground, but in the following they take the form of black and white stripes, the white area being generally the larger; and it may be noted that all belong to the weasel family. They include the skunks, the South African weasel (*Poecilogale*), and the Cape polecat (*Ictonyx*); while similar markings obtain on the head of the badger.

2. Mammals with dark spots.—These may be divided into several sub-groups, according to the form of the spots. Those in which the spots are small, more or less nearly circular, and solid, include the hunting leopard, the tiger cat, the lynx, the spotted hyena, the large spotted civet (*Viverra megaspila*), the African linsang (*Poiana*), and the young of the puma. The blotched genet (*Genetta tigrina*) forms a transition to blotches. While some of the civets are more or less distinctly spotted, in others the coloration is intermediate between spots and longitudinal stripes.

As species in which the spots are enlarged to form more or less quadrangular blotches, we may cite the giraffe and those Oriental civets known as linsangs.

By a splitting up of a simple spot into a more or less complete ring of smaller ones, we have the rosette-like type of ornamentation, as exemplified in the leopard, the snow leopard and the jaguar. In the two former the ring incloses a uniform light area; but in the latter the central area generally carries one or more dark spots. A further development of the ring leads to the so-called clouded type, as displayed by the Oriental clouded leopard, the marbled cat and the American ocelot. Here the ring becomes enlarged into a large squarish or oblong area, inclosing an area of darker hue than the general ground color of the fur and bordered by a narrow black line; the black line in the two former species being, however, confined to the hinder half of the cloudings.

3. Mammals with dark transverse stripes.—Tiger, young lions, wild cat, striped hyena, and wolf (*Proteles*), banded civet (*Hemigale*), banded mongoose (*Crossarchus*), zebra-antelope, gnus, zebras, thylacine and the water opossum (*Chironectes*). Among these, it may be noted that in the zebras the stripes on the hind quarters have a more or less marked longitudinal direction, and whereas in the true zebra and Grevy's zebra they consist of simple dark bands on a light ground, in Burchell's zebra the light areas between the dark stripes are traversed by an intermediate stripe of somewhat darker hue than the ground color.

4. Mammals with white spots arranged in longitudinal lines.—Fallow deer and Indian spotted deer; young tapirs; the paca (*Cœlogenys*) among the rodents, and the dasyures among the marsupials. Both in young tapirs and the paca the spots tend to coalesce into more or less complete longitudinal stripes.

5. Mammals with white transverse bands.—The kudu, eland, bongo (*Tragelaphus angasi*), and harnessed antelope (*T. scriptus*) among the antelopes, and Gunn's bandicoot (*Perameles gunni*) and the banded anteater (*Myrmecobius*) among the marsupials. In the harnessed antelope spots occur as well as stripes.

Many other species might be incorporated in these lists, but the foregoing instances are sufficient to show that no one type of coloration is confined to any particular group, although it may be much more common in one assemblage of animals than in another.

Several attempts have been made to reduce the coloration of animals to some general law, and among these one of the most notable was published some years ago by Prof. Eimer, of Tübingen, who based his conclusions on a comprehensive study of vertebrates in general. As the result of his investigations, this observer declared that the following laws might be laid down in regard to color markings of animals in general:

First, the primitive type of coloration took the form of longitudinal stripes. Secondly, these stripes broke up into spots, retaining in many cases a more or less distinct longitudinal arrangement. Thirdly, the spots again coalesced, but this time into transverse stripes. And fourthly, all markings disappeared, so as to produce a uniform coloration of the whole coat.

As a further development of this theory, it was added that the more specialized features were assumed in many cases more completely by the male than the female, while the primitive coloration often persists in the young. And it was stated that the primitive longitudinal stripes frequently persist on the middle of the back and likewise on the crown and sides of the face. Examples of the latter survival being shown by the head and face stripes of many spotted cats, and the dark and light streaks on the sides of the face of the badger.

Whether these laws hold good for other groups of vertebrates, it is not within the scope of the present article to inquire, and attention will accordingly be concentrated on mammals. If they be true, we should, *prima facie*, expect to find a large number of longitudinally striped forms among the lower members of the class; while those of intermediate grades of evolution would be spotted, and the higher types either transversely striped or uniformly colored.

This, however, could only be the case, as a whole, if all mammals formed one regularly ascending series; whereas, as a matter of fact, they form a number of divergent branches, each containing specialized and generalized forms. The inquiry is thus rendered one of extreme complexity, although there ought, if the theory were true in its entirety, to be a considerable number of longitudinally striped species among the lowest groups of all. Unfortunately, paleontology, from the nature of the case, can afford us no aid, which fact very materially adds to the difficulty.

