THE

NATURAL HISTORY

OF

INSECTS,

COMPILED FROM

SWAMMERDAM, BROOKES, GOLDSMITH, &c.

EMBELLISHED WITH COPPER-PLATES.

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INTRODUCTION.

INTRODUCTION.

THOSE animals which by their ſize chiefly attract our attention, are but the ſmalleſt part of animated nature; the whole earth ſwarms with living beings, every plant, every grain and leaf, ſupports the life of thouſands. Vegetables ſeem, at firſt ſight, to be the parts of organized nature, which are produced in the greateſt abundance; but upon minuter inſpection we ſhall find each ſupporting numberleſs minute creatures, who fill up the various gradations of youth, vigour, and old age, in the ſpace of a few days exiſtence.

Vegetables are generally produced but once in a ſeaſon; but among inſects, eſpecially of the ſmaller kinds, a ſingle ſummer ſuffices for ſeveral generations. Theſe therefore would multiply in greater abundance than the plants on which they ſubſiſt, but that they are deſtroyed by other animals, and often by each other; the ſpider feeds on the fly, the birds upon the ſpiders, and they, in turn, make the food of man and every beaſt of prey.

Some inſects as to their conformation are compoſed of ſeveral rings, joined together by a membrane, which is the uſual form of the body in grubs, worms, and caterpillars. Unlike birds, who traverſe the air with ſuch rapidity, theſe humble animals, ſeemingly leſs favourites of nature, move forward but ſlowly. The whole body conſiſts of a chain of annular muſcles, whoſe orbicular fibres being contracted, render one of the rings that was before ample and dilated narrow and long. The fibres of theſe rings are found to be ſpiral, as are their motions in a great meaſure, ſo that by this means they can the better bore their paſſage into the earth. Their crawling motion may be explained by a wire wound round a walking cane, which when ſlipt off, and attempted to be lengthened, has an elaſtic contraction of one ring to the other. In like manner the earthworm, having ſhot out or extended its body, lays hold upon ſome ſubſtance with its ſmall feet, and ſo brings onward the hinder part of its body.

Caterpillars have feet both before and behind, which not only enable them to move forward by a ſort of ſteps made by their fore and hinder parts, but alſo climb up vegetables, and to ſtretch themſelves out from the boughs and ſtalks to reach food at a diſtance. Behind, their broad palms are beſet almoſt round with ſharp ſmall nails, to hold and graſp whatever they are upon; likewiſe before, their feet are ſharp and hooked, by which they can lay hold of leaves, while their hinder parts are brought up thereto. Reptiles that have many feet may be obſerved to move them regularly one after another, and from one end of the body to another, in ſuch a manner that their legs in walking make a ſort of undulation; and by this means they move much ſwifter forward than one would imagine. The motion of ſnails is performed in a different manner; they have a broad ſkin along each ſide of the belly, which

has an undulating motion, which, with the help of the ſlime that covers their bodies, they can move ſlowly forward, and adhere to every ſurface at pleaſure.

The ſecond ſort of inſects are flies of various kinds, whoſe bodies are covered by ſmall plates not unlike our ancient armour, the pieces of which are lengthened by unfolding, and ſhortened by running over each other. Theſe lead a more luxurious life, transfer themſelves from place to place with rapidity, and ſpend their little exiſtence in feaſting and propagating their kind.

The third ſort are ants, ſpiders, and others, whoſe bodies are divided into two or three portions, joined by a ſort of ligament. Of all the race of reptiles theſe ſeem to be endowed with the greateſt ſhare of ſagacity. The wiſdom of the ant, and it's well formed commonwealth, is too well known to be inſiſted on; but the ſpider, though it leads a ſolitary and rapacious life, ſeems endowed with even ſuperior inſtincts. Its various artifices to enſnare its prey, and, when no longer able to ſupply a new web itſelf, the ſtratagems it lays to get poſſeſſion of that belonging to another, are evidences of its cunning.

The minuteneſs of inſects may render them contemptible in the eyes of the unthinking; but when we conſider the art and mechaniſm in ſo minute a ſtructure, the fluids circulating in veſſels ſo ſmall as to eſcape the ſight, the beauty of their wings and covering, and the manner in which each is adapted for procuring its peculiar pleaſures, we ſhall find how little difference there is between the great and little things of this life, ſince the Maker of all, has beſtowed the ſame contrivance in the formation of the elephant and the ant.

The ſtructure of the eye in inſects is remarkably different from that of other creatures in ſeveral reſpects. It is defended by its own hardneſs againſt external injuries, and its cornea, or outer coat, is all over divided into lenticular facets, and through the microſcope appears as a beautiful piece of lattice work. Each hole in this is of ſuch a nature, that when looked through, every object ſeems inverted. This mechaniſm alone ſupplies the place of the cryſtalline humour, which is not to be found in inſects. Spiders have generally eight eyes, and flies may be ſaid to have as many as there are perforations in the cornea. Other creatures are obliged to turn their eyes different ways to behold objects, but flies have them ſo contrived as to take in every object near them at once. In order to keep their eyes clean, they are provided with two antennæ, or feelers. Some however are of opinion, that they clean their eyes with their fore legs as well as the feelers; nor is this conjecture ill founded, when we conſider, that in ſome ſorts, particularly the fleſh fly, the feelers are too ſhort for this purpoſe, and therefore their legs alone can ſupply the defect.

The mechaniſm in the feet of flies, and other inſects, deſerves alſo our notice. The amphibious inſects, which are obliged to live by land as well as water, have their hindmoſt legs made with commodious flat joints, having griſtles on each ſide ſerving for oars to ſwim with, and placed at the extremity of the limb; but nearer the body there are two ſtiff ſupporters to enable them to walk when they have occaſion. In thoſe inſects whoſe motions are performed by leaping, ſuch as the graſshopper and cricket, their thighs are ſtrong and brawny; thoſe, on the contrary, which uſe their claws in perforating the earth, have ſuch

parts

parts made with ſtrength and ſharpneſs, as in the wild bee, and the beetle. There are even ſome animals that convey themſelves by methods to us unknown. Inſects, which are generated in ſtagnant waters, are often found in new pits and ponds, and ſometimes on the tops of houſes and ſteeples. Spiders with their webs have been known to ſoar to a conſiderable height, having been ſeen above the higheſt ſteeple of *York Minſter*. How theſe animals have been thus capable of conveying themſelves from place to place is a phænomenon for which we are unable to account; ſome years ago, it was the method to give reaſons for every appearance in nature, but as philoſophy grows more mature it becomes more cautious and diffident, nor bluſhes in many inſtances to avow its ignorance.

Thoſe inſects which are provided with wings have tendons, which diſtend and ſtrengthen them; thoſe which are provided with four, uſe the outermoſt rather as caſes to defend the internal wings than as inſtruments in flying. When the inſect is at reſt, the inner wings are generally gathered up in the manner we cloſe a fan, nor is it without ſome efforts that the little animal can unfold it. Thoſe, however, whoſe wings are not caſed in this manner, ſuch as moths and butterflies, have them defended with feathers; for that beautiful variety of colours which we ſo much admire, appears, through a microſcope, to be nothing more than different coloured plumage, as artfully placed as in the wings of birds, but too minute to be diſcerned by the naked eye. Such inſects as have but two wings have two little balls, or poiſers, joined to the body under the hinder part of each wing, that ſerve to keep them ſteady, and in ſome meaſure counteracts the changes of the air, which might at every variation carry them in its current: If one of theſe poiſers be cut off the inſect will ſoon fall to the ground, but if they are both cut, it will ſtill fly, but yet in the direction of every breeze.

They are thus formed for motion, rather to provide ſuſtenance than to avoid danger. As from their natural weakneſs they are the prey of every ſuperior order of animals, they ſeem to find ſafety only in their minuteneſs of retirement; but even with every precaution they furniſh out a repaſt to ſwallows and other birds, who, while to us they ſeem ſporting in the air, are then employed in procuring their neceſſary ſubſiſtance. The inſect itſelf, however, is at the ſame time in purſuit of ſome inferior order of inſects, for there are the ſame hoſtilities among the ſmalleſt that there are amongſt the largeſt animals.

Summer is the ſeaſon of their pleaſures; many of them never live above a ſingle ſeaſon, while others are found to continue but one day. Such however as are more long lived, take the proper precautions to provide for their ſafety in winter, and fix upon the moſt convenient ſituations for ſpending that interval, and ſuch as want food lay in the proper ſtores for ſubſiſtance. But the greateſt number want no ſuch neceſſary ſtock, for they ſleep during the continuance of the winter. Some caterpillars, for inſtance, having fed during the ſummer retire, at the approach of cold, to a place of ſafety, and there, by ſpinning a thread like a cobweb, hang themſelves in ſome commodious place, covered with a factitious coat, which at once ſerves to keep them warm, and guard them from external injuries. Here they continue in this torpid ſtate till the returning ſun calls them to new life;

they now expand new wings, and become butterflies, which ſeem ſcarce employed in any other manner than that of reproducing their kinds. Thus we ſee among inſects thoſe different offices of eating, ſleeping, and generation make different ſeaſons in their lives. Were we to compare them with other animals, we ſhould find, that while thoſe purſue ſuch pleaſures by frequent returns, theſe experience each but once in their lives, and die.

There are ſome inſects, however, which lay up proviſions for the winter, of which the bee and the foreign ant are remarkable inſtances. The waſp, the hornet, and the wild bee are not leſs aſſiduous in laying in a proper ſtock of food, and fitting up commodious apartments; but this is wholly for the ſake of their young, for they forſake their neſts in winter, leave their young furniſhed with every convenience, and retire themſelves to other places, where, in all probability, they live without eating.

In general, all inſects are equally careful for poſterity, and find out proper places wherein to lay their eggs, that, when they are hatched and produce young ones, there may be ſufficient food to maintain them; whether they chuſe trees, plants, or animal ſubſtances, ſtill the paſcent creature finds a bed which at once ſupplies food and protection. The plumb and the pea, each ſeem to give birth to inſects peculiarly formed for reſiding in them. The pear and apple produce a white moth; on the oak leaf are hatched ſeveral of beautiful colours, white, green, yellow, brown, and variegated. The manner in which thoſe inſects lay their eggs is ſufficiently curious; they wound the leaf through, and then depoſite their eggs in the little cavity. As the inſect increaſes, its nidus or bed, increaſes alſo, ſo that we often ſee the leaves of trees with round ſwellings on the ſurface, upon opening of which we may diſcover numberleſs inſects not yet come to maturity. On oak trees theſe neſts appear like little buds, and are in fact only gems, or buds, which are increaſed in thickneſs when they ought to have been puſhed out in length. The inſect thruſts one or more eggs into the very heart of the gem which begins to be turgid in June, and but for this would have ſhot out in July. This egg ſoon becomes a maggot, that eats itſelf a ſmall cell in the midſt of the bud, the vegetation of which being thus obſtructed, the ſap deſigned to nouriſh it is diverted to the remaining parts of the bud, which are only ſcaly integuments that by this means grow large, and become a covering to the caſe in which the inſect lies. But not only the oak, but the willow, and ſome other trees and plants, have knobs thus formed, which generally grow in or near the rib of the leaf. Among theſe caſes formed by inſects, the aleppo galls may be reckoned as the moſt uſeful, the inſects of which, when come to maturity, gnaw their way out, as may be ſeen by the little holes in every nut. But all theſe are formed by the ichneumon kinds of flies, namely, of thoſe kinds which are vulgarly called the blue-bottle fly.

Thoſe kinds, however, which do not wound the leaf, take great pains to lay their eggs on the ſurface, in the exacteſt and moſt curious manner. When thus depoſited, they are always faſtened thereto with a glue, and conſtantly at the ſame end. Thoſe which lay them in the waters, place them in beautiful rows, and generally in a ſizy ſubſtance, to prevent their being carried away with the motion of the water.

Upon

Upon poſts, and on the ſides of windows in country villages, little round eggs have been ſeen reſembling pearls, which produced ſmall hairy caterpillars, and thoſe like the reſt are all laid in very regular order. The gnat, though ſo very ſmall, is yet very curious in the manner of depoſiting her eggs, or ſpawn. It lays them on the water, but fixes them to ſome floating ſubſtance by means of a ſtalk, which prevents them from ſinking. The eggs are contained in a ſort of tranſparent jelly, and very neatly laid; when hatched by the warmth of the ſeaſon, they ſink to the bottom, where they become ſmall maggots, ſtick to the ſtones, and provide themſelves caſes, or cells, which they creep into or go out of at pleaſure, and thus continue till they take the uſual change into that of a fly. Moſt of theſe inſects are tinged with one principal colour, reſembling either that of the leaves on which they ſubſiſt, or the branches to which they faſten; on theſe they march with great ſlowneſs, and by this artifice are confounded with what they ſubſiſt upon, ſo as to eſcape the birds, their rapacious and watchful enemies. Such is the manner with thoſe inſects which being hatched from eggs, are then transformed into caterpillars, which may be called their eating ſtate; after that wrapped round with a covering of their own fabrication, and thus turned into nymphæ, which may be called their ſleeping ſtate; and laſtly furniſhed with wings, and metamorphoſed into butterflies, which is their generating ſtate.

But there are numberleſs other inſects which are brought forth alive, ſuch as the ſpider, and the ſnail produced with a ſhell, which grows with its growth, and is never found to forſake it. Theſe are never ſeen to change, but continue their growth: the ſpider, as it becomes older, has its legs longer, and if they be cut off, like thoſe of the lobſter they grow out afreſh. The ſnail, as it becomes more old, acquires additional ringlets to its ſhell, and contains in itſelf both ſexes. But there is an animal lately diſcovered, whoſe powers of generation are ſtill more extraordinary than any thing hitherto taken notice of, and from the phenomena attending which, Mr *Buffon* has ventured to affirm, that he ſtill believes there may be ſuch a thing as equivocal generation. The animal in queſtion is called the polypus, a ſmall reptile found on aquatic plants, and in muddy ditches. This ſurprizing creature, though cut into never ſo many parts, ſtill continues to live in every diviſion, and each, in leſs than three days, becomes in every reſpect a perfect polypus, like that which was at firſt divided. This I think may be juſtly eſteemed the loweſt of animated beings, and ſcarce to be ranked above the ſenſitive plant, except by being endowed with a locomotive faculty, or a power of moving from one leaf to another. It is thus that Nature chuſes to mix the kinds of being by imperceptible gradation, ſo that it becomes hard to determine where animals end, or vegetables begin. In this there are evident marks of her wiſdom in filling up every chaſm in the great ſcale of being, ſo that no poſſible exiſtence may be wanting in her univerſal plan. Were we to aſk, why theſe minute creatures, in general little regarded by man, except from the prejudice they are of to his labours, where formed in ſuch great abundance, it would be no eaſy taſk to find a reply. For man's uſe they were not made, as they are allowed to be noxious to him; nor for the ſuſtenance of other animals that may be of uſe to him, ſince the advantages of the latter

cannot

cannot compenſate for damage done by the former; perhaps the wiſeſt anſwer would be, that every creature was formed for itſelf, and each allowed to ſeize as great a quantity of happineſs from the univerſal ſtock, as was conſiſtent with the univerſal plan; thus each was formed to make the happineſs of each; the weak of the ſtrong, and the ſtrong of the weak, but ſtill in proportion to every order, power of conqueſt and enjoyment. Thus we ſhall find, that though man may be reciprocally uſeful to other animals, yet in ſome meaſure they were formed for his uſe, becauſe he has been endowed with every power of rendering them ſubſervient, and enjoying their ſubmiſſion.

NATURAL HISTORY

OF

INSECTS.

CHAP. I.

Of Inſects in general.

AN Inſect is a ſmall animal, either compoſed of ſeveral rings joined together by a membrane, or ſeveral ſmall plates, which play one over another, or elſe having a body conſiſting of two or three parts, joined together by a ſort of thread or ſtring. The firſt kind, we commonly call Worms or Grubs; as alſo, Caterpillars. When they advance from one place to another, they ſtretch the muſculous ſkin, which ſeparates the firſt ring from thoſe that follow, and thruſt it forwards to a certain diſtance; then they contract and wrinkle the ſkin on the ſame ſide, bringing forwards the ſecond ring, and ſo on; and thus they can move along without feet, proceed out of the earth, and enter into it again without any danger; beſides, they can proceed in this manner backward or forward as they pleaſe. The ſecond ſort are flies of various kinds, whoſe bodies are an aſſemblage of ſmall plates, which are lengthened by unfolding, and ſhortened by running over each other, much in the ſame manner as ſome parts of the ancient armour. The third ſort are Ants, Spiders, and many others, whoſe bodies are divided into two or three portions, which ſeem to have but a ſmall relation to each other.

Their ſmallneſs renders them contemptible in the eyes of the generality; but rather ſhould be a reaſon for admiring the art and mechaniſm of their ſtructure, which contains ſo many veſſels, fluids, and motions in creatures ſo minute as almoſt to eſcape the ſight; ſuch as mites, and the like. Some of theſe inſects are richly adorned, with robes of various colours, ſuch as blue, green, red, gold and ſilver, and many other embelliſhments. We need only look upon ſhining flies, Cantharides, Butterflies and Caterpillars to be convinced of this truth. The ſame wiſdom which has given theſe ornaments, has armed them from head to foot, and has enabled them to fight, and to defend themſelves; though they do not always catch what they lie in wait for, or ſhun what is hurtful; yet they are provided with what will beſt ſerve them for thoſe purpoſes. Some of them have ſtrong teeth, others a double jaw, or a ſting, or ſtrong claws; and they have ſhelly armour, that cover the whole body. The moſt delicate are furniſhed with hair, which ſerves them to break the ſhocks they may receive, and to weaken the blows, or to preſerve them from the rubs that might hurt them.

They

They are almoſt all very quick in their flight, and getting out of the way of danger; ſome by the help of their wings, and others by the aſſiſtance of threads, which they can throw out, and hang by them under the leaves of trees, on which they live. Others again can leap to a great diſtance, and ſo get out of harm's way.

It is alſo wonderful to conſider the various organs by which they are aſſiſted to live, and the inſtruments they make uſe of each according to their profeſſion. Some are ſkilful in ſpinning, having two diſtaffs and fingers to draw out the thread; others can make nets and webs, and are provided with thread and ſhuttles. Some again build themſelves houſes with wood, and have the ſickles to cut it; others are ſkilful in making way, and have ſcrapers, ſpoons, and trowels. They have generally a trunk, whoſe uſes are more wonderful than that of the elephant; for with it they can extract liquor with more ſkill than any man. Some have tongues, which ſerve them for taſting, and others have a ſort of gimblet to bore holes with. Others have piercers fixed to their tails, by means of which, they make lodgings for themſelves and families, in the heart of fruits, under the bark of trees, and even in the hardeſt wood. Moſt of them have excellent eyes; beſides which, they have horns or feelers, to prevent their meeting with any thing that may do them harm, eſpecially in the dark. Some of theſe horns are full of knots, or joints, like thoſe on the heads of Cray-fiſh; and ſeveral are terminated like a comb. Others again have four large wings, equal to the length of their bodies, and ſome have them ſo fine, that the leaſt obſtacle will tear them in pieces; but theſe are generally hid under two ſtrong ſhells, which may be raiſed up, or ſhut cloſe down, which they always are, when they are at reſt or creep. Beſides theſe, there are other great varieties, which will be taken notice of in their proper places.

All ſorts of inſects are generated like larger animals, from eggs; and theſe at firſt are encloſed in a ſingle or double covering, which opens when the animal is old enough to pierce through. When the brood break the covering, at their coming into the world, theſe creatures are ſaid to be viviparous; as for inſtance, Millipedes, or Hog-lice. When the old ones bring forth the young in a covering, where they are to remain ſome time, they are ſaid to be Oviparous. All theſe inſects, and indeed, all ſorts of animals are brought into the world one of theſe ways; and thoſe of the oviparous kind, always lay their eggs in a proper place, where they are hatched by a certain degree of heat.

It was formerly the common opinion, that all ſorts of inſects proceeded from corruption; but this has been exploded long ago, eſpecially ſince the invention of Microſcopes. And indeed, it would be abſurd to ſuppoſe, that theſe animals which are perfect in their kind, ſhould be the effect of chance. The motions of theſe creatures, may ſeem to us without any deſign; and yet, it is certain that they tend to a certain end, even thoſe of the ſmalleſt, as well as the largeſt. No inſect abandons its eggs to chance; for they are never miſtaken in laying them in places, where they may receive proper nouriſhment, as ſoon as they are hatched. In thoſe countries where Silk Worms naturally live, you will always find their eggs on a mulberry-tree, and no where elſe, which plainly ſhews they know what they are about. The Caterpillars that feed upon cabbages, are never found upon willows,

nor

nor thoſe of willow upon cabbages. The moths delights to be among curtains, woollen ſtuffs, or papers, but never upon plants, nor in mud, nor yet in corrupted aliments; and yet the contrary happens to flies, who lay their eggs in fleſh; and therefore, it is plain, it is inſtinct, and not chance that directs their choice. That this does not ariſe from the corruption of the fleſh is plain, from the following experiment; take a bit of beef freſh killed, and put it into an open veſſel, another into a clean one covered over with a piece of ſilk, ſo thin as to let in the air, and yet thick enough to hinder the eggs of the flie from paſſing through it, and you will find the firſt bit produce maggots as uſual, whereas the ſecond will be entirely without; however, the flies being attracted by the ſmell, will come in crowds to the covering, and endeavour to enter in, and perhaps lay ſome of their eggs upon the ſilk, but they will penetrate no farther; from whence it is plain, that corruption produces nothing.

When ſome of theſe eggs are hatched, the young will appear in their perfect form, which they never change afterwards. Thus, ſnails come into the world with their houſes on their backs, and continue always in the ſame ſhape, as well as that of the houſes; for they grow in proportion to the animal itſelf. Such likewiſe are Spiders, which proceed from their eggs completely formed, and change nothing afterwards but their ſizes. But the greateſt part of other inſects paſs through different ſtates, and aſſume ſucceſſively the figure of two or three animals which have no reſemblance to each other.

Many inſects when they proceed from their eggs, appear to be nothing elſe but a ſort of worms, ſome without feet and others with; thoſe without feet are under the care of their dams, which ſupply them with food, if they are not hatched in a place where they find nouriſhment. Thoſe with feet, go of their own accord to ſearch for food on the leaves of the tree, that is moſt ſuitable to their nature, which is the very ſame where the dams laid their eggs. Theſe grow ſenſible in a ſhort time, and ſome of them throw off their old covering five or ſix times, and ſeem to grow young again, by having a new ſkin. Theſe all paſs through the middle ſtate, which is that of a Nymph or Chryſalis; but this wants explanation. The Caterpillar firſt leaves off feeding, and incloſes itſelf in a ſort of coffin, which is different in the different kinds. This covering preſerves them from external injuries, till they acquire a new form. Theſe have the name of Nymphs, and then they aſſume all the beautiful colours which adorn the various kinds. Some then call it an Aurelia, or Golden Nymph, becauſe the covering which is more or leſs hard, aſſumes a colour as ſhining as gold. Some call this covering a Cod, eſpecially when it is applied to a Silk Worm.

The laſt ſtate or metamorphoſis, is when they ariſe out of their coffin, and become flying inſects; for that which was a worm before is deſtroyed, or rather turns into a fly. There are ſome inſects that live only upon greens, and others that feed on nothing but wood. It is now generally believed, that there is another ſort which are nouriſhed even in ſtones themſelves; however, it is more certain, that there are many which never appear out of the water. There are reckoned no leſs than three hundred kinds of Caterpillars which are already known, and the curious are ſtill making new diſcoveries: their ſhape, their colour, their inclinations, and their manner of living, diſtinguiſhes the

ſeveral ſorts from each other; and yet they are all perfect in their kind. However they are all compoſed of ſeveral rings, which being either extended or contracted, enable them to carry their bodies where ever they have occaſion to go. They have a certain number of feet with joints, and are armed with hooks, wherewith they fix themſelves to the barks of trees, eſpecially when they ſleep, which is the time they paſs from one ſtate to the other. They have almoſt all threads compoſed of a fluid gummy matter, which they get out of the leaves that ſupply them with food. When they perceive any danger of being carried off by birds, or cruſhed by the motions of the branches, they fix themſelves to the trees by means of this gum, which is made into threads by ſeveral openings of their bodies, which threads they unite with their paws, and form ſeveral into one, capable of ſupporting their own weight, and ſo are generally ſecure from danger. Some naturaliſts believe, that the colour of the Caterpillars is one of the beſt preſervatives againſt the birds that are fond of feeding upon them; for they generally are of the ſame principal colour as the leaves whereon they feed, or of the ſmall branches to which they are fixed, when they undergo the metamorphoſis; thus, thoſe that are nouriſhed on the buckthorn-tree are as green as the leaves thereof, and thoſe that live upon apple-trees and buſhes are of the ſame colour as the bark of thoſe plants. Even the ſmalleſt of thoſe animals have methods of ſcreening themſelves from the purſuit of the birds; for they may be often found under the leaves and not above, where they would be more expoſed.

All ſorts of Caterpillars uſe a particular kind of nouriſhment, which they never change upon any account whatever; for though they live upon greens, each has its own plant, and will ſooner die than feed upon any other, unleſs they are nearly of the ſame. Towards the end of the ſummer, when Caterpillars have ſufficiently fed on the green leaves, then they leave off eating, and ſecure a retreat, where they undergo the ſucceeding changes. A few days are ſufficient for ſome to undergo this metamorphoſis, while others continue months, and even years in their coffins. Some at this time hide themſelves in the ground, and others get upon the roofs of houſes, in the holes of walls, under the bark of trees, and even into the heart of the wood; others again, wrap themſelves up in threads and gum, and rowling themſelves in the ſand, make themſelves a ſort of ſtone coffins. Likewiſe, ſome reduce little bits of wood to powder, and with their gum make a covering in which they wrap themſelves; and when it is quite formed, it is not much unlike an *Egyptian* mummy.

Some ſorts of Caterpillars are capable of ſpinning threads, in which they are covered and defended from the rain, particularly Silk-worms, of which more hereafter. The moſt common ſort of Caterpillars are thoſe that we meet with on elms, apple-trees, and buſhes; and the Butterflies that proceed from them, fix upon ſome entire leaf, where they lay their eggs in the autumn, and die ſoon after; but before winter they are hatched and become ſmall Caterpillars, which with their threads make themſelves beds and ſpacious lodgings, where they lie during the cold ſeaſon, diſtributed as it were in different rooms without eating, or coming out. Their coverings are as hard as parchment, and conſequently ſufficient to keep off the rain, wind, and cold; for they lie upon a ſort of thick down, and are ſurrounded with ſeveral

fillets

fillets of the ſtuff wherewith they build their lodgings. Thus, having given ſome account of inſects in general, we ſhall now proceed to particulars.

CHAP. II.

OF INSECTS OF THE BEETLE KIND.

THE Beetle is a flying inſect, with a caſe over its wings to defend them from danger when it does not fly; though ſome would have theſe caſes a different ſort of wings, and therefore place them among four winged inſects but very improperly; for they ſeem to be deſigned by nature to preſerve their wings from hard bodies, which they often meet with when they dig holes in the ground, or gnaw rotten wood with their teeth, to make themſelves houſes or neſts. When they fly they fill the air with a humming noiſe, and perhaps greater than that of any other inſect. They have a great averſion to roſes, whoſe ſmell they cannot bear, and ſome affirm it will kill them. They are naturally fond of ivy, and delight to get under its leaves. There are different ſorts of Beetles, ſome being large with horns, and others ſmall with none, from which they have different names.

The *Elephant Beetle* is the largeſt of this kind hitherto known, and is found in *South-America*, particularly *Guiana* and *Surinam*, as well as about the river *Oroonoko*. It is of a black colour, and the whole body is covered with a very hard ſhell, full as thick and as ſtrong as that of a ſmall crab. Its length from the hinder part to the eyes is almoſt four inches, and from the ſame part to the end of the proboſcis or trunk four inches and three quarters. The tranſverſe diameter of the body is two inches and a quarter, and the breadth of each elytron or caſe for the wings is an inch and three tenths. The antennæ horns or feelers are quite horny, for which reaſon the proboſcis or trunk is moveable at its inſertion into the head, and ſeems to ſupply the place of feelers. The horns are eight tenths of an inch long, and terminate in points. The proboſcis is an inch and a quarter long, and turns upwards, making a crooked line terminating in two horns, each of which is near a quarter of an inch long; but they are not perforated at the end like the proboſcis of other inſects. About four tenths of an inch above the head on that ſide next the body is a prominence or ſmall horn, which if the reſt of the trunk were away, would cauſe this part to reſemble the horn of a Rhinoceros. There is indeed a Beetle ſo called; but then the horn or trunk has no fork at the end, though the lower horn reſembles this. The feet are all forked at the end, but not like lobſters claws.

The *Rhinoceros Beetle*, of this there are ſeveral kinds, one of which was brought from the *Eaſt-Indies*, and is of a jet-black colour, and has a horn growing on its noſe which turns upwards; and about the middle of the belly there is another horn, which ariſes from a tubercle and turns inwards. The whole body, from the end of the horn to the back part, is four inches long, and the breadth is almoſt two. It has alſo

two horns on the head behind the ſnout, and there are ſix feet or legs forked at the ends. This has been juſt taken notice of, and differs chiefly from the Elephant-Beetle, in not having the horn on the ſnout forked at the end; beſides which it has no horn on the belly. There is alſo another Rhinoceros-Beetle, which is common about *Vienna* in *Germany*. The horn has a greater reſemblance to that of a Rhinoceros, for it turns up like it, and is ſharp at the end, and behind the head it has a prominent bump, and there are ſix feet as in the former. It is all over as black as pitch, except the belly, which is of a deep red. The horn of the noſe is ſo very ſharp, that it ſeems to be whetted to a point. The third and fourth kinds are much of the ſame ſhapes, only the wings of the former are longer than the caſes, and in theſe they are ſhorter. They look as if they were covered over with ſhining-ink, and the horns on the head are full of knots. The head is of a greeniſh gold-colour, and the ſhoulders are red; but the belly is purple, and the caſes of the wings are of the ſame colour as the head. The feet and legs are of a dun-colour, and the wings under the caſes are whitiſh.

The *Stag-Beetle* is of a duſky-brown colour on the back, or rather blackiſh, eſpecially about the caſes of the wings and breaſt. It is above an inch long, and about half an inch broad, and it has two horns without joints, but branched like thoſe of a Stag, whence it has its name. When this Beetle is full grown they are as long as a man's little finger, and there are nippers at the end with which this animal can pinch or lay hold of any thing, they being not unlike lobſter claws. The eyes are hard, prominent and whitiſh, and near them on both ſides there are feelers, one pair of which are branched, and placed between the horns and the eyes, having each a joint which makes almoſt a right angle. The other pair are placed in the middle of the forehead and are ſtrait and flat, having each a tubercle like the head of a nail at the end, whence by ſome they are ſaid to be clavated. It has ſix feet, of which the foremoſt pair are longer and greater than the reſt. The horns are ſometimes as red as coral, which give this Beetle a very beautiful appearance; and the eggs when they are hatched turn into worms with ſix feet, which are afterwards changed into Beetles. It is very common in *Kent* and *Suſſex*, and is ſometimes ſeen in other parts of *England*.

The *Beetle* with lunated, prominent, denated jaws, and a ſmooth breaſt, is of the larger kind, being an inch long, and two thirds of an inch broad. The thorax is ſmooth, convex and black, without any prominences, though it has a ſort of an edge. The caſes of the wings are ſmooth and of a blackiſh purple colour. The jaws are in the ſhape of a half-moon, and are prominent and black, having two teeth in each. It is found in hedges where there are aſh trees, for it feeds on the rotten part of their trunks, and burrows in the earth under their roots.

The *Braſs Beetle*, is of the larger kind, and has a ſhort broad breaſt, the ſhape in general being conſiderably broad in proportion to its length; but the eyes are ſmall, and the legs long and ſlender. The whole body and outer part of the caſes of the wings are of a fine ſhining green, with a mixture of yellow. It is ſometimes met with in our gardens.

The *Beetle* with clavated feelers, and the caſes of the wings on the fore part. It is of the ſmall kind, and of an oblong ſhape, with a black head and breaſt. The caſes of the wings are grey towards the top, but elſewhere

elſewhere the colour is of a duſky blackiſh brown, with a tranſverſe ſtreak of white. This is common about the carcaſſes of dead animals, particularly birds. Some would not have this to be properly a Beetle, but call it Dermeſtes.

The *Black Dermeſtes* with a white ſpot on each of the caſes of the wings, is of the ſmall kind, and has a body of an oval ſhape, which is black as well as its legs and feelers; on each of the caſes of the wings there is a remarkable white ſpot, with five others ſo ſmall that they are hardly viſible. This animal when touched, or terrified with a noiſe, will ſtop and draw its head and legs under the ſhell of the body. It is common about ſome houſes and old walls, and more particularly in places where victuals are kept

The *Dermeſtes*, of a cylindrical ſhape, with a thick hairy neck, and teſtaceous caſes for the wings. This is alſo of the ſmall kind, and the body is of the ſhape of a cylinder, with a thick roundiſh black hairy neck. The caſes of the wings are longiſh, blunt at the point, and like ſhells with a black edge or margin running all round them; but the colour of the caſes themſelves are of a whitiſh brown, and the body and legs are black. The antennæ or feelers are reddiſh. The ſize is not much bigger than a large louſe, and when it is touched or terrified it contracts itſelf and lies quite ſtill. It is very common in houſes. The feelers of theſe three ſorts are of a clavated ſhape, and are perforated tranſverſely. There is another ſort of inſects of the Beetle kind, with ſlender feelers like threads, though a little thicker near the ends. This ſort, as well as the former, are by ſome of our beſt authors placed among the Beetles.

The *Green Tortoiſe Beetle* with clavated feelers divided into rings, has a very ſmall oval body, convex on the back and flat on the belly. The upper part conſiſts of the caſes of the wings and the ſhield, which are both green and ſmooth, and appear to be one ſingle cruſt, divided only by a kind of triangular ſuture. The belly is black, and the head is entirely hid under the ſhield. The feelers are pale, only they are of a deeper colour on the top than elſewhere. The legs are of a pale brown, and there is a ſort of a prominent rim running round the caſes of the wings, which entirely cover the body. It is common in gardens, and may be met with on mint and other herbs. Theſe ſort of Beetles are by *Linnæus* called Caſſida, from the ſhield.

The *Black Caſſida*, or Shield Beetle with feelers like briſtles, and a roundiſh body, is a very ſmall Beetle, of a little longiſh ſhape, and of a duſky black colour. The caſes of the wings are oblong, and lightly ſtreaked with ſeveral very ſmall hollowiſh ſpots. The ſhield is roundiſh, being ſomewhat broader than long, and it is rough on the upper part, with a cruciated prominent edge. Sometimes there are two ſpots on the ſide towards the hinder part, with yellow hairs thereon. The belly is black, but in ſome lights has a gloſs of ſilver colour. It is met with in houſes in the country, where it often does a great deal of miſchief, eating holes in woolen cloths and ſtuffs. When it is touched ever ſo lightly it draws up its head and wings under its body.

The over pale-clouded *Caſſida*, or Shield Beetle, with an undivided ſhield that covers the head. It is a very ſmall Beetle, and has a body of an oval ſhape and of a pale brown colour, ſpotted and clouded all over with one that is more duſky, which makes it look ſomewhat like the

the ſhell of a tortoiſe. The ſhield is in the ſhape of a half-moon, and of a pale colour without ſpots; but the caſes of the wings are ſtreaked and ſpeckled, and the ſtreaks run in crooked lines. The body is black, and the feelers are black and ſlender. It may be eaſily found in beds of baum, or mint.

The *Lady-Cow* with reddiſh caſes for their wings, and ſeven black ſpots thereon, is an inſect well known even to children, and has a black head with two white ſpots on the forehead, and a black breaſt, which is whitiſh near the edges. The caſes of the wings are of an orange-colour, and there are three black ſpots towards the baſe of each, and one that is common to both, which with the former makes ſeven in all. The feelers are very ſmall and clavated; and the under part of this inſect is black.

The *Lady-Cow* with red caſes for the wings, and two black ſpots thereon, that is one on each. The breaſt is black, only there is one large white ſpot on its ſide, and two very ſmall ones near the baſe; as alſo two others of the ſame ſize at the inſertions of the feelers. The belly and legs are black, as are the feelers likewiſe; and it is common to be met with on alder and other trees, as the former is among hedges in the Summer time.

The *Lady-Cow* with black caſes for the wings, with four red ſpots thereon, that is two on each caſe. The breaſt, is entirely black, and the ſpots on the caſes of the wings are of a blood-red colour; but that which is neareſt the breaſt on each is largeſt. They are met with on maple trees in the North parts of England, and are ſometimes ſeen, though but ſeldom, in the hedges near London.

The *Chryſomela* is of the Beetle kind, and the feelers are in the ſhape of necklaces of beads, but thickeſt towards the extremities. The body is nearly of an oval ſhape, and the breaſt is oblong and roundiſh.

1. The blew-green *Chryſomela* is one of the largeſt ſort of this kind, though they are all but ſmall. The head is little, the legs ſlender, and the belly ſmooth. The back is roundiſh or convex, and the colour is a mixture of blue and green, with a very fine tincture of gold colour diffuſed throughout. The edges of the caſes of the wings are a little prominent, and they are marked with a few hollowiſh ſmall ſpots all the way round. The feelers, legs and belly are entirely green. It is common in the meadows in May and June.

2. The *Chryſomela* with a breaſt and the caſes of the wings of a red colour, is ſmaller than the former, and not ſo convex on the back. The head is ſmall and black, as well as the body, legs, lower part of the breaſt and feelers; but the upper part of the breaſt is red, as are alſo the caſes of the wings. It is commonly met with on ſome ſort of willow trees in June and July.

3. The blue-green *Chryſomela* with a red breaſt and thighs, is of the ſmall kind, and the head and caſes of the wings are of a beautiful ſhining green with a blueiſh caſt. There are a few hollow ſpots on the head, and the breaſt is ſmall, convex, and of a reddiſh colour, with a caſt of blue-green. The upper part of the legs is reddiſh and the other black as well as the feelers. It is common in moſt parts of this kindom.

4. The black *Chryſomela* with hollowed points, is one of the largeſt of the kind, and is all over black, and the breaſt and caſes of the wings

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are marked with ſmall hollow points very near each other. The wings are flexible, ſoft, and blunt, and the feelers conſiſt of twelve joints. They creep but ſlowly, and are found in quarries.

5. The black ſmooth *Chryſomela* with the baſe of the feelers yellowiſh. It is of a middle ſize, and the joints of its wings are neither hollow nor ſtreaked, but the black colour of this inſect has a blueiſh caſt.

6. The purpliſh black *Chryſomela* with hollow ſtreaked points, is found upon the birch tree, and feeds upon its leaves. This inſect is of a blackiſh blue inclining to purple, and it is rather of a violet colour, but the belly feet and feelers are black, and the head and breaſt are marked with very ſmall hollow points without order. The caſes of the wings are ſtreaked, and the eyes are hardly to be perceived.

7. The purpliſh black *Chryſomela* ſprinkled with hollow points, is found in the Spring ſeaſon on the alder tree. It is like the former, only it is larger, and the caſes of the wings are marked with hollow points, diſperſed here and there, but not ſtreaked.

8. The purpliſh black *Chryſomela* with the breaſt yellow on each ſide, is found upon the willow tree, and is of the ſize and ſhape of the former; as alſo entirely of the ſame colour, only the breaſt is red on the ſides, round in the middle, and of a violet-colour; but a little blacker on the center. The head and lower belly are black, and there is a black point in the middle of the red that is on the ſides of the breaſt.

9. The green ſhining *Chryſomela* with a ſmooth breaſt, and the caſes of the wings marked with hollow points. This is alſo found upon the willow, and is of a bright green colour. It is marked with hollow points that touch each other, and it is blunt towards the vent. It ſeems to open the caſes of the wings with trouble, and the breaſt is ſmooth behind but a little marked with points, and the feelers and feet are black.

10. The green ſhining *Chryſomela* with the breaſt hollow before. It has not the breaſt equally hollowed, but only at the top.

11. The green ſhining *Chryſomela* with a level breaſt, is leſs than the former, but rounder.

12. The *Chryſomela* that is a little teſtaceous, is found in the beginning of the Spring among rotten wood, and is placed by authors among the largeſt kind. The colour of the whole body, which is oval, is cheſnut, but the eyes are black, and the feelers and the feet red. The under parts of the feet are white, and the caſes of the wings are marked with hollow points.

13. The pale green *Chryſomela* is found upon willow trees, and reſembles the former, only it is a little ſmaller; but what diſtinguiſhes this from that is the pale colour, and the nine rows of points on each caſes of the wings, placed long ways. The eyes are black and the bottom of the feet white.

14. The Red *Chryſomela* with a cylindraceous breaſt, is found upon the flower de luce. It is of a middle ſize, and its breaſt, caſes of the wings, and the top of the head are red; but the feelers, eyes, knees, belly, breaſt plate, and under part of the head are black. The breaſt is much narrower than the caſes of the wings, and is hollow on each ſide. The caſes of the wings are marked with hollow points of a middle ſize.

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15. The Copper coloured *Chryſomela* is very common on willows, and is of a middle ſize. It is of the colour of red copper that has been poliſhed.

16. The blackiſh blue *Chryſomela* with red caſes of the wings, is found on the poplar tree, in the begining of ſpring, whoſe leaves it feeds upon. It is one of the largeſt ſort, and its red wings are marked with ſmall points, and the extremity of each caſe of the wings has a black ſpot, and the breaſt is ſmooth and of a green and black colour, as well as the corſet, belly, and feet; but the feelers are black. The caſes of the wings of this kind are not plates or leaves, but ſeem to be made up of eleven joints, of which the laſt is largeſt. It throws out an oily fluid when touched, and ſtinks ſo abominably, that few are able to bear it.

17. The *Chryſomela* with a red cylindraceous breaſt, and red caſes for the wings, is found on the branches of aſparagus, and devours the ſtalks. It is but ſmall, and has a head of a blackiſh blue, with black feelers, and the breaſt narrow and cylindric, marked behind with two black points. The caſes of the wings are oblong, yellow, and of a fallow colour on the external edge; there is alſo a blue ſpot like a croſs on the caſes of the wings.

18. The *Chryſomela* with a green breaſt, and red caſes of the wings, marked with a blue croſs. For ſhape it is much like that of the poplar tree, and the colour of the head and breaſt is that of green copper, with black feelers, and the feet are generally black. The head, breaſt, and caſes of the wings, are of a ſingular beauty, and painted with copper-coloured ſtreaks, a little inclining to blue.

19. The oblong black *Chryſomela* with red caſes of the wings marked with four black ſpots, is very largeſt of this kind, and is of a rounder ſhape. There are two large ſpots on each caſe of the wings, the firſt of which is oval, but the other more ſhort. The feelers are almoſt dentated, and the breaſt is ſhort.

20. The red *Chryſomela* with each caſes of the wings marked with five black ſpots. It is found upon willow trees, and is one of the largeſt of this kind, having a black head with a red breaſt, black in the middle, and red caſes of the wings, upon each of which there are five large black ſpots of an unequal ſize. The belly and the under part of the feet are black.

21. The long duſky *Chryſomela* with the letter S marked on the caſes of the wings. The breaſt is grey with white hair, and the caſes of the wings are of a greyiſh-brown, with a white ſpot of the ſize of a grain of caraway-ſeed, of the ſhape as above.

22. The *Chryſomela* with duſky wings that are livid on the back part, is no larger than a flea, and the body is black, and the breaſt brown.

23. The livid *Chryſomela* with black eyes, is ſmall, and of a pale livid colour.

24 The *Chryſomela* that is reddiſh on the upper part, with two black ſpots on the breaſt, and ſeveral on the caſes of the wings. It is found on the poplar tree, and is of a middle ſize, with a black head.

25. The *Chryſomela* that is of a blackiſh braſs colour, with the edges of the caſes of the wings yellow. It is of a middle ſize, and has the external edge of the caſes of the wings and the breaſt yellow; but the middle

middle of the breaſt and head are of a blackiſh copper-colour. The lower part is quite black, as well as the feet, and the body is oblong.

26. The blackiſh braſs-coloured *Chryſomela* with two yellow lines on the caſes of the wings, has an oblong body. There is on the latteral edge of the breaſt in the middle of each caſe of the wing, and on the external edge, a long line of yellow colour; the legs and the internal part of the thighs are alſo of a yellow colour, and the feelers are knotted.

27. The *Chryſomela* with a black breaſt, and red caſes of the wings marked with a black ſpot. It is of a middle ſize, and has a narrow oblong body, with the feelers, head, breaſt and belly black; but the wings are white, and the feelers ſmaller than in other kinds; the caſes of the wings are of a bright red, furniſhed with eight ſtreaks or upwards, conſiſting of hollow points; and the baſe on the points are black.

28. The blueiſh-green *Chryſomela* with a red breaſt and thighs, makes its neſt in the galls of the willow tree. The head and caſes of the wings are ſhining, and of a blueiſh green, marked with hollow points. The breaſt is ſmall, marked with a reddiſh green or reddiſh cheſnut colour, and it is thick and convex. The feelers and the bottom of the feet are black.

29. The *Chryſomela* of a yellowiſh ſhell colour, with ſhort wings, is met with among flowers, and is of the ſize of a louſe, with an oblong ſmooth body. The feelers are full of knots; but the caſes of the wings are furrowed, and ſhorter than the two joints of the belly.

30. The teſtaceous oblong *Chryſomela* with accumulated caſes of the wings, is found on trees, and is the leaſt inſect of this kind. It is of a cheſnut colour, with the feelers like threads, and pointed caſes of the wings which cover the tail.

31. The duſky *Chryſomela* with a blackiſh head, is found on the windows in the ſpring, and is ſomewhat leſs than a flea. The body is oblong, and the feet are of a paler colour than the body, which is of a black cheſnut colour, with a black head.

32. The *Chryſomela* with duſky caſes of the wings, and a yellow edge, is of a middle ſize, with a brown head. The breaſt is yellowiſh, and the caſes of the wings almoſt black; but the feet are yellow, and the feelers alternately black and yellow. The wings are brown with black veins, and the belly yellow marked with a broad black line.

The *Curculio* or *Weevel*, is a ſmall inſect not unlike a bug, which is found among corn, wherewith it is nouriſhed, and it eats all the inſide, but leaves the bran behind. But there are different kinds of theſe, which feed in a different manner, of which the following are mentioned by *Linnæus*.