It may be added that in Prof. Eimer's scheme no distinction is drawn between light and dark markings—that is to say between the total disappearance of pigment and an ultra-development of the same—and it is obvious that this may be of such prime importance that these two types of coloration have nothing whatever to do with one another. Nevertheless, we may provisionally consider light and dark stripes, and light and dark spots, as respectively equivalent to one another.

With regard to uniformly colored animals, there can be no question as to the truth of the theory, since the young of so many animals, such as lions, pumas, deer, pigs, and tapirs, show more or less marked striped or spotted markings which disappear more or less completely in the adult. The occurrence of bands on the legs and sometimes on the shoulders of mules and dun-colored horses, and likewise the presence of dark bars on the limbs of otherwise uniformly colored species of cats, like the Caffre cat and the bay cat, are further proofs of the same law. Moreover, the fact that in the young of pigs—and to a certain extent those of tapirs—the markings take the form of longitudinal stripes,

whereas in the more specialized deer, whether young or old, they are in the shape of spots arranged in more or less well-defined lines, is, as far as it goes, a confirmation of the theory that spots are newer than stripes. And the presence of transverse stripes in the still more highly specialized antelopes tends to support the derivation of this type of marking from spots, especially if it be remembered that the horned antelopes are partly spotted. Still, it must be borne in mind that these instances apply only to light markings, which, as already stated, may have a totally different origin from dark ones.

There are, however, apparently insuperable difficulties as regards longitudinal and transverse striping in mammals. In the first place, instead of finding a number of the polyprotodont, or more primitive marsupials, showing longitudinal stripes, we have in this group only the three-striped and single-striped opossums thus marked, and in these the stripes are respectively reduced to the numbers indicated by their names. This, however, is not all, for the banded anteater—the most primitive of all living mammals (with the exception of the egg-laying mammals)—takes its name from the narrow transverse white stripes with which the back is marked; while the thylacine, which cannot in any sense be regarded as a specialized type, is similarly marked with broader dark stripes; neither of these animals having any trace of a longitudinal stripe down the back. The water opossum, again, may be regarded as a transversely striped marsupial, although here the stripes are few in number, and approximate in form to blotches. Although in the same order the dasyures are spotted with white, we have no black-spotted marsupial; and if such a type formed the transition between longitudinal and transverse stripes, surely some species showing such a type of coloration ought to have persisted.

Then, again, in the ungulates we have the zebra-antelope, the gnus, and the zebras showing most strongly marked transverse dark stripes; but we have no dark-spotted forms in the whole order except the giraffes, while the only ones with dark longitudinal stripes are young pigs. And it would thus appear that, although all the animals above mentioned are highly specialized species, these transverse stripes and dark blotches must have originated *de novo* quite independently in each of the groups in question. Indeed, when we remember that the coloration of both the zebras and the giraffes is generally stated to be of a protective nature—the stripes of the former rendering the animals invisible on sandy ground in moonlight, and to a great extent also in sunlight, while the blotches of the latter harmonize exactly with the checkered shade thrown by the mimosa trees among which they feed—it is incredible that both types should have been evolved, according to a rigid rule, from animals marked by dark longitudinal stripes.

Another instance of the same nature is afforded by the cats, in most of which the coloration appears to be mainly of a protective nature; plain-colored species, like the puma and lion, having tawny coats harmonizing with the sandy deserts which these animals often inhabit, while the vertical stripes of the tiger resemble the perpendicular lights and shadows of a grass jungle. The clouded markings of the marbled cat and clouded leopard assimilate with the boughs on which these species repose, and the spotted pelage of the Indian desert cat renders the creature almost invisible in stony deserts. To suppose that all such adaptations have been produced in the regular order required by the theory is as incredible as in the last case. There is, moreover, the circumstance that the young of the uniformly colored puma are spotted, thus giving an instance of the direct passage from a spotted to a plain-colored form without the intervention of a transversely striped stage; precisely the same thing also occurring in the case of the deer.

If we look for the most primitive mammals with longitudinal dark stripes over the greater part of the upper surface, such types being wanting in the marsupials, we shall find them in the striped mongooses (*Galictis*) of Madagascar, already mentioned. And as the civets and allies are certainly the most generalized of existing carnivora (although that order occupies a somewhat high position), this case tends, in a certain degree, to lend some support to the view that longitudinal dark stripes are an early type. The rarity of animals exhibiting this pattern over all their bodies, coupled with the frequent retention of a longitudinal dorsal stripe, are likewise in some degree confirmatory of the same view. With regard to the conspicuous black and white stripes on the cheeks of the badger, and throughout the head and body in the skunks, South African weasel, and Cape polecat, it may also be argued, with some show of reason, that we have an old type of coloration. In the ancestors of the badger such a type may have been found too conspicuous, and accordingly have been removed except from the face; whereas in the other forms, all of which are more or less evil-smelling creatures, a conspicuous coloration is an advantage, as warning off other animals from attacking them in mistake for harmless kinds, and the boldly alternating stripes have accordingly been retained and rendered as conspicuous as possible.