1. The brown oblong *Weevel* with ſtrait and ſharp caſes of the wings, is the largeſt of thoſe that are found in *Sweden*. The caſes of the wings are not ſo large as in other inſects of the ſame kind; but the feelers are big, and have the laſt joint of a red colour, and very long.

2. The duſky *Weevel* with ſtreaked caſes of the wings, and as hard as ſhells. *Linnæus* comprehends under this ſpecies the Duſky Weevel with ſhelly caſes of the wings, and marked with two ſtreaks. The greater Beetle, with rough caſes of the wings, of a greeniſh aſh-colour, and variegated with black. The black *Norway* Weevel, variegated with yellowiſh ſignatures. He ſays there are ſeveral ſorts of the ſecond kind in the fields of *Sweden*. It creeps ſlowly, and ſticks faſt to any

thing it touches. When it is taken it endeavours to pinch the ſkin, and is found upon thiſtles. It is of a blackiſh grey, and has the body, mouth, breaſt, caſes of the wings and legs, marked with ſpecks near each other, which are all hollow. This inſect gets among the leaves, where it changes, and becomes a winged Weevel.

3. The *Grey Weevel* with an iron-grey mark on the caſes of the wings, and is found upon willows, being like the former. It is grey and white, with black feelers, and jaws almoſt as long as the breaſt. The end of the breaſt is white, and there is a ſpot of a tawny colour, on the middle of each caſe of the wings.

4. The *Weevel* variegated with black and white, and with a plain carinated trunk of the length of the breaſt. *Friſch* calls it the Weevel with a ſhort ſnout. This inſect is of the ſhape of the former, and the colour is black and white.

5. The *Weevel* of a duſky braſs colour, with a ſhort ſnout and breaſt. It is called in the Tranſactions of *Upſal*, the accumulated Weevel, of a longiſh ſhape and of a duſky braſs colour. This inſect is very common in *Sweden*, the famale is larger by half than the male.

6. The *Weevel* with a ſhort ſnout and breaſt, and marked on the breaſt with three pale ſtreaks. It is common in the gardens and meadows, and is twice as large as a louſe. The body is grey, but the feelers are reddiſh.

7. The *Black Weevel* with a trunk or ſnout the length of the breaſt. It is of a middle ſize.

8. The Aſh-coloured *Weevel* is of a longiſh ſhape, with blunt caſes of the wings. *Liſter* calls it the brown Beetle covered with hoary hair. It is found among graſs, and is leſs than the former, and is oblong, black, and covered over with fine down.

9. The Aſh-coloured oblong *Weevel* with red feet, is like the former in ſhape, ſize, and colour, and might be taken for the ſame, if the thighs, legs and feet, were not of a yellowiſh red colour; beſides it has no down. *Linnæus* takes it to be the female of the former.

10. The *Grey Weevel* clouded with black, is of a longiſh ſhape, and the feet and feelers of a duſky colour. This is to be met with among ſorrel, where it makes its neſt, and afterwards is metamorphoſed into a winged Weevel. It eats the leaves of ſorrel on the under ſide.

11. The green opaque *Weevel* with duſk feet and feelers. This is of a middle ſize.

12. The blueiſh-green ſhining *Weevel* with black feelers, is the ſmall Weevel of *Petiver*, of a ſhining green colour. This inſect is met with on the leaves of the birch tree, and is of the middle ſize. The whole head, breaſt, jaws, caſes of the wings, belly, and feet of a golden blue-green.

13. The purple ſhining *Weevel*, is met with in the woods, and is ſmaller than the former, with a very long head.

14. The *Weevel* marked with a tooth on the fore thighs, and a body clouded with grey. It is found in the bloſſoms of trees, and is larger than a louſe; the colour is brown inclining to grey. It has two ſtreaks that run along the caſes of the wings, and the feelers and feet are of a brown colour.

15. The *Weevel* with all the thighs marked with a tooth, and of an oblong greeniſh body, is found upon nettle-leaves, and is of a middle ſize.

ſize. The body is longiſh, the head of the length of the breaſt, and the caſes of the wings almoſt pointed, which has been ſeen on the ſeed of figwort, before it was ripe.

16. The roundiſh *Weevel*, with two black points on the longitudinal ſuture of the caſes of the wings, and a whitiſh breaſt. In the tranſactions of *Upſal* is called the Globous Weevel, with a trunk turned back; and *Liſter* calls it the ſmall aſh-coloured Beetle, marked with two black ſpots on the caſes of the wings.

17. The roundiſh *Weevel*, clouded with brown, and a white ſpot in the ſhape of a heart on the middle of the back. In the tranſactions of *Upſal* it is called the leaſt aſh coloured roundiſh blunt Weevel; and it is found on the ſame plant as the former, and is of the ſize of a muſtard ſeed.

18. The oblong *Weevel* with a reddiſh ſhell, and the breaſt almoſt as long as the caſes of the wings. *Mr Ray* calls it the ſmall dirty-brown Beetle, with a long trunk bending downwards. It is found upon ſeveral ſorts of ſeeds, on which it lives, and is of the ſize of a louſe.

19. The pitchy *Beetle* with an oval belly, is very common in *Sweden*, which is all that *Linnæus* ſays of it.

20. The Corn *Weevel* is ſhaped like a bug, and feeds upon corn. This is the firſt that was ſpoken of.

21. The black *Weevel* with longiſh opaque caſes of the wings, is twice the ſize of a flea, and is of a black colour. The caſes of the wings are ſtreaked, and marked with opaque points.

22. The black *Weevel* with ſhining caſes of the wings, is leſs by one half than a flea, of a black colour, and the caſes of the wings ſtreaked, ſhining, and marked with points. It is four times leſs than the former, and the caſes of the wings and belly are of an oval ſhape.

23. The black *Weevel* with the caſes of the wings of a blackiſh blue, is found in hedges, and is of the ſize of a flea. The head, breaſt, and feet are black, marked with ſmall hollow points, and the caſes of the wings are of a violet-colour, or of a blackiſh-blue.

24. The blackiſh-blue *Weevel* is found in hedges like the former, and is of the ſize of a flea. The head, breaſt and thighs, are of a blackiſh-blue; but the caſes of the wings are of a deep blue.

25. The black *Weevel* with whitiſh thighs, is very like the former in ſhape and ſize; but the caſes of the wings are black and ſtreaked; and generally the legs are pale, with black feelers. The head and breaſt are marked with hollow points.

26. The aſh-coloured *Weevel* with a black ſpot on the caſes of the wings, and legs of a paleiſh yellow, is found on the leaves of willow. It is no bigger than a louſe, and the head and jaws are black without hair; the breaſt is alſo black, and covered with aſh-coloured hair. The caſes of the wings are black, ſtreaked and covered with the like hair, and in the middle of each wing there is a black ſpot. The feelers are of the ſame colour as the legs.

27. The aſh-coloured *Weevel* with red legs, is common in dry grounds, and is of the ſize of a flea. The colour is aſh, and the caſes of the wings ſtreaked, with reddiſh feet.

28. The Aſh-coloured *Weevel* with longitudinal ſtreaks of a lighter colour, is found among the ſand. It is larger than a louſe, and is of an aſh-colour all over. The eyes are black, the feelers aſh-coloured,

and there are ſeveral lines; one upon the back, of a bright aſh-colour, and another upon the wings of a light aſh-colour.

29. The livid *Weevel* with the caſes of the wings ſpotted with four dark ſpots. It is found upon the leaves of the alder-tree, and is a leaping inſect of the ſize of a louſe.

30. The blood-coloured *Weevel* is found in corn, and is much of the ſize of a louſe.

31. The black *Weevel* with the caſes of the wings red in the middle, is found among flowers, and is of the ſize of a flea.

32. The black *Weevel* with red caſes of the wings, and a longiſh hinder part of the head; differs very much from the former kinds; for the head is black, and looks like that of a fox deprived of hair. The jaws are ſhort, the feelers black, and the wings of a deep red, but ſtreaked and marked with hollow points.

33. The black *Weevel* with black caſes of the wings, and a double white ſtreak at the baſe, which is red, is very common every where. It has a black head ſunk into the breaſt, which is red without hair, and the body is ſhort and without a trunk.

The *Flying-Beetle* of the Weſt-Indies, called by the natives *Acudia*, is a ſhining inſect, and is almoſt as big as a Wren. There are four ſhining ſpots like ſtars, two of which are near the eyes, and two under the wings. Some pretend, the natives, before the coming of the *Spaniards*, made uſe of theſe Beetles inſtead of candles.

There is an inſect of the Beetle kind, known in *England* by the name of a *May Bug*, and in ſome places a *Dorr*. It has two pair of wings, one of which may properly be called the caſes, and the other the real wings. The caſes are hard, and of a reddiſh brown, ſprinkled with a whitiſh duſt, which eaſily comes off. The legs and tail are whitiſh, but the reſt of the body is brown, except a white and dentated line wherewith each joint is marked on both ſides the belly. It is thought that the females make holes in the earth with their tails for the ſake of propagation; but it is uncertain whether they lay eggs or ſmall worms. But be that as it will, theſe worms are prejudicial to the roots of corn and young plants; and they are ſometimes ſo numerous, as to do prodigious miſchief; they continue ſo long in this ſtate, that they are the more dangerous on that account; and it is ſaid the hardeſt froſt will not hurt them. Rooks and hogs are very fond of theſe worms, and devour vaſt numbers of them; hence the advantage of rookeries is very evident, as the inhabitants of the county of *Norfolk* have found to their coſt; for they lately took it in their heads to deſtroy them all, ſince which time they have been peſtered with great numbers of theſe worms, which have deſtroyed the roots of the wheat to their very great damage. One farm in particular was ſo injured by them in the year 1750 and 1751, that the occupier was not able to pay his rent, which the landlord was not only content to loſe, but likewiſe gave him money for the ſupport of his family.

Theſe *May-bugs* are ſeen moſt frequently flying about in the evening; for in the day time they hide themſelves in the leaves of ſeveral trees till ſun-ſet, when they appear in great numbers, and often fly in the faces of paſſengers.

Mouſet informs us, that in 1574 there fell ſuch a great number of theſe inſects into the *Severn*, that they ſtopt the wheels of the water-mills.

mills. This was on the 27th of *February*; but the larger ſort do not appear till *May*. In *Ireland* they ſuffered ſo much by theſe inſects, that they reſolved to ſet fire to a wood of ſome miles extent, to prevent their communication with others at ſome diſtance. And indeed it is certain, that where there are few trees and many rooks, the inhabitants are leaſt infeſted with them.

In ſome years their necks are covered with a red plate, and in others with one that is black; but theſe are diſtinct ſorts; and ſome have obſerved that they do not appear in the ſame year, but alternately. *Roeſel* has been ſo curious as to catch ſome of theſe inſects and put them under glaſſes, where they laid great numbers of eggs; from whence it is plain that they do not bring forth their young alive, which was doubted of before. They ſoon change to worms of a white colour, and at laſt increaſe to a conſiderable bulk, and he kept them two years in this ſtate, and ſome three, without any change, excepting their becoming larger. At this time they were an inch and a half long, and of a yellowiſh white colour. Their body conſiſts of twelve ſegments or joints, as thoſe of caterpillars, without including the head. On each ſide the body there is a protuberance that runs all along the ſegments; in it there are nine holes, through which this worm is ſuppoſed to breathe. Under the three firſt there are ſix feet, of a reddiſh-brown, compoſed of four or five joints, and they are all alike hairy, and of the colour of the feet. The head is large in proportion to the body, and of a browniſh ſhining yellow, with a pincher or nipper placed before, of a deep brown, and blunt, but dentated at the end; between theſe there is a ſort of ſemicircular lip, and by the help thereof, this inſect cuts the roots of plants and ſucks out their moiſture. There is no appearance of eyes, but behind the nipper there is a feeler, conſiſting of five joints, and of a browniſh-yellow colour. This worm changes its ſkin once every year, and towards the end of the fourth year becomes a May-Bug.

The American ball *Beetle*, called by the inhabitants Tumble-dung, is the moſt numerous and remarkable of the Beetle-kind of any in North-America. Their employment is to find neſts for their eggs. They are endowed with ſagacity to diſcover ſubſiſtence by their excellent ſmelling, which directs them in flights to excrements juſt fallen from man or beaſt, on which they inſtantly drop, and fall unanimouſly to work in forming round balls or pellets thereof, in the middle of which they lay an egg. Theſe pellets in *September*, they convey three feet deep in the earth where they lye till the approach of ſpring, when the eggs are hatched and burſt their neſts, and the inſects find their way out of the earth. They aſſiſt each other with indefatigable induſtry in rolling theſe globular balls or pellets to the place where they are to be buried. This they are to perform with the breech foremoſt, by raiſing up their hinder part, and ſhoving along the ball with their hind feet. This inſect is all over of a duſky black, and has ſix legs, two of which are joined to the breaſt and four to the belly. They are always accompanied with other Beetles of a larger ſize, and of a more elegant ſtructure and colour. The breaſt of this is covered with a ſhield of a crimſon colour, and ſhining like metal; the head is of the like colour, mixed with green, and on the crown of the head ſtands a ſhining black horn bended backwards. Theſe are called the kings of theſe beetles,

but

but for what reaſon is uncertain, ſince they partake of the ſame dirty drudgery with the reſt. It is a very ſtrong inſect, for if one of them be put under a braſs candleſtick it will cauſe it to move backwards and forwards as it were by an inviſible hand, to the no ſmall admiration of thoſe who are not accuſtomed to the ſight.

There is another inſect which at firſt appears to be of the Beetle kind, to be met with in *South-America*, and particularly in *Surinam*. It is of a very heavy ſluggiſh nature, and is furniſhed with a long tube or trunk under its noſe, which it thruſts into flowers to ſuck out the honey. When it is preparing itſelf for transformation, it lies motionleſs for a conſiderable time, till at length the ſkin breaking on the back, there comes out a flying inſect, with four wings that are tranſparent, and of a pale roſe colour, veined with ſcarlet, and bordered all round with a pale yellow. The trunk of the body is much the ſame as in the Beetle ſtate, though it entirely throws off its ſkin or ſhell, which was of a deep green colour. When it is transformed to a fly, it is exceeding ſwift, and makes a noiſe with its wings like a harp.

There have been the ſolid ſhells of a ſort of Beetle brought to *England*, that were found on the eaſtern coaſt of *Africa*, over againſt part of the iſland of *Madagaſcar*, which the natives hang to their necks, and make uſe of them as whiſtles to call their cattle together. Their upper ſurface has the appearance of rough wings, which are ſo ſtrongly united to thoſe below after they are dead, that one would imagine they never could be made uſe of while they were alive. On its upper ſide it has above a dozen rows of round knobs, running lengthways, and between them there are others that are very ſmall. The colour is black, ſpotted with red between each knot in the rows of the back, and it has alſo red ſpots on its under ſide. Theſe Beetles when living, will fly with great force againſt a perſon's head or face, though when they are dead they ſeem incapable of any ſuch motion as flying.

Linnæus divides the Beetles into two kinds, the great and the little; of the former, there are,

1. The black *Beetle*, with ſpotted and ſtreaked caſes of the wings; the head is ſmall, the eyes prominent, the feelers conſiſt of eleven joints, and are as long as half the body. All theſe ſorts of Beetles have an oblong body, feelers like briſtles, a breaſt made in the ſhape of a heart, an elevated mouth, a ſtrong ſmell, and they run and fly very ſwiftly. This has the ſmell of tobacco, and is found among rotten wood.

2. The black *Beetle* with greeniſh caſes of the wings, that are convexly ſpotted and ſtreaked. It is like the former, and has the ſame ſmell.

3. The black *Beetle* with the caſes of the wings like copper, and convexly ſpotted and ſtreaked. It is like the former, only the caſes of the wings, the breaſt, and the hinder part of the head, are of the colour of copper. It is found among rotten wood.

4. The purpliſh-black *Beetle* with the caſes of the wings concavely ſpotted and ſtreaked. It is the purple ſpotted Cerambix of *Ray*; and the black Beetle with furrowed caſes of the wings and hollow ſpots. It is like the former, and is found among putrified vegetables.

5. The black *Beetle* with eight ſtreaks on each wing, is like the former, and is found in the ſame places. It is called by *Liſter* the entirely black Beetle, with cruſtaceous caſes of the wings.

6.

6. The blackiſh violet *Beetle* with the caſes of the wings a little wrinkled, is called by *Fryſch* the ſmall black Beetle. It is like the former, only the edges of the breaſt, and the caſes of the wings, are of a blueiſh purple.

7. The green *Beetle* with furrowed caſes of the wings, but without points, and the feet and feelers of a brown colour. It reſembles the former, only it is green, with a blueiſh caſt.

8. The black *Beetle* with green furrowed caſes of the wings, and black feet and feelers. It is the Cerambix of *Ray*, with a back divided into long lines, and the moſt beautiful of all this kind. It is like the former, only the head, breaſt, and caſes of the wings above, are of a ſhining green, marked with three or four ſtreaks of different green, between which there are furrows. The edge of the caſes of the wings is of the colour of fire; but the body, feet, and feelers are black.

Thoſe of the leaſt ſort, according to *Linnæus*, are,

1. The ſhining *Beetle*, with head and breaſt of a blueiſh green, and with purple wings. It ſhines like gold, and the caſes of the wings have ſtreaks that are hardly viſible.

2. The *Beetle* which is of a copper colour above, with hollow pointed caſes of the wings, and red feet. The colour of the back is variegated with green, red, copper colour and brown; the caſes of the wings are marked with three points; the thighs are black, the legs red, and the feelers at the third joint are furniſhed with three ſilky threads. It is of the ſize of a houſe fly, but narrower, and is found in meadows.

3. The black *Beetle* with red feet, is in ſhape and ſize like the former, only it is quite black, and the caſes of the wings are ſtreaked.

4. The blackiſh *Beetle* with pale legs, is only half as big as a houſe-fly, and the head, breaſt, and caſes of the wings are of a blackiſh copper-colour, and the caſes of the wings are marked with eight ſtreaks. The feet are black, except the middle of the legs.

5. The pale teſtaceous *Beetle* with ſmooth wings, is of a middle ſize, with very ſmall feelers.

6. The black *Beetle* with a brown breaſt, as well as the feelers and feet. It has a black head, and the caſes of the wings of the ſame colour, and ſtreaked.

7. The *Beetle* with the head and caſes of the wings blue, and the breaſt red, or of a ſaffron colour. The feelers are moſtly black, and the feet are variegated with red and black. It is of the ſize of a ſmall fly.

8. The *Beetle* with a black head and caſes of the wings, but a red breaſt; it is of the ſame ſize and ſhape as the former, and the feet and feelers are brown.

9. The blackiſh copper-coloured *Beetle* with black feelers and feet, is of the ſize and ſhape of the former. The breaſt is more black than the other parts, and ſhining, marked with two hollow ſpots; but the caſes of the wings are ſtreaked and ſilky at the extremities, and the under part of the body is black.

10. The black *Beetle* with a brown ſtreak on the hinder part of the caſes of the wings, and a ſpot on the ſides of the ſame colour, but the feelers are black and red, the feet pale, and the wings brown.

11. The black *Beetle* with grey caſes of the wings, is about twice the ſize of a louſe.

12.

12. The black *Beetle* with black feet and feelers. The breaſt is ſhining and narrow at the lower part, but the wings are ſtreaked, and on the middle of each there is an hollow point.

13. The pale teſtaceous *Beetle* with black eyes, is of the ſize of a large louſe, and of an opaque colour. The caſes of the wings are ſtreaked.

14. The black *Beetle* with a brown breaſt, and the caſes of the wings marked with four livid ſpots; the feet are alſo brown, and there is a brown ſpot on the joints of the wings.

15. The grey *Beetle* with the head, belly, and baſe of the caſes of the wings blackiſh. It is ſcarce ſo big as a louſe, and the feelers and feet are grey.

Linnæus has ſeventeen ſorts of *Dermeſtes;* namely,

1. The black *Dermeſtes* with the fore parts of the caſes of the wings of an aſh-colour; it is called by *Ray* the beetle with clavated feelers; and by *Fryſch* the ſmall Bacon Beetle, with a tranſverſe ſtreak of a whitiſh colour, on the duſky blackiſh caſes of the wings. It is fond of bacon, and all ſorts of dead bodies.

2. The black *Dermeſtes* with a double undulated white ſtreak on the caſes of the wings; in which laſt particular it differs from the former, but in other reſpects is like it.

3. The black *Dermeſtes* with two white ſpots on the caſes of the wings. It is named by *Fryſch* the black Dermeſtes, with a white ſpot on the caſes of the wings. It is of an oval ſhape, and when the caſes of the wings are cloſed, two white ſpots appear on the back; beſides which there are five others; that is, one on the point of the corſlet, one on each ſide the breaſt, and one along each caſe, towards each caſe; but they are all very ſmall, and the feelers are in the ſhape of a club. It is found among cloaths, on walls, and about proviſions.

4. The black *Dermeſtes* with two red ſpecks on the caſes of the wings. It is called in the tranſactions of *Upſal* the Black Dermeſtes, with the caſes of the wings marked with a red ſpot. This inſect, as well as the two former, is fond of Bacon.

5. The black *Dermeſtes* with four red ſpots on the caſes of the wings. is ſaid by *Fryſch* to be a ſmall beetle, ſpotted with yellow, that proceeds from a hairy worm, found among wool. It may be ſeen on trees, and ſometimes on windows.

6. The ſmooth black *Dermeſtes*, of a clouded aſh-colour, with a yellow corſet. *Fryſch* calls it the Beetle proceeding from a ſmooth black caterpillar.

7. The teſtaceous hairy *Dermeſtes* with ſtreaked blunt caſes of the wings; it is called by *Ray* the Beetle with ten elevated feelers, and in the *Upſal* tranſactions the hairy Dermeſtes, with the points of the caſes of the wings ſeeming to be gnawed off. It is of a bright brown, with ſtreaked, furrowed, and dentated caſes of the wings. It is to be found under the bark of the pine tree, where it makes crooked furrows.

8. The ſmooth teſtaceous *Dermeſtes* with the hinder part of the caſes of the wings hairy and blunt. It is fond of carrion, and alſo feeds on other inſects.

9. The black *Dermeſtes* with grey caſes of the wings that are black on the edges. It is called in the *Upſal* tranſactions, the Cylindrick Dermeſtes, with a thick hairy collar, and teſtaceous caſes of the wings. It is ſmall, and when touched, rolls itſelf up.

10. The black *Dermeſtes* with grey caſes of the wings, is no bigger than a flea.

11. The black oblong *Dermeſtes* with a ſharp belly, is called in the *Upſal* tranſactions, the leaſt flower-eating Beetle; and by *Ray* the Beetle, with clavated feelers, which are divided into rings. It is of the ſize of a louſe, with an oblong body, and a flat belly, pointed at the end.

12. The black *Dermeſtes* with blackiſh caſes of the wings. It is found among putrified cabbages, and in the winter in cellars and green-houſes.

13. The black *Dermeſtes* with red feet, and the caſes of the wings marked with nine ſtreaks, is a water inſect, twice as big as a louſe.

14. The blackiſh-blue *Beetle*, is of the ſize of a grain of rice, blue above, and blackiſh below, with a hairy corſet.

15. The blackiſh-brown *Dermeſtes* with ſhining ſpeckled caſes of the wings; it is of a cylindric ſhape, and of the ſize of a large louſe.

16. The oblong ſmooth teſtaceous *Dermeſtes* with black eyes, may be ſeen among horſe-dung in the beginning of the ſpring.

17. The brown *Dermeſtes* with a breaſt ſomewhat teſtaceous, and the croſſet of a bright brown, is about the ſize of a louſe.

The *Goat-chaffer*, or *Capricorn-beetle*, is of the ſame ſize as the Stag-beetle, as alſo of the ſame colour: the head is broadiſh, and the eyes large, with a forked gaping mouth, and two exceeding hard crooked teeth, with which it is enabled to gnaw wood, at which times it makes a noiſe like the grunting of a pig: the ſhoulders are of a very curious ſtructure, ſeeming to be carved, and having a haft of the colour and poliſh of ebony. It has ſix legs, three of which are furniſhed with knees, that are weak, and ſcarcely able to ſupport the body. It has two horns growing above the eyes, and longer than the body, conſiſting of ten flexible joints, not exactly round, but rough like thoſe of a goat. It can turn them any way it pleaſes, only when it flies they are thruſt directly forwards; and when it is weary with flying, they are uſed inſtead of feet. When it reſts upon trees, it embraces a branch with its horns or feelers, and hangs thereto; inſomuch that it looks not much unlike the bird of Paradiſe.

The larger Capricorn green *Beetle* with the ſcent of muſk, is a very large beautiful inſect, all over a gloſſy lovely blue green colour, with a caſt of a ſhining golden yellow: the body is blue on the upper part, and the wings under the caſe are black: the legs are of the ſame blueiſh green colour, only ſomewhat paler, and the breaſt is pointed at each extremity. Between theſe points there are three little tubercles near the wings, and three ſmaller towards the head: the caſes of the wings are oblong, and ſomewhat in the ſhape of a lance, with three ribs a little raiſed and running longways: the feelers are nearly as long as the body, and are compoſed of many ſmall joints, which grow ſmaller near the ends It is ſometimes found among old willow trees, and has a ſort of a muſky ſmell.

The Ruſſian Capricorn *Beetle* with very long horns, is about three quarters of an inch long, and is all over of a grey colour: the caſes of the wings are blunt and furniſhed with many ſmall hairs; and among them there are ſeveral ſmall tubercles. A duſky blackiſh ſhade runs acroſs the wings, which at the hinder part bends towards the middle: the breaſt is pointed at each end, and has four beautiful yellow ſpots

towards its hinder part: the eyes are black, and there is a black ſpot near the feelers, which are five times as long as the body: they are grey, and conſiſt of ten joints, which are ſhorter the nearer they are to the head; but the wings are black ſtreaked with brown. The female has an elongation at the vent, which renders the body one third of the length of the feelers. It is found among old wood, but is not very common with us.

The black Capricorn *Beetle* with a hairy grey breaſt, has an oblong and ſomewhat depreſſed body, of a deep black colour, with a little mixture of grey. It is covered with many ſhort hairs with prominent tubercles between them; but all the breaſt is hairy and black, though the hairs are white, which give it a greyiſh appearance; only on its hinder part there are two ſmooth prominent ſpots: the feelers are ſlender and black, and about half the length of the body, and there is an undulated line on the caſe of the wings, but ſo faint, that it is ſcarcely viſible. It is found among timber, but it is not very common with us.

Linnæus has eighteen ſorts of theſe Beetles, the firſt of which is the green and blue Capricorn Beetle, with feelers nearly of the length of the body: this has a fine agreeable ſmell, and is found upon willow trees. It is the largeſt ſort that is ſeen in *Sweden*, and is the ſame with one already mentioned.

2. The cloudy Capricorn *Beetle* with feelers longer than the body, and the breaſt marked with four yellow ſpots: this is the ſame as the *Ruſſian* Beetle, and is found on the trunks of trees that are ſtript of their bark with which the peaſants make their huts.

3. The black Capricorn *Beetle* with a flattiſh breaſt, that has three teeth on the margin on each ſide, and the caſes of the wings as black as pitch: this is the ſame as the great Cerambix of *Ray*, with large articulated horns bending back: it has a very large flattiſh body, longer than the feelers, and of the ſhape of a common Beetle: this is a kind of ſtag Beetle.

4. The red Capricorn *Beetle* with the caſes of the wings marked with three longitudinal black ſpots: this is the largeſt kind of Beetle that is found in Europe, and has the belly, feet, mouth and forehead, of a dark red; the belly is covered with hair.

5. The black *Stag-beetle* with ſpeckled caſes of the wings, and pale ſpots ſprinkled thereon, with feelers longer than the body, and a prickly breaſt: it is found in foreſts, and is of the largeſt kind.

6. The ſmall Capricorn *Beetle* of an aſh-colour, with black caſes of the wings, and feelers half as long again as the body: the head is black, and it is found in *Gothland*.

7. The aſh-coloured Capricorn *Beetle* with caſes of the wings, part of which ſeem to be bitten off, marked with black points, with a white ſtreak; as alſo with feelers half as long again as the body: this is of the length of a common fly, but more ſlender; and it is often ſeen in houſes in the country.

8. The Capricorn *Beetle*, of a cloudy black colour, with feelers ſhorter by half than the body, and a prickly breaſt.

9. The aſh-coloured Capricorn *Beetle* with the caſes of the wings marked with two yellow ſtreaks, and feelers by one half ſhorter than the body, with a prickly breaſt. It is like the former, only the caſes of

of the wings are of a browner colour, and marked with two yellow ſtreaks.

10. The teſtaceous Capricorn *Beetle*, with the caſes of the wings marked with two whitiſh ſtreaks, and a prickly breaſt. It is no bigger than a louſe.

11. The black Capricorn *Beetle*, with the caſes of the wings marked with two white undulated ſtreaks, and a ſmooth breaſt: the feelers are long, and it is of the ſame ſize as the former.

12. The blackiſh Capricorn *Beetle*, with a hairy aſh-coloured breaſt, marked with two ſmooth points. It is by ſome called the Tree-Beetle, with ſmall feelers, and an aſh-coloured collar, marked with two points. It is found among piles of wood.

13. The teſtaceous Capricorn *Beetle* with a hairy aſh-coloured breaſt, marked with two ſmooth lines: this inſect is of the ſame ſhape as the former, but ſhorter, and the feelers are not ſo long as the body.

14. The teſtaceous Capricorn *Beetle* with a ſmooth breaſt, does not differ much from the former, only the feelers are longer than the body, and the thighs and feet are yellow inclining to red.

15. The brown Capricorn *Beetle*, with points impreſſed on the breaſt, and feelers ſhorter than the body.

16. The grey Capricorn *Beetle* ſpotted with black: this is called by *Petiver* the *Norway* Capricorn Beetle, of a blackiſh colour, with ſpotted caſes of the wings, and ſpeckled with pale ſpots.

17. The black Capricorn *Beetle*, with the caſes of the wings marked with a longitudinal yellow ſpot, which is dentated, and there are alſo yellow ſpots: this is of a longiſh ſhape, and has the breaſt adorned with yellow hair.

18. The violet-coloured ſhining Capricorn *Beetle*, with black feelers and clavated thighs. It is found in gardens and in woods, and is all over of a fine violet mixed with gold colour: the feelers are a little longer than the body.

There are ſeveral ſorts of *Unicorn Beetles*, which may be placed under two diviſions, the firſt of which has ſharp protuberances on the breaſt, and the ſecond none. Of the firſt diviſion, beſide the two already deſcribed, are the black Unicorn Beetle, with a flatted breaſt, and the edge of it having three feet on each ſide, and the feelers are coal black: the reddiſh Unicorn Beetle with three black lines on the caſes of the wings, running lengthways: the black Unicorn Beetle, with irregular pale ſpots on the caſes of the wings, and a prickly breaſt; and has alſo feelers longer than the body: the grey Unicorn Beetle ſpotted with black, and a black tranſverſe line on the caſes of the wings, and the feelers longer than the body by one half: the grey Unicorn Beetle, with black caſes of wings ſpotted with white, and a white tranſverſe line on each, with feelers longer than the body by one half: the grey and black Unicorn Beetle, with the feelers about half the length of the body: the grey Capricorn Beetle, with two yellow tranſverſe lines on the caſes of the wings, and the feelers half as long as the body: the ſhelly Capricorn Beetle, with a double white tranſverſe line on each wing.

Of the ſecond diviſion, which have no protuberances on the breaſt, there are the black Capricorn Beetle, with two white undulated tranſverſe lines on the caſes of the wings: the ſhelly Capricorn Beetle

with a grey hairy breaſt, and two ſmooth ſhort lines thereon: the ſhelly Capricorn Beetle, with a ſmooth breaſt: the brown Capricorn Beetle, with ſpots impreſſed on the breaſt: the grey Capricorn Beetle, with the caſes of the wings ſpotted with black: the black Capricorn Beetle, with a longitudinal dentated yellow line and yellow ſpots on the caſes of the wings: the ſhining violet-coloured Capricorn Beetle, with black feelers and clavated thighs.

Linnæus has only four ſorts in his *Syſtema Naturæ*, which are mentioned among thoſe above.

The *Leptura* is a ſort of a Beetle with feelers like briſtles, and the caſes of the wings truncated at the points; as alſo a round breaſt: the Tree-Beetle, or greater violet-red Leptura, is of the large kind, with an oblong-ſhaped body, ſmalleſt behind: the legs, feelers, and all the other parts, except the caſes of the wings, are black, though in ſome lights it has a whitiſh caſt: the caſes of the wings of the female are of a deep red; but thoſe of the males are not ſo deep, and are black or grey on the edges. All the ſurface of the caſes of the wings in both is adorned with a multitude of ſmall hollow dots, with a few ſhort fine hairs: the head and breaſt are ſometimes yellowiſh. It may be often met with in the woods, and *Ray* calls it a Unicorn Beetle, with the head, ſhoulders and feelers black; but of a blackiſh yellow at the extremities.

The middle-ſized *Beetle*, with a black oblong narrow belly, and variegated with yellow lines and ſpots. It is of an oblong narrow ſhape, the general colour is of a blackiſh brown; only the upper edge of the breaſt is yellow, and there is a yellow ſpot where the caſes of the wings join. Likewiſe there are ſome undulated yellow lines running tranſverſely thereon; and they are truncated at the point, and are a little hairy, and the feelers and legs are of a reddiſh brown. It is not uncommon among the hedges in orchards and gardens.

The yellow gold-coloured *Leptura*, with black feelers, and dentated hinder legs: the body is oblong, and the head ſmall: the colour reſembles that of copper, with a mixture of fine ſtrong gilded yellow variegations: the head, breaſt, and caſes of the wings, as well as the legs, are all ſpeckled with extremely minute, and almoſt contiguous hollow dots, which are irregularly diſperſed over the breaſt, head, and legs; but on the wings they are pretty regular, and placed in ten rows, running lengthways, forming ſo may lines: the eyes are black, and the feelers brown.

Linnæus has fifteen inſects of this kind, of which the firſt is, The greeniſh-yellow *Leptura*, with yellow feelers, variegated with green. It is the largeſt of the kind, and in the *Upſal* tranſactions is named the greateſt black Leptura, greeniſh underneath.

2. The black *Leptura*, with the breaſt and caſes of the wings red; it is pretty large, and the legs are yellow.

3. The black *Leptura* with blackiſh caſes of the wings, variegated with a livid colour. It is found in *Sweden* as well as the former.

4. The black *Leptura* with reddiſh and greeniſh caſes of the wings, is called by *Ray* the Cerambix, with the head and ſhoulders and feelers black, the caſes of the wings yellow and black at the extremity, and in the *Upſal* tranſactions, the Leptura with teſtaceous caſes of the wings; but this is the male, and the female is termed the Leptura with red

caſes

caſes of the wings. It is a ſort of a *May* Bug, and of a violet-red colour; it is commonly ſeen on buſhes.

5. The black *Leptura* with the throat, caſes of the wings, and legs purple; it is like the former, but twice as big.

6. The black *Leptura*, with the caſes of the wings and breaſt yellowiſh. It is much of the ſame ſhape as the former, but leſs.

7. The *Leptura* with livid caſes of the wings, marked with four black ſpots. It is of the greateſt ſort, and is found in foreſts.

8. The *Leptura* entirely black, is a little bigger than the former, but the wings are not ſo large.

9. The black *Leptura* with teſtaceous caſes of the wings, which are marked with ſix black ſpots. It is called in the *Upſal* tranſactions the Leptura, with teſtaceous caſes of the wings and black ſpots; it is all over black.

10. The black *Leptura* with the caſes of the wings marked with four brown ſpots, has a black body and wings, and is one of the largeſt of the kind.

11. The black *Leptura* with yellow caſes of the wings, is not ſo big as a louſe, and the feelers are almoſt as long as the body, the wings are yellow and black at the points.

12. The black *Leptura* with caſes of the wings marked with tranſverſe yellow lines, and teſtaceous feet. It is called by *Liſter* the Black Beetle, marked with yellow lines and feet nearly of a ſaffron colour. It is found in meadows and the branches of trees, and in gardens.

13. The black *Leptura* with teſtaceous wings, marked with two points, with a croſs and black ſtreaks.

14. The gilded *Leptura* with black feelers, and the hinder thighs dentated. It is called by *Fryſch* the Tree-beetle, of a purpliſh golden colour, and it is found in moiſt places.

15. The *Leptura* of a violet copper-colour, with the hinder thighs dentated. It is found upon the banks of rivers, and in places where there is much ſand and gravel.

The violet-black *Dung-beetle*, called by *Ray*, the Greater Beetle, with an oblong body, of a purpliſh black colour. It has a ſmall head, and large prominent eyes, with pretty long, and very ſlender feelers: the general colour is black, only the edges of the breaſt and wings are of a deep beautiful gloſſy purple: the caſes of the wings have neither dots nor lines, but they have a ſort of wrinkles, which run longways, and others that croſs them, which are not very viſible. It is common on dung-hills, and among rotten vegetables.

The purpliſh black *Dunghill-beetle*, called by *Ray* the Unicorn-Beetle, ſpeckled with purple, is of the large kind, and the body is of an oblong ſhape, and pretty thick: the general colour is blackiſh, with a ſtrong and very fine tinge of gloſſy purple: the caſes of the wings are marked with three lines, each of which is formed by a row of longitudinal, hollow, round ſpots, and there are about twelve on each row: the lines between them are hollowed. It is found in the ſame places as the former.

The black *Dung-beetle* with reddiſh legs, is a ſmall ſpecies, being not much bigger than a common fly: the colour of the body is black, and the breaſt is broad and ſhort: the caſes of the wings are ſtreaked each with eight lines, and the legs are of a reddiſh brown, as are alſo the

the baſes of the feelers. Some authors call it the Burn-cow, or Burſt-cow, with a black body and red legs.

Linnæus divides them into two ſpecies, namely, the greater or ſtinking Beetles, and the leſſer or rapacious Beetles. Of the ſtinking Beetles, there are the black ſtinking Beetle with the caſes of the wings convexly ſtreaked: the black ſtinking Beetle with the caſes of the wings greeniſh, and convexly ſpeckled and ſtreaked: the black ſtinking Beetle with braſſy wings, convexly ſpeckled and ſtreaked: the black ſtinking Beetle with ſixteen ſtreaks on the caſes of the wings: the green ſtinking Beetle with bluntly ſtreaked caſes of the wings, and the head and legs of an iron grey colour: the black ſtinking Bettle with green ſhallow furrowed wings, and black feelers and legs.

The *Mordella* is an inſect of the Beetle kind, with feelers like threads, and have generally legs that ſerve them for leaping. It is called by the *German* Waſſerwante; but we have no *Engliſh* name for it: the oblong Black Mordella, with a ſlender pointed tail, is not above a ſixth part of an inch in length, and the breadth not half ſo much: the colour is black, and it is ſmooth and a little gloſſy on moſt part of the ſurface: the head is ſmall and bent, and the caſes of the wings have no ſtreaks; the breaſt is ſmooth, and very convex, and the feelers are very ſlender, truncated, and jointed: the body grows gradually ſmaller towards the tail, where it terminates in a ſharp thorn or prickle, which is black, and reaches longer than the extremity of the wings: the legs are ſlender and long, by which means it leaps very nimbly.

The roundiſh opake black *Mordella* is ſhorter and thicker than the former, being nearly of a roundiſh ſhape: the head is ſmall, and the breaſt raiſed, being of a duſky deep black, but not gloſſy: the caſes of the wings are of the ſame colour, and ſomewhat ſhorter than the body, but the legs are ſlender and long, which enable it to leap very briſkly. It is common in gardens.

The ſhining blue oval-bodied *Mordella*, called by *Ray* the ſmall leaping Capricorn Beetle, is not much larger than a flea, and the body is ſhort, being nearly of an oval form: the breaſt and back are both very convex and ſmooth, and of a very deep, beautiful, gloſſy blue colour: the legs are long, the thighs thick, robuſt, and whitiſh, and the lower part of the legs are of an iron-grey colour. It hops very nimbly, and is common among cabbages, while they are young.

The roundiſh black *Mordella* with a braſſy tincture, is much leſs than a flea, and is all over of a very deep gloſſy black, with a fine braſſy yellowiſh caſt: the belly and legs are of the ſame fine black, but without the yellow: the caſes of the wings are marked with ſtreaks, that conſiſt of five ſmall hollow ſpots. It may be ſeen in the gardens early in the ſpring.

Linnæus has only three kinds, to which he gives no very diſtinct marks; however there are other ſpecies, as the yellow Mordella; the roundiſh mouſe-coloured Mordella; the roundiſh black opake and dotted Mordella; the roundiſh black gloſſy Mordella with yellow feelers and legs: the oblong black Mordella with an iron-grey ſpot on each caſe of the wings, whoſe ſides are of the ſame colour towards the baſe: the oblong black Mordella with the caſes of their wings yellow down their middle: the reddiſh-brown Mordella with the fore-legs dentated: the

the black Mordella with the caſes of the wings red at their extremities: the brown opake Mordella with the caſes of the wings ſpeckled: the iron grey brown Mordella, with the breaſt depreſſed on the fore part: the Mordella with the joints of a little longiſh ſhape, except that at the end, which is perfectly round.

The *Cicindela* has feelers like threads or briſtles, prominent dentated jaws, and a roundiſh breaſt, though ſomewhat angular: the Green Beetle with ten white ſpots of *Ray* is a Cicindela, and is a very beautiful inſect; the upper ſurface of the body ſhining, and variegated with green and gold: the caſes of the wings are ſmooth, gloſſy, of the ſame colour, and marked with ten white ſpots, ſome of which are roundiſh, ſome oblong, and one in the figure of a half moon; likewiſe the extremities of theſe caſes are white: the breaſt is narrow, roundiſh, and of a deep green; the head is ſmall, depreſſed, and finely tinged with gold colour: the eyes are black and prominent as well as the mouth, and the upper lip is blunt and white: the upper jaws are alſo prominent, and have ſeveral ſtrong teeth therein; but the lower has only one tooth, and that at the extremity: there are two pair of feelers, one of which conſiſts only of two joints, and the other of ten: the legs are very long and ſlender, and there is a kind of hard oval ſubſtance at the baſe of the thighs. It is common in paſture ground in the ſpring, and runs and flies very ſwiftly.

The ſmall gilded *Beetle* is a ſmall ſpecies, and its colour is fine and gloſſy, reſembling a yellow metal with a little mixture of green: the eyes are black and prominent, the breaſt narrow and rounded; and the caſes of the wings are adorned with many broad hollow ſpecks in the centre of each of which there is a prominent point: theſe hollow ſpecks are placed in rows, and are a deep black; but their bottoms are of a fine metalline yellow. Upon the whole it is a very beautiful inſect, and may be eaſily found on the banks of rivers.

The *Cicindela* with the caſes of the wings of a blueiſh green, and a yellow belly: the body is nearly of an oval ſhape, and the head, breaſt, feelers and legs, are all black: the belly is of a yellowiſh tawny colour, and the caſes of the wings of a blue green, variegated with hollow ſpecks: the feelers are ſlender, and conſiſts of ten joints: this inſect is common in the woods.

The black *Cicindela* with the caſes of the wings marked with ſix white ſpots, and a white ſtreak. It is found in the woods, and runs and flies very ſwiftly. It is quite black, except the wings, marked as above, and the thighs and feet are long, ſlender, and a little hairy.

The black *Cicindela* with a red breaſt, and blackiſh blue caſes of the wings: this inſect has black feelers, of the length of the body, and the head and feet are of the ſame colour; but the breaſt is of a reddiſh brown and the caſes of the wings black, with a blueiſh caſt, marked with very ſmall points: the belly is yellow behind, and oblong and narrow.

The *Cicindela* with blueiſh caſes of the wings, and the belly of a fallow colour. It is found at the bottoms of mountains, and in ſhady places, and is of the ſame ſhape as the former: the head, breaſt, feet, and feelers are black, and the belly, near the feet, is of a fallow colour, but the caſes of the wings are of a ſhining blue, marked with hollow points, and the feelers conſiſt of ſix joints.

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The *Cicindela* with a green breaſt, with the caſes of the wings of an iron grey, but behind of a blueiſh black: the feelers are black, the body and the breaſt of a ſhining blue.

The *Burn-cow*, or *Burſt-cow*, called in Latin *Bupreſtis*, is an inſect with feelers like threads or briſtles, and the head half hid within their breaſt, and of a roundiſh ſhape: the yellowiſh green *Burn-cow* without ſpots, is placed by ſome among the Cantharides, only it has a more oblong body: the caſes of the wings are of a greeniſh yellow, or rather of a gold colour; the legs are long and thickiſh, the eyes globous and prominent; and from the forehead near the eyes, there are two oblong horns or feelers, which are articulated: the head is ſmall, the mouth wide, hard, ſtrong, and forked; being armed with teeth, with which it bites very hard: the belly is not round, but longiſh. It will fight with Beetles and efts, wounding them in the belly. It is about half an inch long, and feeds upon moſs, heath, efts, worms, and other inſects, which it vanquiſhes in fight. Nor will it touch any that are killed by other means. *Belonius* deſcribes it thus; it is a winged flying inſect, having a moſt filthy ſmell, and is like a Cantharis, but larger, and is of a yellowiſh colour, and ſo very venomous, that horned cattle which feed in paſtures where they are, are often killed therewith: this however differs from the former in the colour.

There is another *Burn-cow*, with a ſhorter body and a broader belly; as alſo a ſharper tail, and a ſmall head, with prominent eyes, and a wide forked mouth: the caſes of the wings are ſtreaked lengthways, and the colour is as green as graſs, with a mixture of ſhining gold. It has eight legs, which are long in proportion to the body; but more ſlender than in the former ſpecies, and of a blackiſh colour, the feelers are more ſmall and ſlender, and it is as nimble as the firſt, but has a a much more filthy ſmell. It lives upon flies and palmer-worms: theſe are venomous to cattle like the former; and ſome affirm if one of them be ſwallowed it will poiſon a man.

In *Germany* there are alſo two other ſorts, the one of a greeniſh gold colour, and the other of a yellow black: the firſt is like the former above deſcribed, but is a little bigger, and the caſes of the wings are ſtreaked with lines of a deep gold-colour, ſhaded with a little green; and between the lines hollowiſh tubercles ariſe, which look as if they were engraved therein. It is very nimble, and in that is like the other kinds: the yellowiſh-black *Burn-cow* has the ſame qualities as the former, only it is of a different colour, is a little bigger, and has four feelers.

The browniſh braſſy *Burn-cow*, is a very ſmall ſpecies, though the eyes are pretty large and prominent: the feelers are ſhort, and the breaſt is ſhort, and broad, but hollowed, and has a very ſmall rim: the caſes of the wings are very bright and gloſſy, and finely ſtreaked with very minute elegant ſpecks: the legs are ſlender and black, as well as the under part of the body, and the ſnout is prominent. It is common among the reeds near rivers.

The braſſy and clouded *Burn-Cow* with clavated feelers, is alſo a ſmall ſpecies, being hardly ſo big as a flea: the belly and loweſt parts of the body are black; but the upper is all over of a braſſy yellow, with a mixture of brown, and it has a brown ſpot on the back, which touches both the caſes of the wings, which are finely ſtreaked:

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the breaſt is marked with five oblique furrows, and is large: the head is almoſt hid under the breaſt, and the body grows narrower towards the tail. It does not appear that theſe two laſt ſpecies are dangerous to cattle.

The *Virginian Burn-cow*, is of a duſky braſſy colour, with ſpots on the wings, and is of a pretty large ſort: the head is almoſt hid under the breaſt, as in the former kinds, and the breaſt is of a braſſy colour, with a mixture of a reddiſh brown: the caſes of the wings are alſo of the ſame colour, but not ſo much of the red; but they are marked with four or five ſtreaks, and on each there are two ſpots, ſo diſpoſed, as altogether to make a ſquare figure when the caſes are cloſed: they are of a bright and clear yellow.

Linnæus mentions the *Bupreſtis* with a forked mouth, the greater water Bupreſtis, and the leſſer water Bupreſtis.

Water-beetles have generally feelers like briſtles, and feet proper for ſwimming, being a little bearded like an ear of corn, and are ſix in number, the hinder being a little longer and broader than thoſe before: they never fly in the day time, but in the night, or at leaſt very ſeldom.

The great *Water-beetle* is an inch and half long, and is all over of a deep, ſomewhat gloſſy black: the eyes are pretty large, the feelers ſhort, and the caſes of the wings ſmooth on the ſurface, and under them there are wings, with a tincture of a ſilver colour: the body grows ſmaller, and terminates almoſt in a point behind it. It is very common in ponds and ditches, and feeds upon the ſmaller water inſects.

The black *Water-beetle* with the caſes of the wings that are yellow on the edges, is of the ſame ſize with the former; but the head is ſmall in proportion to the body: the eyes are large, and the legs ſtrong and robuſt; the edges of the caſes of the wings are very prominent, eſpecially about the middle, where they are of a yellow colour; but every other part is black. It is common in rivers and brooks.

The goggle eyed *Water-beetle* is not quite ſo large as the two preceding, but it has a big head, and the eyes are very prominent: the caſes of the wings are marked with ten ſtreaks, which do not run through the whole length, for they are ſmooth near the end: the ſtreaks are very deep, and the colour all over is of a blackiſh brown.

The grey *Water-beetle* is not much bigger than the blue fleſh flie, and its breaſt is yellow in the middle, though black at the top and bottom: the caſes of the wings are of a greyiſh colour, and are marked with a great number of ſhining ſpecks of a yellowiſh colour, and at the edges they are entirely yellow: there is alſo a yellow ſpot in the ſhape of a heart, with black edges on the top: the point of the breaſt is blunt, though a little forked.

Linnæus takes notice of the Water-beetle with perfoliated feelers, of that with dilated ſides, of the common Water-beetle, and of the Water-flea: theſe laſt are remarkable for ſkipping up and down upon the water, as if they were at play; but when the water is troubled, they ſink to the bottom, or hide themſelves in the holes of the banks.

The other ſpecies are the Water-beetle with a yellow breaſt, that with brown wings and a black belly: the Water-beetle with a round body, marked with ten ſtreaks on the caſes of the wings: the oval-bodied Water-beetle, with the caſes of the wings and breaſt black, but

the head and legs reddiſh: the brown oval Water-beetle with reddiſh legs, head, and breaſt.

Another inſect of the Beetle kind, is by modern authors called *Elater*, which has feelers like briſtles, and an oblong body. It is remarkable, that when laid on its back, it has the power of ſpringing or leaping up, whence it has its name; for Elater ſignifies a ſpring.

The *Elater* of a mixed brown, green, and braſſy colour, is a ſmall ſpecies, and has an oblong body: the breaſt and caſes of the wings of the male are very bright, abounding pretty much with green, and the feelers are a little pectinated on the ſides: the colour of the female is more yellow, and the breaſt is broader and gloſſy, being more green than the wings, but the feelers are not pectinated. It makes its appearance chiefly in *June*.

The black *Elater* with a red breaſt, is of the ſmalleſt ſpecies, and is all over black, except on the breaſt and the caſes of the wings, which are of a blueiſh caſt; likewiſe the forepart of the breaſt is black, and the other red, and has the appearance of a large red ſpot, in the ſhape of a half moon, the horns of which are turned towards the head: the feelers are black. It is very common in paſture-grounds under hedges, near *London*.

The browniſh black *Elater*, is a pretty large ſpecies, and has an oblong body: the colour is the ſame throughout, being of a browniſh black; but the head is ſmall, and the caſes of the wings are ſmooth, and a little gloſſy.

This is called the brown *Notopeda* by *Linnæus*; who alſo takes notice of the black Elater with a hairy breaſt; the black Elater with a red breaſt, mentioned above; and the black Elater with red caſes of the wings. Other authors mention the greeniſh braſs-coloured Elater, with yellow legs: the black Elater with caſes of the wings blue: the black Elater with caſes of the wings red on the back part: the black Elater with the caſes of the wings livid on the outer edge: the red-breaſted Elater with red caſes of the wings: the black Elater with brown caſes of the wings, and the feelers and legs of a reddiſh brown.

The *Cantharis* is of the beetle kind, from whence comes Cantharides, well known in the ſhops by the name of *Spaniſh* flies, and for their uſe in bliſters: they have feelers like briſtles, flexible caſes of the wings, a breaſt pretty plain, and the ſides of the belly wrinkled.

Cantharides differ from each other in their ſize, ſhape and colour; thoſe uſed in the ſhops alſo do the ſame: the largeſt in theſe parts are about an inch long, and as much in circumference; but others are not above three quarters of an inch. Some are of a pure azure colour, others of that of pure gold, and others again have a mixture of gold and azure-colours; but they are all very brilliant, and extremely beautiful.

There are four parts in this inſect, namely the head, the neck or breaſt, the body, and the belly: the head is ſmall in proportion, but the mouth is pretty large, and there are teeth in the jaws, with two ſorts of articulated pinchers, with which they lay hold of the food and bring it to their mouth; on the forehead there are two eyes of a golden colour, a little prominent, and under them there are two horns or feelers, made like briſtles, pretty long, and moveable, by means of twelve equal articulations, the laſt of which terminates in a point: the top

top of the head riſes in a bump, is extremely ſmooth and poliſhed, and divided into two parts. Inſtead of a chin there is a beard, and the breaſt is formed of a ſingle plate, behind which are a ſort of lungs, and it is connected below to the firſt pair of feet, which are each compoſed of three parts, much of the ſame length, of which the laſt has five knotted joints, terminated with two crooked claws: the caſes of the wings are membraneous, are connected to the breaſt, and are as it were ſhagreened; they are more long than broad, convex above, and hollow beneath; they are thin, but ſtrong, and cover the upper part of the body, to which below the two laſt pair of feet are connected: the belly conſiſts of ſix large rings, that are ſmooth and folded at the ſides: they are ſeemingly without hair, but examined with a microſcope they appear a little hairy, eſpecially in the under part: the body, properly ſo called, is compoſed of eight moveable rings, which are furrowed from one end to the other: they are bred from worms ſhaped almoſt like real Caterpillars. Theſe flies are moſt common in the hot countries, ſuch as *Spain*, *Italy*, and the ſouthern parts of *France*; however there are ſome in all parts of *Europe* at certain times of the year.

The *Glow-worm* is by *Dale* affirmed to be the female of the Cicindela, from the experience and examination of a phyſician in his neighbourhood. It has indeed no wings at all, and is conſequently a creeping inſect; but as it is a female of one of the Beetle kind, it could not be well omitted in this place: the ſhield and ſhape of the breaſt, as well as the folds and wrinkles of the body, plainly ſhew that ſhe belongs to this kind: the body has eleven joints, or rather inciſures, the firſt of which lies on the ſhield of the breaſt, and is of a half oval ſhape, flatted, marginated, and truncated at the hinder part: the head is placed under this, and is very ſmall; and the three laſt joints of the body are of a yellowiſh colour, which ſhine or look like fire in the dark. It is often ſeen under hedges by travellers in the night, and if carefully taken up and laid upon a graſſy turf, will continue to ſhine for ſeveral nights.

The *Cantharis* with blackiſh caſes of the wings, and a red breaſt, is of the largeſt kind, being above an inch and a half long, and about a quarter of an inch in diameter. It is ſofter to the touch than moſt other inſects of the Beetle kind, and has a flattiſh head and back, except under the eyes, where it is a little reddiſh: the mouth is ſmall and forked, and the feelers at the mouth are very ſhort and ſmall; but there are others half the length of the body, and conſiſt of eleven joints, reddiſh near the root, and brown every where elſe: the breaſt is depreſſed behind, and in the ſhape of a heart; but the edges are ſomewhat prominent, and the whole is reddiſh, except a black ſpot on the upper part, cloſe to the head: the caſes of the wings are plain, ſmooth, and oblong, but very ſoft and flexible, feeling like ſilk, and of a brownish black colour: the body is brown, except the laſt joint, which is reddiſh, and there is a tincture of the ſame colour along the ſides, which are compreſſed all the way: the joints are folded in ſome ſenſe over each other, and their extremities are ſoft, being covered with a ſort of pimples. It is common about houſes in the country, and under hedges.

The red-breaſted *Cantharis* with red caſes of the wings, is a ſmall ſort, having a black body, and the caſes of the wings of a bright ele-

gant red, as well as the breaſt, only there is a black ſpot thereon: the feelers are ſlender, and the caſes of the wings are very ſoft, ſilky, and flexible, and the wings are thin and brown. This is not very common with us.

The *Cantharis* with black caſes of the wings marked with two red tranſverſe lines, is not much bigger than a louſe, and the legs and feelers are black, but the head and breaſt of a greeniſh colour: the caſes of the wings are of a deep gloſſy black, marked with two tranſverſe red ſtreaks, one of which is near the baſe, and the other near the point or extremity: the ſides of the body are reddiſh. It is not uncommon under hedges and paſture grounds.

Linnæus takes notice of ten ſorts of *Catharides*; the firſt of which he calls the Female Cantharis, without wings, and it is uſually found upon juniper trees. He ſays he has never ſeen the male, though he does not queſtion but there is one, becauſe this ſhines in the night time, as he thinks with an intent to let the males know where to find her: this is the ſame as the Glow-worm, and in ſome meaſure confirms what *Dale* has ſaid about her.

2. The *Cantharis* with teſtaceous caſes of the wings, and a red breaſt without ſpots. It is found in the ſame places as the former, and is of the ſame ſhape and ſize, reſembling it in all things except the colour of the caſes of the wings, which are of a pale yellow colour; likewiſe the breaſt is without ſpots, and the eyes are black.

3. The *Cantharis* with black caſes of the wings, and a red breaſt marked with a white ſpot. It is called the Tree-beetle by ſome, of a blackiſh-brown colour, with ſlender caſes of the wings.

4. The *Cantharis* with red caſes of the wings, and a red breaſt marked with a black ſpot; this is found in different places, and ſometimes among heaps of iron ore: it is leſs by one half than the former, and the body is entirely black: the feelers are very ſlender, and the caſes of the wings are of a deep red, of ſaffron colour, ſlightly ſtreaked, but the wings themſelves are brown.

5. The green copper coloured *Cantharis* with the caſes of the wings red on the outſide: this is found on large nettles, and other plants; it is of a middle ſize, and has the head, breaſt, feelers, the rings of the belly, the lower part of the caſes of the wings, and the inner edges, of a greeniſh copper-colour; but the hinder part of the caſes of the wings near the point, as well as the ſides, are red, and the remainder of a greeniſh copper-colour; but the wings themſelves are brown.

6. The *Cantharis* of a greeniſh copper colour, with the point of the caſes of the wings red, is much ſmaller than the former, and the wings are of a blackiſh brown, and the feelers quite black: the breaſt, head, and caſes of the wings, are of a deep green, inclining to a copper-colour, with red or ſaffron coloured points: the belly is longer than the caſes, and beneath is of a copper colour; but the inſide of the wings are red: this ſort varies with regard to the caſes of the wings, which are ſometimes blue, and at other times red.

7. The *Cantharis* with black caſes of the wings, marked with two red ſtreaks, is no larger than a louſe: the head and the breaſt are green.

8. The *Cantharis* with black caſes of the wings with yellow points, and a black breaſt, is of the ſize of the former, but the head and the

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breaſt are quite black: the end of the caſes of the wings is yellow, or of the colour of ſulphur, and the ſides of the belly are yellow.

9. The brown *Cantharis* with the caſes of the wings yellow at the point, and a red breaſt. It is of the ſize of a louſe, and the breaſt is of a ruſty red, with a black ſpot; the caſes of the wings are brown, and do not reach half way on the belly; but their points are yellow: the thighs are black, the legs pale, and the ſegment on the belly yellow on the edges.

10. The black *Cantharis* with livid caſes of the wings, is the leaſt of theſe kind of flies, and is found upon plants.

Mouſet informs us that the *Cantharides* of the ſhops, have a pretty large, oblong, thick body, not much unlike a grain of wheat, and that there are tranſverſe gold-coloured lines on the caſes of the wings; but theſe lines are not common to all, for in ſome they are of a ſhining green, and in others of a murrey or ruddy colour; but they have all a a ſort of ſplendor, and are agreeable to look upon: that they live upon pulſe and corn, particularly wheat, in which laſt caſe, he affirms their virtues are moſt conſiderable: they ſmell like tar, and taſte like cedar-wood. As for their uſe in medicine, it is too well known to inſiſt upon it in this place.

The *Stinking Beetle*, called by ſome the *Tenerio*, from its hating the light, is a pretty large inſect, which is all over of a coal black: the body is of ſuch a form, that any one would conclude it was a winged inſect, and that it had caſes for wings; and yet *Mouſet* aſſures us, that upon examination he could not find any, though by ſome it is called the black *Tenebrio* with accumulated wings: the legs and thighs are ſlender, and the feelers are pretty long, being compoſed of joints, which are longiſh, except the laſt, that is round: the breaſt is marked with ſmall ſpecks, and has a rim. What ſome take for the caſes of the wings, are wrinkled: it walks very ſlowly, and keeps in the deep holes of dunghills in the day time, but comes out in the night: it has a filthy ſmell, which is very nauſeous in places where they abound: it is a ſolitary animal, for even ſo much as two are ſeldom or never ſeen together.

The black *Tenebrio* with the caſes of the wings rounded behind, is a pretty large inſect, and has a back a little prominent, with a ſmall head, and long legs. It is all over of fine deep black, with a purpliſh caſt, and is frequent about the hot-beds in gardens.

The black *Tenebrio* with prominent jaws, is not much bigger than a common fly, and the colour is of a deep duil black: the legs are long, and the feelers ſlender, and pretty long: it may be found on the half-rotten branches of trees. *Linnæus* tells us, that this kind of inſect has feelers like ſmall threads, and that the upper part of the body, which appear like caſes of the wings, are united together; for they have no wings at all; though it muſt be obſerved, that he mentions no more than the Stinking Beetle.

The *Oil-Beetle*, called by *Mouſet* and *Linnæus* the *Proſcarabæus*, has a ſoft body, of a duſky-blue colour, with a ſhining blackiſh caſt. On the ſhoulders there are two wings, or rather the rudiments of wings, which it makes uſe of much like Oſtriches, to help their running, and not for flying: the circles which ſurround their backs and bellies in the young, are greeniſh, but in the adult more blue: upon the ſlighteſt

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motion or touch, they ſhed a ſort of an oil, not unlike liquid honey. *Mouſet* informs us, it is never ſeen except in *May;* but ſince the change of the ſtile, it may now appear in the beginning of *June.*

Linnæus affirms, that the feelers are like ſmall threads, and it has no wings, but there are a ſort of caſes for them, not above half as long in proportion, as in others of the Beetle kind.

The *Necydalis*, ſo called by *Linnæus*, is an inſect of the Beetle kind, with feelers like briſtles, and the caſes of the wings that reach but half way, leaving the rings partly naked. He has only one ſort, which he calls the Necydalis with globous knees. Another author ſays it is hardly bigger than a louſe, but has a ſmall black head, with yellow jaws, and a yellow breaſt; that the caſes of the wings are black, excepting the middle, where they are browniſh, and a yellow ſpot at the extremities. The wings themſelves are black, and twice the length of the caſes, lying one over another like a croſs. The feelers are almoſt as long as the body, and are yellowiſh, at the baſe, but black elſewhere: the body is brown, with a yellowiſh caſt on the ſides, and the lower part of the legs are alſo yellowiſh: this inſect is not commonly met with.

The *Necydalis* with a white line on the extremities of the caſes of the wings, has a black head and breaſt, and is of an oblong, but ſomewhat depreſſed ſhape: there are two white ſpots on the breaſt, and the caſes of the wings are grey, being ſcarce half ſo long as the body: the wings themſelves are half naked, and the feelers are twice as long as the body, and of a grey colour: the legs are alſo grey, and thick in the upper part: they are often met with in hedges.

The *Ear-wig*, is called by *Linnæus Forficula*, and has feelers like briſtles, a forked tail, and caſes of the wings which reach but half way, though they entirely cover the wings themſelves: the feelers conſiſt of thirteen or fourteen joints, and the covering of the breaſt is flat, it being truncated on the fore part, rounded behind, black in the middle, and paler about the edges: the caſes of the wings are of a pale reddiſh brown, and at the extremity of the wings themſelves there is a white oval ſpot: the body is of a reddiſh-brown: this is a very common inſect, and generally known: there is another ſort, about half the ſize of the former, but in other reſpects differs very little from it.

The *Staphylinus*, ſo called by *Linnæus*, is an inſect of the Beetle kind, with feelers like threads, and two veſicles over the tail: the caſes of the wings reach but half way, and the wings themſelves are covered.

Linnæus mentions fifteen ſorts of theſe inſects, namely,

1. The hairy black *Staphylinus* with the throat and lower belly yellow. It is very common in Friezland.

2. The hairy aſh-coloured *Staphylinus* clouded with black, is found in horſe dunghills.

3. The black ſmooth *Staphylinus* with jaws as long as the head. It is called by *Liſter* the greater black Beetle, with biting nippers; and by *Ray* the *Staphylinus* that is entirely black: this ſeems to be the ſame as one hereafter mentioned. It lives in woods upon inſects.

4. The black *Staphylinus* with red caſes of the wings and feet. It is found in dunghills.

5. The black *Staphylinus* with a braſs-coloured ſhining breaſt, and the caſes of the wings of a blackiſh-blue.

6. The reddiſh *Staphylinus* with a head, wings, and hinder part of the belly black.

7. The duſky *Staphylinus* with the future of the caſes of the wings, the belly and feet of an iron-grey colour. It is found among rotten wood.

8. The black ſmooth *Staphylinus* with red feet.

9. The black ſmooth *Staphylinus* with red feet, and the edges of the caſes of the wings yellow: this is a very ſmall inſect, being no bigger than a flea.

10. The black *Staphylinus*, with the caſes of the wings grey on the fore part, and red legs. It is found in moiſt ſand on the banks of rivers, where it produces its young.

11. The black *Staphylinus* with blood-coloured caſes of the wings. It is found in no particular place, but in all alike.

12. The teſtaceous *Staphylinus*, ſo called by a *Swediſh* naturaliſt, is found on plants and dunghills.

13. The black *Staphylinus* with the breaſt, caſes of the wings, and feet, a little teſtaceous.

14. The black *Staphylinus* with the caſes of the wings, feelers and feet, of an iron-grey colour.

15. The black *Staphylinus* with the caſes of the wings and legs of a duſky colour.

The common *Staphylinus* with long jaws, is about an inch in length, and the head, breaſt, and caſes of the wings, are of a ſhining black, and ſmooth, though the caſes are ſometimes variegated with grey: the body is of a deep black, but not very gloſſy, and the legs are long and black; and there are two hard, long, very ſharp horns, on the forehead. It is common under ſhady hedges.

The reddiſh-brown *Staphylinus* is about the ſize of a common Ant, and the body is of a pale red, with a little mixture of brown, but the head, and the three or four laſt rings of the body are black: the caſes of the wings are of a deep blue, and the legs reddiſh, with black joints: the feelers conſiſt of eleven joints, and are of a pale colour, except at the ends, where they are black. It is ſometimes met with near the banks of brooks and rivers.

The hoary *Staphylinus* has an oblong body, of a greeniſh colour, with a braſſy caſt, and clouded with black ſpots: the head is large, and ſomewhat flat, and the mouth is forked; the feelers conſiſt of nine joints, and the caſes of the wings are ſhort, of a greyiſh-black colour, with a braſſy caſt: the tail is furniſhed with two plumous hairs, and on preſſing the body, two white hooks will be thruſt out from the tail. It is an inhabitant of the dunghills.

The black *Staphylinus* is about half an inch in length, and has a long flattiſh body, with a black gloſſy head: the caſes of the wings are of a deep blue, with a mixture of black, and are bright and gloſſy: they have a metalline caſt, and have many ſmall ſpecks: the feelers conſiſt of nine joints; but the principal diſtinction is the ſpots on the breaſt, which are ten in number, and a little hollowed. It may be ſometimes met with among decayed trees in the woods.

The *Mill-beetle*, has feelers like briſtles, two horns on the tail, membraneous caſes of the wings, and a flattiſh, roundiſh, marginated breaſt. It is of the ſize of a Cricket, and is of a deep iron colour, approaching

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to black: the ſhield that lies over the breaſt is plain and oval, and the caſes of the wings are alſo of an oval ſhape; they are ſomewhat ſhorter than the body, and a little tranſparent: there are three ſtreaks upon each, the middlemoſt of which is raiſed, and the more inward hollow and crooked: there are two prickles on the tail, and the legs are alſo prickly: the female has only the rudiments of the wings, and their caſes. It never appears in the day time, and therefore is ſaid to be a hater of the light. It is very common in mills and bakers houſes. *Linnæus* calls this a Blatta.

The yellow *Blatta* is not much larger than a flie, and the ſhield that covers the breaſt is membranaceous, of an oval ſhape, and marginated. The caſes of the wings are membranaceous and tranſparent, of a brownish colour, and have raiſed ſtreaks, with black ſpots thereon: the legs look like horns, and are prickly, and the feelers are long; there are alſo two articulated horns or prickles above the vent. It is not met with in *England*, but is common in *Lapland*, for which reaſon, it is called by *Linnæus* the *Lapland* Blatta.

The American *Blatta* or *Cock-roach*, is of a reddiſh-brown colour. It is a very troubleſome deſtructive inſect, and are ſo numerous and voracious, that it is impoſſible to keep victuals of any kind from being devoured by them, without cloſe covering: they eat not only leather, but linen and paper: they diſappear in winter, and are moſt numerous in the hotteſt days of ſummer; but what miſchief they do is chiefly in the night. Theſe inſects lay their eggs in heaps, which they wrap all round in a bag or web, in the manner of ſome ſpiders. When the eggs are hatched, the young ones appear quite perfect, and run out of their ſhells very nimbly. At firſt they are no bigger than Ants, for which reaſon they creep through cracks and key-holes, and into boxs and cheſts, where they gnaw and ſpoil every thing they can come at. They have two very long horns or feelers, ſix hairy legs, with two claws at the ends like forks, and the head is black, with a reddiſh round circle on the upper parts. When it is arrived at its full growth, it caſts its ſkin, which burſts on its back, and then the Cock Roach is perfectly formed. The wings are ſoft and tender, being at firſt whitiſh, and after of a reddiſh colour; but the head, horns, and the remaining parts, are of the ſame ſhape and colour as before its ſkin was thrown off.

The inſects that *Linnæus* places under the name of *Gryllus*, has briſtly feelers, membranaceous covers of the wings, which are narrow, and in the ſhape of the inſects of the Flie kind, and their legs are proper for leaping.

The *Houſe-cricket* is a very inoffenſive and pretty animal. Though there be a ſpecies of this inſect that lives entirely in the woods and fields, yet that with which we are beſt acquainted is the Houſe-cricket, whoſe voice is ſo well known behind a country fire in a winter's evening. There is ſomething ſo unuſual in hearing a ſound while we do not ſee the animal producing it, nor diſcover the place from whence it comes, that among the country people the chirping of the cricket is always held ominous; and whether it deſerts the fire-ſide, or pays an unexpected viſit, the credulous peaſantry always find ſomething to be afraid of. In general, however, the killing of a cricket is conſidered as a moſt unlucky omen; and though their company is not much deſired, yet no methods muſt be taken to remove them.

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The cricket very much reſembles the graſshopper in its ſhape, its manner of ruminating, its voice, its leaping, and methods of propagation. It differs in its colour, which is uniformly of a ruſty brown; in its food, which is more various; and in its place of reſidence, which is moſt uſually in the warmeſt chinks behind a country hearth. They are, in ſome meaſure, obliged to the bad maſonry employed in making peaſants houſes for their retreats. The ſmalleſt chink ſerves to give them ſhelter; and where they once make their abode they are ſure to propagate. They are of a moſt chilly nature, ſeldom leaving the fireſide; and, if undiſturbed, are ſeen to hop from their retreats, to chirrup at the blaze in the chimney. The wood-cricket is the moſt timorous animal in nature; but the chimney-cricket, being uſed to noiſes, diſregards not only thoſe, but the appearance of people near it. Whether the voice of this animal is formed in the ſame manner with that of the graſshopper, by a fine membrane at the baſe of the wings, which is moved by a muſcle, and which being coiled up, gives a ſound like a quail-pipe is not yet aſcertained; nor do we well know the uſe of this voice, ſince anatomical inſpection has not yet been able to diſcover the ſmalleſt organs of hearing. Still, however, we can make no doubt of their power of diſtinguiſhing ſounds, though probably not in the ſame manner with the more perfect ranks of Nature. Certain it is that I have often heard them call, and this call was as regularly anſwered by another, although none but the males are vocal.

As the cricket lives chiefly in the dark, ſo its eyes ſeem formed for the gloomineſs of its abode; and thoſe who would ſurpriſe it, have only to light a candle unexpectedly; by which it is dazzled, and cannot find the way back to its retreat. It is a very voracious little animal, and will eat bread, flower, and meat; but it is particularly fond of ſugar. They never drink, but keep for months together at the back of the chimney, where they could poſſibly have had no moiſture. The warmth of their ſituation only ſerves to increaſe their mirth and loquacity. Except in the very coldeſt weather, they never ceaſe their chirruping, but continue that little piercing note, which is as pleaſing to ſome as it is diſagreeable to others. The great Scaliger was particularly delighted with the chirruping of crickets, and kept ſeveral of them for his amuſement, encloſed in a box, which he placed in a warm ſituation. Others, on the contrary, think there is ſomething ominous and melancholy in the ſound, and uſe every endeavour to baniſh this inſect from their houſes. Ledelius tells us of a woman who was very much incommoded by crickets, and tried, but in vain, every method of baniſhing them from her houſe. She at laſt accidentally ſucceeded; for having one day invited ſeveral gueſts to her houſe, where there was a wedding, in order to increaſe the feſtivity of the entertainment, ſhe procured drums and trumpets to entertain them. The noiſe of theſe was ſo much greater than what the little animals were uſed to, that they inſtantly forſook their ſituation, and were never heard in that manſion more.

The *Field Cricket* is of a blackiſh colour, and the male has a longer body than the female; the head in proportion to the body, is large, and the eyes big and prominent: the forehead is furniſhed with two feelers without joints, but it can turn them any way it pleaſes: it has ſix feet or legs, the ſame colour as the body, and thoſe behind are the longeſt, that it may leap the better: the wings ſeem to be lightly varie-

gated with ſculptures, ſeeming almoſt to cover the whole body, and the tail is forked: the bulk of the body of the male is leſs than that of the female, for this laſt has a larger belly, and graſs-green eyes, with red feelers, and a tail like a trident: they are found in the fields in the ſummer time, making holes in the ground, where they build their neſt, and where they lie concealed in a mild winter, but in one that is ſevere, they die in their holes: they make a particular ſort of noiſe with their wings, which is plain from this; namely, that when their wings are taken off the noiſe ceaſes: they ſing day and night, and they delight in the ſun, ſitting at the mouths of their holes. They frequent paſture-grounds and meadows that are quite open, for they ſhun ſhady places. They ſing moſt when people are at a diſtance, for when they come near they are ſilent, and get into their holes.

The *Water Cricket* has a five cornered head, with prominent globous black eyes, but not large; near the mouth there are very ſhort feelers, and there are three feet on each ſide; but the hindermoſt are much the longeſt: the wings are on the back, or at leaſt the rudiments of them, and the tail is forked: the body is of a browniſh colour, or rather of a whitiſh black. It differs from the land Cricket in having a more prominent head, and ſomewhat of a neck: the wings ſeem likewiſe to be uſeleſs for flying, though they help to raiſe this inſect up. It is commonly ſeen ſitting upon water-plants, and is ſaid to ſing like the land Crickets.

But of all the cricket kind, that which is called the *Mole-Cricket* is the moſt extraordinary. This animal is the largeſt of all the inſects with which we are acquainted in this country, being two inches and a half in length, and three quarters of an inch in breadth. The colour is of a duſky brown; and at the extremity of the tail there are two hairy excreſcences, reſembling in ſome ſenſe the tail of a mouſe. The body conſiſts of eight ſcaly joints or ſeparate folds, is brown on the upper part, and more deeply tinged below. The wings are long, narrow, and terminate in a ſharp point, each having a blackiſh line running down it: however, when they are extended, they appear to be much broader than could at firſt ſight be ſuppoſed. The ſhield of the breaſt is of a firm texture, of a blackiſh colour and hairy. The fore-feet, which are this animal's principal inſtruments of burrowing into the earth, are ſtrong, webbed, and hairy; it generally, however, runs backward; but it is commonly under ground, where it burrows even faſter than a mole. It is thought alſo to be amphibious; and capable of living under water, as well as under ground.

Of all inſects this is the moſt deteſted by gardeners, as it chiefly reſides in that ground which lies light, and where it finds ſufficient plenty under the ſurface. Thus, in a ſingle night's time, it will run along a furrow which has been newly ſown, and rob it of all its contents. Its legs are formed in ſuch a manner that it can penetrate the earth in every direction; before, behind, and above it. At night it ventures from its under ground habitation, and, like the cricket, has its chirping call. When the female is fecundated, ſhe makes a cell of clammy earth, the inſide of which is large enough to hold two hazle-nuts; and in this ſhe lays her eggs. The whole neſt is about the ſize of a common hen's egg, cloſed up on every ſide, and well defended from the ſmalleſt breath of air. The eggs generally amount to the number of

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an hundred and fifty, being white, and about the fize of a carraway-comfit. They are thus carefully covered, as well to defend them from the injuries of the weather, as from the attacks of the black-beetle; that being itfelf an under ground inhabitant, would, but for this precaution, devour or deftroy them. To prevent this, the female mole cricket is often poſted as a centinel near the neſt, and when the black invader plunges in to ſeize its prey, the guardian inſect ſeizes him behind, and inſtantly bites him in two.

Nothing can exceed the care and aſſiduity which theſe animals exhibit in the preſervation of their young. Wherever the neſt is placed, their ſeems to be a fortification, avenues, and entrenchments, drawn round it: there are numberleſs winding-ways that lead to it, and a ditch drawn about it, which few of its inſect enemies are able to paſs. But their care is not confined to this only; for at the approach of winter they carry their neſt entirely away, and ſink it deeper in the ground, ſo that the froſt can have no influence in retarding the young brood from coming to maturity. As the weather grows milder, they raiſe their magazine in proportion; till, at laſt they bring it as near the ſurface as they can, to receive the genial influence of the ſun, without wholly expoſing it to view: yet, ſhould the froſt unexpectedly return, they ſink it again as before.

Belonging to the ſecond order of inſects, we find a tribe of little animals, which, though differing in ſize and colour, ſtrongly reſemble each other in figure, appetites, nature, and transformation. But though they all appear of one family, yet man has been taught to hold them in different eſtimation; for while ſome of this tribe amuſe him with their chirpings, and baniſh ſolitude from the fields, others come in ſwarms, eat up every thing that is green, and in a ſingle night convert the moſt delightful landſcape into a dreary waſte. However, if theſe animals be ſeparately conſidered, the devouring locuſt is not in the leaſt more miſchievous than the muſical graſshopper; the only difference is, that one ſpecies come for food in a ſwarm, the other feeds ſingly.

That animal which is called the *graſshopper* with us, differs greatly from the *cicada* of antiquity; for as our inſect is active enough in hopping through the long graſs, from whence it has taken its name, the cicada had not this power, but either walked or flew. The little hiſſing note alſo of our graſshopper is very different from the ſong of the cicada, which was louder and far more muſical. The manner in which this note is produced by the two animals is very different; for the cicada makes it by a kind of buckler, which the male has beneath its belly; the graſshopper by a tranſparent membrane that covers an hole at the baſe of its wings. There is ſtill a greater variety in all theſe with regard to ſhape and colour. Some are green, ſome black, ſome livid, and ſome variegated; but many of them do not ſhew all their colours till they fly. Some have long legs, ſome ſhort; ſome with more joints, others with fewer. Some ſing others are mute; ſome are innocent, doing no damage to the huſbandman; while others do ſuch prodigious miſchief, that they are looked upon in ſome countries as one of the terrible ſcourges of the incenſed Divinity.

Of this variegated tribe, the little graſshopper that breeds in ſuch plenty in every meadow, and that continues its chirping through the

ſummer, is beſt known to us; and by having its hiſtroy we ſhall be poſſeſſed of that of all the reſt. This animal is of the colour of green leaves except a line of brown which ſtreaks the back, and two pale lines under the belly and behind the legs. It may be divided into the head, the corſlet, and the belly. The head is oblong, regarding the earth, and bearing ſome reſemblance to that of a horſe. Its mouth is covered by a kind of round buckler jutting over it, and armed with teeth of a brown colour, hooked at the points. Within the mouth is perceivable a large reddiſh tongue, and fixed to the lower jaw. The feelers or horns are very long, tapering off to a point; and the eyes are like two black ſpecks, a little prominent. The corſlet is elevated, narrow, armed above and below, by two ſerrated ſpines. The back is armed with a ſtrong buckler, to which the muſcles of the legs are firmly bound, and round theſe muſcles are ſeen the veſſels by which the animal breathes, as white as ſnow. The laſt pair of legs are much longer and ſtronger than the firſt two pair, fortified by thick muſcles, and very well formed for leaping. It has four wings; the anterior ones ſpringing from the ſecond pair of legs, the poſterior from the third pair. The hinder wings are much finer and more expanſive than the foremoſt, and are the principal inſtruments of its flight. The belly is conſiderably large, compoſed of eight rings, and terminated by a forkey tail, covered with down, like the tail of a rat. When examined internally, beſides the gullet, we diſcover a ſmall ſtomach; and behind that a very large one, wrinkled and furrowed within ſide: lower down there is ſtill a third; ſo that it is not without reaſon that all the animals of this order are ſaid to chew the cud, as they ſo much reſemble ruminant animals in their internal conformation.

A ſhort time after the graſshopper aſſumes its wings, it fills the meadows with its note; which like that among birds, is a call to courtſhip. The male only of this tribe is vocal; and, upon examining the baſe of the wings, there will be found a little hole in its body, covered with a fine tranſparent membrane. This is thought, by Linnæus, to be the inſtrument it employs in ſinging; but others are of opinion the ſound is produced by rubbing its hinder legs againſt each other: however this be, the note of one male is ſeldom heard, but it is returned by another; and the two little animals, after many mutual inſults of this kind, are ſeen to meet and fight deſperately. The female is generally the reward of victory; for, after the combat, the male ſeizes her with his teeth behind the neck, and thus keeps her for ſeveral hours, till the buſineſs of fecundation is performed. They are at that time ſo ſtrongly united, that they can ſcarcely be ſeparated without tearing aſunder. Towards the latter end of autumn the female prepares to depoſit her burthen; and her body is then ſeen greatly diſtended with her eggs, which ſhe carries to the number of one hundred and fifty. In order to make a proper lodgement in the earth for them, Nature has furniſhed her with an inſtrument at her tail, ſomewhat reſembling a two-edged ſword, which ſhe can ſheathe and unſheathe at pleaſure: with this ſhe pierces the earth as deep as ſhe is able; and into the hole which her inſtrument has made, ſhe depoſits her eggs, one after the other.

Having thus provided for the continuation of her poſterity, the animal herſelf does not long ſurvive; but, as the winter approaches, ſhe dries

dries up, ſeems to feel the effects of age, and dies from a total decay. Some, however, aſſert, that ſhe is killed by the cold; and others, that ſhe is eaten by worms: but certain it is, that neither the male, nor female are ever ſeen to ſurvive the winter. In the mean time the eggs which have been depoſited, continue unaltered, either by the ſeverity of the ſeaſon, or the retardation of the ſpring. They are of an oval figure, white, and of the conſiſtence of horn: their ſize nearly equals that of a grain of aniſe: they are enveloped in the body within a covering, branched all over with veins and arteries; and when excluded, they crack, on being preſſed between the fingers; their ſubſtance within is a whitiſh, viſcous, and tranſparent fluid. In this manner they remain depoſited beneath the ſurface of the earth, during the whole winter; till the genial return of ſpring begins to vivify and hatch them. The ſun, with its warmth, beginning to animate all Nature, the inſect eggs feel its benign influence; and generally, about the beginning of May, every egg produces an inſect, about the ſize of a flea. Theſe at firſt are of a whitiſh colour; at the end of two or three days they turn black; and ſoon after they become of a reddiſh brown. They appear, from the beginning, like graſshoppers wanting wings; and hop among the graſs as ſoon as excluded, with great agility.

Yet ſtill they are by no means arrived at their ſtate of full perfection; although they bear a ſtrong reſemblance to the animal in its perfect form. They want, or ſeem to want the wings, which they are at laſt ſeen to aſſume; and can only hop among the graſs, without being able to fly. The wings, however are not wanting, but are concealed within four little bunches, that ſeem to deform the ſides of the animal: there they lie rolled up in a moſt curious manner; and occupying a ſmaller ſpace than one would conceive who ſaw them extended. Indeed, all inſects, whatever tranſmutations they ſeem to undergo, are yet brought forth with thoſe very limbs, parts and wings, which they afterwards ſeem to acquire. In the moſt helpleſs caterpillar, there is ſtill to be ſeen the rudiments of that beautiful plumage which it afterwards expands when a butterfly: and though many new parts ſeem unfolded to the view, the animal acquires none but ſuch as it was from the beginning poſſeſſed of. The graſshopper, therefore, though ſeemingly without wings, is in reality, from the firſt, poſſeſſed of thoſe inſtruments, and only waits for ſufficient force to break the bonds, that hold them folded up, and to give them their full expanſion.

The graſshopper, that for above twenty days from its excluſion has continued without the uſe of its wings, which are folded up to its body, at length prepares for its emancipation, and for a life of greater liberty and pleaſure. To make the proper diſpoſitions for the approaching change, it ceaſes from its graſſy food, and ſeeks about for a convenient place; beneath ſome thorn or thiſtle, that may protect it from an accidental ſhower. The ſame laborious writhings and workings, heavings and palpitations, which we have remarked in every other inſect upon an approaching change, are exhibited in this. It ſwells up its head and neck; it then ſeems to draw them in again; and thus alternately, for ſome time, it exerts its powers to get free. At length, the ſkin covering the head and breaſt is ſeen dividing above the neck; the head is ſeen iſſuing out firſt from the burſting ſkin; the efforts ſtill continuing, the other parts follow ſucceſſively; ſo that the little animal, with

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its long feelers, legs and all, works its way from the old ſkin, that remains fixed to the thiſtle or the thorn. It is, indeed, inconceivable how the inſect can thus extricate itſelf from ſo exact a ſheath as that which covered every part of its body.

The graſshopper, thus diſengaged from its outer ſkin, appears in its perfect form; but then ſo feeble, and its body ſo ſoft and tender, that it may be moulded like wax. It is no longer of that obſcure colour which it exhibited before, but a greeniſh white, which becomes more vivid as the moiſture on the ſurface is dried away. Still, however, the animal continues to ſhew no ſigns of life, but appears quite ſpent and fatigued with its labour for more than an hour together. During this time, the body is drying, and the wings unfolding to their greateſt expanſion, and the curious obſerver will perceive them, fold after fold, opening to the ſun, till at laſt they become longer than the two hinder legs. The inſect's body alſo is lengthened during this operation, and it becomes much more beautiful than before.

Theſe inſects are generally vocal in the midſt of ſummer, and they are heard at ſunſetting much louder than during the heats of the day. They are fed upon graſs; and, if their belly be preſſed, they will be ſeen to return the juices of the plants they have laſt fed upon. Though unwilling to fly, and ſlow in flight, particularly when the weather is moiſt or cool, they are ſometimes ſeen to fly to conſiderable diſtances. If they are caught by one of the hinder legs, they quickly diſengage themſelves from it, and leave the leg behind them. This, however, does not grow again, as with crabs or ſpiders; for as they are animals but of a ſingle year's continuance, they have not ſufficient time for repairing thoſe accidental misfortunes. The loſs of their leg alſo prevents them from flying; for being unable to lift themſelves in the air, they have not room upon the ground for the proper expanſion of their wings. If they be handled roughly, they will bite very fiercely; and when they fly, they make a noiſe with their wings. They generally keep in the plain, where the graſs is luxuriant, and the ground rich and fertile: there they depoſit there eggs, particularly in thoſe cracks which are formed by the heat of the ſun.

Such are the habits and nature of thoſe little vocal inſects, that ſwarm in our meadows, and enliven the landſcape. The larger kinds only differ from them in ſize, in rapidity of flight, and the powers of injuring mankind, by ſwarming upon the production of the earth. The quantity of graſs which a few graſshoppers that ſport in the fields can deſtroy is trifling; but when a ſwarm of locuſts, two or three miles long, and ſeveral yards deep, ſettle upon a field, the conſequences are frightful. The annals of every country are marked with the devaſtation which ſuch a multitude of inſects produces; and though they ſeldom viſit Europe in ſuch dangerous ſwarms as formerly, yet, in ſome of the ſouthern kingdoms, they are ſtill formidable. Thoſe which have at uncertain intervals viſited Europe, in our memory, are ſuppoſed to have come from Africa, and the animal is called the great Brown Locuſt. It was ſeen in ſeveral parts of England in the year 1748, and many dreadful conſequences were apprehended from its appearance. This inſect is about three inches long; and has two horns or feelers, an inch in length. The head and horns are of a browniſh colour; it is blue about the mouth, as alſo on the inſide of the larger legs. The

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ſhield that covers the back is greeniſh; and the upper ſide of the body brown, ſpotted with black, and the under ſide purple. The upper wings are brown, with ſmall duſky ſpots, with one larger at the tips; the under wings are more tranſparent, and of a light brown, tinctured with green, but there is a dark cloud of ſpots near the tips. This is that inſect that has threatened us ſo often with its viſitations; and that is ſo truly terrible in the countries where it is bred. There is no animal in the creation that multiplies ſo faſt as theſe, if the ſun be warm, and the ſoil in which their eggs are depoſited be dry. Happily for us, the coldneſs of our climate, and the humidity of our ſoil, are no way favourable to their production; and they are but the animals of a year, they viſit us and periſh.

The Scripture, which was written in a country where the locuſt made a diſtinguiſhed feature in the picture of Nature, has given us ſeveral very ſtriking images of this animal's numbers and rapacity. It compares an army, where the numbers are almoſt infinite, to a ſwarm of locuſts: it deſcribes them as riſing out of the earth, where they are produced; as purſuing a ſettled march to deſtroy the fruits of the earth, and co-operate with Divine Indignation.

When the locuſts take the field, as we are aſſured, they have a leader at their head, whoſe flight they obſerve, and pay a ſtrict attention to all his motions. They appear, at a diſtance, like a black cloud, which, as it approaches, gathers upon the horizon, and almoſt hides the light of the day. It often happens that the huſbandman ſees this imminent calamity paſs away without doing him any miſchief; and the whole ſwarm proceed onward, to ſettle upon the labours of ſome leſs fortunate country. But wretched is the diſtrict upon which they ſettle: they ravage the meadow and the paſture ground; ſtrip the trees of their leaves, and the garden of its beauty: the viſitation of a few minutes deſtroys the expectation of a year; and a famine but too frequently enſues. In their native tropical climates they are not ſo dreadful as in the more ſouthern parts of Europe. There, though the plain and the foreſt be ſtriped of their verdure, the power of vegetation is ſo great, that an interval of three or four days repairs the calamity: but our verdure is the livery of a ſeaſon; and we muſt wait till the enſuing ſpring repairs the damage. Beſides, in their long flights to this part of the world, they are famiſhed by the tedioufneſs of their journey, and are therefore more voracious wherever they happen to ſettle. But it is not by what they devour that they do ſo much damage as by what they deſtroy. Their very bite is thought to contaminate the plant, and to prevent its vegetation. To uſe the expreſſion of the huſbandman, they burn whatever they touch; and leave the marks of their devaſtation for two or three years enſuing. But if they be noxious while living, they are ſtill more ſo when dead; for wherever they fall, they infect the air in ſuch a manner that the ſmell is inſupportable. Oroſius tells us, that in the year 3800, there was an incredible number of locuſts which infeſted Africa; and, after having eaten up every thing that was green, they flew off and were drowned in the African ſea; where they cauſed ſuch a ſtench, that the putrifying bodies of hundreds of thouſands of men could not equal it.