Did space permit, we might dilate to almost any extent on the subject of spots and stripes; but sufficient has, we hope, been said to indicate the interest attaching to the coloration of mammals, and to show how far we are from understanding the causes and modes which have brought about the present state of things. That uniformly colored mammals form the climax of color evolution in the case of stripes and spots may be pretty safely admitted. It may further be considered probable that longitudinal dark stripes are an old type of coloration in at least some groups, although it does not follow that this will hold good for all, the marsupials being possibly an exception. Transverse stripes cannot, however, be made to accord with Prof. Eimer's theory, since not only do they exist in some of the most primitive of all mammals, but they reappear in certain specialized groups where there is no evidence of a previous spotted stage having been passed through. While, therefore, far from improbable that there may be a certain substratum of truth in what we may call the "longitudinal-spotted-transverse-uniform" theory of coloration, we submit that in its present guise it cannot adequately explain the whole evolution of "spots and stripes in mammals."—Knowledge.

THE WARBLE FLY.*

It is only within comparatively recent years that much attention has been paid to the insect pests of the farm and garden. It is true that when these assume unusually devastating proportions, especially when they make their appearance suddenly, as in the case of locust swarms, the attention of whole nations is called to them for the moment; but the loss caused by less obtrusive creatures may proceed unchecked and almost unsuspected for years, without attracting the notice even of those who suffer from it most. But there are now many entomologists, among whom Miss Ormerod deserves special notice in England and Prof. Riley in America, who have been working zealously for years to diminish the loss and injury caused by injurious insects; and the pamphlet before us, with its clear descriptions and statistics and excellent illustrations, conveys a mass of information, in a very handy form, which certainly deserves the most serious attention of all who are interested in the cattle and leather trades, whether as graziers, butchers or tanners.

The total loss caused by the warble fly in the United Kingdom alone is estimated at something like £8,000,000 per annum, an enormous amount, but which the facts given in Miss Ormerod's pamphlet fully appear to bear out. When hides are sometimes so deteriorated that the loss on each may be as much as from twenty-five to thirty shillings, to say nothing of hides rendered utterly worthless; cattle killed, or the best parts of the carcass destroyed, and diminished yield of milk, the importance of the matter becomes very apparent. And beyond this there remains a very serious question which Miss Ormerod has not touched upon at all: how far the milk of badly infested cows, or the apparently sound portions of a carcass, even when all the obviously diseased part has been conscientiously removed, may be liable to cause disease in man—disease, possibly, of a nature the origin of which is at present absolutely unknown and unsuspected by medical men. And yet we remember once to have met with the statement that the best hides generally contained warbles. This, however, if true in any sense, could only mean that the fly attacks the strongest and healthiest animals in preference to weaker ones, thereby, of course, increasing the mischief produced by its attacks.

Although the insect is so abundant that as many as 500 maggots have been found in a single hide, yet the fly is rarely seen. When the cattle are attacked by it they gallop wildly about, with their tails in the air, and seek the shelter of trees or sheds, or rush into the

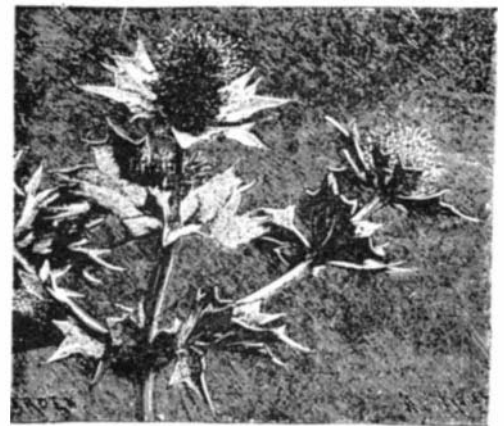
enormous loss which is frequently caused by it to all persons interested in living or dead cattle. The fly appears to be found in most parts of the world, but is a much greater pest in some countries than in others; and it is worthy of notice that while goats appear to suffer from the warble as much or more than cattle, horses seem never to be attacked by it.

Miss Ormerod, however, gives several easy, harmless and efficacious methods by which the mischief may be abated or removed; and the fly appears to be sluggish and not to stray far from where it lived as a maggot, for after a few years' careful destruction of the maggots, the pest seems to disappear, without the farm being liable to fresh incursions from surrounding farms where similar precautions have not been taken to exterminate the maggots. Miss Ormerod has evidently done her best to show the farmers how they may best exterminate the pest; and if they do not avail themselves of the information which she has been at so much trouble to collect and to disseminate, it will not be her fault. The accompanying illustration is from her useful pamphlet.—W. F. Kirby, in Nature.

SEA HOLLIES.

(ERYNGIUM.)