In the year 1690, a cloud of locuſts was ſeen to enter Ruſſia in three different places; and from thence to ſpread themſelves over Poland and

and Lithuania, in ſuch aſtoniſhing multitudes, that the air was darkened, and the earth covered with their numbers. In ſome places they were ſeen lying dead, heaped upon each other four feet deep; in others, they covered the ſurface like a black cloth: the trees bent beneath their weight; and the damage which the country ſuſtained exceeded computation. In Barbary their numbers are formidable, and their viſits are frequent. In the year 1724, Dr Shaw was a witneſs in that country of their devaſtation. Their firſt appearance was about the latter end of March, when the wind had been ſoutherly for ſome time. In the beginning of April, their numbers were ſo vaſtly increaſed, that in the heat of the day they formed themſelves into large ſwarms, which appeared like clouds, and darkened the ſun. In the middle of May they began to diſappear, retiring into the plains to depoſit their eggs. In the next month, being June, the young brood began to make their appearance, forming many compact bodies of ſeveral hundred yards ſquare; and afterwards marching forward, climbed the trees, walls, and houſes, eating every thing that was green in their way. The inhabitants, to ſtop their progreſs, laid trenches all over their fields and gardens, filling them with water. Some placed large quantities of heath, ſtubble, and ſuch like combuſtible matter, in rows, and ſet them on fire on the approach of the locuſts. But all this was to no purpoſe; for the trenches were quickly filled up, and the fires put out by the vaſt number of ſwarms that ſucceeded each other. A day or two after one of theſe was in motion, others that were juſt hatched came to glean after them, gnawing off the young branches and the very bark of the trees. Having lived near a month in this manner, they arrived at their full growth, and threw off their worm-like ſtate, by caſting their ſkins. To prepare themſelves for this change, they fixed their hinder feet to ſome buſh or twig, or corner of a ſtone, when immediately, by an undulating motion uſed on this occaſion, their heads would firſt appear, and ſoon after the reſt of their bodies. The whole transformation was performed in ſeven or eight minutes time; after which, they were a little while in a languiſhing condition; but as ſoon as the ſun and air had hardened their wings, and dried up the moiſture that remained after caſting off their ſloughs, they returned again to their former greedineſs, with an addition both of ſtrength and agility. But they did not continue long in this ſtate before they were entirely diſperſed; after laying their eggs, directing their courſe northward, and probably periſhing in the ſea. It is ſaid that the holes theſe animals make, to depoſit their eggs in, are four feet deep in the ground; the eggs are about fourſcore in number, of the ſize of carraway comfits and bundled up together in cluſters.

It would be endleſs to recount all the miſchiefs which theſe famiſhed inſects have at different times occaſioned; but what can have induced them to take ſuch diſtant flights, when they come into Europe, is not ſo eaſy to be accounted for. It ſeems moſt probable, that by means of a very dry ſeaſon in the heart of Africa, they are propagated in ſuch numbers, that the vegetables of the ſpot where they are produced are not ſufficient to ſuſtain them. Thus being obliged to find out other countries, they traverſe the ſandy deſerts, where they can find no ſuſtenance; ſtill meeting with nothing to allure them from their height, they

they proceed forward acroſs the ſea, and thus come into Europe, where they alight upon the firſt green paſtures that occur.

In ſome parts of the world, the inhabitants turn what ſeems a plague to their own advantage. Locuſts are eaten by the natives in many kingdoms of the eaſt; and are caught in ſmall nets provided for that purpoſe. They parch them over the fire in an earthen pan; and when their wings and legs are fallen off, they turn reddiſh, of the colour of boiled ſhrimps. Dampier has eat them thus prepared, and thinks them a tolerable diſh. The natives of Barbary alſo eat them fried with ſalt; and they are ſaid to taſte like cray-fiſh.

There is a locuſt in Tonquin, about the bigneſs of the top of a man's finger, and as long as the firſt joint. It breeds in the earth, in low grounds; and in the months of January and February, which is the ſeaſon for taking them, they iſſue from the earth in vaſt ſwarms. At firſt they can hardly fly, ſo that they often fall into the rivers in great numbers: however, the natives in theſe months watch the rivers, and take them up in multitudes in ſmall nets. They either eat them freſh, broiled on the coals, or pickle them for keeping. They are conſidered as a great delicacy in that part of the world, as well by the rich as the poor. In the countries where they are eaten, they are regularly brought to market, and ſold as larks or quails in Europe. They muſt have been a common food with the Jews, as Moſes, in the book of Leviticus, permits them to eat four different kinds of this animal, which he takes care to ſpecify. This diſh, however, has not yet made its way into the kitchens of the luxurious in Europe: and though we may admire the delicacies of the Eaſt, we are as yet happily deprived of the power of imitation.

Of all animals, however, of this noxious tribe, the Great Weſt-Indian Locuſt, individually conſidered, is the moſt formidable. It is about the thickneſs of the barrel of a gooſe-quill, and the body is divided into nine or ten joints, in the whole about ſix or ſeven inches long. It has two ſmall eyes, ſtanding out of the head like thoſe of crabs, and two feelers like long hair. The whole body is ſtudded with ſmall excreſcences, which are not much bigger than the points of pins. The ſhape is roundiſh, and the body diminiſhes in circumference to the tail, which is forked into two horns. Between theſe, there is a ſort of a ſheath containing a ſmall dangerous ſting. If any perſon happens to touch this inſect he is ſure to be ſtung; and is immediately taken with a ſhivering and trembling all over the body; which, however, may ſoon be put a ſtop to, by rubbing the place that was affected with a little palm oil.

Nieuhoff informs us, that in the *Eaſt-Indies* there are Graſshoppers and Locuſts of ſeveral kinds, one of which is as long as a man's finger, but no thicker than a gooſe quill. The body is diſtinguiſhed into ſeveral joints, and they have ſix feet, with two ſmall horns or feelers. Other Locuſts have brown wings, with a yellow belly, and two feelers, and they can leap a great way. They are likewiſe ſeen flying together in great ſwarms. There is another ſort, of the ſame ſhape, but green, and of the length of a man's finger; but they come in ſuch prodigious ſwarms, that they devour every thing that is green in the places where they ſettle; inſomuch that the inhabitants of *Batavia* are often obliged to change their habitations, for want of their uſual ſuſtenance.

Le Bruin informs us, on the 9th of *October* near *Rama* in the *Holy Land*, there was a ſouth-eaſt wind, which blew over the wilderneſs, and cauſed a violent heat, that laſted ſeveral days. He is of opinion, that it is to this wind, that the prodigious number of Locuſts are owing, which flock thither in certain years, and cover the ſurface of the earth. In the ſpace of two hours, they devoured all the graſs and herbs round about *Rama*. There are many birds that feed upon them, and particularly ſtorks. At the time when the locuſts engender, they make holes in the earth, about four feet deep, where they lay their eggs, which are about the ſize of caraway comfits, there being bundles of them together, at leaſt four-ſcore in number. In fifteen or ſixteen days time, they become young Locuſts, and are all over black, when firſt hatched; but in twenty-four hours they change, and become green; however it is three weeks before they can uſe their wings. In many places where theſe inſects die upon the ground, there ariſes ſuch a ſtench from their bodies, that it often breeds a dreadful plague.

CHAP. III.

OF FOUR WINGED INSECTS.

OF theſe there are ſeveral ſorts, the firſt of which mentioned by *Linnæus*, is the Cicada, by which *Dale* underſtands a Bawm Cricket; but he means an inſect that has a ſnout bent downwards, very ſhort feelers, four cruciated wings, feet proper for leaping, a convex back, and a roundiſh breaſt.

The *Cuckow-Spit* inſect, called by *Swammerdam* the Flea-Locuſt, and by others the Froth-Worm, has an oblong, obtuſe body, and a large head, with ſmall eyes: the external wings are of a duſky brown colour, marked with two white ſpots, and there is a broad, tranſverſe, double line of the ſame: the reſt of the body is of a duſky brown, and the head is black. It is uſually covered over with a frothy matter, reſembling ſpittle, which it does not diſcharge at the mouth, but at the vent, and at other parts of the body.

The *Cicada* with green wings and a yellow head, is as big as a large flie, but very narrow in proportion to its length: the external wings are of a fine deep green, and the internal of a blueiſh grey; the covering of the breaſt is alſo green, but paler than the wings, and the head is yellow, marked with two large ſpots on the hinder part, and ſeveral ſmall ones at the ſides: there are alſo tranſverſe ſtreaks on the forehead, and the body is of a blueiſh-grey, with yellow legs. It is commonly ſeen about water-plants in autumn. *Ray* calls it the third flea Locuſt.

The *Cicada* with yellow external wings, is about the ſize of a common flie, is all over of a beautiful yellow, except when the wings are cloſed, and then a longitudinal black line appears on each ſide the back, which is ſo divided in the middle, to form as it were two lines, the one running from the breaſt, and the other from the tail to the middle, where they are obliquely ſeparated: the two upper parts of theſe lines join

join near the breaſt, and there is on each ſide, a black ſpot on the head and breaſt, but they both unite into one: the feelers are ſhort, the fore-head is a little furrowed tranſverſely, and the body, when the wings are extended, appears to be yellow on the middle, and black on each ſide. It may be met with in paſture grounds in *June*.

Linnæus has eight ſorts of *Cicadæ*, which he calls the *American* Laternaria, the *Chineſe* Laternaria, the Ranatra, the flea Locuſt, the Cicada with a double homed breaſt, the Cicada bearing manna, the Cicada of the elm-tree, and the Cicada of the roſe.

Other authors have the *Italian* or true Cicada, which is an inch long, more than half an inch broad, and of a duſky-brown colour: the ſmaller *Italian* Cicada: the brown Cicada, with wings ſpotted with paler brown, and with punctated nerves: the black Cicada with three equal tranſverſe white lines: the yellow Cicada with wings ſpotted with brown, and marked with four black ſpots, but yellow on the hinder part: the whitiſh Cicada with a black longitudinal line on each ſide: the black Cicada with white eyes: the black Cicada with the edges of the external wings white: the black Cicada with a white head: the yellow compreſſed Cicada: the Cicada with greeniſh yellow wings, with the extremities black, and gilded: this is the elm Cicada mentioned by *Linnæus*: the yellow Cicada with the exremity of the wings white and membranaceous: the leaſt white Cicada.

The proper *Cimex* is generally underſtood to mean only a common Bug; and *Linnæus* defines it to be an inſect with a ſnout bending downwards, and feelers that have four joints, four cruciated wings, feet proper for running, a flat back, and a marginated breaſt.

This is one of thoſe nauſeous inſects that intrude upon the retreats of mankind; and that often baniſh that ſleep, which even ſorrow and anxiety permitted to approach. This, to many men, is, of all other inſects, the moſt troubleſome and obnoxious. The night is uſually the ſeaſon when the wretched have reſt from their labour; but this ſeems the only ſeaſon when the bug iſſues from its retreats, to make its depredations. By day it lurks like a robber, in the moſt ſecret parts of bed; takes the advantage of every chink and cranny, to make a ſecure lodgment; and contrives its habitation with ſo much art, that ſcarce any induſtry can diſcover its retreat. It ſeems to avoid the light with great cunning; and even if candles be kept burning, this formidable inſect will not iſſue from its hiding-place. But when darkneſs promiſes ſecurity, it then iſſues from every corner of the bed, drops from the teſter, crawls from behind the arras, and travels with great aſſiduity to the unhappy patient, who vainly wiſhes for reſt and refreſhment. It is generally vain to deſtroy one only, as there are hundreds more to revenge their companion's fate; ſo that the perſon who thus is ſubject to be bitten, remains the whole night like a centinel upon duty, rather watching the approach of freſh invaders, than inviting the pleaſing approaches of ſleep.

Nor are theſe inſects leſs diſagreeable from their nauſeous ſtench, than their unceaſing appetites. When they begin to crawl, the whole bed is infected with the ſmell; but if they are accidentally killed, then it is inſupportable.

Theſe are a part of the inconveniences that reſult from the perſecution of theſe odious inſects: but happily for Great Britain, they multiply leſs

in theſe iſlands, than in any part of the continent. In France and Italy the beds, particularly in their inns, ſwarm with them; and every piece of furniture ſeems to afford them a retreat. They grow larger alſo with them than with us, and bite with more cruel appetite.

This animal, if examined minutely, appears to conſiſt of three principal parts; the head, the corſelet, and the belly. It has two brown eyes, that are very ſmall and a little prominent, beſides two feelers, with three joints: underneath theſe there is a crooked trunk, which is its inſtrument of torture, and which, when in motion, lies cloſe upon the breaſt. The breaſt is a kind of ring, in which are placed the two firſt pair of legs. The belly conſiſts of nine rings; under which are placed two pair of legs more, making ſix in all. Each leg has three joints, which form the thigh, the leg, and the foot, which is armed with a crooked claw, like an hook. The body is ſmooth, except a few ſhort hairs, that may be ſeen by the microſcope, about the vent, and on the two laſt rings. Its motion is ſlow and unwieldy; yet its ſight is ſo exquiſite, that the inſtant it perceives the light, it generally makes good its retreat; and they are ſeldom caught, though the bed ſwarms with them.

If we examine this inſect internally, we ſhall find the great artery, which in all inſects performs the functions of the heart; we ſhall find the apertures of the lungs on the right ſide and the left, through which the animal breathes; we ſhall find a ſtomach and inteſtines, which, as in other animals, run from the mouth to the anus. If the inſect has been kept long faſting, there will be a mucus found in its body, like the white of an egg; but if cruſhed after a full meal, the human blood, which it has ſucked in, will appear a little darkened by having paſſed through the inſect's body.

The male and female of theſe animals are plainly diſtinguiſhable from each other; and the parts of generation are obvious enough. They are often found coupling tail to tail; and in this ſtate are very eaſily deſtroyed. The female has an ovary filled with eggs, joined together like a bunch of grapes; each egg being oblong, almoſt cylindrical, inclining to white, and pretty tranſparent. In about two days after impregnation by the male, ſhe depoſits her eggs to the number of about an hundred and fifty, in ſome convenient place where they are likely to receive no diſturbance. There they continue for ſome months; during which time, neither cold nor heat, neither moiſture nor fumigation, can in the leaſt retard their excluſion; but they come forth active, and ready for miſchief. It is this hardineſs in the ſhell that ſeems to continue the breed; as the old ones die every winter, or are eaſily deſtroyed by any fumigation that is uſed for that purpoſe. But the eggs ſeem incapable of deſtruction; even thoſe men who make a livelihood by killing theſe naufeous inſects, though they can anſwer for the parent, can never be ſure of the egg. For this reaſon they uſually pay thoſe houſes to which they are called a ſecond or a third viſit, and at laſt exterminate them by perſeverance.

The manner of deſtroying them ſeems rather the effects of aſſiduity than antidote; for the men called in upon this occaſion, take every part of the furniture aſunder, bruſh every part of it with great aſſiduity, anoint it with a liquid which I take to be a ſolution of corroſive ſublimate,

mate, and having performed this operation twice or thrice, the vermin are moſt uſually deſtroyed.

Cleanlineſs, therefore, ſeems to be the beſt antidote to remove theſe nauſeous inſects; and wherever that is wanting, their increaſe ſeems but a juſt puniſhment. Indeed, they are ſometimes found in ſuch numbers among old furniture, and neglected chambers, expoſed to the ſouth, that, wanting other ſuſtenance, they devour each other. They are alſo enemies to other vermin, and deſtroy fleas very effectually; ſo that we ſeldom have the double perſecution of different vermin in the ſame bed. Of the bug kind Linnæus reckons up forty.

The *Aphis* or *Plant Louſe*, has a bended ſnout, two horns on the hinder part of the body, four erect wings, and feet proper for walking. *Linnæus* has ſixteen ſorts, namely, that of the Currant-buſh; that of the Elm-tree; that of the Elder; that of the Mapple; that of the Lime-tree; that of the Birch; that of the Pine; that of the Roſe; that of the Parſnip; that of the Dock; that of the Carduus Benidictus; that of Mug-wort; that of Saw-wort; that of Chick-weed; that of the Lily, and that of the Cabbage.

The Currant *Louſe* is about the ſize of a common louſe, and of a browniſh-green colour: the legs are green, and the joints of the knees commonly ſtand up above the body and are brown; the feelers are ſlender, ſtrait, and have a joint, at which they are bent near the head, and are of a black colour: the hinder part of the breaſt is blackiſh, and the ſides of the body are variegated with ſmall black ſpots; the wings are erect and whitiſh, only they have a few black veins, and two of them are very ſmall, but the vent is prominent, and has two briſtly appendages ſhorter than the wings.

This is ſufficient to give a ſpecimen of their ſhape, for as they belong to particular trees and plants, they may be readily ſeen thereon when the leaves are in perfection: there are doubtleſs many more than thoſe already mentioned, which belong to particular trees.

The *Coccus*, ſo called by *Linnæus*, has the trunk on its breaſt, and the body is hairy or downy behind.

The *Coccus* of the berry-bearing Ilex, a ſort of an oak, is what is known in the druggiſts ſhops, by the name of *Kermes*. It appears to be a membranaceous bladder, of the ſize of a pea, ſmooth, and ſhining, and of a browniſh red colour, covered with very fine down or aſh-coloured powder, ſwelling with reddiſh eggs or inſects, which being rubbed with the fingers, pour out a crimſon liquor. It is only met with in pretty hot countries, in the months of *May* and *June*. In *March* there is firſt perceived a ſort of inſect leſs than a millet-ſeed, and of an oblong oval form, only a little narrower towards the tail: the upper part is convex, red, and marked with exceeding minute golden ſpecks, and a few tranſverſe wrinkles. It has ſix feet, and two moveable feelers, which almoſt equal the length of the body; it has alſo black eyes, and a double tail of the ſame length as the body. It adheres to the trunk, branches, and leaves of the tree, and becomes torpid and immoveable, ſwelling or growing bigger very ſenſibly. If at that time its body is beheld with a microſcope, it appears of a crimſon colour, ſhining with golden ſpecks, and lying in a ſort of whitiſh down, which in ſome places of the back, under and about the belly, riſes up in flocks like a ſort of neſt: the back riſes very high, and is round, and

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in the forepart of the body, which is inſtead of a head, three protuberances are perceived, of which the middle is thickiſh and roundiſh, but thoſe on the ſides more ſlender and crooked about the middle.

In the month of *April*, this inſect becomes of the ſize and ſhape of a pea, and its membrane or ſkin is firmer, and the down, which at the beginning lay in bands on the ſkin, covers the whole ſurface like a ſort of powder, and then it ſeems to be no longer an animal, but a bladder full of pale and watery blood.

About the middle or end of *May*, the inner part of the bladder, under the belly of the animalcula, is furniſhed with oval grains, about half the ſize of white poppy ſeeds, of a pale reddiſh colour, ſpeckled with gold; they conſiſt of a thin, white, tranſparent ſkin, full of a pale reddiſh liquor: they are about two thouſand in number on each bladder, and the eggs of the former inſect, which being ſhaked off, becomes exactly the ſame as thoſe that run about the branches and leaves of the Ilex. In the following ſpring, they fix themſelves in the diviſions of the trunk and branches, where they afterwards lay their eggs. When this inſect has attained its proper ſize, the ſkin of the belly or lower part, is pulled up towards the back, leaving a vacant ſpace between the belly and the down, inſomuch that they have the appearance of Hog-lice half rolled up. It is in this ſpace that they lay their eggs, which done the animal dies, and is dried up. They live upon the juice of the leaves, which they ſuck in with the ſnouts or trunks.

They are of two ſexes, and the females have been hitherto deſcribed but the males are very diſtinct from the former, and are a ſort of ſmall flies like gnats, with ſix feet, of which the four forward are ſhort, and the two backward long, divided into four joints, and armed with three crooked nails: there are two feelers on the head a line and a half long, which are moveable, ſtreaked, and articulated: the tail at the back part of the body is half a line long, and forked: the whole body is covered with two tranſparent wings, and they leap about in the manner of fleas. The harveſt of the Kermes is greater or leſs, in proportion to the ſeverity of the winter; and the women gather them before ſunriſing, tearing them off with their nails; for fear there ſhould be any loſs from the hatching of the inſects, they ſprinkle them with vinegar, and lay them in the ſun to dry, where they acquire a red colour.

There is another ſort of *Kermes* mentioned by other authors, which the country people call worms, and which as they affirm, lay whitiſh eggs, from which proceed inſects of the ſame colour, full of ſilver ſpecks. It ſeems to be an inſect of the ſame ſpecies as the former, little differing from the red Kermes.

There is another blackiſh *Kermes*, found near *Leghorn* in *Tuſcany*, upon the dwarf Ilex, like the red kind, only when it comes to maturity, it is full of a whitiſh liquor, and eggs; from theſe a ſort of inſects proceed, not unlike the true Kermes, but whitiſh. Hence it appears there are ſeveral kinds of Kermes, which only differ in colour; but the red only is uſed in medicine, and for dying. Doctor *Liſter* has found an inſect analogous to this, on the twigs of the cherry, and other trees; for it cannot be ſaid to be the ſame.

Cochineal, or the grains of the Indian fig, as they appear in our ſhops, when brought from *America*, are of an irregular ſhape, convex on one ſide, and a little concave on the other; but are both marked with tranſverſe

verſe ſtreaks or wrinkles: they are of a ſcarlet colour within, and without of a blackiſh red, and ſometimes of a white reddiſh aſh-colour, which are accounted the beſt, and they are brought to us from *Mexico*. They have been a long while taken for fruit, but they are now known to be inſects adhering to the prickly pear-tree or ſhrub.

The *Cochineal Inſect*, is of an oval form, of the ſize of a ſmall pea, with ſix feet, and a ſnout or trunk, and brings forth its young alive, and is nouriſhed by ſucking the juice of the plant. Its body conſiſts of ſeveral rings, and when it is once fixed on the plant, it continues immoveable, being ſubject to no change. Some pretend there are two ſorts, the one domeſtic, which is beſt, and the other wild, that is of a vivid colour, however they appear to be the ſame, only with this difference; that the wild feed upon cultivated trees, without any aſſiſtance; whereas the domeſtic are carefully at a ſtated ſeaſon, removed to cultivated trees, where they feed upon a purer juice. Thoſe who take care of theſe inſects, place them on the prickly pear-plant, in a certain order, and are very induſtrious in defending them from other inſects; for if any other kind come among them, they take care to bruſh them off with foxes tails.

Towards the end of the year, when the rains and cold weather are coming on, which are fatal to theſe inſects, they take off the leaves or branches covered with cochineal, that have not attained their utmoſt degree of perfection, and keep them in their houſes till the winter is paſt. Theſe leaves are very thick and juicy, and ſupply them with ſufficient nouriſhment, while they remain within doors. When the milder weather returns, and theſe animals are about to exclude their young, the natives make them neſts, like thoſe of birds, but leſs, of tree-moſs, or ſoft hay, or the down of cocoa-nuts, placing twelve in every neſt. Theſe they fix on the thorns of the prickly pear-plant, and in three or four days time, they bring forth their young, which leave their neſts in a few days, and creep upon the branches of the plant, till they find a proper place to reſt in taking their nouriſhment; and when the females are fecundated by the males, they produce a new offspring; ſo that they have a harveſt, as it were thrice a year.

When the native *Americans* have gathered the cochineal, they put them into holes in the ground, where they kill them with boiling water, and afterwards dry them in the ſun, or in an oven, or lay them upon hot plates. From the various methods of killing them, ariſe the different colours which they appear in when brought to us. While they are living, they ſeem to be ſprinkled over with a white powder, which they loſe as ſoon as the boiling water is poured upon them. Thoſe that are dried upon hot places, are the blackeſt. What we call cochineal, are only the females; for the males are a ſort of fly, as in the Kermes. They are uſed both for dying, and in medicine, and are ſaid to have much the ſame virtue as the Kermes; though they are now ſeldom uſed alone, but are mixed with other things, for the ſake of the colour.

The *Poliſh Scarlet Grain*, is, when full grown, of the ſize of a ſmall pepper-corn, and is of a roundiſh ſhape, there being but little ſign of an animal. It ſticks to the root of the tree on which it feeds, and is of a deep purple colour, tinged with blue. It lies in a rough cup, ſomewhat reſembling that of an acorn, when they are gathered for uſe.

They

They ſeem to be excreſcences upon the root where they produce their young, which at firſt are evidently real inſects, having ſmall, and ſomewhat longiſh flattiſh bodies, which conſiſt of ſeveral ſegments; and they have ſix legs, which are ſhort and ſlender, and two fine feelers: they are alſo of a purple colour, but not ſo deep as that of the parent. When theſe are grown to their full ſize, they fix themſelves to the root of the plant, and appear as above deſcribed: the young ones are bred in the caſe or ſkins of the old ones, after they are dead: the male is a flie with two wings, as in the kinds already mentioned.

The *Poliſh Cochineal* is a ſort of Kermes found at the roots of the tree called Polonian knawel, which are full of a purple juice, and worms of the ſame colour: this plant is very common in the *Ukrain*, eſpecially in the moſt deſart places. The *Armenians* and the *Turks* dye the wool, ſilk, and hair therewith, as well as the manes and tails of their horſes.

Theſe inſects are placed by *Linnæus* in the number of thoſe with half wings, that have the mouth placed in the breaſt, and the belly hairy below; however it is only the male that has wings.

The *Gall Inſects* are bred in a ſort of bodies, adhering to a kind of oak in *Aſia*, which differ with regard to their colour, ſize, roughneſs, ſmoothneſs, and ſhape, and which we call galls: they are not fruit as ſome have imagined, but preternatural tumors, owing to the wounds given to the buds, leaves, and twigs of the tree, by a kind of inſects wherein they breed and lay their eggs. When the Galls are ripe and opened while freſh, a ſort of worms are found therein, ſometimes one, and ſometimes more, near the center in cells, which after ſome time turn to flies: they make themſelves a paſſage out, by eating the ſubſtance of the gall, and making a round hole therein, they get abroad and fly away. However we do not meet with any author that has given a minute deſcription of them.

The green ſtove *Bug* is a ſmall inſect of an oval flat ſhape, which firmly adheres to the bark or leaves of trees: the back is a little prominent, and its belly hollowed; and the forepart is blunt, but that behind forked. It appears in a kind of ſhell or covering, which incloſes the body of the inſect; it has ſix very ſlender legs, and the eyes ſmall and black, and the feelers very ſlender. It is of a greeniſh colour, and can thruſt out its legs at pleaſure, ſometimes moving about though ſlowly; however it generally adheres to the leaf of the tree, continuing in the ſame place, and ſucking out the juice. The male is a ſmall flie, and not nearly ſo big as the female, having a ſlender oblong body, and long legs: the feelers are ſhort, and the wings white. The female is common here in *England*, on the orange and lemon trees preſerved in ſtoves in green-houſes; and is probably the ſame which *Linnæus* calls the Coccus of the citron tree, or the ſhielded Louſe.

The water *Coccus* has a body of an oval figure, rounded on the back, and flat on the belly; and its colour is brown. It thruſts out a ſort of white hairy beard from its hinder part, which is cloven in two, and near it there is placed a blunt tubercle, and towards the other extremity another that is blunt. It is common on the leaves of water-plants, and ſhews its legs but very ſeldom, which are ſlender, and ſomewhat downy. The male is a ſmall flie, with ſilky whitiſh wings, ſpotted with brown.

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The *Coccus* of the birch tree, is larger than the former, and has an oblong body, ſomewhat downy, which is compoſed of ſeveral rings or joints. It is of a deep duſky olive-colour, with ſhort legs, and very ſlender feelers. It is common on ſeveral trees in woods, where it fixes to the diviſion of the branches. The male is a little flie with duſky brown wings.

The *Coccus* of inſects is very ſmall, and is found on the bodies of the larger kind of Beetles, where it is fixed almoſt during its whole life: the body is of an oval ſhape, with a ſharp edge; and is ſomewhat convex, and of a reddiſh brown colour: the ſurface of the whole body is ſmooth, but not gloſſy, and the legs are very ſhort, as well as the feelers, which are ſcarce viſible.

Beſides theſe *Linnæus* has the *Coccus* of the common Mouſe-ear; that of Canary-graſs; and that of the Birch tree; and there are probably other kinds not yet diſcovered.

The *Thrips*, ſo called by *Linnæus*, has little or no ſnout, and the body is of a linear ſhape, with four ſtrait wings lying on the back.

The *Thrips* with blueiſh wings and a black body, is not ſo big as a flea, and its wings muſt conſequently be ſmall and delicate: it has ſix legs, two near the neck, and four on the breaſt; the feelers are ſlender, black, and conſiſt of ſix joints, the external wings are of a greyiſh colour, and hairy at the extremities, and at the edges. It flies very ſeldom, but runs very ſwiftly, twiſting its body into various ſhapes.

The black bodied *Thrips*, is about the ſize of a Louſe, and has an oblong ſlender body: the external wings are very beautiful, variegated with nine alternate tranſverſe ſtreaks of black and white, there being three of each colour: it is found on the flowers of the larger hawkweeds, and runs very ſwift, but ſeldom flies.

The *Thrips* with a brown body, and ſnow white wings, is of the ſame ſize as the former: its brown appearance is owing to the wings, for the colour of the body is coal black: the legs are ſhort, and the feelers very ſlender, conſiſting of five joints: it is ſometimes found on the *Bermudas* cedars, which are planted in our gardens.

CHAP. IV.

OF INSECTS WITH MEMBRANACEOUS WINGS, WHICH ARE FOUR IN NUMBER, AND RETICULATED WITH VEINS.

THE *Panorpa*, ſo called by *Linnæus*, is the Scorpion Flie: that taken notice of by *Mouſet*, is about the ſize of a common flie, and of the colour of honey; only the top joint of the tail is black, and armed with a double ſting: the wings are like thoſe of the Graſshopper, and its walk is like that of a crab: that which other authors call a Scorpion Flie, has an oblong roundiſh body, and a ſmall head, and a hard horny oblong ſnout, bending downwards: the feelers are briſtly, black, and conſiſt of thirty joints: the back is brown, the ſides yellow, and the wings white, with ſome duſky ſpots diſpoſed in tranſverſe rows,

forming a ſort of line: the tail is articulated, and is terminated by a weapon reſembling that of a Scorpion: this is doubtleſs the ſame inſect with that of *Mouſet*. *Linnæus* ſays that it has a horny cylindric ſnout, and a ſhelly tail.

The *Raphidia* or ſharp-tailed Flie, has a horney flattiſh head, and a briſtly ſharp tail, and is of the ſame ſize as the Scorpion Flie, pretty much reſembling it in ſhape: the head is black, ſmooth, and narrow on the hinder part, and the breaſt is narrow, rounded, and black: the feelers are ſlender, white, and conſiſt of a great number of joints; the body is ſlender, oblong, and of a brown colour, variegated with tranſverſe white lines: the wings are thin and membranaceous, being reticulated, and having each an oblong brown ſpot towards the edge. From the hinder part of the body of the female, there grows a long, ſharp, ſlender, and bended weapon. It is common in the meadows near the waters, in *July*.

The *Chryſops* or *Golden-Eye*, by ſome called the Stinking Flie, is a very beautiful inſect, and is about three quarters of an inch in length: its body is very ſlender, and of a greeniſh yellow colour; the wings are very large and tranſparent, except the larger ribs or fibres that are of a fine green, which are pretty numerous: the eyes are very large, and have the appearance of gold; but when this inſect is cruſhed, it ſends forth an intolerable ſtench, for which reaſon it is called the ſtinking flie. It is produced from a worm that feeds upon the plant-lice, upon which account it is named the plant-louſe Lion.

The *Formica Leo*, or *Ant Lion*, is of the length of the common hog-louſe, but ſomewhat broader; and it has a pretty long head, and a roundiſh body, which becomes a little narrower towards the tail: the colour is a dirty grey, ſpeckled with black, and the body is compoſed of ſeveral flat rings, which ſlip one upon another: there are ſix feet, four of which are fixed to the breaſt, and two to the neck: the head is ſmall and flat, and before there are two little ſmooth horns or feelers, which are hard, two lines in length, and crooked at the ends. At the baſes of the feelers, there are two ſmall black lively eyes, by which it can ſee the ſmalleſt object. Other animals have wings or feet, which enable them to advance towards their prey, but this can only run backwards, for it would ſooner die than take the leaſt ſtep towards it; for which reaſon the prey muſt come to it, or rather into the ſnare provided for it; which is the only means this inſect has to live.

It chuſes a dry and ſandy place, at the foot of a wall, or under ſome ſhelter, in order to preſerve its work from the rain: the drieſt ſand is the moſt proper for it, becauſe any other would defeat its labour. When it goes about to dig the hole where it takes its prey, it begins to bend its hinder part, which is pointed, and begins to work upon the ſand backwards, making after ſeveral attempts, a circular furrow, whoſe diameter is always equal to the depth of the hole or pit. On the edge of this firſt furrow it digs a ſecond, then a third, and afterwards others which are always leſs than thoſe preceding; then it begins to ſink deeper and deeper into the ſand: which it throws with its horns or feelers towards the edges, and farther marching always backwards in a ſpiral line, in proportion as it ſinks into the ſand: the repeated motions of its head, throw the ſand out of the circle, till the pit is quite made. It always deſcribes a perfect circle, and traces a

ſpiral

ſpiral line without compaſſes; and the pit itſelf reſembles the inſide of a funnel turned upſide down.

When this inſect is newly hatched, the firſt pit it makes is very ſmall; but as it grows bigger, it makes them larger, one of which is about two inches and upwards in diameter, and about as much deep: the work being finiſhed, it places itſelf in ambuſcade, hiding itſelf at the bottom under the ſand, in ſuch a manner, that its two horns exactly embrace the point, which is the bottom and middle of the pit. It then waits for its prey; and if by misfortune, a hog louſe, an ant, or other inſect, begins to walk round the edge of the precipice, which is made ſhelving on purpoſe to make them fall into the trap, which they generally do, the Ant-Lion never fails to ſeize upon them. When the fall of a few grains of ſand gives notice of the approach of its prey, it begins to ſhake the bottom of the ſand, which never fails to fall down together with the prey. But if the prey is ſo nimble, as to run or fly away ſpeedily, it ſhoots up the ſand, which falls down again like hail upon it, and it being blinded and overwhelmed therewith, it is dragged by the motion of the ſand to the center of the hole, where it falls between the two feelers or nippers of the enemy, and is ſoon buried in the ſand, where the Ant-Lion feeds upon it. When there remains nothing but the ſhell of the body, this inſect takes it up with its feelers, and throws it at leaſt ſix inches from the edge of the pit; and then it goes to work again to repair the damage that has been done. It is wonderful to conſider that this inſect will wait patiently for its prey, ſometimes a week, or even a month, without ſtirring from its place, and conſequently without eating. Some of theſe that have been kept in a box with ſand, have lived ſix months and upwards, without feeding at all. However it muſt be owned, that thoſe that feed, become much larger, and more ſtrong.

When the *Ant-Lion* attains a certain age, in which it is to change into another form, then it leaves off making pits; but it continues to make furrows in the land, though in an irregular manner, probably with a deſign to put itſelf in a ſweat; after which it hides itſelf under the ſand. Either the ſweat, or a gummy liquor that proceeds from the body, unites the grains of ſand, which form a ſort of cruſt all over it, and then it appears like a ball, half an inch in diameter; but ſo as to leave room enough for the inſect to move, but it muſt be obſerved, that the gummy liquor alſo condenſes into a thread, finer than thoſe of the ſilk-worm, which it firſt fixes to one place, then to another, croſſing and recroſſing it in ſuch a manner, as to line the inſide of its retreat with a fine ſilky ſtuff work, of a pearl colour, extremely delicate, and perfectly beautiful. But though the work is ſo curious and commodious on the inſide, without it appears to be nothing but ſand, inſomuch that it cannot eaſily be diſtinguiſhed from that which lies next it, and ſo it eſcapes the ſearch of birds, that might otherwiſe prey upon it.

This inſect continues thus ſhut up for ſix weeks, or two months, and gradually parts with its eyes, its feelers, its feet, and its ſkin; and all the ſlough falls to the bottom of the ball like a rag: then there remains a Nymph, which has other legs, other feet, and other entrails; as alſo wings which are wrapped up in a ſkin, which ſeems to be nothing elſe but a liquor dried on its outſide, in the ſame manner as it happens to all ſorts of Butterflies. When the members of this new in-

ſect have acquired the neceſſary conſiſtence and vigour, it tears its lodging, and breaks through its wall. For this purpoſe it has two teeth, like thoſe of Graſshoppers, with which it eats through, and enlarges the opening, till it gets quite out. Its body which is turned like a ſcrew, takes up no more than the ſpace of a quarter of an inch; but when it is unfolded, it becomes half an inch in length; then its fore wings likewiſe unfold, and in two minutes time, become longer than the body. In ſhort it becomes a large and beautiful Flie, laying aſide its barbarity, and rapacious diſpoſition: it has then a long ſlender body, of a brown colour, a ſmall head, with large bright eyes, and long, ſlender, pale brown legs, with four large reticulated wings: it greatly reſembles the Golden Eye in all things, except its colour, which is not quite ſo agreeable: it is common in moſt parts of *Europe*: there are other inſects akin to this, which only differ in their ſize and colour; but the progreſs of their metamorphoſis has not been deſcribed.

The *Summer Flie* has a prominent palate, with two feelers on each ſide, which are twice as long as the body, and blueiſh-black wings; the body is oblong, and of a duſky brown; but his legs, which are ſlender, are of a duſky greyiſh black. While it is a worm, it may be frequently ſeen at the bottoms of ſmall clear brooks, hid in a caſe of ſtraw: and when it turns to a flie, it comes out of the water, and roves over or about the ſame ſtreams: that mentioned by *Mouſet*, has four wings, of a brown colour, an oblong body, and two ſhort feelers, with a forked tail, or rather with two briſtles proceeding from it. However there are a great many others of this kind, which leave ſufficient room for curious enquirers to enlarge the hiſtory of theſe inſects.

Linnæus takes notice of ſeveral kinds of the Water Flies, and he calls the firſt, the black Phryganea with white wings, ſtreaked and ſpeckled with white: this flie has four wings, and is of the ſize of the Scorpion Flie; the wings are longer than the body, white, pointed, and ſtreaked with brown veins. It is found in dirty ſplaſhy paths.

2. The *Phryganea* or *Water Flie*, with teſtaceous wings, and nervous ſtreaks; the feelers are placed forwards. It is found in the ſame places as the former.

3. The grey *Phryganea* with the upper wings clouded, and marked with a black ſpot in the margin. It is of a middle ſize, and is found in waters.

4. The *Phryganea* with aſh-coloured teſtaceous wings, and two longitudinal black lines, with a white point.

5. The *Phryganea* with deflexed flat wings of a yellowiſh-colour, and marked on the edge with a rhomboidal white ſpot.

6. The *Phryganea* with duſky wings, and a double yellow ſpot on the edges.

7. The *Phryganea* with reticulated wings, without a weapon in the tail, and yellow edges on the breaſt: this keeps very ſtill upon the waters.

8. The *Phryganea* with wings reticulated with veins, and a brown tail. It is called in the *Upſal* tranſactions, the Summer Flie, with a tail that has two hairs, and aſh coloured wings reticulated with veins. It is a large water Flie, which appears in ſummer.

9. The *Phryganea* with blueiſh-black wings, and feelers twice as long as the body. It is called by *Ray* a ſmall four winged flie, with very long feelers,

feelers, in proportion to the body. It is found fluttering among the reeds, and in cloudy weather great ſwarms of them may be ſeen in the air.

10. The *Phryganea* with cloudy upper wings, and feelers three times as long as the body.

11. The leaping *Phryganea* with feelers as long as the body, and the wings marked with a green and white ſpot.

12. The black *Phryganea* with incumbent cloudy aſh-coloured wings, and three blunt hairs at the tail. It may be met with every where in the beginning of the ſpring.

13. The duſky *Phryganea* without ſpots, is found at *Fahlun* in *Sweden*.

The *Ephemera* is a Flie ſo called, becauſe it has been ſaid to live but a day, which is in ſome ſenſe true; though there are a ſort that never enjoy the benefit of the ſun at all; for they do not come into the world till after the ſun is ſet, and die before its riſing: they are in general very pretty flies, and might be ranked among Butterflies, on account of their ſhape and their wings: theſe laſt are ſhorter and broader in proportion, than thoſe of the common flies, and have a large baſe; but they differ from thoſe of Butterflies, in not being covered with the duſt that renders them opaque; for they are very tranſparent, and very thin: they have four wings, the uppermoſt of which are much the largeſt. When this inſect is at reſt, it generally lays its wings one over the other on the back; and the body is long, being formed of ſix rings that are larger at the origin than near the extremity, and from this a tail proceeds, that is longer than all the reſt of the flie, and conſiſts ſometimes of three threads of an equal length, and ſometimes of two long threads, and one ſhort.

All Ephemeras were at firſt worms, and then Aurelias; and under theſe forms they grow very ſlowly in the water; for *Swammerdam* thinks that ſome of this kind continue three years under the water. Mr *Reaumur* has known them that have been two years there, and many that have been one. But when the flies that proceed from theſe worms, come to be inhabitants of the air, they all die almoſt immediately, though Mr *Reaumur* aſſerts, that ſome flies of this name live for ſeveral Days.

The inſect that is to become the flie called *Ephemera*, has ſix ſcaly legs, fixed on the corſlet, which in ſome of theſe kinds is double, or as it were, divided into two parts: the head is triangular, and a little flatted above and below; the eyes, which are placed before, may be diſtinguiſhed by their largeneſs and colour: they are brown in moſt of theſe inſects, and near the baſe of each, there is a feeler on the inner ſide; the mouth is furniſhed with teeth, and the body conſiſts of ſix rings; that next the corſlet is the largeſt, and they grow leſs and leſs to the end; and the laſt ring is the ſhorteſt, from which the three threads proceed, which are as long as the whole body.

Theſe inſects live in different places, for ſome have fixed habitations, and ſome wander about: thoſe that have fixed habitations, lye in holes on the ſurface of the earth, under the water of rivers and ſlow ſtreams. One of theſe ſeldom leaves its hole, unleſs through neceſſity, and then it makes another: thoſe that wander about, ſometimes ſwim, and ſometimes creep on bodies that are under the water; ſometimes they hide themſelves among the ruſhes, or under pieces of wood, and at other times become quiet and ſtill on the ſame bodies.

Among

Among thoſe that do not change their place, there are a ſort of tufts on each ſide, which ſome have taken for fins; but Mr *Reaumur* found by the help of a microſcope, that they are the gills of this inſect, which he affirms to be a real fiſh: the number of the gills is not the ſame in different kinds, for *Swammerdam* tells us, there are ſix on each ſide, and *Reaumur* ſeven.

While theſe inſects continue in the ſtate of worms, they are of a fleſh-colour, and the Aurelias, when they have been juſt transformed, are the ſame; but when they are ready to become flies, they turn to a pretty ſtrong yellow, and the corſlet is brown: the Ephemeras of *Holland* appear about St *John's* day, when clouds of them may be ſeen; whereas they do not appear about *Paris* till the middle of *Auguſt*. Some make their appearance about ſix o'clock, that is about two hours before ſun-ſet, while others are not ſeen till the ſun is juſt ready to diſappear.

Though the lives of theſe flies are ſo ſhort, they have ſufficient time to perform the end of their production; for they are no ſooner metamorphoſed into flies but they begin to lay their eggs, which ſome do in rivers, and others on any ſubſtance that they meet with; and they are ſaid to lay more at a time than any other inſect whatever; for each bunch of eggs is ſaid to conſiſt of three hundred and fifty, and there are generally two bunches.

There are ſeveral ſorts of flies, belonging to this claſs, that live ſeveral days, as was before obſerved; one kind of which are in a condition different from all other flies, for they have ſtill another caſe or ſkin to get rid of: theſe are to be ſeen in the fields, and in woods diſtant from any water; but it is more common to find them among thoſe that are neareſt. Some of theſe may be ſeen ſticking upon walls and trees, and often with the head downwards, without changing place, or having any ſenſible motion; for they wait for the moment when they ſhall be diveſted of their laſt incommodious garment; but ſometimes this does not happen till twenty-four hours are expired.

Linnæus places them among flies that have nervous wings, and takes notice of ſix different ſorts. The firſt kind of Ephemera has wings ſpotted with brown, the tail conſiſting of three threads; and this is found near lakes.

2. The ſecond has white wings that are ſtreaked, and has a forked tail. It is called in the tranſactions of *Upſal*, the Ephemera with wings of a whitiſh fleſh-colour: they are ſeen fluttering in ſwarms by the ſides of waters.

3. The *Ephemera* with white ſtreaked wings, may be diſtinguiſhed from all others of this kind, by that mark only.

4. The brown *Ephemera* with a tail conſiſting of two threads, with white wings.

5. The *Ephemera* with white wings, having a thick blackiſh edge, and a tail conſiſting of two threads. It is called in the *Upſal* tranſactions, the leaſt Ephemera with white wings.

6. The black *Ephemera* with white lower wings.

The *Ephemera* with white reticulated wings, and two hairs at the tail, is a pretty large flie, with an oblong ſlender whitiſh body, except towards the tail, where it is brown: the head is ſmall, and on its top there are two prominences, which have the appearance of eyes, but

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are really placed above them: the breaſt is compreſſed, and the two hairs of the tail are twice as long as the body; and between them there are two ſhort crooked ones; the legs are white as ſnow, but thoſe before are longer than the reſt. It is commonly ſeen flying over waters in the ſummer months.

The *Ephemera* with ſtreaked wings, is a ſmall flie, with an oblong ſlender browniſh body, and a blunt tail without hairs: the wings are large, white, and ſtreaked, and ſo formed, as to appear like net-work; there are two prominent tubercles on the head that are ſmaller than the eyes, and the male has a black breaſt, and a tranſparent body; but that of the female is of a reddiſh brown.

The brown *Ephemera* is about the ſize of a Gnat, and has an oblong ſlender body, and of a duſky brown, with a black breaſt, and long and ſlender legs: the wings are large and tranſparent, and ſomewhat of a whitiſh colour; and the tubercles above the eyes are very large, being of a deep blueiſh black; there are alſo two hairs at the tail, which are as long as the body.

The *Libellula*, ſo called by *Linnæus*, is a ſort of water flie, for which reaſon they are called water Nymphs by the *Germans*, and ſometimes Dragon Flies.

The blueiſh green bodied *Libellula* is a beautiful inſect, and has a body almoſt an inch in length, which is of a fine green, with a blueiſh caſt: the head is large, as well as the eyes, which are prominent; and the legs are ſlender and black: the wings are browniſh, with a yellowiſh tincture, and have each an oblong white ſpot near the edge: the male has a blue body, and blueiſh wings, and is commonly ſeen flying over waters.

The red bodied *Libellula* has a body nearly as long as the former; but it is more ſlender, and of a bright red colour, with a large head, and large prominent eyes: the legs are ſlender, and there are ſome black lines near the ſegments of the belly; but the wings are pellucid and browniſh, and have each a brown ſpot near the edge. It is common about fiſh-ponds.

The *Libellula* with a double ſpot on the edge of each wing, is near an inch and a half long, and conſiderably thick; but it is larger at the two extremities than in the middle: the breaſt is thick, of a greyiſh colour, and hairy on the upper part; the wings are yellowiſh towards the baſe, and whitiſh elſewhere, except the double ſpots, which are of a duſky brown: the body itſelf is of a ſhining green, and a little hairy on the ſides, and the tail has two appendages. It is common about rivers.

Linnæus likewiſe divides theſe inſects into the middle ſized, the ſmall, and the great.

1. The firſt of the middle ſized is called by the author the *Libellula* with a ſilky ſhining body, and wings of a yellowiſh duſky colour. It is termed by *Ray* the middle ſized Libella with a blueiſh green body, and dun wings without ſpots. It frequents the ſides of rivers, and the colour is blue, inclining a little to black; the wings are of a yellowiſh brown, without any ſpeck on the external edges of the wings, which all other kinds are marked with, except the two following.

2. The *Libellula* with a blue ſhining body, and wings of a blueiſh-green, duſky at the point, and without ſpots on the edge. It is called

by *Ray* the middle ſized Libella, with a blue body, and the greateſt part of the wings of a blackiſh blue. This likewiſe frequents rivers, and is of the ſize and ſhape of the former, but the wings are of a blackiſh blue, with the points of a pale brown, and the tail horny at the end.

3. The *Libellula* with a greeniſh-blue body, duſky wings, and a white ſpot upon the edge. It is termed by *Ray* the middle ſized Libella, with a green body, and wings of a dunniſh colour, marked with ſmall ſpots, that are white near the extreme angle: the body is of a green ſhining colour, with black feet and brown wings, which are marked on the edges with an oblong white ſpot. Some think it is the female of the former.

4. The *Libellula* with a ſilky ſhining body, and the wings of a duſky gold colour, marked with a black ſpot. It is termed by *Ray* the middle ſized Libella, with a body partly green, and partly blue, and the wings marked in the middle with very large blueiſh black ſpots: the body is of a bright blue, the feet black, and half the wings next the point, of a blueiſh-black, with points of a gilt brown; the other half of the wings near the baſe, are of a gold colour.

Of the *Libellula* of the laſt kind are,

1. That with a ſilky body, and the wings marked on the edge with a duſky ſpot. It is called by *Ray* the leſſer Libella with reticulated wings, a green back, and whitiſh furrows: this flie flutters on the ſides of marſhes, and has a back of the colour of copper, with gilded ſhining wings, marked on the edge with a rhomboidal brown ſpeck: the wings are compoſed of two nerves, which are particular to this inſect; and the breaſt, belly and ſides, are of a livid colour; the eyes are of an aſh-colour, but brown above, and the head, as far as the back, is of the colour of copper: the feelers are black, ſhort, and thick at the laſt joint.

2. The *Libellula* with a fleſh-coloured body, and wings with a duſky ſpot on the edges. It is termed by *Ray* the middle ſized Libella, with two black ſpots near the incitures: it is very like the former, both in ſize and ſhape; but near the furrows of the belly there are black lines or characters, and a brown ſpot on the edge of the wings.

3. The *Libellula* with a ſilky body, and the edge of the wings marked with a black ſpot, is named by *Ray* the Libella with a blueiſh livid body: it has white wings, and the upper part of the body is of a greeniſh ſhining blue, without mixture.

4. The *Libellula* with a blue body variegated with aſh-colour, and a black ſpot on the edges of the wings; *Ray* terms it the leſſer Libella with ſhort wings, and a blue body, marked with tranſverſe black ſpots. It is of the ſame ſize and ſhape as the three former, and the wings are white; the joints of the belly, viewed before, are of an aſh colour, and behind of a ſhining blue.

Of the large kind of *Libellula*, there are,

1. That with a double ſpot on the edges of the wings, called by *Ray* the greateſt Libella, with a long, ſhining, ſlender, ſmooth, greeniſh belly, at the beginning, and ſwelling near the end. It is diſtinguiſhed from the reſt, by having two ſpots on the wings, that are white, but yellow towards the baſe, and black underneath the yellow colour.

2. The *Libellula* with white wings, but yellow at the baſe; it is named by *Ray* the greateſt Libella, with a broad, ſhort, yellow belly.

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It is yellow on the back, but black underneath; and on each ſide there are two oblique yellow lines: the forehead is green, the eyes grey, the feet black, and the wings of a ruſty colour at the baſe.

3. The *Libellula* with a duſky body, and white wings, is called by *Ray* the greateſt Libella with a yellow narrow body, and no duſky ſpots at the root of the wings: the body is black, the wings white, with a reddiſh brown ſpeck on the edges, and the vent without any appendage.

4. The *Libellula* with yellow ſides and white wings, is commonly ſeen on waters, and the ſides of the breaſt and belly are of a yellow colour; the ſpecks on the edges of the wings are of a brown ruſty colour.

5. The *Libellula* with a green ſhining breaſt, yellow lines, pale wings, and a black belly. It is termed by *Ray* the great Libella with a ſhort blue belly: the head and breaſt are of a ſhining green, the eyes brown, and there are two yellow lines on the ſides of the breaſt; but the wings are whitiſh yellow at the baſe, and the marginal ſpot is brown.

6. The *Libellula* of a gilded green, with pale wings and black feet, is like the former, only it differs from it in the male, which has a dentated tail, and in the female, whoſe tail conſiſts of leaves, in the ſhape of a lance.

7. The grey *Libellula* with yellowiſh wings, and the ſides of the breaſt marked with yellow lines, with a tail conſiſting of two leaves, it is called by *Ray* the great Libellula with a long ſlender belly, and yellowiſh wings.

8. The *Libellula* with the breaſt of a yellowiſh green, with black lines, and a blackiſh belly, with yellow marks.

CHAP. V.

OF MEALY WINGED INSECTS, WITH A SPIRAL MOUTH.

IF we take a curſory view of inſects in general, *Caterpillars* alone, and the *Butterflies* and *Moths* they give birth to, will make a third part of the number. Wherever we move, wherever we turn, theſe inſects, in one ſhape or another, preſent themſelves to our view. Some, in every ſtate, offer the moſt entertaining ſpectacle; others are beautiful only in their winged form. Many perſons, have an invincible averſion to caterpillars, and worms of every ſpecies: there is ſomething diſagreeable in their ſlow crawling motion, for which the variety of their colouring can never compenſate. But others feel no repugnance at obſerving, and even handling them with the moſt attentive application.

There is nothing in the butterfly ſtate ſo beautiful or ſplendid as theſe inſects. They ſerve, not leſs than the birds themſelves, to baniſh ſolitude from our walks, and to fill up our idle intervals with the moſt pleaſing ſpeculations. The butterfly makes one of the principal ornaments of oriental poetry; but, in thoſe countries, the inſect is larger and more beautiful than with us.

The beauties of the fly may therefore very well excite our curioſity to examine the reptile. But we are ſtill more ſtrongly attached to this

tribe, from the uſefulneſs of one of the number. The ſilk worm is, perhaps, the moſt ſerviceable of all other animals; ſince, from its labours, and the manufacture attending it, near a third part of the world are clothed, adorned, and ſupported.

Caterpillars may be eaſily diſtinguiſhed from worms or maggots, by the number of their feet; and by their producing butterflies or moths. When the ſun calls up vegetation, and vivifies the various eggs of inſects, the caterpillars are the firſt that are ſeen, upon almoſt every vegetable and tree, eating its leaves, and preparing for a ſtate of greater perfection. They have feet both before and behind; which not only enable them to move forward by a ſort of ſteps made by their fore and hinder parts, but alſo to climb up vegetables, and to ſtretch themſelves out from the boughs and ſtalks, to reach their food, at a diſtance. All of this claſs have from eight feet at the leaſt, to ſixteen; and this may ſerve to diſtinguiſh them from the worm tribe, that never have ſo many. The animal into which they are converted, is always a butterfly or a moth; and theſe are always diſtinguiſhed from other flies, by having their wings covered over with a painted duſt, which gives them ſuch various beauty. The wings of flies are tranſparent, as we ſee in the common fleſh fly; while thoſe of beetles are hard, like horn: from ſuch the wing of a butterfly may be eaſily diſtinguiſhed; and words would obſcure their differences.

From hence it appears, that caterpillars, whether in the reptile ſtate, or advanced to their laſt ſtate of perfection into butterflies, may eaſily be diſtinguiſhed from all other inſects; being animals peculiarly formed, and alſo of a peculiar nature. The tranſmutations they undergo, are alſo more numerous than thoſe of any inſect hitherto mentioned; and, in conſequence, they have been placed in the third order of changes by Swammerdam, who has thrown ſuch lights upon this part of natural hiſtory. In the ſecond order of changes, mentioned before, we ſaw the graſshopper and the earwig, when excluded from the egg, aſſume a form very like that which they were after to preſerve; and ſeemed arrived at a ſtate of perfection, in all reſpects, except in not having wings; which did not bud forth until they were come to maturity. But the inſects of this third order, that we are now about to deſcribe, go through a much greater variety of transformations: for, when they are excluded from the egg, they aſſume the form of a ſmall caterpillar, which feeds and grows larger every day, often changing its ſkin, but ſtill preſerving its form. When the animal has come to a certain magnitude in this ſtate, it diſcontinues eating, makes itſelf a covering or huſk, in which it remains wrapped up, ſeemingly without life or motion; and after having for ſome time continued in this ſtate, it once more burſts its confinement, and comes forth a butterfly. Thus we ſee this animal put on no leſs than three different appearances, from the time it is firſt excluded from the egg. It appears a crawling caterpillar; then an inſenſible aurelia, as it is called, without life or motion; and laſtly, a butterfly, variouſly painted, according to its different kind. Having thus diſtinguiſhed this claſs of inſects from all others, we will firſt ſurvey their hiſtory in general; and then enter particularly into the manners and nature of a few of them, which moſt deſerve our curioſity and attention.

When

When winter has diſrobed the trees of their leaves, Nature then ſeems to have loſt her inſects. Ther. are thouſands of different kinds, with and without wings, which, though ſwarming at other ſeaſons, then entirely diſappear. Our fields are re-peopled, when the leaves begin to bud, by the genial influence of ſpring; and caterpillars, of various ſorts, are ſeen feeding upon the promiſe of the year, even before the leaves are completely unfolded. Thoſe caterpillars, which we then ſee, may ſerve to give us a view of the general means which Nature employs to preſerve ſuch a number of inſects during that ſeaſon, when they can no longer find ſubſiſtence. It is known, by united experience, that all theſe animals are hatched from the eggs of butterflies; and thoſe who obſerve them more cloſely, will find the fly very careful in depoſiting its eggs in thoſe places where they are likely to be hatched with the greateſt ſafety and ſucceſs. During winter, therefore, the greateſt number of caterpillars are in an egg ſtate; and in this lifeleſs ſituation, brave all the rigours and the humidity of the climate; and though often expoſed to all its changes, ſtill preſerve the latent principles of life, which is more fully exerted at the approach of ſpring. That ſame power that puſhes forth the budding leaf, and the opening flower, impels the inſect into animation; and Nature at once ſeems to furniſh the gueſt and the banquet. When the inſect has found force to break its ſhell, it always finds its favourite aliment provided in abundance before it.

But all caterpillars are not ſent off from the egg in the beginning of ſpring; for many of them have ſubſiſted during the winter in their aurelia ſtate: in which, as we have briefly obſerved above, the animal is ſeemingly deprived of life and motion. In this ſtate of inſenſibility, many of theſe inſects continue during the rigours of winter; ſome encloſed in a kind of ſhell, which they have ſpun for themſelves at the end of autumn; ſome concealed under the bark of trees; others in the chinks of old walls; and many buried under ground. From all theſe, a variety of butterflies are ſeen to iſſue, in the beginning of ſpring; and adorn the earlieſt part of the year with their painted flutterings.

Some caterpillars do not make any change whatſoever at the approach of winter; but continue to live in their reptile ſtate, through all the ſeverity of the ſeaſon. Theſe chuſe themſelves ſome retreat, where they may remain undiſturbed for months together; and there they continue quite motionleſs, and as inſenſible as if they were actually dead. Their conſtitution is ſuch, that food, at that time, would be uſeleſs; and the cold prevents their making thoſe diſſipations which require reſtoration. In general, caterpillars of this kind are found in great numbers together, encloſed in one common web, that covers them all, and ſerves to protect them from the injuries of the air.

Laſtly, there are ſome of the caterpillar kind, whoſe butterflies live all the winter; and who, having fluttered about for ſome part of the latter end of autumn, ſeek for ſome retreat during the winter, in order to anſwer the ends of propagation, at the approach of ſpring. Theſe are often found lifeleſs and motionleſs in the hollows of trees, or the clefts of timber; but, by being approached to the fire, they recover life and activity, and ſeem to anticipate the deſires of ſpring.

In general, however, whether the animal has ſubſiſted in an egg ſtate, during the winter; or whether as a butterfly, bred from an au-

relia, in the beginning of ſpring; or a butterfly that has ſubſiſted during the winter, and lays eggs as ſoon as the leaves of plants are ſhot forward, the whole ſwarms of caterpillars are in motion to ſhare the banquet that Nature has provided. There is ſcarce a plant that has not its own peculiar inſects; and ſome are known to ſupport ſeveral of different kinds. Of theſe, many are hatched from the egg, at the foot of the tree, and climb up to its leaves for ſubſiſtence: the eggs of others, have been glued by the parent butterfly to the leaves; and they are no ſooner excluded from the ſhell, but they find themſelves in the midſt of plenty.

When the caterpillar firſt burſts from the egg, it is ſmall and feeble; its appetites are in proportion to its ſize, and it ſeems to make no great conſumption: but as it increaſes in magnitude, it improves in its appetites; ſo that, in its adult caterpillar ſtate, it is the moſt ravenous of all animals whatſoever. A ſingle caterpillar will eat double its own weight of leaves in a day, and yet ſeems no way diſordered by the meal.—What would mankind do, if their oxen or their horſes were ſo voracious!

Theſe voracious habits, with its ſlow crawling motion, but ſtill more a ſtinging like that of nettles, which follows upon handling the greateſt number of them, make theſe inſects not the moſt agreeable objects of human curioſity. However, there are many philoſophers who have ſpent years in their contemplation; and who have not only attended to their habits and labours, but minutely examined their ſtructure and internal conformation.

The body of the caterpillar, when anatomically conſidered, is found compoſed of rings, whoſe circumference is pretty near circular or oval. They are generally twelve in number, and are membraneous; by which caterpillars may be diſtinguiſhed from many other inſects, that nearly reſemble them in form. The head of the caterpillar is connected to the firſt ring by the neck; that is generally ſo ſhort and contracted, that it is ſcarce viſible. All the covering of the head in caterpillars ſeems to conſiſt of a ſhell; and they have neither upper nor under jaw, for they are both placed rather vertically, and each jaw armed with a large thick tooth, which is ſingly equal to numbers. With theſe the animals devour their food in ſuch amazing quantities; and with theſe, ſome of the kind defend themſelves againſt their enemies. Though the mouth be kept ſhut, the teeth are always uncovered; and while the inſect is in health, they are ſeldom without employment. Whatever the caterpillar devours, theſe teeth ſerve to chop it into ſmall pieces, and render the parts of the leaf fit for ſwallowing. Many kinds, while they are yet young, eat not only the ſucculent part of the leaf, and leave all the fibres untouched; others, however, attack the whole leaf, and eat it clean away. One may be amuſed, for a little time, in obſerving the avidity with which they are ſeen to feed; ſome are ſeen eating the whole day; others have their hours of repaſt; ſome chuſe the night others the day. When the caterpillar attacks a leaf, it places its body in ſuch a manner that the edge of the leaf ſhall fall between its feet, which keeps it ſteady, while the teeth are employed in cutting it; theſe fall upon the leaf, ſomewhat in the manner of a pair of gardener's ſheers; and every morſel is ſwallowed as ſoon as cut. Some caterpillars

terpillars feed upon leaves ſo very narrow, that they are not broader than their mouths; in this caſe the animal is ſeen to devour it from the point, as we would eat a raddiſh.

As there are various kinds of caterpillars, the number of their feet are various; ſome having eight, and ſome ſixteen. Of theſe feet the ſix foremoſt are covered with a ſort of ſhining griſtle; and are therefore called the ſhelly legs. The hindmoſt feet, whatever be their number, are ſoft and flexible, and are called membranaceous. Caterpillars alſo, with regard to their external figure, are either ſmooth, or hairy. The ſkin of the firſt kind is ſoft to the touch, or hard, like ſhagreen; the ſkin of the latter, is hairy, and as it were thorny; and generally, if handled, ſtings like nettles. Some of them even cauſe this ſtinging pain, if but approached too nearly.

Caterpillars, in general, have ſix ſmall black ſpots placed on the circumference of the fore ring, and a little to the ſide of the head. Three of theſe are larger than the reſt, and are convex and tranſparent: theſe Reaumur takes to be the eyes of the caterpillar; however, moſt of theſe reptiles have very little occaſion for ſight, and ſeem only to be directed by their feeling.

But the parts of the caterpillar's body which moſt juſtly demand our attention, are the ſtigmata, as they are called; or thoſe holes on the ſides of its body, through which the animal is ſuppoſed to breathe. All along this inſect's body, on each ſide, theſe holes are eaſily diſcoverable. They are eighteen in number, nine on a ſide, rather nearer the belly than the back; a hole for every ring, of which the animal's body is compoſed, except the ſecond, the third, and the laſt. Theſe oval openings may be conſidered as ſo many mouths, through which the inſect breathes; but with this difference, that as we have but one pair of lungs, the caterpillar has no leſs than eighteen. It requires no great anatomical dexterity to diſcover theſe lungs in the larger kind of caterpillars; they appear, at firſt view, to be hollow cartilaginous tubes, and of the colour of mother-of-pearl. Theſe tubes are often ſeen to unite with each other; ſome are perceived to open into the inteſtines; and ſome go to different parts of the ſurface of the body. That theſe veſſels ſerve to convey the air, appears evidently, from the famous experiment of Malpighi; who, by ſtopping up the mouths of the ſtigmata with oil, quickly ſuffocated the animal, which was ſeen to die convulſed the inſtant after. In order to aſcertain his theory, he rubbed oil upon other parts of the inſect's body, leaving the ſtigmata free; and this ſeemed to have no effect upon the animal's health, but it continued to move and eat as uſual: he rubbed oil on the ſtigmata of one ſide, and the animal underwent a partial convulſion, but recovered ſoon after. However it ought to be obſerved, that air is not ſo neceſſary to theſe as to the nobler ranks of animals, ſince caterpillars will live in an exhauſted receiver for ſeveral days together; and though they ſeem dead at the bottom, yet, when taken out, recover, and reſume their former vivacity.

If the caterpillar be cut open longitudinally along the back, its inteſtines will be perceived running directly in a ſtraight line from the mouth to the anus. They reſemble a number of ſmall bags opening into each other; and ſtrengthened on both ſides by a fleſhy cord, by which they are united. Theſe inſects are, upon many occaſions, ſeen

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to caſt forth the internal coat of their inteſtines with their food, in the changes which they ſo frequently undergo. But the inteſtines take up but a ſmall part of the animal's body, if compared to the fatty ſubſtance in which they are involved. This ſubſtance changes its colour when the inſect's metamorphoſis begins to approach; and from white it is uſually ſeen to become yellow. If to theſe parts, we add the caterpillar's implements for ſpinning, (for all caterpillars ſpin at one time or another) we ſhall have a rude ſketch of this animal's conformation: however we ſhall reſerve the deſcription of thoſe parts, till we come to the hiſtory of the ſilk-worm, where the manner in which theſe inſects ſpin their webs, will moſt properly find place.

The life of a caterpillar ſeems one continued ſucceſſion of changes; and it is ſeen to throw off one ſkin only to aſſume another; which alſo is diveſted in its turn: and thus for eight or ten times ſucceſſively. We muſt not, however, confound this changing of the ſkin with the great metamorphoſis which it is afterwards to undergo. The throwing off one ſkin, and aſſuming another, ſeems, in compariſon, but a ſlight operation among theſe animals: this is but the work of a day; the other is the great adventure of their lives. Indeed, this faculty of changing the ſkin, is not peculiar to caterpillars only, but is common to all the inſect kind; and even to ſome animals that claim a higher rank in Nature. We have already ſeen the lobſter and the crab out-growing their firſt ſhells, and then burſting from their confinement, in order to aſſume a covering more roomy and convenient. It is probable that the louſe, the flea, and the ſpider, change their covering from the ſame neceſſity; and growing too large for the cruſt in which they have been for ſome time incloſed, burſt it for another. This period is probably that of their growth; for as ſoon as their new ſkin is hardened round them, the animal's growth is neceſſarily circumſcribed, while it remains within it. With reſpect to caterpillars, many of them change their ſkins five or ſix times in a ſeaſon; and this covering, when caſt off, often ſeems ſo complete, that many might miſtake the empty ſkin for the real inſect. Among the hairy caterpillars, for inſtance, the caſt ſkin is covered with hair; the feet, as well griſtly as membraneous, remain fixed to it; even the parts which nothing but a microſcope can diſcover, are viſible in it; in ſhort, all the parts of the head; not only the ſkull but the teeth.

In proportion as the time approaches in which the caterpillar is to caſt its old ſkin, its colours become more feeble, the ſkin ſeems to wither and grow dry, and in ſome meaſure reſembles a leaf, when it is no longer ſupplied with moiſture from the ſtock. At that time, the inſect begins to find itſelf under a neceſſity of changing; and it is not effected without violent labour, and perhaps pain. A day or two before the critical hour approaches, the inſect ceaſes to eat, loſes its uſual activity, and ſeems to reſt immoveable. It ſeeks ſome place to remain in ſecurity; and no longer timorous, ſeems regardleſs even of the touch. It is now and then ſeen to bend itſelf and elevate its back; again it ſtretches to its utmoſt extent: it ſometimes lifts up the head, and then lets it fall again; it ſometimes waves at three or four times from ſide to ſide, and then remains in quiet. At length, ſome of the rings of its body, particularly the firſt and ſecond, are ſeen to ſwell conſiderably, the old ſkin diſtends and burſts, till, by repeated ſwellings

ings and contractions in every ring, the animal diſengages itſelf, and creeps from its inconvenient covering.

How laborious ſoever this operation may be, it is performed in the ſpace of a minute; and the animal, having thrown off its old ſkin, ſeems to enjoy new vigour, as well as to have acquired colouring and beauty. Sometimes it happens that it takes a new appearance and colours very different from the old. Thoſe that are hairy, ſtill preſerve their covering; although their ancient ſkin ſeems not to have loſt a ſingle hair: every hair appears to have been drawn, like a ſword from the ſcabbard. However the fact is, that a new crop of hair grows between the old ſkin and the new, and probably helps to throw off the external covering.

The caterpillar having in this manner continued for ſeveral days feeding, and at intervals caſting its ſkin, begins at laſt to prepare for its change into an aurelia. It is moſt probable that, from the beginning, all the parts of the butterfly lay hid in this inſect, in its reptile ſtate; but it required time to bring them to perfection; and a large quantity of food, to enable the animal to undergo all the changes requiſite for throwing off theſe ſkins, which ſeemed to clog the butterfly form. However, when the caterpillar has fed ſufficiently, and the parts of the future butterfly have formed themſelves beneath its ſkin, it is then time for it to make its firſt, great, and principal change into an aurelia, or a cryſalis, as ſome have choſen to call it; during which, as was obſerved, it ſeems to remain for ſeveral days, or even months, without life or motion.

Preparatory to this important change, the caterpillar moſt uſually quits the plant, or the tree on which it fed; or at leaſt attaches itſelf to the ſtalk or the ſtem, more gladly than the leaves. It forſakes its food, and prepares, by faſting, to undergo its tranſmutation. In this period, all the food it has taken is thoroughly digeſted; and it often voids even the internal membrane which lined its inteſtines. Some of this tribe, at this period alſo, are ſeen entirely to change colour; and the vivacity of the tints, in all, ſeems faded. Thoſe of them which are capable of ſpinning themſelves a web, ſet about this operation; thoſe which have already ſpun, await the change in the beſt manner they are able. The web or cone, with which ſome cover themſelves, hides the aurelia contained within from the view; but in others, where it is more tranſparent, the caterpillar, when it has done ſpinning, ſtrikes into it the claws of the two feet under the tail, and afterwards forces in the tail itſelf, by contracting thoſe claws, and violently ſtriking the feet one againſt the other. If, however, they be taken from their web at this time, they appear in a ſtate of great languor; and, incapable of walking, remain on that ſpot where they are placed. In this condition they remain one or two days, preparing to change into an aurelia; ſomewhat in the manner they made preparations for changing their ſkin. They then appear with their bodies bent into a bow, which they now and then are ſeen to ſtraighten: they make no uſe of their legs; but if they attempt to change place, do it by the contortions of their body. In proportion as their change into an aurelia approaches, their body becomes more and more bent; while their extenſions and convulſive contractions become more frequent. The hinder end of the body is the part which the animal firſt diſengages from its caterpillar ſkin; that part of the ſkin remains empty, while the body is drawn up contracted-

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ly towards the head. In the ſame manner they diſengage themſelves from the two ſucceeding rings; ſo that the animal is then lodged entirely in the fore part of its caterpillar covering: that half which is abandoned, remains flaccid and empty; while the fore part, on the contrary, is ſwollen and diſtended. The animal, having thus quitted the hinder part of its ſkin, to drive itſelf up into the fore part, ſtill continues to heave and work as before; ſo that the ſkull is ſoon ſeen to burſt into three pieces, and a longitudinal opening is made in the three firſt rings of the body, through which the inſect thruſts forth its naked body with ſtrong efforts. Thus at laſt it entirely gets free from its caterpillar ſkin, and for ever forſakes its moſt odious reptile form.

The caterpillar, thus ſtripped of its ſkin for the laſt time, is now become an aurelia; in which the parts of the future butterfly are all viſible; but in ſo ſoft a ſtate, that the ſmalleſt touch can diſcompoſe them. The animal is now become helpleſs and motionleſs; but only waits for the aſſiſtance of the air to dry up the moiſture on its ſurface, and ſupply it with a cruſt capable of reſiſting external injuries. Immediately after being ſtripped of its caterpillar ſkin, it is of a green colour, eſpecially in thoſe parts, which are diſtended by an extraordinary afflux of animal moiſture; but in ten or twelve hours after being thus expoſed, its parts harden, the air forms its external covering into a firm cruſt, and in about four and twenty hours, the aurelia may be handled without endangering the little animal that is thus left in ſo defenceleſs a ſituation. Such is the hiſtory of the little pod or cone that is found ſo common by every pathway, ſticking to nettles, and ſometimes ſhining like poliſhed gold. From the beautiful and reſplendent colour, with which it is thus ſometimes adorned, ſome authors have called it a Chryſalis, implying a creature made of gold.

Such are the efforts by which theſe little animals prepare for a ſtate of perfection; but their care is ſtill greater to provide themſelves a ſecure retreat, during this ſeaſon of their imbecility. It would ſeem like erecting themſelves a monument, where they were to reſt ſecure, until Nature had called them into a new and more improved exiſtence. For this purpoſe, ſome ſpin themſelves a cone or web, in which they lie ſecure till they have arrived at maturity: others, that cannot ſpin ſo copious a covering, ſuſpend themſelves by the tail, in ſome retreat where they are not likely to meet diſturbances. Some mix ſand with their gummy and moiſt webs, and thus make themſelves a ſecure incruſtation; while others, before their change, bury themſelves in the ground, and thus avoid the numerous dangers that might attend them. One would imagine that they were conſcious of the preciſe time of their continuance in their aurelia ſtate; ſince their little ſepulchres, with reſpect to the ſolidity of the building, are proportioned to ſuch duration. Thoſe that are to lie in that ſtate of exiſtence but a few days, make choice of ſome tender leaf, which they render ſtill more pliant by diffuſing a kind of glue upon it: the leaf thus gradually curls up, and withering as it enfolds, the inſect wraps itſelf within, as in a mantle, till the genial warmth of the ſun enables it to ſtruggle for new life, and burſt from its confinement. Others, whoſe time of transformation is alſo near at hand, faſten their tails to a tree, or to the firſt worm hole they meet, in a beam, and wait in that defenceleſs ſituation. Such caterpillars, on the other hand, are ſeen to lie ſeveral months in their aurelia ſtate,

act with much greater circumſpection. Moſt of them mix their web with ſand, and thus make themſelves a ſtrong covering: others build in wood, which ſerves them in the nature of a coffin. Such as have made the leaves of willows their favourite food, break the tender twigs of them firſt into ſmall pieces, then pound them as it were to powder; and, by means of their glutinous ſilk, make a kind of paſte, in which they wrap themſelves up. Many are the forms which theſe animals aſſume in this helpleſs ſtate; and it often happens, that the moſt deformed butterflies iſſue from the moſt beautiful aurelias.

In general, however, the aurelia takes the rude outline of the parts of the animal which is contained within it; but as to the various colours which it is ſeen to aſſume, they are rather the effect of accident; for the ſame ſpecies of inſect does not at all times aſſume the ſame hue, when it becomes an aurelia. In ſome, the beautiful gold colour is at one time found; in others, it is wanting. This brilliant hue, which does not fall ſhort of the beſt gilding, is formed in the ſame manner in which we ſee leather obtain a gold colour, though none of that metal ever enters into the tincture. It is only formed by a beautiful brown varniſh, laid upon a white ground; and the white thus gleaming through the tranſparency of the brown, gives a charming golden yellow. Theſe two colours are found, one over the other, in the aurelia of the little animal we are deſcribing; and the whole appears gilded, without any real gilding.

The aurelia thus formed, and left to time to expand into a butterfly, in ſome meaſure reſembles an animal in an egg, that is to wait for external warmth to hatch it into life and vigour. As the quantity of moiſture that is encloſed within the covering of the aurelia, continues to keep its body in the moſt tender ſtate, ſo it is requiſite that this humidity ſhould be dried away, before the little butterfly can burſt its priſon. Many have been the experiments to prove that Nature may in this reſpect be aſſiſted by art; and that the life of the inſect may be retarded or quickened, without doing it the ſmalleſt injury. For this purpoſe, it is only requiſite to continue the inſect in its aurelia ſtate, by preventing the evaporation of its humidity; which will conſequently add ſome days, nay weeks, to its life: on the other hand, by evaporating its moiſture, in a warm ſituation, the animal aſſumes its winged ſtate before its uſual time, and goes through the offices aſſigned its exiſtence. To prove this, Mr Reaumur encloſed the aurelia in a glaſs tube; and found the evaporated water, which exhaled from the body of the inſect, collected in drops at the bottom of the tube: he covered the aurelia with varniſh; and this making the evaporation more difficult and ſlow, the butterfly was two months longer than its natural term, in coming out of its caſe: he found, on the other hand, that by laying the animal in a warm room, he haſtened the diſcloſure of the butterfly; and by keeping it in an ice-houſe in the ſame manner, he delayed it. Warmth acted, in this caſe, in a double capacity; invigorating the animal, and evaporating the moiſture.

The aurelia, though it bears a different external appearance, nevertheleſs contains within it all the parts of the butterfly in perfect formation; and lying each in a very orderly manner, though in the ſmalleſt compaſs. Theſe, however, are ſo faſt and tender, that it is impoſſible to viſit without diſcompoſing them. When either by warmth, or in-

creaſing vigour, the parts have acquired the neceſſary force and ſolidity, the butterfly then ſeeks to diſembarraſs itſelf of thoſe bands which kept it ſo long in confinement. Some inſects continue under the form of an aurelia not above ten days; ſome twenty; ſome ſeveral months; and even for a year together.

The butterfly, however, does not continue ſo long under the form of an aurelia, as one would be apt to imagine. In general, thoſe caterpillars that provide themſelves with cones, continue within them but a few days after the cone is completely finiſhed. Some, however, remain buried in this artificial covering for eight or nine months, without taking the ſmalleſt ſuſtenance during the whole time: and though in the caterpillar ſtate no animals were ſo voracious, when thus transformed, they appear a miracle of abſtinence. In all, ſooner or later, the butterfly burſts from its priſon; not only that natural priſon which is formed by the ſkin of the aurelia, but alſo from that artificial one of ſilk, or any other ſubſtance in which it has encloſed itſelf.

The efforts which the butterfly makes to get free from its aurelia ſtate, are by no means ſo violent as thoſe which the inſect had in changing from the caterpillar into the aurelia. The quantity of moiſture ſurrounding the butterfly is by no means ſo great as that attending its former change; and the ſhell of the aurelia is ſo dry, that it may be cracked between the fingers.

If the animal be ſhut up within a cone, the butterfly always gets rid of the natural internal ſkin of the aurelia, before it eats its way through the external covering which its own induſtry has formed round it. In order to obſerve the manner in which it thus gets rid of the aurelia covering, we muſt cut open the cone, and then we ſhall have an opportunity of diſcovering the inſect's efforts to emancipate itſelf from its natural ſhell. When this operation begins, there ſeems to be a violent agitation in the humours contained within the little animal's body. Its fluids ſeem driven, by an haſty fermentation, through all the veſſels; while it labours violently with its legs, and makes ſeveral other violent ſtruggles to get free. As all theſe motions concur with the growth of the inſect's wings and body, it is impoſſible that the brittle ſkin which covers it ſhould longer reſiſt: it at length gives way, by burſting into four diſtinct and regular pieces. The ſkin of the head and legs firſt ſeparates; then the ſkin at the back flies open, and dividing into two regular portions, diſengages the back and wings: then there likewiſe happens another rupture in that portion which covered the rings of the back of the aurelia. After this, the butterfly, as if fatigued with its ſtruggles, remains very quiet for ſome time, with its wings pointed downwards, and its legs fixed in the ſkin which it had juſt thrown off. At firſt ſight the animal, juſt ſet free, and permitted the future uſe of its wings, ſeems to want them entirely: they take up ſuch little room, that one would wonder where they were hidden. But ſoon after, they expand ſo rapidly, that the eye can ſcarce attend their unfolding. From reaching ſcarce half the length of the body, they acquire, in a moſt wonderful manner, their full extent and bigneſs, ſo as to be each five times larger than they were before. Nor is it the wings alone that are thus increaſed: all their ſpots and paintings, before ſo minute as to be ſcarce diſcernible, are proportionably extended; ſo that, what a few minutes before ſeemed only a number of confuſed, unmeaning

points,

points, now become diſtinct and moſt beautiful ornaments. Nor are the wings, when they are thus expanded, unfolded in the manner in which earwigs and graſshoppers diſplay theirs, who unfurl them like a lady's fan: on the contrary, thoſe of butterflies actually grow to their natural ſize in this very ſhort ſpace. The wing, at the inſtant it is freed from its late confinement, is conſiderably thicker than afterwards; ſo that it ſpreads in all its dimenſions, growing thinner as it becomes broader. If one of the wings be plucked from the animal juſt ſet free, it may be ſpread by the fingers, and it will ſoon become as broad as the other, which has been left behind. As the wings extend themſelves ſo ſuddenly, they have not yet had time to dry; and accordingly appear like pieces of wet paper, ſoft, and full of wrinkles. In about half an hour, they are perfectly dry, their wrinkles entirely diſappear, and the little animal aſſumes all its ſplendour. The tranſmutation being thus perfectly finiſhed, the butterfly diſcharges three or four drops of a blood-coloured liquid, which are the laſt remains of its ſuperfluous moiſture. Thoſe aurelias which are encloſed within a cone, find their exit more difficult, as they have ſtill another priſon to break through: this, however, they perform in a ſhort time; for the butterfly, freed from its aurelia ſkin, butts with its head violently againſt the walls of its artificial priſon; and probably with its eyes, that are rough and like a file, it rubs the internal ſurface away; till it is at laſt ſeen burſting its way into open light; and, in leſs than a quarter of an hour, the animal acquires its full perfection.

Thus, to uſe the words of Swammerdam, we ſee a little inſignificant creature diſtinguiſhed, in its laſt birth, with qualifications and ornaments, which man, during his ſtay upon earth, can never even hope to acquire. The butterfly, to enjoy life, needs no other food but the dews of Heaven; and the honeyed juices which are diſtilled from every flower. The pageantry of princes cannot equal the ornaments with which it is inveſted; nor the rich colouring that embelliſhes its wings. The ſkies are the butterfly's proper habitation, and the air its element: whilſt man comes into the world naked, and often roves about without habitation or ſhelter; expoſed, on one hand, to the heat of the ſun; and, on the other, to the damps and exhalations of the earth; both alike enemies of his happineſs and exiſtence.—A ſtrong proof that, while this little animal is raiſed to its greateſt height, we are as yet, in this world, only candidates for perfection!

It has been already ſhewn that all Butterflies are bred from caterpillars; and we have exhibited the various circumſtances of that ſurpriſing change. It has been remarked, that butterflies may be eaſily diſtinguiſhed from flies of every other kind, by their wings; for, in others, they are either tranſparent, like gauze, as we ſee in the common fleſh fly; or they are hard and cruſted, as we ſee the wings of the beetle. But in the butterfly, the wings are ſoft, opake, and painted over with a beautiful duſt, that comes off with handling.

The number of theſe beautiful animals is very great; and though Linnæus has reckoned up above ſeven hundred and ſixty different kinds, the catalogue is ſtill very incomplete. Every collector of butterflies can ſhew undeſcribed ſpecies: and ſuch as are fond of minute diſcovery, can here produce animals that have been examined only by himſelf. In general, however, thoſe of the warm climates, are larger and more

beautiful than ſuch as are bred at home; and we can eaſily admit the beauty of the butterfly, ſince we are thus freed from the damage of the caterpillar. It has been the amuſement of ſome to collect theſe animals, from different parts of the world; or to breed them from caterpillars at home. Theſe they arrange in ſyſtematic order; or diſpoſe ſo as to make ſtriking and agreeable pictures: and all muſt grant, that this ſpecious idleneſs is far preferable to that unhappy ſtate which is produced by a total want of employment.

The wings of butterflies, as was obſerved, fully diſtinguiſh them from flies of every other kind. They are four in number; and though two of them be cut off, the animal can fly with the two others remaining. They are, in their own ſubſtance, tranſparent; but owe their opacity to the beautiful duſt with which they are covered; and which has been likened, by ſome naturaliſts, to the feathers of birds; by others, to the ſcales of fiſhes; as their imaginations were diſpoſed to catch the reſemblance. In fact, if we regard the wing of a butterfly with a good microſcope, we ſhall perceive it ſtudded over with a variety of little grains of different dimenſions and forms, generally ſupported upon a foot ſtalk, regularly laid upon the whole ſurface. Nothing can exceed the beautiful and regular arrangement of theſe little ſubſtances: which thus ſerve to paint the butterfly's wing, like the tiles of an houſe. Thoſe of one rank are a little covered by thoſe that follow: they are of many figures: on one part of the wing may be ſeen a ſucceſſion of oval ſtuds; on another part, a cluſter of ſtuds, each in the form of an heart: in one place they reſemble a hand open; and in another they are long or triangular; while all are interſperſed with taller ſtuds, that grow between the reſt like muſhrooms upon a ſtalk. The wing itſelf is compoſed of ſeveral thick nerves, which render the conſtruction very ſtrong, though light; and though it be covered over with thouſands of theſe ſcales or ſtuds, yet its weight is very little increaſed by the number. The animal is with eaſe enabled to ſupport itſelf a long while in air, although its flight be not very graceful. When it deſigns to fly to a conſiderable diſtance, it aſcends and deſcends alternately; going ſometimes to the right, ſometimes to the left, without any apparent reaſon. Upon cloſer examination, however, it will be found that it flies thus irregularly in purſuit of its mate; and as dogs bait and quarter the ground in purſuit of their game, ſo theſe inſects traverſe the air, in queſt of their mates whom they can diſcover at more than a mile's diſtance.

If we proſecute our deſcription of the butterfly, the animal may be divided into three parts; the head, the corſelet, and the body.

The body is the hinder part of the butterfly, and is compoſed of rings, which are generally concealed under long hair, with which that part of the animal is clothed. The corſelet is more ſolid than the reſt of the body, becauſe the fore wings, and the legs are fixed therein. The legs are ſix in number, although four only are made uſe of by the animal; the two fore legs being often ſo much concealed in the long hair of the body, that it is ſometimes difficult to diſcover them. If we examine theſe parts internally, we ſhall find the ſame ſet of veſſels in the butterfly that we obſerved in the caterpillar, but with this great difference, that as the blood, or humours, in the caterpillar, circulated from the tail to the head, they are found, in the butterfly, to take a direct

direct contrary courſe, and to circulate from the head to the tail; ſo that the caterpillar may be conſidered as the embryo animal, in which, as we have formerly ſeen, the circulation is carried on differently from what it is in animals when excluded.

But leaving the other parts of the butterfly, let us turn our attention particularly to the head. The eyes of butterflies have not all the ſame form; for in ſome they are large, in others ſmall; in ſome they are the larger portion of a ſphere, in others they are but a ſmall part of it, and juſt appearing from the head. In all of them, however, the outward coat has a luſtre, in which may be diſcovered the various colours of the rainbow. When examined a little cloſely, it will be found to have the appearance of a multiplying glaſs; having a great number of ſides, or facets, in the manner of a brilliant cut diamond. In this particular, the eye of the butterfly, and of moſt other inſects, entirely correſpond; and Luenhoek pretends, there are above ſix thouſand facets on the cornea of a flea. Theſe animals, therefore, ſee not only with great clearneſs; but view every object multiplied in a ſurpriſing manner. Puget adapted the cornea of a flea in ſuch a poſition, as to ſee objects through it by the means of a microſcope; and nothing could exceed the ſtrangeneſs of its repreſentations: a ſoldier, who was ſeen through it, appeared like an army of pigmies; for while it multiplied, it alſo diminiſhed the object: the arch of a bridge exhibited a ſpectacle more magnificent than human ſkill could perform; the flame of a candle ſeemed a beautiful illumination. It ſtill, however, remains a doubt, whether the inſect ſees objects ſingly, as with one eye; or whether every facet is itſelf a complete eye, exhibiting its own object diſtinct from all the reſt.

Butterflies, as well as moſt other flying inſects, have two inſtruments, like horns, on their heads which are commonly called feelers. They differ from the horns of greater animals, in being moveable at their baſe; and having a great number of joints, by which means the inſect is enabled to turn them in every direction. Thoſe of butterflies are placed at the top of the head, pretty near the external edge of each eye. What the uſe of theſe inſtruments may be, which are thus formed with ſo much art, and by a Workman who does nothing without reaſon, is as yet unknown to man. They may ſerve to guard the eye; they may be of uſe to clean it; or they may be the organ of ſome ſenſe which we are ignorant of: but this is only explaining one difficulty by another.

We are not ſo ignorant of the uſes of the trunk, which few inſects of the butterfly kind are without. This inſtrument is placed exactly between the eyes; and when the animal is not employed in ſeeking its nouriſhment, it is rolled up, like a curl. A butterfly, when it is feeding, flies round ſome flower, and ſettles upon it. The trunk is then uncurled, and thruſt out either wholly or in part; and is employed in ſearching the flower to its very bottom, let it be ever ſo deep. This ſearch being repeated ſeven or eight times, the butterfly then paſſes to another; and continues to hover over thoſe agreeable to its taſte, like a bird over its prey. This trunk conſiſts of two equal hollow tubes, nicely joined to each other, like the pipes of an organ.

Such is the figure and conformation of theſe beautiful inſects, that cheer our walks, and give us the earlieſt intimations of ſummer. But it is not by day alone that they are ſeen fluttering wantonly from flower

to

to flower, as the greateſt number of them fly by night, and expand the moſt beautiful colouring, at thoſe hours when there is no ſpectator. This tribe of inſects has therefore been divided into Diurnal and Nocturnal Flies; or, more properly ſpeaking, into Butterflies and Moths: the one only flying by day, the other moſt uſually on the wing in the night. They may be eaſily diſtinguiſhed from each other, by their horns or feelers: thoſe of the butterfly being clubbed, or knobbed at the end; thoſe of the moth, tapering finer and finer to a point. To expreſs it technically—the feelers of the butterflies are clavated; thoſe of moths, are filiform.

The butterflies, as well as the moths, employ the ſhort life aſſigned them, in a variety of enjoyments. Their whole time is ſpent either in queſt of food, which every flower offers; or in purſuit of the female, whoſe approach they can often perceive at a very great diſtance. Their ſagacity in this particular is not leſs aſtoniſhing than true; but by what ſenſe they are thus capable of diſtinguiſhing each other at ſuch diſtances, is not eaſy to conceive. It cannot be by the ſight, ſince ſuch ſmall objects as they are muſt be utterly imperceptible, at half the diſtance at which they perceive each other: it can ſcarcely be by the ſenſe of ſmelling, ſince the animal has no organs for that purpoſe. Whatever be their powers of perception, certain it is, that the male, after having fluttered, as if careleſsly, about for ſome time, is ſeen to take wing, and go forward, ſometimes for two miles together, in a direct line to where the female is perched on a flower.

The general rule among inſects is, that the female is larger than the male; and this obtains particularly in the tribe I am deſcribing. The body of the male is ſmaller and ſlenderer; that of the female, more thick and oval. Previous to the junction of theſe animals, they are ſeen ſporting in the air, purſuing and flying from each other, and preparing, by a mock combat, for the more important buſineſs of their lives. If they be diſturbed while united, the female flies off with the male on her back, who ſeems entirely paſſive upon the occaſion.

But the females of many moths and butterflies ſeem to have aſſumed their airy form for no other reaſon but to fecundate their eggs, and lay them. They are not ſeen fluttering about in queſt of food, or a mate: all that paſſes, during their ſhort lives, is a junction with the male of about half an hour; after which they depoſit their eggs, and die, without taking any nouriſhment, or ſeeking any. It may be obſerved, however, that in all the females of this tribe, they are impregnated by the male by one aperture, and lay their eggs by another.

The eggs of female butterflies are diſpoſed in the body like a bed of chaplets; which, when excluded, are uſually oval, and of a whitiſh colour: ſome, however, are quite round; and others flatted, like a turnip. The covering or ſhell of the egg, though ſolid, is thin and tranſparent; and in proportion as the caterpillar grows within the egg, the colours change, and are diſtributed differently. The butterfly ſeems very well inſtructed by nature in its choice of the plant, or the leaf, where it ſhall depoſit its burthen. Each egg contains but one caterpillar; and it is requiſite that this little animal, when excluded, ſhould be near its peculiar proviſion. The butterfly, therefore, is careful to place her brood only upon thoſe plants that afford good nouriſhment to its poſterity. Though the little winged animal has been fed itſelf upon

upon dew, or the honey of flowers, yet it makes choice for its young of a different proviſion, and lays its eggs on the moſt unſavoury plants; the rag-weed, the cabbage, or the nettle. Thus every butterfly chuſes not the plant moſt grateful to it in its winged ſtate; but ſuch as it has fed upon in its reptile form.