THIS genus belongs to the Umbellifers, but is so unlike that class of plants in general appearance as to be



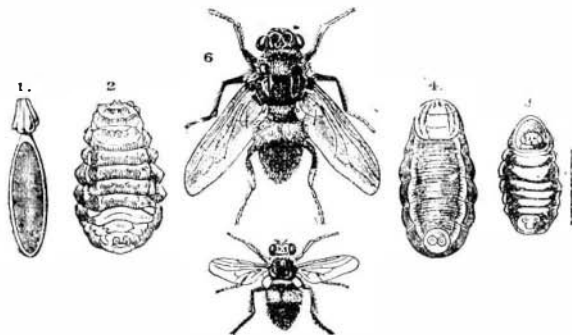
THE COMMON SEA HOLLY (*E. MARITIMUM*).

often mistaken for thistles and such like, which, indeed, they very much resemble. For general garden purposes, whether the decoration of the rockery, the border or the lawn, few plants yield a greater variety in the shape and length of leaves or size and brilliancy of involucre and stems. The latter in many cases are so singularly beautiful with their vivid steel-blue tints, surmounted with an involucre even more brilliant, that the effect of good large groups is hardly excelled by that of any plants that stand the rigors of our climate. The great diversity in the cutting of the leaves is very interesting, ranging from the great Pandanus-like foliage of *E. pandanifolium* to the very small thistle-



THE AMETHYST SEA HOLLY (*E. AMETHYSTINUM*).

like leaves of *E. dichotomum*. Those belonging to the Pandanus set, such as *E. Lasseauxii*, *eburneum*, *bromeliifolium*, and others, are useful in sub-tropical arrangements; their leaves being mostly of a thick succulent or leathery nature, are not liable to be damaged by the cold nights in early autumn; indeed, in all but very damp places or heavy soils they continue effective as regards foliage all through the winter season. *E. alpinum*, *Olivierianum*, *giganteum*, etc., are very useful for furnishing the mixed border or rockery, and all are the more valuable for this purpose owing to the length of time they continue in bloom, and in the latter set especially for the long time they retain their handsome blue tints. A good rich but well-drained soil suits most of the species; the latter especially should be attended to, as damp carries off more of the tender species during winter than cold. Coddling is a great mistake, as the sea hollies will stand any amount of exposure so long as the drainage is perfect. In localities



HYPODERMA BOVIS.

1, egg; 2, maggot; 3 and 4, chrysalis case; 5 and 6, fly; 3 and 5 natural size, after B uey Cla k; the other figures, after Brauer, and all magnified.

water; and in any of these situations, the fly does not appear to follow them. Cattle will act in the same manner when attacked by true gad flies, one of the largest British species of which, *Tabanus bovinus*, is likewise noticed and figured by Miss Ormerod in her pamphlet. The gad flies, however, simply pierce the skin of the cattle and suck their blood, but inflict no permanent injury; and their larvæ are subterranean, and not epizootic.

According to the observations of Prof. Riley in America, the egg of the warble fly is deposited on, and not under, the skin. In the earliest stage of the maggot, which Miss Ormerod has herself observed, it is a small blood-red, worm-like creature, scarcely visible to the naked eye, embedded in a slight swelling, composed of blood-red tissue, through which a fine channel, no wider than a hair, passes up to the surface of the skin. In the very young stage, the maggot, which always rests with its head at the bottom of the sore, and the breathing apparatus, which is at the opposite extremity of the body, directed toward the opening which communicates with the external air, is provided with two forks or diggers, probably used for piercing through the substance of the hide. In this stage, too, the maggots are capable of inflating themselves with fluid which they have apparently no means of discharging, and become so hard that they can scarcely be compressed with the fingers, thus forming living and growing plugs, which act the part of setons, and which cannot be pressed back out of the wound, more especially as they are furnished with short bands of prickles along a portion of the back. Having penetrated the hide, the maggot rests in the sore, and presently assumes a more pear-shaped form.

When about one-third grown, a great change takes place in the structure of the creature, which, while it was forcing its passage, was "little more than a bag of fluid, with a large proportion of the space occupied by breathing tubes." At this stage, however, "the hard tips necessary, or at least serviceable for forcing a passage up the hide, are no longer needed, and they are exchanged for a broad forum of spiracle, and the internal organs become suited to provide material for the development of the fly, which will presently form in the dry husk of the maggot, which serves as the chrysalis case."

The further development of the maggot is so well known that we scarcely need trace its course until it reaches its final shape of a hairy two-winged fly, not very unlike a small humble-bee in general appearance, nor need we go into the elaborate accounts of the

* "Observations on Warble Fly or Ox Bot Fly (*Hypoderma bovis*, De Geer)." By Eleanor A. Ormerod, F.R.Met.Soc., etc. London: Simpkin, Marshall, Hamilton, Kent & Co., Limited, 1894.