All the eggs of butterflies are attached to the leaves of the favourite plant, by a ſort of ſize or glue; where they continue, unobſerved, unleſs carefully ſought after. The eggs are ſometimes placed round the tender ſhoots of plants, in the form of bracelets, conſiſting of above two hundred in each, and generally ſurrounding the ſhoot, like a ring upon a finger. Some butterflies ſecure their eggs from the injuries of air, by covering them with hair, plucked from their own bodies, as birds ſometimes are ſeen to make their neſts; ſo that their eggs are thus kept warm, and alſo entirely concealed.

All the tribe of female moths lay their eggs a ſhort time after they leave the aurelia; but there are many butterflies that flutter about the whole ſummer, and do not think of laying, till the winter begins to warn them of their approaching end; ſome even continue the whole winter in hollows of trees, and do not provide for poſterity until the beginning of April, when they leave their retreats, depoſit their eggs, and die. Their eggs ſoon begin to feel the genial influence of the ſeaſon: the little animals burſt from them in their caterpillar ſtate, to become aurelias, and butterflies in their turn; and thus continue the round of Nature.

Nature, though it has rendered ſome animals ſurpriſingly fruitful, yet ever takes care to prevent their too great increaſe. One ſet of creatures is generally oppoſed to another: and thoſe are chiefly the moſt prolific, that are, from their embecility, incapable of making any effectual defence. The caterpillar has perhaps, of all other animals, the greateſt number of enemies; and ſeems only to exiſt, by its ſurpriſing fecundity. Some animals devour them by hundreds; others, more minute, yet more dangerous, mangle them in various ways: ſo that, how great ſoever their numbers may be, their deſtroyers are in equal proportion. Indeed, if we conſider the miſchiefs theſe reptiles are capable of occaſioning, and the various damages we ſuſtain from their inſatiable rapacity, it is happy for the other ranks of Nature, that there are thouſands of fiſhes, birds, and even inſects, that live chiefly upon caterpillars, and make them their moſt favourite repaſt.

When we deſcribed the little birds that live in our gardens, and near our houſes, as deſtructive neighbours, ſufficient attention was not paid to the ſervices which they are frequently found to render us. It has been proved, that a ſingle ſparrow and its mate, that have young ones, deſtroy above three thouſand caterpillars in a week; not to mention ſeveral butterflies, in which numberleſs caterpillars are deſtroyed in embryo. It is in purſuit of theſe reptiles that we are favoured with the viſits of many of our moſt beautiful ſongſters; that amuſe us during their continuance and leave us when the caterpillars diſappear.

The maxim which has often been urged againſt man, that he, of all other animals, is the only creature that is an enemy to his own kind, and that the human ſpecies only are found to deſtroy each other, has been adopted, by perſons who never conſidered the hiſtory of inſects. Some of the caterpillar kind in particular, that ſeem fitted only to live upon

upon leaves and plants, will, however, eat each other; and the ſtrongeſt will devour the weak, in preference to their vegetable food. That which lives upon the oak, is found to ſeize any of its companions, which it conveniently can, by the firſt rings, and inflict a deadly wound: it then feaſts in tranquillity on its prey, and leaves nothing of the animal but the huſk.

But it is not from each other they have moſt to fear, as in general they are inoffenſive; and many of this tribe are found to live in a kind of ſociety. Many kinds of flies lay their eggs either upon, or within their bodies; and as theſe turn into worms, the caterpillar is ſeen to nouriſh a ſet of inteſtine enemies within its body, that muſt ſhortly be its deſtruction: Nature having taught flies, as well as all other animals, the ſureſt methods of perpetuating their kind.—"Towards the end of Auguſt," ſays Reaumur, "I perceived a little fly, of a beautiful gold colour, buſily employed in the body of a large carerpillar, of that kind which feeds upon cabbage. I gently ſeparated that part of the leaf on which theſe inſects were placed, from the reſt of the plant, and placed it where I might obſerve them more at my eaſe. The fly wholly taken up by the buſineſs in which it was employed, walked along the caterpillar's body, now and then remaining fixed to a particular ſpot. Upon this occaſion, I perceived it every now and then dart a ſting, which it carried at the end of its tail, into the caterpillar's body, and then drew it out again, to repeat the ſame operation in another place. It was not difficult for me to conjecture the buſineſs which engaged this animal ſo earneſtly; its whole aim was to depoſit its eggs in the caterpillar's body; which was to ſerve as a proper retreat for bringing them to perfection. The reptile thus rudely treated, ſeemed to bear all very patiently, only moving a little when ſtung too deeply; which, however, the fly ſeemed entirely to diſregard. I took particular care to feed this caterpillar; which ſeemed to me to continue as voracious and vigorous as any of the reſt of this kind. In about ten or twelve days, it changed into an aurelia, which ſeemed gradually to decline, and died: upon examining its internal parts, the animal was entirely devoured by worms; which, however, did not come to perfection, as it is probable they had not enough to ſuſtain them within."

What the French philoſopher perceived upon this occaſion, is every day to be ſeen in ſeveral of the larger kinds of caterpillars, whoſe bodies ſerve as a neſt to various flies, that very carefully depoſit their eggs within them. The large cabbage catterpillar is ſo ſubject to its injuries that, at certain ſeaſons, it is much eaſier to find them with than without them. The ichneumon fly, as it is called, particularly infeſts theſe reptiles, and prevents their fecundity. This fly is of all others, the moſt formidable to inſects of various kinds. The ſpider, that deſtroys the ant, the moth, and the butterfly, yet often falls a prey to the ichneumon; who purſues the robber to his retreat, and, deſpiſing his nets, tears him in pieces, in the very labyrinth he has made. This inſect, as redoubtable as the little quadruped that deſtroys the crocodile, has received the ſame name; and from its deſtruction of the caterpillar tribe, is probably more ſerviceable to mankind. This inſect, I ſay, makes the body of the caterpillar the place for depoſiting its eggs; to the number of ten, fifteen, or twenty. As they are laid in thoſe parts which are not mortal, the reptile ſtill continues to live, and to feed,

feed, ſhewing no ſigns of being incommoded by its new gueſts. The caterpillar changes its ſkin; and ſometimes undergoes the great change into an aurelia: but ſtill the fatal intruders work within, and ſecretly devour its internal ſubſtance: ſoon after they are ſeen burſting through its ſkin, and moving away, in order to ſpin themſelves a covering, previous to their own little transformation. It is indeed aſtoniſhing ſometimes to ſee the number of worms, and thoſe pretty large, that thus iſſue from the body of a ſingle caterpillar, and eat their way through its ſkin: but it is more extraordinary ſtill, that they ſhould remain within the body, devouring its entrails, without deſtroying its life. The truth is, they ſeem inſtructed by Nature not to devour its vital parts; for they are found to feed only upon that fatty ſubſtance which compoſes the largeſt part of the caterpillar's body. When this ſurpriſing appearance was firſt obſerved, it was ſuppoſed that the animal thus gave birth to a number of flies, different from itſelf; and that the ſame caterpillar ſometimes bred an ichneumon, and ſometimes a butterfly: but it was not till after more careful inſpection, it was diſcovered, that the ichneumon tribe were not the caterpillar's offspring, but its murderers.

Having before mentioned the damages inflicted by the caterpillar tribe, we now come to an animal of this kind, that alone compenſates for all the miſchief occaſioned by the reſt. This little creature, which only works for itſelf, has been made of the utmoſt ſervice to man; and furniſhes him with a covering more beautiful than any other animal can ſupply. We may declaim indeed againſt the luxuries of the times, when ſilk is ſo generally worn; but were ſuch garments to fail, what other arts could ſupply their deficiency?

Though ſilk was anciently brought in ſmall quantities to Rome, yet it was ſo ſcarce as to be ſold for its weight in gold; and was conſidered as ſuch a luxurious refinement in dreſs, that it was infamous for a man to appear in habbits of which ſilk formed but half the compoſition. It was moſt probably brought among them from the remoteſt parts of the Eaſt; ſince it was, at the time of which I am ſpeaking, ſcarcely known even in Perſia.

Nothing can be more remote from the truth, than the manner in which their hiſtorians deſcribe the animal by which ſilk is produced. Pauſanius informs us, that ſilk came from the country of the Seres, a people of Aſiatic Scythia; in which place an inſect, as large as the beetle, but in every other reſpect reſembling a ſpider, was bred up for that purpoſe. They take great care, as he aſſures us, to feed and defend it from the weather; as well during the ſummer's heat, as the rigours of winter. This inſect, he obſerves, makes its web with its feet, of which it has eight in number. It is fed, for the ſpace of four years, upon a kind of paſte, prepared for it; and at the beginning of the fifth, it is ſupplied with the leaves of the green willow, of which it is particularly fond. It then feeds till it burſts with fat; after which they take out its bowels, which are ſpun into the beautiful manufacture ſo ſcarce and coſtly.

The real hiſtory of this animal was unknown among the Romans till the times of Juſtinian; and it is ſuppoſed, that ſilkworms were not brought into Europe till the beginning of the twelfth century, when Roger of Sicily brought workmen in this manufacture from Aſia Minor, after his return from his expedition to the Holy Land, and ſettled them

in Sicily and Calabria. From theſe the other kingdoms of Europe learned this manufacture; and it is now one of the moſt lucrative carried on among the ſouthern provinces of Europe.

The ſilkworm is now very well known to be a large caterpillar, of a whitiſh colour, with twelve feet, and producing a butterfly of the moth kind. The cone on which it ſpins, is formed for covering it while it continues in the aurelia ſtate; and ſeveral of theſe, properly wound off, and united together, form thoſe ſtrong and beautiful threads, which are woven into ſilk. The feeding theſe worms, the gathering, the winding, the twiſting, and the weaving their ſilk, is one of the principal manufactures of Europe; and, as our luxuries increaſe, ſeems every day more and more neceſſary to human happineſs.

There are two methods of breeding ſilk-worms; for they may be left to grow, and remain at liberty upon the trees where they are hatched; or they may be kept in a place built for that purpoſe, and fed every day with freſh leaves. The firſt method is uſed in China, Tonquin, and other hot countries; the other is uſed in thoſe places where the animal has been artificially propagated, and ſtill continues a ſtranger. In the warm climates, the ſilk worm proceeds from an egg, which has been glued by the parent moth upon proper parts of the mulberry-tree, and which remains in that ſituation during the winter. The manner in which they are ſituated and fixed to the tree, keeps them unaffected by the influence of the weather; ſo that thoſe froſts which are ſevere enough to kill the tree, have no power to injure the ſilkworm.

The inſect never proceeds from the egg till Nature has provided it a ſufficient ſupply; and till the budding leaves are furniſhed, in ſufficient abundance, for its ſupport. When the leaves are put forth, the worms ſeem to feel the genial ſummons, and burſting from their little eggs, crawl upon the leaves, where they feed with a moſt voracious appetite. Thus they become larger by degrees; and after ſome months feeding, they lay, upon every leaf, ſmall bundles, or cones of ſilk, which appear like ſo many golden apples, painted on a fine green ground. Such is the method of breeding them in the Eaſt: and without doubt it is beſt for the worms, and leaſt troubleſome for the feeder of them. But it is otherwiſe in our colder European climates; the frequent changes of the weather, and the heavy dews of our evenings, render the keeping them all night expoſed, ſubject to ſo many inconveniences, as to admit of no remedy. It is true, that by the aſſiſtance of nets, they may be preſerved from the inſults of birds; but the ſevere cold weather, which often ſucceeds the firſt heats of ſummer, as well as the rain and high winds, will deſtroy them all: and, therefore, to breed them in Europe, they muſt be ſheltered and protected from every external injury.

For this purpoſe, a room is choſen, with a ſouth aſpect; and the windows are ſo well glazed, as not to admit the leaſt air: the walls are well built, and the planks of the floor exceeding cloſe, ſo as to admit neither birds nor mice, nor even ſo much as an inſect. In the middle there ſhould be four pillars erected, or four wooden poſts, ſo placed as to form a pretty large ſquare. Between theſe are different ſtories made with oſier hurdles; and under each hurdle there ſhould be a floor, with an upright border all round. Theſe hurdles and floors muſt hang upon pullies, ſo as to be placed, or taken down at pleaſure.

When

When the worms are hatched, ſome tender mulberry leaves are provided, and placed in the cloth or paper box in which the eggs were laid, and which are large enough to hold a great number. When they have acquired ſome ſtrength, they muſt be diſtributed on beds of mulberry leaves, in the different ſtories of the ſquare in the middle of the room, round which a perſon may freely paſs on every ſide. They will fix themſelves to the leaves, and afterwards to the ſticks of the hurdles, when the leaves are devoured. They have then a thread, by which they can ſuſpend themſelves on occaſion, to prevent any ſhock by a fall; but this is by no means to be conſidered, as the ſilk which they ſpin afterwards in ſuch abundance. Care muſt be taken that freſh leaves be brought every morning, which muſt be ſtrewed very gently and equally over them; upon which the ſilk worms will forſake the remainder of the old leaves, which muſt be carefully taken away, and every thing kept very clean; for nothing hurts theſe inſects ſo much as moiſture and uncleanlineſs. For this reaſon their leaves muſt be gathered when the weather is dry, and kept in a dry place, if it be neceſſary to lay in ſtore. As theſe animals have but a ſhort time to live, they make uſe of every moment, and almoſt continually are ſpinning, except at thoſe intervals when they change their ſkins. If mulberry leaves be difficult to be obtained, the leaves of lettuce or holyoak will ſuſtain them: but they do not thrive ſo well upon their new diet; and their ſilk will neither be ſo copious, nor of ſo good a quality.

Though the judicious choice, and careful management of their diet, is abſolutely neceſſary, yet there is another precaution of equal importance, which is to give them air, and open their chamber windows, at ſuch times as the ſun ſhines warmeſt. The place alſo muſt be kept as clean as poſſible; not only the ſeveral floors that are laid to receive their ordure, but the whole apartments in general. Theſe things well obſerved, contribute greatly to their health and increaſe.

The worm, at the time it burſts the ſhell, is extremely ſmall, and of a black colour; but the head is of a more ſhining black than the reſt of the body: ſome days after, they begin to turn whitiſh, or of an aſh-coloured grey. After the ſkin begins to grow too rigid, or the animal is ſtinted within it, the inſect throws it off, and appears clothed a-new: it then becomes larger and much whiter, though it has a greeniſh caſt: after ſome days, which are more or leſs, according to the different heat of the climate, or to the quality of the food, it leaves off eating, and ſeems to ſleep for two days together: then it begins to ſtir, and put itſelf into violent motions, till the ſkin fall off the ſecond time, and is thrown aſide by the animal's feet. All theſe changes are made in three weeks or a month's time; after which it begins to feed once more, ſtill in its caterpillar form, but a good deal differing from itſelf before its change. In a few days' time it ſeems to ſleep again; and, when it awakes, it again changes its clothing, and continues feeding as before. When it has thus taken a ſufficiency of food, and its parts are diſpoſed for aſſuming the aurelia form, the animal forſakes for the laſt time, all food and ſociety, and prepares itſelf a retreat to defend it from external injuries, while it is ſeemingly deprived of life and motion.

This retreat is no other than its cone, or ball of ſilk, which Nature has taught it to compoſe with great art; and within which it buries

itſelf, till it aſſumes its winged form. This cone or ball is ſpun from two little longiſh kinds of bags that lie above the inteſtines, and are filled with a gummy fluid, of a marigold colour. This is the ſubſtance of which the threads are formed; and the little animal is furniſhed with a ſurpriſing apparatus for ſpinning it to the degree of fineneſs which its occaſions may require. This inſtrument in ſome meaſure reſembles a wire-drawer's machine, in which gold or ſilver threads are drawn to any degree of minuteneſs; and through this the animal draws its thread with great aſſiduity. As every thread proceeds from two gum bags, it is probable that each ſupplies its own; which, however, are united, as they proceed from the animal's body. If we examine the thread with a microſcope, it will be found that it is flatted on one ſide, and groved along its length: from hence we may infer, that it is doubled juſt upon leaving the body; and that the two threads ſtick to each other by that gummy quality of which they are poſſeſſed. Previous to ſpinning its web, the ſilkworm ſeeks out ſome convenient place to erect its cell, without any obſtruction. When it has found a leaf, or a chink fitted to its purpoſe, it begins to wreathe its head in every direction, and faſtens its thread on every ſide to the ſides of its retreat. Though all its firſt eſſays ſeem perfectly confuſed, yet they are not altogether without deſign: there appears indeed, no order or contrivance in the diſpoſal of its firſt threads; they are by no means laid artfully over each other, but are thrown out at random, to ſerve as an external ſhelter againſt rain; for Nature having appointed the animal to work upon trees in the open air, its habits remain, though it is brought up in a warm apartment.

Malphigi pretends to have obſerved ſix different layers in a ſingle cone of ſilk: but what eaſily may be obſerved is, that it is compoſed externally of a kind of rough cotton-like ſubſtance, which is called floſs; within the thread is more diſtinct and even; and next the body of the aurelia, the apartment ſeems lined with a ſubſtance of the hardneſs of paper, but of a much ſtronger conſiſtence. It muſt not be ſuppoſed, that the thread which goes to compoſe the cone, is rolled round, as we roll a bottom; on the contrary, it lies upon it in a very irregular manner, and winds off now from one ſide of the cone, and then from the other. This whole thread, if meaſured, will be found about three hundred yards long; and ſo very fine, that eight or ten of them are generally rolled off into one by the manufacturers. The cone, when completed, is in form like a pigeon's egg, and more pointed at one end than the other; at the ſmaller end, the head of the aurelia is generally found; and this is the place that the inſect, when converted into a moth, is generally ſeen to burſt through.

It is generally a fortnight or three weeks before the aurelia is changed into a moth; but no ſooner is the winged inſect completely formed, than having diveſted itſelf of its aurelia ſkin, it prepares to burſt through its cone, or outward priſon: for this purpoſe it extends its head towards the point of the cone, butts with its eyes, which are rough, againſt the lining of its cell, wears it away, and at laſt puſhes forward, through a paſſage which is ſmall at firſt, but which enlarges as the animal increaſes its efforts for emancipation; while the tattered remnants of its aurelia ſkin lie in confuſion within the cone, like a bundle of dirty linen.

The

The animal, when thus ſet free from its double confinement, appears exhauſted with fatigue, and ſeems produced for no other purpoſe but to tranſmit a future brood. It neither flies nor eats; the male only ſeeking the female, whoſe eggs he impregnates; and their union continues for four days, without interruption. The male dies immediately after ſeparation from his mate; and ſhe ſurvives him only till ſhe has laid her eggs, which are not hatched into worms till the enſuing ſpring.

However, there are few of theſe animals ſuffered to come to a ſtate of maturity; for as their burſting through the cone deſtroys the ſilk, the manufacturers take care to kill the aurelia, by expoſing it to the ſun, before the moth comes to perfection. This done, they take off the floſs, and throw the cones into warm water, ſtirring them till the firſt thread offers them a clue for winding all off. They generally take eight of the ſilken threads together; the cones ſtill kept under water, till a proper quantity of the ſilk is wound off: however, they do not take all; for the latter parts grow weak, and are of a bad colour. As to the paper-like ſubſtance which remains, ſome ſtain it with a variety of colours, to make artificial flowers, others let it lie in the water, till the glutinous matter which cements it is all diſſolved: it is then carded like wool, ſpun with a wheel, and converted into ſilk ſtuffs of an inferior kind.

CHAP. VI.

OF FLY INSECTS WITH FOUR MEMBRANACEOUS WINGS.

THE *Tenthredo* is diſtinguiſhed from others of this kind, by the female having a ſerrated weapon or ſting at the tail, and the worm from which it proceeds, has ſeveral feet. *Linnæus* diſtinguiſhes them into that clavated with feelers; that of the willow-tree; that of the poplar-tree; that of fig-wort; that of the roſe; and that of the birds cherry-tree.

The black *Tenthredo* with clavated feelers, is nearly of the ſize of a Hornet, and the body is black and hairy, only the third, fourth, and fifth joints, are of an iron-grey. The wings are thin and tranſparent, and the legs black, but the feet are yellow within, and the feelers are yellow, except at the loweſt joint, which is black. There are a few dark grey nerves in the wings, and the wings themſelves are of a brownish tincture towards the outer edge. The worm it proceeds from, is ſmooth and green, only there is a black liſt down the back, edged with yellow; it has twenty-eight legs, and often rolls itſelf up.

The black *Tenthredo* with feelers that have eleven joints, is of the ſize of a common Flie, and the wings have ſeveral veins; there are two black ſpots, on the uppermoſt of which, that neareſt the breaſt, is in the ſhape of a half-moon, but the other is round, and near it, towards the top, there is one that is white.

The yellow-legged *Tenthredo* is not much larger than a Flea, though the ſlender feelers are compoſed of ten joints. The head and breaſt are

below,

black, and bunched, and the body is of an oval ſhape, of an iron-grey below, and black towards the vent: the wings are larger than the body, of a whitiſh colour, and without ſpots.

The other ſpecies of the *Tenthredo* are,

1. The black *Tenthredo* with clavated feelers, an oval body, and iron-grey wings.

2. The black *Tenthredo* with iron grey legs, and a ſmall horn at the vent.

3. The black *Tenthredo* with iron-grey legs, and a depreſſed ſharp point at the vent.

4. The *Tenthredo* with feelers conſiſting of ſeven joints, with a yellow body, with the head and middle of the breaſt black; as alſo an oval ſpot on the wings.

5. The *Tenthredo* with feelers conſiſting of ſeven joints, and a yellow body, but black on the hinder part.

6. The *Tenthredo* with feelers conſiſting of ſeven joints, and a yellow body, and a black ſtreak on the wings.

7. The yellow *Tenthredo* with an iron-grey ſpot on each wing.

8. The black *Tenthredo* with yellow legs, and yellow marks on the breaſt.

9. The black *Tenthredo* with ſhort feelers.

10. The *Tenthredo* of the willow, which proceeds from a worm of a blueiſh-green, and has the breaſt and tail yellow.

11. The black *Tenthredo* with feelers that conſiſt of ſeven joints, and has the edges almoſt, and the ſegments of the body, yellow.

12. The *Tenthredo* with feelers conſiſting of ſeven joints, and a black back, marked with pale, tranſverſe, crooked lines.

13. The *Tenthredo* with feelers conſiſting of eighteen joints, and iron-grey legs, the hinder part being variegated with black and white.

14. The *Tenthredo* with black feelers, conſiſting of twelve joints, and the body is of an iron-grey below, and the legs yellow.

15. The *Tenthredo* with a braſſy green breaſt, and the body of a gold yellow colour.

16. The braſſy-blue *Tenthredo* with legs of a pale colour.

17. The black *Tenthredo* with the upper part of the breaſt greeniſh, and the legs proper for hopping.

18. The *Tenthredo* with a ſhining green breaſt, and a brown body, having a pale belt at the baſe, and yellow legs.

19. The *Tenthredo* with a black body, and yellow legs.

20. The black *Tenthredo* with white legs.

21. The *Tenthredo* proceeding from the gall of the willow leaf.

22. The *Tenthredo* proceeding from the gall of the beach leaf.

23. The *Tenthredo* proceeding from the gall of the Ilex.

24. The *Tenthredo* proceeding from the gall of ground-ivy.

25. The *Tenthredo* proceeding from the gall of the hairy hawk-weed.

Linnæus calls theſe inſects that proceed from galls, Cynips, of which he makes five kinds.

The *Ichneumon Flie* is diſtinguiſhed from others, by having a weapon with three forks at the tail, and are,

1. The common *Ichneumon Flie* with red legs, has a long, ſlender, black body, and the head, breaſt, feelers, and weapon at the tail, are of the ſame colour; but the legs are reddiſh, long, and ſlender, and the wings

are

are tranſparent, only there is a black ſpot near the edge. The weapon at the tail is longer than the body, and conſiſts of three parts like hairs, the two outermoſt of which are black, and the middlemoſt red. It is called by *Ray* the Waſp Ichneumon, with a ſlender, longiſh body, and three very long briſtles at the tail.

2. The yelloviſh *Waſp Ichneumon* with large wings, is all over of the ſame colour, and the body is of a crooked ſhape, but narrow at the baſe; the feelers are equal to the body in length, and are compoſed of a great number of joints; the eyes are large and black.

5. The *Ichneumon Flie* with ſilver-coloured wings, has an oblong black body, only it is of a blackiſh red in the middle, and it has two black feelers; the wings are marked near the upper edge with a blackiſh ſpot, and the legs are reddiſh, and at the tail there are three long hairs, and it flies very ſwiftly: this is nearly like that firſt deſcribed.

4. The whitiſh *Ichneumon Flie* is all over white, except four black ſpots on the wings, of which the outermoſt are greateſt, and the innermoſt leaſt. It keeps its wings when ſitting, erect, and has ſix feet, whereof the four legs are fixed to the body, and the pair before which are greater and black, take their riſe cloſe to the neck. It has two globous prominent black eyes, and two black ſhort feelers: the body is ſlender, round, and as long as the breadth of a man's finger, and it has three briſtles at the tail, as long as the body, which in flying it keeps of a triangular form. It appears in *May* and *June*, before and after rain. It uſes the fore feet as feelers, and ſeems to extend them as ſuch.

5. The *Ichneumon Flie* with ſilver wings and a black body, has a forked and crooked mouth, or ſnout, and on the forehead there are two ſhort horns or feelers. It has four legs or feet, and the pair under the breaſt are ſlender and ſhort; but the reſt below are ſtronger: the tail is oblong, with two ſhort hairs, and another in the middle, which is much longer.

6. The *Ichneumon Flie* with a black body and tail, has an oblong body, and two wings ſomewhat ſhorter than the body, with feet or legs of a ſaffron colour: the tail is equal in length to the reſt of the body, and it is a very uncommon Flie.

7. The *Ichneumon* called the *Cotton Flie*, becauſe it makes a web of the ſubſtance of cotton, of the ſize of a pigeon's egg, and is common among the graſs in the autumn.

8. The *Ichneumon Flie* whoſe worm feeds on the fleſh of the Caterpillar of the cabbage, being bred within its body.

9. The *Ichneumon Flie* with a hairy blueiſh black body.

10. The *Ichneumon Flie* with ſhelly thighs, and the feelers white in the middle.

11. The black *Ichneumon Flie* with iron-grey legs, and feelers of the ſame colour.

12. The black *Ichneumon Flie* with ſhelly legs, and feelers pale on the under part.

13. The black *Ichneumon Flie* with the hinder legs of an iron grey, and the reſt black, and the feelers white in the middle.

14. The black *Ichneumon Flie* with the legs and top of the breaſt white.

15. The black *Ichneumon Flie* with reddiſh legs, and a pale forehead.

16.

16. The black *Ichneumon Flie* with reddiſh legs, only the top of thoſe behind are black, and the feelers white in the middle.

17. The black *Ichneumon Flie* with iron-grey legs, only the hinder pair are variegated with black and white.

18. The black *Ichneumon Flie* with red legs, a white forehead, and white ſpots on the body.

19. The black *Ichneumon Flie* with black legs, and four white ſpots on each ſide of the body.

20. The *Ichneumon Flie* with the body and legs of an iron-grey, and the middle of the feelers white.

21. The *Ichneumon Flie* with the body and legs of an iron grey, and a white ring on the feelers.

22. The yellow *Ichneumon Flie* with the extremity of the body black.

23. The *Ichneumon Flie* with an iron-grey body, only it is black at the extremity, and there is a white circle on the feelers.

24. The *Ichneumon Flie* with black feelers, and the body of an iron-grey, but black at the extremity.

25. The entirely iron-grey *Ichneumon Flie.*

26. The iron grey *Ichneumon Flie*, with the extremity of the body, and the lower part of the breaſt black.

27. The yellow-bodied *Ichneumon Flie*, that is yellow on the fore part, and black behind, with black joints of the legs.

28. The black and yellow *Ichneumon Flie*, having the body yellow on the fore part.

29. The black *Ichneumon Flie* with the fore part of the body of an iron-grey, and the top of the breaſt yellow.

30. The black *Ichneumon Flie* with brown wings, and the forward ſegments of the body of a reddiſh colour.

31. The *Ichneumon Flie* with the body of an iron-grey before, and black behind, and four white ſpots thereon.

32. The *Ichneumon Flie* with the forepart of the body of an iron-grey, and the hinder part black, with five yellow ſpots thereon, and the feelers whitiſh on one ſide.

33. The *Ichneumon Flie* with the fore part of the body of an iron-grey, and the hinder black, without ſpots; but the feelers are marked with a white circle.

34. The *Ichneumon Flie* with the fore part of the body of an iron-grey, and the hinder black, with yellowiſh inciſures, and a white circle on the feelers.

35. The red and black *Ichneumon Flie*, the middle of the body and the fore legs being reddiſh, and the lower of thoſe behind white.

36. The black *Ichneumon Flie* with the ſecond and third ſegments of the body yellow, as well as the legs.

37. The black *Ichneumon Flie* with white wings, and a double tranſverſe line on each.

38. The long ſlender-bodied *Ichneumon Flie* with briſtly feelers as long as the body, and clavated legs.

39. The braſſy green elegant *Ichneumon Flie* with black ſpiral feelers.

40. The great black *Ichneumon Flie* with the extremity of the body red.

CHAP.

CHAP. VII.

OF INSECTS OF THE BEE, OR WASP KIND, THAT HAVE STINGS IN THEIR TAILS.

TO give a complete hiſtory of this inſect in a few pages, which ſome have exhauſted volumes in deſcribing, and whoſe nature and properties ſtill continue in diſpute, is impoſſible. It will be ſufficient to give a general idea of the animal's operations; which, though they have been ſtudied for more than two thouſand years, are ſtill but incompletely known. The account given us by Reaumur is ſufficiently minute, and, if true, ſufficiently wonderful: but I find many of the facts which he relates, doubted by thoſe who are moſt converſant with bees; and ſome of them actually declared not to have a real exiſtence in nature.

It is unhappy, therefore, for thoſe whoſe method demands an hiſtory of bees, that they are unfurniſhed with thoſe materials which have induced ſo many obſervers to contradict ſo great a naturaliſt. His life was ſpent in the contemplation; and it requires an equal ſhare of attention, to prove the error of his diſcoveries. Without entering, therefore, into the diſpute, I will take him for my guide; and juſt mention, as I go along, thoſe particulars in which ſucceeding obſervers have begun to think him erroneous. Which of the two are right, time only can diſcover; for my part I have only heard one ſide, for as yet none have been ſo bold as openly to oppoſe Reaumur's delightful researches.

There are three different kinds of bees in every hive. Firſt, the labouring bees, which make up the far greateſt number, and are thought to be neither male nor female, but merely born for the purpoſes of labour, and continuing the breed, by ſupplying the young with proviſion, while yet in their helpleſs ſtate. The ſecond ſort are the drones; they are of a darker colour, longer, and more thick by one third than the former: they are ſuppoſed to be the males; and there is not above a hundred of them, in a hive of ſeven or eight thouſand bees. The third ſort is much larger than either of the former, and ſtill fewer in number: ſome aſſert, that there is not above one in every ſwarm; but this later obſervers affirm not to be true, there being ſometimes five or ſix in the ſame hive. Theſe are called queen bees, and are ſaid to lay all the eggs from which the whole ſwarm is hatched in a ſeaſon.

In examining the ſtructure of the common working bee, the firſt remarkable part that offers is the trunk, which ſerves to extract the honey from flowers. It is not formed, like that of other flies, in the manner of a tube, by which the fluid is to be ſucked up; but like a beſom, to ſweep, or a tongue, to lick it away. The animal is furniſhed alſo with teeth, which ſerve it in making wax. This ſubſtance is gathered from flowers, like honey; it conſiſts of that duſt or farina which contributes to the fecundation of plants, and is moulded into wax by the little animal, at leiſure. Every bee, when it leaves the hive to collect this precious ſtore, enters into the cup of the flower, particularly ſuch as ſeem charged with the greateſt quantities of this yellow farina. As the animal's body is covered over with hair, it rolls itſelf within the flower, and ſoon becomes quite covered with the duſt, which it ſoon after bruſhes off with its two hind legs, and kneads into two little balls. In the

thighs of the hind legs there are two cavities, edged with hair; and into theſe, as into a baſket, the animal ſticks its pellets. Thus employed, the bee flies from flower to flower, increaſing its ſtore, and adding to its ſtock of wax; until the ball, upon each thigh, becomes as big as a grain of pepper: by this time, having got a ſufficient load, it returns, making the beſt of its way to the hive.

The belly of the bee is divided into ſix rings, which ſometimes ſhorten the body, by ſlipping one over the other. It contains within it, beſide the inteſtines, the honey-bag, the venom bag, and the ſting. The honey bag is as tranſparent as cryſtal, containing the honey that the bee has bruſhed from the flowers; of which the greater part is carried to the hive, and poured into the cells of the honey-comb; while the remainder ſerves for the bee's own nouriſhment: for, during ſummer, it never touches what has been laid up for the winter. The ſting, which ſerves to defend this little animal from its enemies, is compoſed of three parts; the ſheath, and two darts, which are extremely ſmall and penetrating. Both the darts have ſeveral ſmall points or barbs, like thoſe of a fiſh-hook, which renders the ſting more painful, and makes the darts rankle in the wound. Still, however, this inſtrument would be very ſlight, did not the bee poiſon the wound. The ſheath, which has a ſharp point, makes the firſt impreſſion; which is followed by that of the darts, and then the venomous liquor is poured in. The ſheath ſometimes ſticks ſo faſt in the wound, that the animal is obliged to leave it behind; by which the bee ſoon after dies, and the wound is conſiderably inflamed. It might at firſt appear well for mankind, if the bee were without its ſting; but, upon recollection, it will be found, that the little animal would then have too many rivals in ſharing its labours. An hundred other lazy animals, fond of honey, and hating labour, would intrude upon the ſweets of the hive; and the treaſure would be carried off, for want of armed guardians to protect it.

From examining the bee ſingly, we now come to conſider it in ſociety, as an animal not only ſubject to laws, but active, vigilant, laborious, and diſintereſted. All its proviſions are laid up for the community; and all its arts in building a cell, deſigned for the benefit of poſterity. The ſubſtance with which bees build their cells is wax; which is faſhioned into convenient apartments for themſelves and their young. When they begin to work in their hives, they divide themſelves into four companies: one of which roves in the fields in ſearch of materials; another employs itſelf in laying out the bottom and partitions of their cells; a third is employed in making the inſide ſmooth from the corners and angles; and the fourth company bring food for the reſt, or relieve thoſe who return with their reſpective burthens. But they are not kept conſtant to one employment; they often change the taſks aſſigned them: thoſe that have been at work, being permitted to go abroad; and thoſe that have been in the fields already, take their places. They ſeem even to have ſigns, by which they underſtand each other; for when any of them wants food, it bends down its trunk to the bee from whom it is expected, which then opens its honey-bag, and lets ſome drops fall into the other's mouth, which is at that time opened to receive it. Their diligence and labour is ſo great, that, in a day's time, they are able to make cells, which lie upon each other, numerous enough to contain three thouſand bees.

If

If we examine their cells, they will be found formed in the exacteſt proportion. It was ſaid by Pappus, an ancient geometrician, that, of all other figures, hexagons were the moſt convenient; for, when placed touching each other, the moſt convenient room would be given, and the ſmalleſt loſt. The cells of the bees are perfect hexagons: theſe, in every honeycomb, are double, opening on either ſide, and cloſed at the bottom. The bottoms are compoſed of little triangular panes, which, when united together, terminate in a point, and lie exactly upon the extremities of other panes of the ſame ſhape, in oppoſite cells. Theſe lodgings have ſpaces, like ſtreets, between them, large enough to give the bees a free paſſage in and out; and yet narrow enough to preſerve the neceſſary heat. The mouth of every cell is defended by a border, which makes the door a little leſs than the inſide of the cell, which ſerves to ſtrengthen the whole. Theſe cells ſerve for different purpoſes: for laying up their young; for their wax, which in winter becomes a part of their food; and for their honey, which makes their principal ſubſiſtence.

It is well known that the habitation of bees ought to be very cloſe; and what their hives want, from the negligence or unſkilfulneſs of man, theſe animals ſupply by their own induſtry: ſo that it is their principal care, when firſt hived, to ſtop up all the crannies. For this purpoſe they make uſe of a reſinous gum, which is more tenacious than wax, and differs greatly from it. This the ancients called *Propolis*: it will grow conſiderably hard in June; though it will in ſome meaſure ſoften by heat; and is often found different in conſiſtence, colour, and ſmell. It has generally an agreeable aromatic odour when it is warmed; and by ſome it is conſidered as a moſt grateful perfume. When the bees begin to work with it, it is ſoft, but it acquires a firmer conſiſtence every day; till at length it aſſumes a brown colour, and becomes much harder than wax. The bees carry it on their hinder legs; and ſome think it is met with on the birch, the willow, and poplar. However it is procured, it is certain that they plaiſter the inſide of their hives with this compoſition.

If examined through a glaſs hive, from the hurry the whole ſwarm is in, the whole at firſt appears like anarchy and confuſion: but the ſpectator ſoon finds every animal diligently employed, and following one purſuit with a ſettled purpoſe. Their teeth are the inſtruments by which they model and faſhion their various buildings, and give them ſuch ſymmetry and perfection. They begin at the top of the hive; and ſeveral of them work at a time, at the cells which have two faces. If they are ſtinted with regard to time, they give the new cells but half the depth which they ought to have; leaving them imperfect, till they have ſketched out the number of cells neceſſary for the preſent occaſion. The conſtruction of their combs, coſt them a great deal of labour: they are made by inſenſible additions; and not caſt at once in a mould, as ſome are apt to imagine. There ſeems no end of their ſhaping, finiſhing, and turning them neatly up. The cells for their young are moſt carefully formed; thoſe deſigned for lodging the drones, are larger than the reſt; and that for the queen-bee, the largeſt of all. The cells in which the young brood are lodged, ſerve at different times for containing honey; and this proceeds from an obvious cauſe: every worm, before it is transformed into an aurelia, hangs its old ſkin on the par-

titions of its cell; and thus, while it ſtrengthens the wall, diminiſhes the capacity of its late apartment. The ſame cell in a ſingle ſummer, is often tenanted by three or four worms in ſucceſſion; and the next ſeaſon by three or four more. Each worm takes particular care to fortify the pannels of its cell, by hanging up its ſpoils there: thus, the partitions being lined, ſix or eight deep, become at laſt too narrow for a new brood, and are converted into ſtore-houſes, for honey.

Thoſe cells where nothing but honey is depoſited, are much deeper than the reſt. When the harveſt of honey is ſo plentiful that they have not ſufficient room for it, they either lengthen their combs, or build more; which are much longer than the former. Sometimes they work at three combs at a time; for when there are three work-houſes, more bees may be thus employed, without embarraſſing each other.

But honey, as was before obſerved, is not the only food upon which theſe animals ſubſiſt. The meal of flowers, of which their wax is formed, is one of their moſt favourite repaſts. This is a diet which they live upon during the ſummer; and of which they lay up a large winter proviſion. The wax of which their combs are made, is no more than this meal digeſted, and wrought into a paſte. When the flowers upon which bees generally feed, are not fully blown, and this meal or duſt is not offered in ſufficient quantities, the bees pinch the tops of the ſtamina in which it is contained, with their teeth; and thus anticipate the progreſs of vegetation. In April and May, the bees are buſy, from morning to evening, in gathering this meal; but when the weather becomes too hot in the midſt of ſummer, they work only in the morning.

The bee is furniſhed with a ſtomach for its wax, as well as its honey. In the former of the two, their powder is altered, digeſted, and concocted into real wax: and is thus ejected by the ſame paſſage by which it was ſwallowed. Every comb, newly made, is white: but it becomes yellow as it grows old, and almoſt black when kept too long in the hive. Beſide the wax thus digeſted, there is a large portion of the powder kneaded up for food in every hive, and kept in ſeparate cells, for winter proviſion. This is called by the country people, bee-bread; and contributes to the health and ſtrength of the animal during winter. Thoſe who rear bees, may rob them of their honey, and feed them during the winter, with treacle; but no proper ſubſtitute has yet been found for the bee-bread; and without it, the animals become conſumptive and die.

As for the honey, it is extracted from that part of the flower called the nectareum. From the mouth this delicious fluid paſſes into the gullet; and then into the firſt ſtomach, or honey-bag, which, when filled, appears like an oblong bladder. Children, that live in country places, are well acquainted with this bladder; and deſtroy many bees to come at their ſtore of honey. When a bee has ſufficiently filled its firſt ſtomach, it returns back to the hive, where it diſgorges the honey into one of the cells. It often happens that the bee delivers its ſtore to ſome other, at the mouth of the hive, and flies off for a freſh ſupply. Some honey-combs are always left open for common uſe; but many others are ſtopped up, till there is a neceſſity of opening them.

Each

Each of theſe are covered carefully with wax; ſo cloſe, that the covers ſeem to be made at the very inſtant the fluid is depoſited within them.

Having thus given a curſory deſcription of the inſect, individually conſidered, and of the habitation it forms, we next come to its ſocial habits and inſtitutions: and, in conſidering this little animal attentively, after the neceſſary precautions for the immediate preſervation of the community, its ſecond care is turned to the continuance of poſterity. How numerous ſoever the multitude of bees may appear in one ſwarm, yet they all owe their original to a ſingle parent, which is called the *Queen-Bee.* It is indeed ſurpriſing that a ſingle inſect ſhall, in one ſummer, give birth to above twenty thouſand young: but, upon opening her body, the wonder will ceaſe; as the number of eggs appearing, at one time, amounts to five thouſand. This animal, whoſe exiſtence is of ſuch importance to her ſubjects, may eaſily be diſtinguiſhed from the reſt, by her ſize, and the ſhape of her body. On her ſafety depends the whole welfare of the commonwealth; and the attentions paid her by all the reſt of the ſwarm, evidently ſhew the dependence her ſubjects have upon her ſecurity. If this inſect be carefully obſerved, ſhe will be ſeen at times attended with a numerous retinue, marching from cell to cell, plunging the extremity of her body into many of them, and leaving a ſmall egg in each.

The bees which generally compoſe her train, are thought to be males, which ſerve to impregnate her by turns. Theſe are larger and blacker than the common bees; without ſtings, and without induſtry. They ſeem formed only to tranſmit a poſterity; and to attend the queen, whenever ſhe thinks proper to iſſue from the ſecret retreats of the hive, where ſhe moſt uſually reſides. Upon the union of theſe two kinds depends all expectations of a future progeney; for the working bees are of no ſex, and only labour for another offspring: yet ſuch is their attention to their queen, that if ſhe happens to die, they will leave off working, and take no farther care of poſterity. If, however, another queen is in this ſtate of univerſal deſpair preſented them, they immediately acknowledge her for ſoverign, and once more diligently apply to their labour. It muſt be obſerved, however, that all this fertility of the queen bee, and the great attentions paid to her by the reſt, are controverted by more recent obſervers. They aſſert, that the common bees are parents themſelves; that they depoſit their eggs in the cells which they have prepared; that the females are impregnated by the males, and bring forth a progeny, which is wholly their own.

However, to go on with their hiſtory, as delivered us by Mr Reaumur—When the queen-bee has depoſited the number of eggs neceſſary in the cells, the working bees undertake the care of the riſing poſterity. They are ſeen to leave off their uſual employments; to conſtruct proper receptacles for eggs; or to complete thoſe that are already formed. They purpoſely build little cells, extremely ſolid, for the young; in which they employ a great deal of wax: thoſe deſigned for lodging the males, as was already obſerved, are larger than the reſt; and thoſe for the queen-bees the largeſt of all. There is uſually but one egg depoſited in every cell; but when the fecundity of the queen is ſuch, that it exceeds the number of cells already prepared, there are ſometimes three or four eggs crowded together in the ſame apartment. But this is an inconvenience that the working bees will by no means ſuffer.

They

They ſeem ſenſible that, two young ones, ſtuffed up in the ſame cell, when they grow larger, will but embarraſs, and at laſt deſtroy each other: they therefore take care to leave a cell to every egg; and remove, or deſtroy the reſt.

The ſingle egg that is left remaining, is fixed to the bottom of the cell, and touches it but in a ſingle point. A day or two after it is depoſited, the worm is excluded from the ſhell of the egg, having the appearance of a maggot rolled up in a ring, and lying ſoftly on a bed of a whitiſh coloured jelly; upon which alſo the little animal begins to feed. In the mean time, the inſtant it appears, the working bees attend it with the moſt anxious and parental tenderneſs; they furniſh it every hour with a ſupply of this whitiſh ſubſtance, on which it feeds and lies; and watch the cell with unremitting care. They are nurſes that have a greater affection for the offspring of others, than many parents have for their own children. They are conſtant in viſiting each cell, and ſeeing that nothing is wanting; preparing the white mixture, which is nothing but a compoſition of honey and wax, in their own bowels, with which they feed them. Thus attended, and plentifully fed, the worm, in leſs than ſix days time, comes to its full growth, and no longer accepts the food offered it. When the bees perceive that it has no further occaſion for feeding, they perform the laſt offices of tenderneſs, and ſhut the little animal up in its cell; walling up the mouth of its apartment with wax: there they leave the worm to itſelf; having ſecured it from every external injury.

The worm is no ſooner left incloſed, but, from a ſtate of inaction, it begins to labour, extending and ſhortening its body; and by this means lining the walls of its apartment with a ſilken tapeſtry, which it ſpins in the manner of caterpillars, before they undergo their laſt transformation. When their cell is thus prepared, the animal is ſoon after transformed into an aurelia; but differing from that of the common caterpillar, as it exhibits not only the legs, but the wings of the future bee, in its preſent ſtate of inactivity. Thus, in about twenty, or one and twenty days after the egg was laid, the bee is completely formed, and fitted to undergo the fatigues of its ſtate. When all its parts have acquired their proper ſtrength and conſiſtence, the young animal opens its priſon, by piercing with its teeth the waxen door that confines it. When juſt freed from its cell, it is as yet moiſt, and incommoded with the ſpoils of its former ſituation; but the officious bees are ſoon ſeen to flock round it, and to lick it clean on all ſides with their trunks; while another band, with equal aſſiduity, are obſerved to feed it with honey: others again begin immediately to cleanſe the cell that has been juſt left; to carry the ordures out of the hive, and to fit the place for a new inhabitant. The young bee ſoon repays their care, by its induſtry; for as ſoon as ever its external parts become dry, it diſcovers its natural appetites for labour, and induſtriouſly begins the taſk, which it purſues unremittingly through life. The toil of man is irkſome to him, and he earns his ſubſiſtence with pain; but this little animal ſeems happy in its purſuits, and finds delight in all its employments.

When juſt freed from the cell, and properly equipped by its fellow bees for duty, it at once iſſues from the hive, and inſtructed only by Nature, goes in queſt of flowers, chooſes only thoſe that yield it a ſupply, rejects ſuch as are barren of honey, or have been already drained

by

by other adventurers; and when loaded, is never at a loſs to find its way back to the common habitation. After this firſt ſally, it begins to gather th mealy powder, that lies on every flower, which is afterwards converted into wax; and with this, the very firſt day, it returns with two large balls ſtuck to its thighs.

When bees firſt begin to break their priſons, there are generally above an hundred excluded in one day. Thus, in the ſpace of a few weeks, the number of the inhabitants in one hive, of moderate ſize, becomes ſo great, that there is no place to contain the new comers; and they are ſcarcely excluded from the cell, when they are obliged, by the old bees, to ſally forth in queſt of new habitations. In other words, the hive begins to ſwarm, and the new progeny prepares for exile.

While there is room enough in the hive, the bees remain quietly together; it is neceſſity alone that compels the ſeparation. Sometimes, indeed, the young brood, with graceleſs obſtinacy, refuſe to depart, and even venture to reſiſt their progenitors. The young ones are known by being browner than the old, with whiter hair; the old ones are of a lighter colour, with red hair. The two armies are therefore eaſily diſtinguiſhable, and dreadful battles are often ſeen to enſue. But the victory almoſt ever terminates with ſtrict poetical juſtice in favour of the veterans, and the rebellious offspring are driven off, not without loſs and mutilation.

In different countries, the ſwarms make their appearance at different times of the year, and there are ſeveral ſigns previous to this intended migration. The night before, an unuſual buzzing is heard in the hive; in the morning, though the weather be ſoft and inviting, they ſeem not to obey the call, being intent on more important meditations within. All labour is diſcontinued in the hive, every bee is either employed in forcing, or reluctantly yielding a ſubmiſſion; at length, after ſome noiſe and tumult, a queen bee is choſen to guard rather than conduct the young colony to other habitations, and then they are marſhalled without any apparent conductor. In leſs than a minute they leave their native abode, and forming a cloud round their protectreſs, they ſet off, without ſeeming to know the place of their deſtination: *The world before them, where to chooſe their place of reſt.* The uſual time of ſwarming is from ten in the morning to three in the afternoon, when the ſun ſhines bright, and invites them to ſeek their fortunes. They flutter for a while in the air, like flakes of ſnow, and ſometimes undertake a diſtant journey, but more frequently are contented with ſome neighbouring aſylum; the branch of a tree, a chimney-top, or ſome other expoſed ſituation. It is, indeed, remarkable, that all thoſe animals, of whatever kind, that have long been under the protection of man, ſeem to loſe a part of their natural ſagacity, in providing for themſelves. The rabbit, when domeſticated, forgets to dig holes, the hen to build a neſt, and the bee to ſeek a ſhelter, that ſhall protect it from the inclemencies of the winter. In thoſe countries, where the bees are wild, and unprotected by man, they are always ſure to build their waxen cells in the hollow of a tree; but with us, they ſeem improvident in their choice, and the firſt green branch that ſtops their flight, ſeems to be thought ſufficient for their abode through winter. However, it does not appear, that the queen chuſes

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the place where they are to alight, for many of the ſtragglers, who ſeem to be pleaſed with a particular branch, go and ſettle upon it; others are ſeen to ſucceed, and at laſt, the queen herſelf, when ſhe finds a ſufficient number there before her, goes to make it the place of her head quarters. When the queen is ſettled, the reſt of the ſwarm ſoon follow; and, in about a quarter of an hour, the whole body ſeem to be at eaſe. It ſometimes is found, that there are two or three queens to a ſwarm, and the colony is divided into parties; but it moſt uſually happens, that one of theſe is more conſiderable than the other, and the bees by degrees, deſert the weakeſt, to take ſhelter under the moſt powerful protector. The deſerted queen does not long ſurvive this defeat; ſhe takes refuge under the new monarch, and is ſoon deſtroyed by her jealous rival. Till this cruel execution is performed, the bees never go out to work; and if there ſhould be a queen bee belonging to the new colony left in the old hive, ſhe always undergoes the fate of the former. However, it muſt be obſerved, that the bees never ſacrifice any of their queens, when the hive is full of wax and honey; for there is at that time, no danger in maintaining a plurality of breeders.

When the ſwarm is thus conducted to a place of reſt, and the policy of government is ſettled, the bees ſoon reſume their former labours. The making cells, ſtoring them with honey, impregnating the queen, making proper cells for the reception of the riſing progeny, and protecting them from external danger, employ their unceaſing induſtry. But ſoon after, and towards the latter end of ſummer, when the colony is ſufficiently ſtored with inhabitants, a moſt cruel policy enſues. The drone bees, which are (as has been ſaid) generally in a hive, to the number of an hundred, are marked for ſlaughter. Theſe, which had hitherto led a life of indolence and pleaſure, whoſe only employment was in impregnating the queen, and rioting upon the labours of the hive, without aiding in the general toil, now ſhare the fate of moſt voluptuaries, and fall a ſacrifice to the general reſentment of ſociety.

The working bees, in a body, declare war againſt them; and in two or three days time, the ground all round the hive is covered with their dead bodies. Nay, the working bees will kill ſuch drones, as are yet in the worm ſtate, in the cell, and eject their bodies from the hive, among the general carnage.

When a hive ſends out ſeveral ſwarms in the year, the firſt is always the beſt, and the moſt numerous. Theſe, having the whole ſummer before them, have the more time for making wax and honey, and conſequently their labours are the moſt valuable to the proprietor. Although the ſwarm chiefly conſiſts of the youngeſt bees, yet it is often found that bees of all ages compoſe the multitude of emigrants, and it often happens, that bees of all ages are ſeen remaining behind. The number of them is always more conſiderable than that of ſome populous cities, for ſometimes upwards of forty thouſand are found in a ſingle hive. So large a body may well be ſuppoſed to work with great expedition; and in fact, in leſs than twenty-four hours, they will make combs above twenty inches long, and ſeven or eight broad. Sometimes they will half fill their hives with wax, in leſs than five days. In the firſt fifteen days, they are always found to make more wax than they do afterwards during the reſt of the year.

Such

Such are the out-lines of the natural hiſtory of theſe animals, as uſually found in our own country. How they are treated, ſo as to produce the greateſt quantity of honey, belongs rather to the rural œconomiſt, than the natural hiſtorian; volumes have been written on the ſubject, and ſtill more remains equally curious and new. One thing, however, it may be proper to obſerve that a farm, or country, may be over-ſtocked with bees, as with any other ſort of animal; for a certain number of hives, always require a certain number of flowers to ſubſiſt on. When the flowers near home are rifled, then are theſe induſtrious inſects ſeen taking more extenſive ranges, but their abilities may be over taxed; and if they are obliged, in queſt of honey, to go too far from home, they are over-wearied in the purſuit, they are devoured by birds, or beat down by the winds and rain.

From a knowledge of this, in ſome parts of France and Piedmont, they have contrived, as I have often ſeen, a kind of floating bee houſe. They have on board one barge, threeſcore or an hundred bee-hives, well defended from the inclemency of an accidental ſtorm; and with theſe the owners ſuffer themſelves to float gently down the river. As the bees are continually chooſing their flowery paſture along the banks of the ſtream, they are furniſhed with ſweets before unrifled; and thus a ſingle floating bee-houſe, yields the proprietor a conſiderable income. Why a method ſimilar to this has never been adopted in England, where we have more gentle rivers, and more flowery banks, than in any other part of the world, I know not; certainly it might be turned to advantage, and yield the poſſeſſor a ſecure, though perhaps a moderate income.

Having mentioned the induſtry of theſe admirable inſects, it will be proper to ſay ſomething of the effects of their labour, of that wax and honey, which are turned by man to ſuch various uſes. Bees gather two kinds of wax, one coarſe and the other fine. The coarſer ſort is bitter, and with this, which is called *propolis*, they ſtop up all the holes and crevices of their hives. It is of a more reſinous nature than the fine wax, and is conſequently better qualified to reſiſt the moiſture of the ſeaſon, and preſerve the works warm and dry within. The fine wax is as neceſſary to the animal's preſervation as the honey itſelf. With this they make their lodgings, with this they cover the cells of their young, and in this they lay up their magazines of honey. This is made, as has been already obſerved, from the duſt of flowers, which is carefully kneaded by the little inſect, then ſwallowed, and having undergone a kind of digeſtion, is formed into the cells, which anſwers ſuch a variety of purpoſes. To collect this, the animal rolls itſelf in the flower it would rob, and thus takes up the vegetable duſt with the hair of its body. Then carefully bruſhing it into a lump, with its fore paws it thruſts the compoſition into two cavities behind the thighs, which are made like ſpoons to receive the wax, and the hair that lines them, ſerves to keep it from falling.

As of wax, there are alſo two kinds of honey: The white and the yellow. The white is taken without fire from the honey-combs. The yellow is extracted by heat, and ſqueezed through bags, in a preſs. The beſt honey is new, thick, and granulated, of a clear tranſparent white colour, of a ſoft and aromatic ſmell, and of a ſweet and lively taſte. Honey made in mountainous countries, is preferable to that of the valley. The honey made in the ſpring, is more highly eſteemed,

than that gathered in ſummer, which laſt is ſtill more valuable, than that of autumn, when the flowers begin to fade and loſe their fragrance.

The bees are nearly alike in all parts of the world, yet there are differences worthy our notice. In Guadaloupe, the bee is leſs by one half, than the European, and more black and round. They have no ſting, and make their cells in hollow trees; where, if the hole they meet with is too large, they form a ſort of waxen houſe, of the ſhape of a pear, and in this they lodge and ſtore their honey, and lay their eggs. They lay up their honey in waxen veſſels, of the ſize of a pigeon's egg, of a black or deep violet colour: and theſe are ſo joined together, that there is no ſpace left between them. The honey never congeals, but is fluid, of the conſiſtence of oil, and the colour of amber. Reſembling theſe, there are are found little black bees, without a ſting, in all the tropical climates; and though theſe countries are replete with bees, like our own, yet thoſe form the moſt uſeful and laborious tribe in that part of the world. The honey they produce, is neither ſo unpalatable, nor ſo ſurfeiting as ours; and the wax is ſo ſoft, that it is only uſed for medicinal purpoſes, it being never found hard enough to form into candles, as in Europe.

Of inſects, that receive the name of bees, among us, there are ſeveral; which, however, differ very widely from that induſtrious, ſocial race we have been juſt deſcribing. The Humble Bee is the largeſt of all this tribe, being as large as the firſt joint of one's middle finger. Theſe are ſeen in every field, and perched on every flower. They build their neſt in holes in the ground, of dry leaves, mixed with wax and wool, defended with moſs from the weather. Each humble bee makes a ſeparate cell about the ſize of a ſmall nutmeg, which is round and hollow, containing the honey in a bag. Several of theſe cells are joined together, in ſuch a manner, that the whole appears like a cluſter of grapes. The females, which have the appearance of waſps, are very few, and their eggs are laid in cells, which the reſt ſoon cover over with wax. It is uncertain whether they have a queen or not; but there is one much larger than the reſt, without wings and without hair, and all over black, like poliſhed ebony. This goes and views all the works, from time to time, and enters into the cell, as if it wanted to ſee whether every thing was done right: In the morning, the young humble bees are very idle, and ſeem not at all inclined to labour, till one of the largeſt, about ſeven o'clock, thruſts half its body from a hole, deſigned for that purpoſe, and ſeated on the top of the neſt, beats its wings for twenty minutes ſucceſſively, buzzing the whole time, till the whole colony is put in motion. The humble bees gather honey, as well as the common bees; but it is neither ſo fine, nor ſo good, nor the wax ſo clean, or ſo capable of fuſion.

Beſides the bees already mentioned, there are various kinds among us, that have much the appearance of honey-makers, and yet make only wax. The Wood Bee is ſeen in every garden. It is rather larger than the common queen bee; its body of a blueiſh black, which is ſmooth and ſhining. It begins to appear at the approach of ſpring, and is ſeen flying near walls expoſed to a ſunny aſpect. This bee makes its neſt in ſome piece of wood, which it contrives to ſcoop and hollow for its purpoſe. This, however is never done in trees that are ſtanding,

ſtanding, for the wood it makes choice of is half rotten. The holes are not made directly forward, but turning to one ſide, and have an opening ſufficient to admit one's middle finger; from whence runs the inner appartment, generally twelve or fifteen inches long. The inſtruments uſed in boaring theſe cavities, are their teeth; the cavity is uſually branched into three or four apartments; and in each of theſe, they lay their eggs, to the number of ten or twelve, each ſeparate and diſtinct from the reſt: The egg is involved in a ſort of paſte, which ſerves at once for the young animal's protection and nouriſhment. The grown bees, however, feed upon ſmall inſects, particularly a louſe, of a reddiſh brown colour, of the ſize of a ſmall pin's head.

Maſon Bees make their cells with a ſort of mortar, made of earth, which they build againſt a wall that is expoſed to the ſun. The mortar, which at firſt is ſoft, ſoon becomes as hard as ſtone, and in this their eggs are laid. Each neſt contains ſeven or eight cells, an egg in every cell, placed regularly one over the other. If the neſt remains unhurt, or wants but little repairs they make uſe of them the year enſuing: and thus they often ſerve three or four years ſucceſſively. From the ſtrength of their houſes, one would think theſe bees in perfect ſecurity, yet none are more expoſed than they. A worm with very ſtrong teeth, is often found to bore into their little fortifications, and devour their young.

The *Ground Bee* builds its neſt in the earth, wherein they make round holes, five or ſix inches deep; the mouth being narrow, and only juſt ſufficient to admit the little inhabitant. It is amuſing enough, to obſerve the patience and aſſiduity with which they labour. They carry out all the earth, grain by grain, to the mouth of the hole, where it forms a little hillock, an Alps compared to the power of the artiſt by which it is raiſed. Sometimes the walks of a garden are found undermined by their labours; ſome of the holes running directly downward, others horizontally beneath the ſurface. They lay up in theſe cavities proviſions for their young, which conſiſt of a paſte that has the appearance of corn, and is of a ſweetiſh taſte.

The *Leaf-cutting Bees* make their neſt and lay their eggs among bits of leaves very artificially placed in holes in the earth, of about the length of a tooth-pick caſe. They make the bits of leaves of a roundiſh form, and with them line the inſide of their habitations. This tapeſtry is ſtill further lined by a reddiſh kind of paſte, ſomewhat ſweet or acid. Theſe bees are of various kinds; thoſe that build their neſts with cheſnut-leaves are as big as drones, but thoſe of the roſe-tree are ſmaller than the common bee.

The *Wall Bees* are ſo called, becauſe they make their neſts in walls of a kind of ſilky membrane with which they fill up the vacuities between the ſmall ſtones which form the ſides of their habitation. Their apartment conſiſts of ſeveral cells placed end to end, each in the ſhape of a woman's thimble. Though the web which lines this habitation is thick and warm, yet it is tranſparent and of a whitiſh colour. This ſubſtance is ſuppoſed to be ſpun from the animal's body. The male and females are of a ſize, but the former are without a ſting. To theſe varieties of the bee kind might be added ſeveral others which are all different in nature, of which hereafter.

However ſimilar many inſects may be in appearance, this does not imply a ſimilitude in their hiſtory. The bee and the waſp reſemble each other very ſtrongly, yet, in examining their manner and their duration, they differ very widely; the bee labours to lay up honey, and lives to enjoy the fruits of its induſtry; the waſp appears equally aſſiduous, but only works for poſterity, as the habitation is ſcarcely completed when the inhabitant dies.

The waſp is well known to be a winged inſect with a ſting. To be longer in proportion to its bulk than the bee, to be marked with bright yellow circles round its body, and to be the moſt ſwift and active inſect of all the fly kind. On each ſide of the mouth this animal is furniſhed with a long tooth, notched like a ſaw, and with theſe it is enable to cut any ſubſtance, not omitting meat itſelf, and to carry it to its neſt. Waſps live like bees in community, and ſometimes ten or twelve thouſand are found inhabiting a ſingle neſt.

Of all other inſects the waſp is the moſt fierce, voracious, and moſt dangerous when enraged. They are ſeen wherever fleſh is cutting up, gorging themſelves with the ſpoil, and then flying to their neſts with their reeking prey. They make war alſo on every other fly, and the ſpider himſelf dreads their approaches.

Every community among bees is compoſed of females or queens, drones or males, and neutral or working bees. Waſps have ſimilar occupation; the two firſt are for propagating the ſpecies, the laſt for nurſing, defending, and ſupporting the riſing progeny. Among bees, however, there is ſeldom above a queen or two in an hive; among waſps there are above two or three hundred.

As ſoon as the ſummer begins to invigorate the inſect tribes, the waſps are the moſt of the number, and diligently employed either in providing proviſions for their neſt, if already made, or in making one, if the former habitation be too ſmall to receive the increaſing community. The neſt is one of the moſt curious objects in natural hiſtory, and contrived almoſt as artificially as that of the bees themſelves. Their principal care is to ſeek out an hole that has been begun by ſome other animal, a field mouſe, a rat, or a mole, to build their neſts in. They ſometimes build upon the plain, where they are ſure of the dryneſs of their ſituation, but moſt commonly on the ſide of a bank to avoid the rain or water that would otherwiſe annoy them. When they have choſen a proper place they go to work with wonderful aſſiduity. Their firſt labour is to enlarge and widen the hole, taking away the earth and carrying it off to ſome diſtance. They are perfectly formed for labour, being furniſhed with a trunk above their mouths, two ſaws on each ſide which play to the right and left againſt each other, and ſix ſtrong muſcular legs to ſupport them. They cut the earth into ſmall parcels with their ſaws, and carry it out with their legs or paws. This is the work of ſome days; and at length the outline of their habitation is formed, making a cavity of about a foot and an half every way. While ſome are working in this manner, others are roving the fields to ſeek out materials for their building. To prevent the earth from falling down and cruſhing their riſing city into ruin, they make a ſort of roof with their gluey ſubſtance, to which they begin to fix the rudiments of their building, working from the top downwards, as if they were hanging a bell, which, however, at length they cloſe up at the bottom.

tom. The materials with which they build their nefts are bits of wood and glue. The wood they get where they can from the rails and poſts which they meet with in the fields and elſewhere. Theſe they ſaw and divide into a multitude of ſmall fibres, of which they take up little bundles in their claws, letting fall upon them a few drops of gluey matter with which their bodies are provided, by the help of which they knead the whole compoſition into a paſte, which ſerves them in their future building. When they have returned with this to their neſt, they ſtick their load of paſte on that part where they make their walls and partitions; they tread it cloſe with their feet, and trowel it with their trunks, ſtill going backwards as they work. Having repeated this operation three or four times, the compoſition is at length flatted out until it becomes a ſmall leaf of a grey colour, much finer than paper, and of a pretty firm texture. This done the ſame waſp returns to the field to collect a ſecond load of paſte, repeating the ſame ſeveral times, placing layer upon layer, and ſtrengthening every partition in proportion to the wants or convenience of the general fabric. Other working waſps come quickly after to repeat the ſame operation laying more leaves upon the former, till at length, after much toil, they have finiſhed the large roof which is to ſecure them from the tumbling in of the earth. This dome being finiſhed, they make another entrance to their habitation, deſigned either for letting in the warmth of the ſun, or for eſcaping in caſe one door be invaded by plunderers. Certain however it is, that by one of theſe they always enter, by the other they ſally forth to their toil; each hole being ſo ſmall that they can paſs but one at a time. The walls being thus compoſed, and the whole ſomewhat of the ſhape of a pear, they labour at their cells, which they compoſe of the ſame paper like ſubſtance that goes to the formation of the outſide works. Their combs differ from thoſe of bees, not leſs in the compoſition than the poſition which they are always ſeen to obtain. The honey comb of the bees is edgeways with reſpect to the hive; that of the waſp is flat, and the mouth of every cell opens downward. Thus is their habitation, contrived ſtory above ſtory, ſupported by ſeveral rows of pillars which give firmneſs to the whole building, while the upper ſtory is flat-roofed, and as ſmooth as the pavement of a room, laid with ſquares of marble. The waſps can freely walk upon theſe ſtories between the pillars to do whatever their wants require. The pillars are very hard and compact, being larger at each end than in the middle, not much unlike the columns of a building. All the cells of the neſt are only deſtined for the reception of the young, being replete with neither wax nor honey.

Each cell is like that of the bee, hexagonal; but they are of two ſorts, the one larger for the production of the male and female waſps, the other leſs for the reception of the working part of the community. When the females are impregnated by the males, they lay their eggs, one in each cell, and ſtick it in with a kind of gummy matter to prevent its falling out. From this egg proceeds the inſect in its worm ſtate, of which the old ones are extremely careful, feeding it from time to time till it becomes large, and entirely fills up its cell. But the waſp community differs from that of the bee in this; that among the latter the working bees take the parental duties upon them, whereas among the waſps the females alone are permitted to feed their young, and to nurſe

their

their riſing progeny. For this purpoſe the female waits with great patience till the working waſps have brought in their proviſions, which ſhe takes from them, and cuts into pieces. She then goes with great compoſure from cell to cell, and feeds every young one with her mouth. When the young worms have come to a certain ſize they leave off eating, and begin to ſpin a very fine ſilk, fixing the firſt end to the entrance of the cell, then turning their heads, firſt on one ſide, then on the other, they fix the thread, to different parts, and thus they make a ſort of a door which ſerves to cloſe up the mouth of the cell. After this they diveſt themſelves of their ſkins after the uſual mode of transformation, the aurelia by degrees begins to emancipate itſelf from its ſhell; by little and little it thruſts out its legs and wings, and inſenſibly acquires the colour and ſhape of its parent.

The waſp thus formed, and prepared for depredation, becomes a bold, troubleſome, and dangerous inſect: there are no dangers which it will not encounter in purſuit of its prey, and nothing ſeems to ſatiate its gluttony. Though it can gather no honey of its own, no animal is more fond of ſweets. For this purpoſe it will purſue the bee and the humble bee, deſtroy them with its ſting, and then plunder them of their honey-bag, with which it flies triumphantly loaded to its neſt to regale its young. Waſps are ever fond of making their neſts in the neighbourhood of bees, merely to have an opportunity of robbing their hives, and feaſting on the ſpoil. Yet the bees are not found always patiently ſubmiſſive to their tyranny, but fierce battles, are ſometimes ſeen to enſue, in which the bees make up by conduct and numbers what they want in perſonal proweſs. When there is no honey to be had, they ſeek for the beſt and ſweeteſt fruits, and they are never miſtaken in their choice. From the garden they fly to the city, to the grocers ſhops, and butchers ſhambles. They will ſometimes carry off bits of fleſh half as big as themſelves, with which they fly to their neſts for the nouriſhment of their brood. Thoſe who cannot drive them away, lay for them a piece of ox's liver, which being without fibres, they prefer to other fleſh; and whenever they are found, all other flies are ſeen to deſert the place immediately. Such is the dread with which theſe little animals impreſs all the reſt of the inſect tribes, which they ſeize and devour without mercy, that they vaniſh at their approach. Wherever they fly, like the eagle or the falcon, they form a deſert in the air around them. In this manner the ſummer is paſſed in plundering the neighbourhood, and rearing up their young; every day adds to their numbers; and from their ſtrength, agility, and indiſcriminate appetite for every kind of proviſion, were they as long lived as the bee, they would ſoon ſwarm upon the face of Nature, and become the moſt noxious plague of man: but providentially their lives are meaſured to their miſchief, and they live but a ſingle ſeaſon.

While the ſummer heats continue, they are bold, voracious, and enterpriſing; but as the ſun withdraws, it ſeems to rob them of their courage and activity. In proportion as the cold increaſes, they are ſeen to become more domeſtic; they ſeldom leave the neſt, they make but ſhort adventures from home, they flutter about in the noon-day heats, and ſoon after return chilled and feeble.

As their calamities increaſe, new paſſions ſoon begin to take place; the care for poſterity no longer continues, and as the parents are no

longer

longer able to provide their growing progeny a ſupply, they take the barbarous reſolution of ſacrificing them all to the neceſſity of the times. In this manner, like a garriſon upon ſhort allowance, all the uſeleſs hands are deſtroyed; the young worms, which a little before they fed and protected with ſo much aſſiduity, are now butchered and dragged from their cells. As the cold increaſes they no longer find ſufficient warmth in their neſts, which grow hateful to them, and they fly to ſeek it in the corners of houſes, and places that receive an artificial heat. But the winter is ſtill inſupportable; and, before the new year begins, they wither and die; the working waſps firſt, the males ſoon following, and many of the females ſuffering in the general calamity. In every neſt, however, one or two females ſurvive the winter, and having been impregnated by the male during the preceding ſeaſon, ſhe begins in ſpring to lay her eggs in a little hole of her own contrivance. This bundle of eggs, which is cluſtered together like grapes, ſoon produces two worms which the female takes proper precaution to defend and ſupply, and theſe when hatched ſoon give aſſiſtance to the female, who is employed in hatching two more; theſe alſo gathering ſtrength, extricate themſelves out of the web that encloſed them, and become likewiſe aſſiſtants to their mother; fifteen days after, two more make their appearance; thus is the community every day increaſing, while the female lays in every cell, firſt a male and then a female. Theſe ſoon after become breeders in turn, till, from a ſingle female, ten thouſand waſps are ſeen produced before the month of June. After the female has thus produced her progeny, which are diſtributed in different diſtricts, they aſſemble from all parts, in the middle of ſummer, and provide for themſelves the large and commodious habitation, which has been deſcribed above.

Such is the hiſtory of the ſocial waſp; but, as among bees, ſo alſo among theſe inſects, there are various tribes that live in ſolitude: theſe lay their eggs in a hole for the purpoſe, and the parent dies long before the birth of its offspring. In the principal ſpecies of the SOLITARY WASPS, the inſect is ſmaller than the working waſp of the ſocial kind. The filament, by which the corſelet is joined to the body, is longer and more diſtinctly ſeen, and the whole colour of the inſect is blacker than in the ordinary kinds. But it is not their figure, but the manners of this extraordinary inſect that claim our principal regard.

From the end of May to the beginning of July, this waſp is ſeen moſt diligently employed. The whole purpoſe of its life ſeems to be in contriving and fitting up a commodious apartment for its young one, which is not to ſucceed it till the year enſuing. For this end it is employed, with unwearied aſſiduity in boring a hole into the fineſt earth ſome inches deep, but not much wider than the diameter of its own body. This is but a gallery leading to a wider apartment deſtined for the convenient lodgment of its young. As it always chuſes a gravelly ſoil to work in, and where the earth is almoſt as hard as ſtone itſelf; the digging and hollowing this apartment is an enterpriſe of no ſmall labour: for effecting its operations, this inſect is furniſhed with two teeth, which are ſtrong and firm, but not ſufficiently hard to penetrate the ſubſtance through which it is reſolved to make its way. In order therefore to ſoften that earth which it is unable to pierce, it is furniſhed with a gummy liquor which it emits upon the place, and which ren-

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ders it more eaſily ſeparable from the reſt, and the whole becoming a kind of ſoft paſte is removed to the mouth of the habitation. The animal's proviſion of liquor in theſe operations is however ſoon exhauſted; and it is then ſeen either taking up water from ſome neighbouring flower or ſtream in order to ſupply the deficiency.

At length, after much toil, a hole ſome inches deep is formed, at the bottom of which is a large cavity; and to this no other hoſtile inſect would venture to find its way, from the length and the narrowneſs of the defile through which it would be obliged to paſs. In this the ſolitary waſp lays its egg, which is deſtined to continue the ſpecies; there the naſcent animal is to continue for above nine months, unattended and immured, and at firſt appearance the moſt helpleſs inſect of the creation. But when we come to examine, new wonders offer, no other inſect can boaſt ſo copiouſly luxurious a proviſion, or ſuch confirmed ſecurity.

As ſoon as the mother waſp has depoſited her egg at the bottom of the hole, her next care is to furniſh it with a ſupply of proviſions, which may be offered to the young inſect as ſoon as it leaves the egg. To this end ſhe procures a number of little green worms, generally from eight to twelve, and theſe are to ſerve as food for the young one the inſtant it awakens into life. When this ſupply is regularly arranged and laid in, the old one then, with as much aſſiduity as it before worked out its hole, now cloſes the mouth of the paſſage; and thus leaving its young one immured in perfect ſecurity, and in a copious ſupply of animal food, ſhe dies ſatisfied with having provided for a future progeny.

When the young one leaves the egg it is ſcarcely viſible, and is ſeen immured among a number of inſects, infinitely larger than itſelf, ranged in proper order around it, which, however give it no manner of apprehenſion. Whether the parent, when ſhe laid in the inſect proviſion, contrived to diſable the worms from reſiſtance, or whether they were at firſt incapable of any, is not known. Certain it is, that the young glutton feaſts upon the living ſpoil without any controul; his game lies at his hand, and he devours one after the other as the calls of appetite incite him. The life of the young animal is therefore ſpent in the moſt luxurious manner, till its whole ſtock of worms is exhauſted, and then the time of its transformation begins to approach; and then ſpinning a ſilken web, it continues fixed in its cell till the ſun calls it from its dark abode the enſuing ſummer.

The waſps of Europe are very miſchievous, yet they are innocence itſelf when compared to thoſe of the tropical climates, where all the inſect tribes are not only numerous, but large, voracious, and formidable. Thoſe of the Weſt Indies are thicker, and twice as long as the common bee; they are of a grey colour, ſtriped with yellow, and armed with a very dangerous ſting. They make their cells in the manner of a honey-comb, in which the young ones are hatched and bred. They generally hang their neſts by threads, compoſed of the ſame ſubſtance with the cells, to the branches of trees, and the caves of houſes. They are ſeen every where in great abundance, deſcending like fruit, particularly pears, of which ſhape they are, and as large as one's head. The inſide is divided into three round ſtories, full of cells, each hexagonal, like thoſe of an honey-comb. In ſome of the iſlands theſe inſects

ſects are ſo very numerous, that their neſts are ſtuck up in this manner, ſcarce two feet aſunder, and the inhabitants are in continual apprehenſion from their accidental reſentment. It ſometimes happens, that no precautions can prevent their attacks, and the pains of their ſting is almoſt inſupportable. Thoſe who have felt it think it more terrible than even that of a ſcorpion; the whole viſage ſwells, and the features are ſo disfigured, that a perſon is ſcarcely known by his moſt intimate acquaintance.

CHAP. VIII.

A MORE PARTICULAR ACCOUNT OF BEES, AND THE FRENCH METHOD OF MANAGING THEM.

BEES being the moſt profitable inſects yet known, except ſilk Worms, the reader will not be diſpleaſed to have a more particular account of them, and their management, by way of ſupplement to what has been ſaid before. And if any thing be repeated, that has been mentioned before, it will be only done to render this account more complete and uniform.

Bees in ancient times were all wild, and they inhabited the vaſt foreſts of *Poland*, *Ruſſia*, and other northern countries, lodging in hollow trees, holes in the rocks, and in the ground. They are inſects of a wonderful kind, and which naturaliſts have treated of in different ages; inſomuch that ſome pretend there have been philoſophers, who ſpent the greateſt part of their time, in ſtudying their nature. However in this age, they are better known by much than formerly; *Swammerdam* in particular, has made curious reſearches into their nature, as well as *Maraldi*, and *Reaumur*, two ingenious members of the royal academy of ſciences.

We now are very certain, that in every hive, there are three diſtinct kinds of Bees; the moſt numerous of which are the common ſort, whoſe buſineſs it is to gather the honey and wax. Theſe may be called the labouring Bees, and according to the moſt curious obſervers, they are neither male nor female. Another ſort are the drones, and theſe are males. Of the third ſort, there is generally but one, which was commonly called the king, but is now known to be the queen, for it is a female, and is always the mother of a numerous poſterity.

With regard to the external parts of the common Bees, the moſt remarkable are the head, the corſlet or breaſt, and the body or belly. In the head there are the eyes, placed on each ſide, and two feelers, compoſed of ſeveral joints, and two teeth or pinchers, and the trunk or ſnout, which is a kind of tongue, encloſed in two caſes, and of a ſubſtance reſembling that of a horn, or ſcales, with a large mouth, ſeated at the root of the tongue. The corſlet is joined to the head by a ſhort neck, and on it there are four wings above, and ſix legs or feet below, of which the two hindermoſt are longer than the reſt, and externally in the middle, there is a hollowneſs, in the ſhape of a ſpoon,

bordered with fifteen hairs. The loweſt part of each leg, which may be called the foot, is compoſed of five joints, by which they are enabled to uſe them as hands, and they terminate in a kind of bruſh: the body properly ſo called, or belly, is joined to the corſlet by a ſort of thread, and is compoſed of ſix ſcaly rings: the whole body of the Bee, appears hairy to the naked eye; and as for the reſt, they differ a little from theſe, in ſize and colour.

With regard to the inward parts, upon examination, there appears a veſicle of the ſize of a ſmall pea, and when it is full of honey, it is tranſparent: the ſting is placed at the extremity of the body, and is one ſixth of an inch in length, terminating in a fine point. Towards the baſe of the ſting, there is a bladder, remarkable for its tranſparence and ſolidity, which is oblong like an olive, and full of a very clear fluid, terminating by a kind of excretory veſſel, deſigned to conduct the poiſon of the reſervoir into the ſting, which enters and paſſes out in great ſwiftneſs, by the means of certain muſcles.

The *Drone* may be diſtinguiſhed from the working Bee, not only by the trunk, the teeth, and the eyes, but by the corſlet, which is more hairy than that of the common Bee, and the rings of the belly are more ſmooth. Beſides the hairs of the bruſhes of the hind feet, are more crouded together, and ſhorter: the body is generally larger and longer, by about a third part, and the head in particular, is more round and more full of hair. Add to this, that at certain ſeaſons, there are two fleſhy horns behind, about a third part as long as the body, and ſometimes longer; and between theſe two horns, there is a fleſhy ſubſtance, which riſes upon the hinder part of the body, and is crooked like a bow: the inward parts are alſo different, for he has no ſting, and within the body, there is little elſe but thick, white, crooked veſſels, that are pretty ſolid, and contain a milky fluid.

The *Queen* is longer, but not ſo thick as the Drone, and the wings are very ſhort, in proportion to the length of the body; for they ſcarcely cover it half way: the trunk is much ſhorter, and more ſlender, than that of the working Bee; but longer and thicker than that of the Drone: the corſlet is brown, and the rings of the belly are of a deep cheſnut colour: the ſting is much larger than that of the common Bee; but inſtead of being ſtraight, turns back a little towards the belly; the bladder of venom is proportionable thereto. Her eggs are diſtributed into two ovaries, one of which is on the right ſide, and the other on the left. Each ovary is an aſſemblage of veſſels, all which terminate in a common canal, and which are full of eggs, at the time of breeding.

In the management of *Bees*, great care muſt be taken to provide them a proper lodging: the hives deſigned for this purpoſe, are of different forms, and different materials, in different countries; but they are generally a ſort of baſkets, nearly of a conical figure: thoſe that are moſt ſkilful in the management of theſe inſects, affirm, that the hives ought to be made of plaited rye ſtraw, becauſe they are moſt proper to defend the Bees againſt the ſeverity of the winter cold, and the ſcorching heat of ſummer. Some plaiſter them over with a mortar, or with aſhes, mixed with cow dung; by which means no rain can get into the hive; for all the crannies will be ſtopped up, by which it might enter.

The hives ought always to be placed where the ſun may ſhine upon them the greateſt part of the day, and conſequently they ſhould never

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be expoſed to the north wind. Likewiſe they will be beſt to be ſo placed, that the ſun may ſhine upon them early in the morning, as alſo late in the evening. However it muſt be obſerved, that though the ſun is very advantageous to Bees, yet there are times, when his beams are too ſcorching, which will render the hives too hot, ſo as to diſturb the Bees, and to melt their wax. Upon this account, it will be beſt to place them under a cover or roof, to preſerve them from the extreme heat of the ſun, and from the rain. But where this cannot eaſily be done, they may be thatched or covered with ſtraw, which will have the ſame effect.

Glaſs hives are a new invention, and were deſigned to enable perſons to ſee what was doing in the inſide. However they are needleſs in the winter ſeaſon, becauſe when there is a froſt, the Bees are ſo benumbed, that any one may examine their hives, by laying them on one ſide, or even turning them upſide down. Then the Bees may be ſeen heaped together, and lying as cloſe to each other as poſſible. They generally keep in the lower part of the cakes of wax, or at moſt about the middle of the hive. But as ſoon as it thaws, and eſpecially if the ſun ſhines, ſo as to render the hive warm, they then are rouzed out of their lethargy. Hence it appears, that heat is abſolutely neceſſary for their preſervation; and this they endeavour to encreaſe, by their motion, and the agitation of their wings. Likewiſe the more numerous the bees are in a hive, the warmer they are. However when their activity is returned, they are then under a neceſſity of taking nouriſhment, and conſequently they have recourſe to their proviſions; for then they begin to feed upon the lower combs. Hence the milder the winter is, the more honey they conſume; and they are ſometimes in danger of a famine, and to die of hunger, before the flowry ſeaſon returns. Thus a very ſevere winter, and one that is too mild, are equally dangerous.

It is commonly ſaid, that the aſhes of a fig tree, is capable of bringing dead Bees to life; but this is a miſtake, for thoſe Bees which are thought to be dead, becauſe they are motionleſs, are not really ſo; though it muſt be owned, that in extreme cold weather, any perſon may be deceived. At this time a handful may be taken, without the danger of being ſtung; but if they are put upon warm aſhes, or near a gentle fire, they will immediately ſhow that they are alive.

Beſides cold, hunger, and old age, Bees are ſaid to be ſubject to fluxes, which ſometimes bring on a mortality among them; and they are alſo ſubject to other diſeaſes; and thoſe Bees that are brought into any cloſe place, ſuch as a green-houſe, during the winter, are more ſubject to diſeaſes, than others, that are left in the gardens, with an aperture, by which freſh air may enter, and through which they are at liberty to fly out when they pleaſe, and when the weather is fine. However the middle practice is the beſt, which is to leave thoſe hives in the open air, that are well ſtocked with Bees, and to place thoſe in the green houſe, which are thin of Bees. It is the opinion of *Reaumur*, that it will be the beſt to put theſe laſt into tubs, open at the top, and to fill up the empty ſpaces, between the ſides of the tub and the hive, with fine hay, ſhort ſtraw, ſand, or dried earth; but they muſt be defended from the rain, by a covering, placed at a proper diſtance over it. This he thinks is a good expedient to preſerve

them from the effects of cold, and much better than to place them in a green houſe. The charge will be little, becauſe the ſame tubs will ſerve for a great number of years. Large wicker baſkets may be alſo made uſe of in the ſame manner.

The deſign of the ſtings of Bees, is not to hurt mankind, but to defend them againſt their enemies which are very numerous. Hornets and Waſps will tear open the bellies of Bees, to ſuck the contents. Spiders alſo are enemies, but they are not able to do ſo much harm; as for Ants, they want nothing but the honey; but Lizards, Frogs, and Toads, will eat the Bees entirely up, when they can catch them. There is alſo a ſort of Moths, that will get into their cells, and will penetrate into a great number of them, to feed upon the wax, of which they are extremely fond. Old Bees are ſubject to a kind of Lice, which are not found upon the young; however they do not appear to be greatly moleſted by them. Field Mice and Birds, are greater enemies to Bees, than any thing elſe; inſomuch that in one night, when they are benumbed in the winter ſeaſon, a ſingle field Mouſe is able to deſtroy a hive that is very well ſtocked. *Reaumur* obſerves, that theſe animals generally eat nothing but the heads and the breaſts. They will ſerve Birds much in the ſame manner, for the young Larks have been found near the neſts, that have nothing wanting but the head and the neck. It is alſo ſaid, that among Birds, that thoſe called Bee eaters, Swallows, and Titmice, feed greatly upon Bees; but the Bird that does moſt miſchief among them, and deſtroys more than all the reſt put together, is the Sparrow. They ſwallow them like grains of corn, and they have been ſeen to carry three Bees at a time, to feed their young with, that is one in their bills, and two others in their claws.

Thoſe that are accuſtomed to take care of Bees, may go among them very ſafely, provided they do not anger them; but if they do, they muſt expect the reward of their raſhneſs. They generally attempt to ſting people in their faces, and when any one is ſtung, if the Bee is forced away too ſoon, it always leaves its ſting behind, with its appendages; but then the Bee will live but a ſhort time after it. The ſting is generally more painful in ſummer than in winter; for this depends upon the quantity of the venom, and the vigour of the Bee: beſides there are perſons which are more affected with the ſtings of Bees than others. Generally ſpeaking, the ſting is followed with an itching, an inflammation, a ſwelling, and a ſharp pain; and if it happens to be near the eyes, the eye-lids will ſometimes cloſe up for ſeveral days. Authors that have wrote upon this ſubject, pretend to give ſeveral remedies againſt the ſtinging of Bees; but *Reaumur* has tried them all, with little ſucceſs; however he thinks that the herb called arſe-mart, has proved better than any thing elſe, when bruiſed in a mortar, and applied thereto. But the beſt way is to take out the ſting as ſoon as poſſible, and then apply a little water, or vinegar, to the wound, as ſoon as poſſible, and then the pain will vaniſh; yet it has been obſerved, that it has ſometimes returned again, with as much violence as before.

Some have pretended, that there are certain ſmells, which give great offence to Bees; and that they are fondeſt of every thing that is clean and pure; but this is a miſtake, for they always like ſtanding dirty

dirty water, better than that which is quite limpid. But ſmoak will cauſe them to get at a diſtance from it, and if they cannot readily, it benumbs them, and makes them lye as if they were dead; this is the method ſome make uſe of, to get part of the honey out of the hive. This operation is performed at different times, in different countries; but the beſt is in the morning, after the Bees have been rendered leſs active by the coldneſs of the night, and then it will be almoſt needleſs to ſmoak them. However, in a warm ſeaſon, when flowers are plenty, they may be made to paſs out of a hive that is full of wax and honey, into another that is quite empty; but then the brood will be loſt; that is, the eggs, the nymphs, and the worms ready to be changed into nymphs. When the honey is taken away, it is but reaſonable, and even neceſſary, to leave the Bees about half for their own uſe.

In ſome places, when the ſummer is dry, and in conſequence thereof, the fields are leſs fruitful, then it is very difficult for the Bees to gather a ſufficient quantity of wax; but in thoſe countries that are full of meadows, that are well watered, and produce a ſucceſſion of different flowers; or even if there are woods, which by their ſhade, preſerve the moiſtneſs and coolneſs of the air, and by that means cauſe the vegetation of a great number of plants, in the hotteſt part of ſummer, then the Bees will find every thing in plenty, neceſſary for their uſe.

It was formely a cuſtom of the *Egyptians*, to carry the hives up the river *Nile* in boats, that the Bees might enjoy the benefit of the flowers that grew upon the banks; thus they removed them from place to place, that they might always enjoy the benefit of freſh flowers. The nations that live near the banks of the river *Po*, manage their Bees much in the ſame manner, as the ancient *Egyptians;* and the ſame practice has been recommended in *France;* but whether it has ever been done or not, is uncertain. *Columella* acquaints us, that the *Greeks* were accuſtomed every year, to remove the hives from *Achaia* into *Attica;* and the ſame thing is done at this very day, in the dutchy of *Juliers*, a diſtrict of *Weſtphalia*, in *Germany*. One perſon in particular, in the territory, called *Gatonis* in *France*, has been at the pains of removing his hives, after the harveſt of Sainfoin, into the plains of *Beauce*, where the melilot abounds, and then into *Salogne*, where it is well known the Bees may enjoy the advantage of Buck-wheat, till towards the end of *September*, for ſo long that plant retains its flowers. However this practice cannot be very agreeable to the Bees, becauſe their being carried in carts, diſturbs them more, than if they were in boats upon the water.

Authors have given different accounts of the length of the life of Bees; but they have generally maintained, that they may live ſeveral years; that is as long as a hive retains plenty of inhabitants; but this is a bad reaſon. Some affirm that Bees will live ſix or ſeven years, and others upwards of twelve. Others again pretend to be certain, that a third part in every hive, dies in autumn, and as many in the ſpring; for which reaſon they conclude, that they cannot live above a ſingle year. It is pretty certain, that the Bees of each hive, are renewed every year, or in two years time at moſt.

It is generally acknowledged, that the habitation of Bees ought to be very cloſe, and therefore it is their principal care, at firſt when they

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are hived, to ſtop up all the crannies. They make uſe of a ſort of reſinous gum, which is more tenaceous than wax, and differs greatly from it. This the *French* call propolis. It will grow conſiderably hard in *June*, though it will always grow ſoft with heat, and it varies in conſiſtence, colour, and ſmell. It has generally an aromatic, agreeable ſmell, when it is warmed, inſomuch that ſome place it in the rank of perfumes. The outward colour is of a reddiſh brown; but the inward more yellowiſh, and nearer the colour of wax. When the Bees begin to work with it, it is ſoft; but it acquires a firmer conſiſtence every day; till at length it becomes harder than wax. The Bees carry it on their hinder legs, and ſome think it is met with on poplar, birch, and willow trees; but there are others that will ſupply them with the ſame. It is much harder for them to get it from hence, than the powder which is upon the ſtamina of plants, and more difficult to manage, the Bees make uſe of the ſame ſubſtance to cover the ſticks laid croſsways, which help to ſupport the combs; and often they plaiſter a great part of the inner ſides of their hives therewith.

It is wonderful to conſider how the Bees build their combs, wherein the cells are of ſo regular a form, and applied ſo ingeniouſly, one againſt another. Every thing ſeems to be diſpoſed with ſo much ſymmetry, and ſo well finiſhed, that at firſt ſight, one may be tempted to think, that they are the principal workmanſhip of theſe induſtrious inſects. All the cells are hexagons, that is, they have ſix equal ſides; and this figure, not only takes up the leaſt room, but is the moſt capacious.

It is no eaſy matter to ſee them at work, except by the aſſiſtance of a glaſs hive. They are always ready to aſſiſt each other, in laying the foundation of ſome new comb, or enlarging the old, though a ſpectator might conclude from the hurry that they are in, that there was nothing but confuſion among them. However it is eaſy to perceive, that their teeth are the inſtruments, by which they model and faſhion their combs. They begin at the bottom of their building, and ſeveral of them work at a time, at the cells, which have two faces. But if they are ſtinted with regard to time, they give the new cells but half the depth which they ought to have, leaving them imperfect, and put off finiſhing them, till they have ſketched out the number of cells, which are neceſſary for the preſent time. The conſtruction of their combs, coſts them a great deal of labour, for they are not able to make them in molds, as at firſt ſome might think they were. They are all buſied in erecting, ſhaping, and poliſhing the cells that are unfiniſhed; and the uſe they make of them, is to lodge their honey, and to depoſit their brood therein, for there the eggs increaſe and grow, till they are transformed into Bees. But the cells deſigned for the worms to change into drones, ought to be larger than the reſt; and for that reaſon, they make ſome with greater diameters than others. The cells of the brood, at different times, ſerve for the honey-comb; however thoſe that were deſigned for the honey only, are much deeper than the reſt. When the harveſt of honey is ſo plentiful, that they have no ſufficient room for it, they either lengthen their combs, or build more, which are much longer than the former.

Sometimes they work at three combs at a time; for when there are three workhouſes, more Bees may be employed at a time, without embarraſſing each other, and they can perform their buſineſs more readi-

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ly. The combs are generally parallel to each other, and they are ſlightly faſtened to the top of the hive. There is always a ſpace between two combs, which are like ſtreets, that will only admit two at a time, a-breaſt. Though the combs conſiſt of very thin leaves of wax, yet when they are full of honey, they become heavy. The Bees have a method of connecting their combs to the ſides of their hive, for which reaſon, thoſe that make them, ſhould place ſmall ſticks acroſs each other, to ſerve as ſupports to the combs that are to be built, this will ſave the Bees a great deal of labour.

The ſubſtance wherewith they make their combs, is gathered from flowers; but not from every ſort indifferently; for it is only the ſtamina of flowers, that yield proper materials for making their wax; for they find none ready made. It is very common to ſee Bees ſitting upon flowers, with their bodies all over powder, which they could have got no where elſe. Sometimes they are ſo full of it, that they become quite yellow, and might be miſtaken, for another inſect. However they take care to clean themſelves with the bruſhes of their feet; and to make the powder into two ſmall balls, which they place in the two triangular cavities of their hinder legs. Sometimes theſe balls are as large as a grain of pepper, a little flatted. When the flowers are not fully blown, the Bees pinch the tops of the ſtamina with their teeth, wherein they know the grains of duſt are encloſed; and by this means they force them open. Some of theſe balls are yellow, others red, others of a whitiſh yellow, and others again green. In *April* and *May*, the Bees are buſy from morning to evening, in gathering the wax; but when the weather becomes hot, in *June* and *July*, they work only in the morning, till about ten o'clock, becauſe then the powder of the ſtamina, having been moiſtened with the dew, or with the fluid that they tranſpire, is of a more proper conſiſtance, than at other times, to be moulded into a maſs.

It is ſaid that the ſecond ſtomach is the organ, by which this powder is altered, digeſted, and connected into real wax; and is thrown out, through the ſame paſſage that it went in. It is with this ſort of paſte, that they build their combs, and when it is dry, it becomes the ſubſtance, named Bees wax. Every comb newly made is white; but they become yellowiſh as they grow old, and the very oldeſt of all, become almoſt black. But all theſe do not furniſh wax equally white, as is well known to thoſe, whoſe buſineſs it is to blanch it.

However as it is neceſſary for Bees to make a proviſion of rough wax, there is in every hive, a pretty large portion of the combs, whoſe cells are filled with nothing but wax; and theſe are like ſo many little magazines, where the Bees go to depoſit their little balls, one after another, while other Bees take care to knead them, preſs them, and place them in order. The Bees ſometimes come out of their hives at 4 o'clock in the morning, and continue labouring till 8 in the evening. They fly backwards and forwards, four or five times in a day, and ſometimes more, for this depends on the length of their journies, and the plenty of flowers.

It is obſervable that the Bees extract but a ſmall quantity of real wax out of the powder which they gather; becauſe a great part of the materials of wax, ſerves to feed them; it is alſo remarkable, that the drones never employ themſelves in making wax, all their nouriſhment being

being honey. With regard to the honey, it is but lately taken notice of, that there are veſſels in flowers full of a ſweet fluid, to which authors have given the name of nectarium, and it is to theſe that the Bees reſort, to gather the liquor, which afterwards becomes honey. To this purpoſe, they make uſe of their trunks, and with theſe the Bees conduct the fluid to their mouths, cauſing it to run along the upper part of their trunks. The powder of the ſtamina, is not the only nouriſhment of Bees, for it is very well known, they do not make honey on purpoſe for us. The ſweet fluid falls from the oeſophagus or gullet, into the firſt ſtomach, which while it is filled with honey, is in ſhape like an oblong bladder. Children that live in country places, are well acquainted with this bladder; and they even ſeek for it in the bodies of the Bees, and more eſpecially in thoſe of humble Bees, to ſuck out the honey. When a Bee has ſufficiently filled her firſt ſtomach it returns back to the hive, where it throws up the honey into a cell. There is reaſon to believe, that the honey does not return out of the body unchanged; becauſe the firſt ſtomach is capable of contraction, in the ſame manner as that of ruminating animals. It often happens, that the Bee, inſtead of flying back to the hive, goes back to the places where the other Bees are buſy in their ſeveral employments, and offers them honey, perhaps to hinder them from leaving off their work, to go in ſearch of food. Some of the honey combs are always left open for common uſe, but many others are ſtopped up, till there is a neceſſity of opening them; each of theſe are covered carefully with wax, ſo cloſe, that the covers ſeem to be made at the ſame time. This practice tends to preſerve the honey in the ſame degree of fluidity, as they deſign it ſhould have.

The ancients were of opinion, that the generation of Bees, was occaſioned by putrified ſubſtances, and not in a manner analogous to that of other animals. Some who have built their faith too much on what *Virgil* has ſaid in the fourth book of his Georgics, in the fable of the ſhepherd *Ariſtæus;* and have taken a bull of two years old, have ſtopped up his noſtrils, and afterwards killed him, and ſo left him to putrify. But this procedure was ſo far from producing ſwarms of Bees, that they only met with thouſands of maggots, and a dreadful ſtench. Others have publiſhed variety of fictitious ſtories, to acquaint the world in what manner theſe inſects generated.

During the greater part of the year, there is but one female in every hive, which may readily be diſtinguiſhed from other Bees, by the ſhape of her body; but it is ſomewhat difficult to find her out. The males, who may be ſeen by hundreds, ſpend almoſt their whole lives in company with the female. For this reaſon, they are ſeldom out of the hive, but they lie idle therein, doing nothing at all, but feeding upon the honey, which the working Bees have gathered. Nevertheleſs they are not uſeleſs, for though they do not work, they are abſolutely neceſſary for the production of other Bees.

The Bee, called the Queen, is moſt prodigiouſly fertile, for ſhe alone produces all the reſt of the Bees in the ſame hive. Inſomuch that there is no connection that can be greater, than between the reſt of the Bees and her. It is certain, that all the Bees leave off working, and take no farther care of futurity, after the death of the queen. She is full of a prodigious number of eggs; and it is for the ſake of theſe, that the Bees ſet themſelves to work. Beſides, if any other female Bee be

be put in among them, ſhe is immediately acknowledged for queen. The life of all the reſt, is nothing in compariſon of her's. They do her all manner of ſervices, and pay her all the homage, that is due from ſubjects to a ſovereign; for ſhe never goes abroad, without a numerous guard; they keep her body clean with their trunks, and follow her wherever ſhe goes. When after her death the Bees continue in a ſtate of perfect idleneſs; if another queen is preſented them, they immediately apply to their labour again. In ſhort the life of the reſt of the Bees depends upon that of the queen, for in a few days after her death, they will all ſuffer themſelves to die with hunger.

The working Bees are always very provident in providing cells for the young; and they will leave off their common employment, to conſtruct proper receptacles for the eggs. They build purpoſely, little cells, of a roundiſh oblong ſhape, and extremely ſolid, and they employ great plenty of wax in this work. This poſition is greatly different from that of the other combs; theſe ſort of Bees, know, or at leaſt appear to know what number of eggs the queen lays in a year, from whence proceed other females, that give birth to ſeveral thouſands of the working Bees, and ſeveral hundred males. Sometimes they do not lay but three or four at firſt, and ſometimes none at all; but in this laſt caſe, the hives produce no ſwarms. The fecundity of this Bee is ſuch, that in ſeven or eight weeks time, ſhe will produce 10 or 12000 Bees and upwards. Generally ſpeaking, ſhe lays but one egg in each cell, becauſe it would not be ſufficient to hatch any more. In two or three days time, according to the heat of the weather, the egg will appear hatched at the bottom of the cell. It has the appearance of a kind of a maggot, which is always white, and placed in the ſame attitude, that is, rolled up like a ring, lying ſoftly in a bed of a kind of gelly, of a whitiſh colour; and this is what the brood feeds upon. The common bees are a kind of nurſes to the brood, and have greater affection for it, than the hired nurſes among mankind. They take care in viſiting each cell, and in examining whether any thing is wanting. They are fed with honey and wax, prepared in the bodies of the Bees; and in leſs than ſix days time, the worm comes to its full growth. When the Bees perceive that the worms have no farther occaſion for feeding, they ſhut them up in their lodgings, and wall them up, if the expreſſion may be allowed, with wax. Then the worm continuing in a ſtate of perfect reſt, begins to grow larger, and lines the walls of the cell with ſilken tapeſtry, which they ſpin in the ſame manner as Caterpillars, before they undergo their laſt transformation. But it is obſervable, that the Bees bring them more nouriſhment than they are able to conſume. Before they ſpin their covering, they eat up all their proviſion of gelly, leaving the bottom of the cell clean and dry. In a day's time, or longer, they obtain their full growth, and then they caſt off their ſkins, which ſerved them in their worm ſtate, and become an Aurelia Nymph. The worms that produce Drones, are of the ſame ſize as thoſe of the working Bees. Theſe laſt take care of them with the ſame application; and it may well be imagined, that they are not leſs attentive to thoſe which are to be metamorphoſed into female Bees; for it has been obſerved, that they ſupply them with nouriſhment, in greater profuſion.

When all parts of the Aurelia have acquired the conſiſtence proper to the parts of the Bee; then that which is to appear, opens its priſon, by piercing with its teeth, the waxen cover about its middle. The Bees which perceive that which is coming to light, flock about it, and ſeem to expreſs their joy, that they are going to be metamorphoſed; and this they diſcover by their good offices. Two or three of them lick and clean all its ſides with their trunks, and ſome of them feed it with honey. Others again begin immediately to cleanſe the cell that has been juſt left; and carry away the filth out of the hive. As ſoon as the external parts of the young Bee become dry, it begins to diſcover what employment it is to have during life; for it immediately proceeds out of the hive, and goes in queſt of flowers; and is not at all at a loſs to find its way back to the common habitation. After this firſt ſally, it begins ſometimes to gather the powder of the ſtamina; and *Maraldi* aſſures us, that he has ſeen one of theſe, on the very day it came into the world, return back with two large balls of this ſubſtance. When the Bees firſt begin to break their priſons, there is generally above 100 of them in a day; inſomuch that in the ſpace of a few weeks, the number of the inhabitants becomes ſo great, that the hive cannot contain them; and then they begin to ſalley out in ſwarms. Young Bees are the browneſt, with white hair; and the old are of a lighter colour, with red hair. The ſwarm is made on purpoſe to ſeek out a new ſettlement; and that the head of it, is the queen; for one of theſe is ſufficient to conduct the whole ſwarm. About five or ſix days after the birth of a female Bee, ſhe is ready to lay her eggs, and conſequently is in a condition to place herſelf at the head of thoſe that are diſpoſed to follow her.

In different countries, the ſwarms make their ſally at different times; and in the ſame country, they leave the hives ſometimes ſooner, and ſometimes later. There are ſeveral ſigns, which foretel when the Bees are going to ſwarm; but the moſt certain is, when the working Bees do not fly into the fields, in their accuſtomed numbers; though the weather ſeems to invite them. The time is from 10 in the morning, till 3 in the afternoon, that the ſwarms leave the hives. When the ſun ſhines bright, eſpecially upon the hive, it invites the Bees to ſeek their fortune; for the heat has a great influence in this procedure, and renders the number more conſiderable. In leſs than a minute, all thoſe that are to compoſe the ſwarm, leave the hive and flutter in the air, like flakes of ſnow. However it does not appear that the queen chuſes the place where they are to alight; for ſeveral of the Bees, which are pleaſed with a particular branch of a tree, go and ſettle thereon; and they are followed by many others, as well as the queen herſelf; but ſhe does not join them, till there are a great number together. When it comes to be pretty large, then it ſoon is highly encreaſed; inſomuch that in about a quarter of an hour, they all ſeem to be at eaſe. Sometimes when they leave the hive, they riſe ſo high in the air, that they get out of ſight; and to make them come down, they throw handfuls of ſand or duſt after them. Some ſuppoſe that the Bees take the grains of ſand for drops of rain; but it is the common method to beat braſs kettles and pans, as ſoon as ever they perceive the ſwarm ready to fly. It is pretended, that the tinkling of

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theſe veſſels, is taken for thunder, and that it obliges the Bees to ſeek a proper place for a retreat. When the Bees are fixed, they cauſe them to enter into a hive, rubbed with the leaves of balm, mixed with a little honey. When they make their firſt ſally, there may be ſeveral females, inſomuch that a ſwarm has ſometimes two queens, and is even divided into two bands. But as it commonly happens, that one of theſe is more conſiderable than the other, the Bees who are fond of a large company, the ſmalleſt band dwindles by little and little, by their going to join the largeſt. Thus a ſwarm may have two queens, and ſometimes more; but they do not continue long, for the ſupernumerary queens are always killed in the hive, where the ſwarm ſettles; and till this cruel execution is performed, the Bees never fly abroad to work. If there ſhould be any female Bees left in the old hive, that did not go out with the ſwarm, they always undergo the ſame fate; that is, thoſe that have been newly transformed. Hence it follows, that there is never more than one queen in the ſame hive. However it muſt be obſerved, that the Bees, never ſacrifice any of the females, when their hives are full of honey and wax; and it is given as a reaſon, that there is no danger at that time, to maintain a plurality of breeders.

Bees in ſome ſenſe, obſerve the ſame rules as Waſps; for when the time is come, that the males are no longer neceſſary, the working Bees declare war againſt them; and in two or three days time, they make a dreadful havock amongſt them; inſomuch, that the ground all round the hive, is ſtrewed with dead bodies; nay they will even kill thoſe that are yet in their worm ſtate, or of that of an Aurelia. This butchery is performed at different times; for in ſome hives, it happens in *June*, and in others not till *July* or *Auguſt*.

When the hive ſends out ſeveral ſwarms in a year; that which firſt proceeds therefrom, is always the beſt, and moſt numerous; and then likewiſe they are able to lay up the greateſt plenty of honey and wax. It is remarkable, that a ſwarm, always conſiſts of Bees of all ages, and likewiſe there continues in the hive Bees of all ages. The number of them is always more conſiderable, than that of the inhabitants of many large cities; for ſometimes they are upwards of 40,000. It is wonderful to conſider the activity of the Bees, when they firſt enter an empty hive; for often in leſs than twenty-four hours time, they will make combs, above twenty inches long, and ſeven or eight broad; and ſometimes they will half fill their hives with wax in five days; inſomuch, that a ſwarm will make more wax in the firſt fifteen days, than they do afterwards all the reſt of the year. When a ſwarm is conſiderable, and appears early, they ſometimes ſend out another the ſame year.

In conſideration of the care and trouble that people are at, in taking care of the preſervation and multiplication of Bees, it appears reaſonable that they ſhould partake with them, of the fruit of their labour. But it is a kind of a barbarity to deſtroy all the Bees with ſulphur, or otherwiſe to get all the wax or honey; and yet we ſee this is often done, by thoſe who make a trade of dealing in ſuch commodities. In ſome countries, this practice is forbid, and particularly in *Tuſcany*. With proper care, a great number of hives might be ſaved every year, and there cannot be too many in thoſe places that greatly abound in flowers. It muſt be acknowledged, that honey is not in ſuch great requeſt as formerly, before the making of ſugar was found out. How-

ever it is of great uſe ſtill in many reſpects; and the conſumption of wax is greater than ever. In *France*, a good ſwarm in two years, will yield two pounds and a half of wax, and near thirty pounds of honey; and therefore under a good regulation, a conſiderable profit may be made of them. But Bees are ſtill more beneficial, in countries that are covered with flowers the greateſt part of the year, eſpecially in hot countries, ſuch as *Spain*, *Peru*, and *Mexico*, where tallow is always too ſoft to make candles with.

In *Muſcovy*, and in *America*, there is ſometimes found in the trunks of old trees, a ſort of black wax, in round bits, of the ſize of a nutmeg. This is produced by ſmall Bees, who make their combs in theſe hollow trunks, whoſe honey is of a citron colour, and of a very agreeable taſte. This wax, when heated, has a ſmell like balm, but it is ſeldom to be met with in *France*. The *Americans* make candles with the wax, and likewiſe ſmall veſſels, which they make uſe of to gather the balſam of Tolu.

With regard to the medicinal qualities of Bees, it is well known, that they are diuretic, when reduced to powder, and the doſe is half a dram in a morning, incorporated with the extract of juniper berries; or it may be given in a glaſs of diuretic wine. The ſame powder ſtrowed upon the head, will make the hair grow, and it will become thicker than before.

There are two ſorts of honey, that is, the white and the yellow. The white is taken without fire from the honey-combs. Theſe they break ſoon after they are made, and lay them upon hurdles or mats of oſier, or on linen cloth, faſtened at the four corners to as many poſts, and then an excellent white honey will fall from the combs, and grow hard in a ſhort time. Afterwards they put it into glazed earthen pots, this they call virgin honey. Some preſs this honey out, but then it is not ſo agreable, for it will taſte of the wax. The beſt ſort of this honey, that the *French* are acquainted with, is that of *Languedoc*; and they call it honey of *Narbonne*. It ſhould be new, thick, granulated, of a clear tranſparent white colour, of a ſoft, and ſomewhat aromatic ſmell, and of a ſweet and lively taſte. If it is very pure, it is almoſt as hard as ſugar candy; and that which renders it different from all others, are the many aromatic flowers, that grow in thoſe parts; and from which the Bees gather their honey. It is always obſervable, that the honey made in mountainous countries, where the ſun has a great power, is more fine, and more ſpirituous, than that which is produced in low grounds, not well warmed by the ſun.

Yellow honey is made from all ſorts of honey-combs, that is, old as well as new; and even of thoſe from whence the virgin honey has been extracted. They break the combs, and heat them with a little water in baſons, or pots, keeping them continually ſtirring; then they put them into bags of thin linen-cloth, and theſe they put in a preſs, to ſqueeze out the honey. The wax ſtays behind in the bags, though there is always a little of it paſſes through with the honey; for when it is diſtilled, there is always found ſmall bits of wax that riſe with the ſpirit. Yellow wax ſhould always be of a good conſiſtence, of a fine yellow, and well taſted; the *French* take that to be the beſt, that is made in *Campbagne*, becauſe the ſoil is dry in that country, and the flowers aromatic. It contains a great deal of eſſential or acid ſalt, and

phlegm,

phlegm, and a little oil and earth. The white honey contains the ſame principles, but not quite ſo much ſalt.

The ancients, as has been already taken notice of, made greater uſe of honey, than we do at preſent, becauſe ſugar was not then ſo common; but in ſome caſes, it is ſtill preferred; for it is more purging in glyſters, and cleanſes wounds better, upon which account it is mixed with digeſtives. It is a greater preſervative of the compoſitions into which it enters, than ſugar, on account of its clammineſs; and for this reaſon, it is made uſe of in venice treacle, and mithridate. It alſo deſerves to be preferred, becauſe it contains the moſt eſſential ſubſtance of flowers, and may be ſaid to contain the quinteſſence of aromatic plants. Honey taken in ſubſtance, is pectoral, laxative, and deterſive, and is good in many diſordes of the lungs, occaſioned by a groſs phlegm. It alſo looſens the belly, and is made uſe of in clyſters. The whiteſt honey is beſt for inward uſe, as the yellow is for outward. Some uſe it as an aliment, and then it is eaſy of digeſtion, and ſupplies the blood with a new balſam of life; however it is not good for dry bilious conſtitutions. We are told in the *German* ephemerides, that a young country girl, having eaten a great deal of honey, became ſo inebriated with it, that ſhe ſlept a whole day, and talked a little idly the day following.

The moſt common preparations of honey for drink are mead, and methegelin; theſe in ſome countries are in high eſteem. The common hydromel is made with boiling an ounce and a half of honey, with a quart of ſpring water, taking off the ſcum; after which it is ſtrained through a cloth, and may be uſed as common drink. This is good againſt coughs in old people, and when any perſon cannot bring up phlegm without difficulty. Some direct it againſt internal ulcers, becauſe they ſuppoſe it is an enemy to putrefaction.

Vinous hydromel is made by mixing four pounds of virgin honey, with ten quarts of ſpring water, and boiling it till about a third is conſumed, or till an egg will ſwim thereon. Then it is to be poured into a caſk, which muſt be expoſed to the heat of the ſun, or in a ſtove for forty days; or till the liquor will ferment no longer, ſhaking it from time to time. Then the caſk muſt be ſtopped up, and put in a cellar, to be kept for uſe. This ſtrengthens the ſtomach, and is very well taſted.

There is kept in the ſhops, other preparations of honey, namely, ſimple oxymel, and oxymel of ſquills. The firſt is made by mixing two parts of good honey, with one of white wine vinegar, and boiling it to the conſiſtence of a ſyrup. The doſe is half a ſpoonful, and it is thought to be good to incide thick viſcous humours, that adhere to the bronchia of the lungs, in a moiſt aſthma. Oxymel of ſquills has the ſame virtues, but much ſtronger.

Honey-water, made by the chymiſts, has an agreeable ſmell, and a ſharpiſh taſte; and it is looked upon as cordial, pectoral, and aperitive. Some waſh their heads with it, to make their hair grow, or apply it every day with a ſpunge. Spirit of honey is opening, and the oil is good againſt rotten bones.

Externally, wine mixed with honey, is very good to cleanſe ulcers, and aſſiſt in forming a cicatrice. Honey-water is good to clear the ſight; and take off the ſpots of the cornea. Some make uſe of the mare of Bees, which is nothing elſe than what remains after the wax

of

of the combs is preſſed out, to cure the pleuriſy. For this purpoſe, they mix it with vinegar, and lay it between two clean linen cloths; after which they apply it as a poultice, to the pained part, and ſprinkle it with vinegar from time to time, without taking it off. It is alſo good in cold and oedematous ſwellings, which are hard to be reſolved. Farriers alſo make uſe of it, againſt bruiſes in horſes.

Bees wax is compoſed of two parts, namely, a great deal of phlegm, which keeps an acid diſſolved, and an oil. It ſhould be new, hard, compact, a little glutinous to the touch, of a fine yellow colour, and of a pleaſant ſmell, ſomewhat like that of honey; but it ſhould have no taſte at all. Virgin wax, is that which is made without the help of fire; and is nothing but a preparation of the yellow; which muſt be melted, waſhed ſeveral times in water, divided into pieces, and layed upon linen cloths, which muſt be expoſed for ſix weeks or two months to the ſun, till it becomes white. Some make uſe of tartar, and chryſtals of tartar, by which means they render it of a very fine white. When it is very white, clear, tranſparent, hard, brittle, taſteleſs, and will not ſtick to the teeth when chewed, it is beſt; for it is then emollient, and opening, as well as the yellow; but it is not ſo reſolutive, becauſe the greateſt part of ſalts are waſhed away. Bees wax in ſubſtance, is ſeldom or never given inwardly; though it has been uſed to cure bloody fluxes; but it is prepared, by putting it into a hollow ſweet apple, and which muſt be roaſted under hot cinders, in ſuch a manner, that the wax muſt melt, and enter into the ſubſtance of the apple. There muſt be about two drams of wax, and the whole muſt be given, thus roaſted, in the aforeſaid diſorder; and the pain will vaniſh immediately. The butter of wax, gained by diſtillation, is good to reſolve cold tumours, and for pains in the joints; as alſo for the palſy, as well as for parts that are frozen, and for chaps in the breaſt, when uſed as a liniment, and applied to the part affected. Four drops of the oil of wax, which is nothing but the butter rectified, given in a proper water, is very diuretic, and is good in the nephritic cholic. Some give ten drops for this purpoſe.

The propolis taken notice of above, is an attenuant and reſolvent, and good to ripen boils, as well as for malignant ulcers. It is mixed in *France*, in plaſters and in ointments, and if the vapour of it is received into the mouth, by means of a funnel, it is ſaid to be very good to mitigate inveterate coughs. The method is, to throw bits into a chafing-diſh that has fire in it.

There are ſeveral kinds of wax, and of different colours, which are occaſioned by the ingredients that are added thereto. Thus green wax is compoſed of white wax, ſoftened with a little turpentine, and coloured with verdigreaſe in fine powder. This is good for corns in the feet, being applied thereto in the form of a plaſter. Red wax is made in the ſame manner, with the addition of vermillion; it is reſolvent, when applied outwardly.

The *Bee Flie* is a ſort of ſpecies by itſelf, it being of a nature between a Bee and a common Flie, and it feeds its brood with a ſort of ſweet paſte. The trunk differs from that of the common Bee, for its greateſt part is hid in a ſort of ſhelly ſheath; and when it is thruſt out of it, it is accompanied with a ſort of threads, four in number; but when it is not uſed, it lies under the teeth. Under theſe there is a ſort of a fleſhy

fleſhy ſeat, which is the real tongue of this Flie, with which it licks the trunk. The body is longer than that of any other Bee, and the rings that compoſe the trunk neareſt the breaſt-plate, are reddiſh on the upper part. They make their neſts in the earth, nine or ten inches deep; and ſome of theſe Flies are armed with a ſting, which are the females; but the males, which are larger, have none.

The *Tapeſtry Bees* are ſo called, from lining their neſts with a ſort of tapeſtry, which they get from the flowers of the wild poppy, newly blown, placing bits thereof at very ſmall diſtances from each other. The places where they chuſe to build their neſts in the earth, are by the ſides of highways, and the paths in corn fields. It is more hairy than the common Bee, but much of the ſame colour, only ſhorter in proportion; when their neſt is finiſhed, they fill it with paſte like ſome of the former.

There are ſeveral ſorts of foreign *Bees*, particularly thoſe of *Gaudaloupe*, which are leſs by one half than the *European*, and they are more black and round. They have no ſting, and they make their hives in hollow trees, where if the hole that they meet with, is too large, they make themſelves a ſort of a waxen houſe, in the ſhape of a pear, and in which they lodge, place their honey, and lay their eggs. Their wax is black, or at leaſt of a deep violet-colour. They lay up their honey in waxen veſſels, of the ſize of a pigeon's egg, and in the ſhape of the air-bladders of carps; and they are ſo joined together, that there is no ſpace left between them. The honey is always fluid, of the conſiſtence of oil, olive, and of the colour of amber. The wax is always too ſoft for candles, and therefore they make uſe of it inſtead of corks, to ſtop up their bottles; and it is very good to ſoften corns on the feet, and warts on the hands, and when it has been applied for ſome time, the corns may be drawn out.

In *Æthiopia* there are little black *Bees* that make excellent honey, and they have no ſting. In the *Canary Iſlands*, there are ſwarms of Bees on the mountains, which produce large quantities of honey, but they are of different kinds. The Bees of *Guiney* make excellent wax, and delicious honey. In *Congo* and *Angola* there are two ſorts of Bees, one of which make their neſt in the middle of woods, and the other on the roofs of houſes. Authors and travellers take notice of ſeveral ſorts of Bees, but as they are not particularly deſcribed, nothing more needs to be ſaid about them.

CHAP. IX.

OF INSECTS OF THE ANT KIND.

THE *Ant* is an inſect that keeps together in companies like the Bees, and maintain a ſort of a republic, governed by laws. The neſt is not exactly ſquare, but longer one way than the other, and in it there are a ſort of paths, which lead to different magazines. Some of the Ants are employed in making the ground firm, by mixing it with

a ſort of glue, for fear it ſhould crumble, and fall down upon their heads. They may be ſometimes ſeen to gather ſeveral twigs, which ſerve them for rafters, which they place over the paths, to ſupport the covering; they lay others acroſs them, and upon them ruſhes, weeds, and dried graſs, which they heap up into a double declivity, which ſerves to turn off the water from their magazines. Some of theſe ſerve to lay up their proviſions in, and in others they lay their eggs.

As for the proviſions, they lay up every thing that is fit for them to eat; and you may often ſee one loaded with pippin, or grain of fruit, another with a dead Flie, and ſeveral together with the carcaſe of a May-bug, or other inſect. If they meet with any they cannot bring away, they eat it upon the ſpot, or at leaſt ſo much of it, as may reduce it to a bulk ſmall enough for them to carry. They do not run about where they pleaſe, at all adventures; for ſome of them are ſent abroad to make diſcoveries; and if they bring back news they have met with a pear, or a ſugar-loaf, or a pot of ſweetmeats, they will run from the bottom of the garden, as high as the third ſtory of a houſe, to come at it. They all follow each other in the ſame path, without wandering to the right or the left; but in the fields they are more at their liberty, and are allowed to run about in ſearch of game. There is a ſort of green Flie, that does a great deal of miſchief among the flowers, and which curl up the leaves of peach and pear-trees; and theſe are ſurrounded with a ſort of glue, or honey, which the Ants hunt after very greedily; for they touch neither the plant nor the Flies themſelves; however this is ſometimes thought to be done by the Ants, which raiſes them a great many enemies, who endeavour to deſtroy them, though they are really innocent of the fact.

Next to this, their greateſt paſſion is to lay up hoards of wheat, and other corn, and for fear the corn ſhould ſprout by the moiſture of the ſubterraneous cells, they gnaw off the end which would produce the blade. The Ants are often ſeen puſhing grains of wheat, or barley, much larger than themſelves.

The Ants after having ſpent the ſummer in labour, keep cloſe in the winter, enjoying the proviſions that they have laid up. However ſome think they ſleep in the winter, like other inſects, and they do not lay in the corn for winter proviſions, but to provide a ſtore that is neceſſary to feed their brood with. They feed them as ſoon as they proceed from the eggs, with inceſſant care, which employs the whole company. The young ones, when they proceed from the egg, are no larger than grains of ſand. After they have been fed for ſome time, they weave themſelves a covering of white or yellow ſtuff, and then they leave off eating, and become Chryſalides; many people, while they are in this ſtate, take them for Ant's eggs. But they are in reality the nymphs from whence the young Ants proceed.

In *Africa*, and particularly in *Guiney*, the Ants are exceeding troubleſome, and do a great deal of miſchief. They make their neſts twice as high as a man, of earth in the fields; beſides which they build large neſts in high trees, from which places they advance to the *European* ſettlements, in ſuch prodigious ſwarms, that they frequently oblige the inhabitants to quit their beds in the night time. They will ſometimes attack a living ſheep, which in a night's time, they will reduce to a perfect ſkeleton, leaving not the leaſt thing except the bones. It is

common

common for them to ſerve domeſtic fowls in the ſame manner, and even the rats themſelves cannot eſcape them. If you place a Worm or a Beetle, only where one or two Ants are, they will immediately depart, and bring with them above an hundred; after which they ſeize their prey, and march off with it in good order. Theſe Ants are of various ſorts, ſome great, others ſmall, ſome black, and others red; the ſting of this laſt is very painful, and cauſes an inflammation; the white are as tranſparent as chryſtal, and have ſuch ſtrong teeth, that in a night's time, they will eat their way through a thick wooden cheſt, and make it as full of holes, as if it had been penetrated by hail ſhot.

There are alſo ſeveral ſorts of Ants in the *Eaſt-Indies*, whoſe numbers are prodigious; ſome of them are exceeding large, and of a ruddy colour, inclining to black, and ſome have wings, but others have none. They are very pernicious to the fruits of the earth, and do a great deal of miſchief in houſes, unleſs great care is taken to prevent them. It is remarkable, that if one Ant meets another that is loaden, it always gives way to let it paſs freely.

1. The *Horſe-ant* is the largeſt of this kind in *England*, being twice as big as the common ſort; it has a black head, and has a breaſt of a duſky iron-grey colour, only it is black towards the hinder part, and white at the other extremity. The legs are iron-grey, and the ſcale which is placed between the body and the breaſt is of a roundiſh oval figure, pointed at the top, and undivided; the body is brown, and conſiſts of five ſegments. It is uſually met with in hollow trees.

2. The red *Ant* is ſmaller than the common ſort, having a ſmall head, and a large breaſt; and the ſcale which ſeparates that from the body, is of a roundiſh ſhape, and ſlightly dentated. The legs are ſlender, and the wings are very thin, and of a browniſh colour. It is met with in dry paſtures, on the leaves and ſtalks of the ſmaller weeds.

3. The black *Ant* is neither ſo large as the common ſort, nor ſo ſmall as the red Ant, its head is large, in proportion to the body, and the breaſt is flatted, being at ſome diſtance from the hinder part. The ſcale that ſeparates them, is of an oval ſhape, and undivided on the edges; the legs are longer and ſlenderer than in the other kinds. It is met with in heaths, and in dry paſtures.

4. The common *Ant* is of a dark brown or reddiſh colour, with long legs, on the hindermoſt of which it will raiſe itſelf, as if it wanted to ſee at a diſtance. It has a large head, at the upper end of which there are two prominent eyes, like thoſe of a Flie, but ſmaller. On the ſnout there are two horns or feelers, and beyond them two indented jaws, which open ſide ways, very wide, and at the ends of them there are teeth, which ſlide on the ſide of each other, when the mouth is ſhut. With theſe it is able to hold a body three times its own weight. It has ſix legs, ſhaped like thoſe of a Flie, and the body conſiſts of three joints or ſegments, and ſome of them have long wings, with which they are enabled to fly where they pleaſe. The whole body is caſed with a ſort of armour, and when viewed through a microſcope, ſeem covered with multitudes of ſmall white ſhining briſtles, and the legs, feelers, head, and the middle part of the body, are furniſhed with hairs, that are ſmaller, and of a darker colour. Some have obſerved, that as in Bees, thoſe that make up the great body of the Ants, are neither male nor female, theſe laſt only having wings, and the reſt none. The

females are the largeſt, the males of a middle ſize, and the working Ants much leſs than either.

5. The *American Ant* is of a very large kind, and ſo voracious, that they will devour all the leaves of a tree in a night's time. They have two crooked teeth, which meet each other like nippers, with which they cut the leaves of trees, and other things that they feed upon. They ſometimes cut them off, and when they are fallen to the ground, they carry them to their neſts to feed their brood. Theſe Ants, when they are arrived to their full growth, ſhed their coats in the ſame manner as Flies that proceed from Caterpillars, and then become winged inſects, in which ſtate they lay their eggs. They make their holes in the earth of a great depth, and build their neſts very artificially. They are great enemies to all other inſects, and when they rove abroad, which is always once a year, they will go into every room of a houſe, and kill all the Spiders, and other inſects that are therein.

The *American Velvet Ant* is of the ſize of a Hornet, and the body is elegantly marked with black and crimſon velvet: the breaſt is ſo ſtrong and hard, that though they are trod upon by men or cattle, they receive no harm: they have a long ſting in their tails, which occaſions great pain and inflammation.

The *Ants* of *Brazil* in *South-America*, are very numerous, and devour every thing that comes in their way, whether fruit, fleſh, fiſh, or inſects. There is alſo a flying Ant, an inch in length, with a triangular head, and the body ſeparated into two parts, being only joined together by a ſmall ſtring. On the head there are two ſlender and long horns, or feelers, and their eyes are very ſmall. On the fore part of breaſt, there are ſix legs, conſiſting of three joints, and they have four thin tranſparent wings, the hindermoſt of which are round, and are of a bright brown colour. They dig into the ground like moles; but they are eaten by the negroes.

There is another large *Ant*, reſembling a Flie, whoſe body is ſeparated into three diſtinct parts, the hindermoſt of which for ſhape and ſize, reſembles a barley-corn; the middlemoſt is of an oblong ſhape, with ſix legs, each of which is near half an inch long, and conſiſt of four joints: the fore part, or head, is pretty thick, and in the ſhape of a heart, with two horns or feelers, and as many black crooked teeth: the eyes round the pupils, are inclining to black, and the fore and hind parts of the head are of a bright red colour.

There is alſo a bright black *Ant* with bright rough legs, near an inch in length with a large four-ſquare head, and prominent black eyes and teeth, with two horns or feelers, near half an inch long: the body of this is alſo ſeparated into three parts, the foremoſt of which is of an oblong ſhape, but not very thick, with ſix legs, each of which is near half an inch long: the middle part is ſmall and ſquare, not exceeding the bigneſs of a louſe: that behind is the largeſt of the three, and is of an oval figure, only it is ſharp at the end: the three parts are faſtened together by a ſort of ſtring.

The cheſnut brown *Ant* is alſo a native of *Brazil*, and has a head as large as that of other Ants, with two horns or feelers, and two tuſks inſtead of teeth: the whole body is covered with hair, and is divided into two parts, the foremoſt of which has ſix legs, and is ſomewhat leſs than that behind. At certain ſeaſons of the year it has four wings, the-

the foremoſt of which are ſomewhat larger than the hindermoſt, but it loſes them again after a certain time.

Linnæus takes notice of four ſorts of *Ants*, namely, the horſe Ant, the red Ant, the black Ant, and the corn Ant.

CHAP. X.

OF THE ANT.

(From Goldsmith.)

THOUGH the number of two-winged flies be very great, and the naturaliſts have taken ſome pains to deſcribe their characters and varieties; yet there is ſuch a ſimilitude in their forms and manners, that in a work like this, one deſcription muſt ſerve for all. We now therefore, come to a ſpecies of four-winged inſects, that are famous from all antiquity, for their ſocial and induſtrious habits, that are marked for their ſpirit of ſubordination, that are offered as a patron of parſimony to the profuſe, and of unremitting diligence to the ſluggard.

In the experiments, however, which have been more recently made, and the obſervations which have been taken, much of their boaſted frugality and precaution ſeem denied them; the treaſures they lay up, are no longer ſuppoſed intended for future proviſion, and the choice they make in their ſtores, ſeems no way dictated by wiſdom. It is, indeed, ſomewhat ſurpriſing, that almoſt every writer of antiquity ſhould deſcribe this inſect, as labouring in the ſummer, and feaſting upon the produce during the winter. Perhaps, in ſome of the warmer climates, where the winter is mild, and of ſhort continuance, this may take place; but in France and England, theſe animals can have no manner of occaſion for a ſupply of winter proviſions, as they are actually in a ſtate of torpidity during that ſeaſon.

The common ants of Europe, are of two or three different kinds; ſome red, ſome black, ſome with ſtings, and others without. Such as have ſtings inflict their wounds in that manner; ſuch as are unprovided with theſe weapons of defence, have a power of ſpurting, from their hinder parts, an acid pungent liquor, which, if it lights upon the ſkin, inflames and burns it like nettles.

The body of an ant is divided, into the head, breaſt, and belly. In the head the eyes are placed, which are entirely black, and under the eyes, there are two ſmall horns or feelers, compoſed of twelve joints, all covered with a fine ſilky hair. The mouth is furniſhed with two crooked jaws, which project outwards, in each of which are ſeen inciſures, that look like teeth. The breaſt is covered with a fine ſilky hair, from which project ſix legs, that are pretty ſtrong and hairy, the extremities of each armed with two ſmall claws, which the animal uſes in climbing. The belly is more red than the reſt of the body, which is of a brown cheſnut colour, ſhining as glaſs, and covered with extremely fine hair.

From ſuch a formation, this animal ſeems bolder, and more active, for its ſize, than any other of the inſect tribe, and fears not to attack a creature, often above ten times its own magnitude.

As ſoon as the winter is paſt, in the firſt fine day in April, the ant-hill, that before ſeemed a deſert, now ſwarms with new life, and myriads of theſe inſects are ſeen juſt awaked from their annual lethargy, and preparing for the pleaſures and fatigues of the ſeaſon. For the firſt day they never offer to leave the hill, which may be conſidered as their citadel, but run over every part of it, as if to examine its preſent ſituation, to obſerve what injuries it has ſuſtained during the rigours of winter*, while they ſlept, and to mediate and ſettle the labours of the day enſuing.

At the firſt diſplay of their forces, none but the wingleſs tribe appears, while thoſe furniſhed with wings remain at the bottom. Theſe are the working ants, that firſt appear, and that are always deſtitute of wings; the males and females, that are furniſhed with four large wings each, are more ſlow in making their appearance.

Thus, like bees, they are divided into males, females, and the neutral or the working tribe. Theſe are all eaſily diſtinguiſhed from each other; the females are much larger than the males; the working ants are the ſmalleſt of all. The two former have wings; which, however, they ſometimes are diveſted of; the latter never have any, and upon them are devolved all the labours that tend to the welfare of the community. The female, alſo may be diſtinguiſhed, by the colour and ſtructure of her breaſt, which is a little more brown than that of the common ant, and a little bigger than that of the male.

In eight or ten days after their firſt appearance, the labours of the hill are in ſome forwardneſs; the males and females are ſeen mixed with the working multitude, and purſued or purſuing each other. They ſeem no way to partake in the common drudgeries of the ſtate; the males purſue the females with great aſſiduity and in a manner force them to compliance. They remain coupled for ſome time, while the males thus united, ſuffer themſelves to be drawn along by the will of their partner.

In the mean time, the working body of the ſtate takes no part in their pleaſures, they are ſeen diligently going from the ant-hill, in purſuit of food for themſelves and aſſociates, and of proper materials for giving a comfortable retreat to their young, or ſafety to their habitation. In the fields of England, ant-hills are formed with but little apparent regularity. In the more ſoutheren provinces of Europe, they are conſtructed with wonderful contrivance, and offer a ſight highly worthy a naturaliſt's curioſity. Theſe are generally formed in the neighbourhood of ſome large tree and a ſtream of water. The one is conſidered by the animals, as the proper place for getting food; the other for ſupplying them with moiſture, which they cannot well diſpenſe with. The ſhape of the ant-hill, is that of a ſugar loaf, about three feet high, compoſed of various ſubſtances; leaves, bits of wood, ſand, earth, bits of gum, and grains of corn. Theſe are all united into a compact body, perforated with galleries down to the bottom, and winding ways within the body of the ſtructure. From this retreat, to the water, as well as to the tree, in different directions, there are many paths worn by conſtant aſſiduity, and along theſe the buſy inſects are ſeen

* Memoires pour ſervir a'l Hiſtorie des inſectes par Charles de Geer.

ſeen paſſing and repaſſing continually; ſo that from May, or the beginning of June, according to the ſtate of the ſeaſon, they work continually, till the bad weather comes on.

The chief employment of the working ants, is in ſuſtaining not only the idlers at home, but alſo finding a ſufficiency of food for themſelves. They live upon various proviſions, as well of the vegetable as of the animal kind. Small inſects they will kill and devour; ſweets of all kinds they are particularly fond of. They ſeldom, however, think of their community, till they themſelves are firſt ſatiated. Having found a juicy fruit, they ſwallow what they can, and then tearing it in pieces, carry home their load. If they meet with an inſect above their match, ſeveral of them will fall upon it at once, and having mangled it, each will carry off a part of the ſpoil. If they meet, in their excurſions, any thing that is too heavy for one to bear, and yet, which they are unable to divide, ſeveral of them will endeavour to force it along; ſome dragging and others puſhing. If any one of them happens to make a lucky diſcovery, it will immediately give advice to others, and then at once, the whole republic will put themſelves in motion. If in theſe ſtruggles, one of them happens to be killed, ſome kind ſurvivor will carry him off to a great diſtance, to prevent the obſtructions his body might give to the general ſpirit of induſtry.

But while they are thus employed in ſupporting the ſtate, in feeding abroad, and carrying in proviſions to thoſe that continue at home, they are not unmindful of poſterity. After a few days of fine weather, the female ants begin to lay their eggs, and thoſe are as aſſiduouſly watched and protected by the working ants, who take upon themſelves to ſupply whatever is wanting to the naſcent animal's convenience or neceſſity. They are carried as ſoon as laid, to the ſafeſt ſituation, at the bottom of their hill, where they are carefully defended from cold and moiſture. We are not to ſuppoſe, that thoſe white ſubſtances which we ſo plentifully find in every ant-hill, are the eggs as newly laid. On the contrary, the ant's egg is ſo very ſmall, that, though laid upon a black ground, it can ſcarcely be diſcerned. The little white bodies we ſee, are the young animals in their maggot ſtate, endued with life long ſince freed from the egg, and often involved in a cone, which it has ſpun round itſelf, like the ſilk worm. The real egg when laid, if viewed through a microſcope, appears ſmooth, poliſhed, and ſhining, while the maggot is ſeen compoſed of twelve rings, and is often larger than the ant itſelf.

It is impoſſible to expreſs the fond attachment which the working ants ſhew to their riſing progeny. In cold weather they take them in their mouths, but without offering them the ſmalleſt injury, to the very depths of their habitation, where they are leſs ſubject to the ſeverity of the ſeaſon. In a fine day they remove them, with the ſame care, nearer the ſurface, where their maturity may be aſſiſted by the warm beams of the ſun. If a formidable enemy ſhould come to batter down their whole habitation, and cruſh them by thouſands in the ruin, yet theſe wonderful inſects, ſtill mindful of their parental duties, make it their firſt care to ſave their offspring. They are ſeen running wildly about, and different ways, each loaded with a young one, often bigger than the inſect that ſupports it. I have kept, ſays Swammerdam, ſeveral of the working ants in my cloſet, with their young, in a glaſs filled with earth

earth. I took pleaſure in obſerving, that in proportion as the earth dried on the ſurface, they dug deeper and deeper to depoſit their eggs; and when I poured water thereon, it was ſurpriſing to ſee with what care, affection, and diligence they laboured, to put their brood in ſafety, in the drieſt place. I have ſeen alſo, that when water has been wanting for ſeveral days, and when the earth was moiſtened after it a little, they immediately carried their young ones to have a ſhare, who ſeemed to enjoy and ſuck the moiſture.

When the young maggot is come to its full growth, the breaſt ſwells inſenſibly, it caſts its ſkin, and loſes all motion. All the members which were hidden before, then begin to appear, an aurelia is formed, which repreſents very diſtinctly, all the parts of the animal, though they are yet without motion, and as it were, wrapped up in ſwaddling-clothes. When at length, the little inſect has paſſed through all its changes, and acquired its proper maturity, it burſts this laſt ſkin, to aſſume the form it is to retain ever after. Yet this is not done by the efforts of the little animal alone, for the old ones very aſſiduouſly break open, with their teeth, the covering in which it is incloſed. Without this aſſiſtance the aurelia would never be able to get free, as Mr. De Geer often found, who tried the experiment, by leaving the aurelia to themſelves. The old ones not only aſſiſt them, but know the very preciſe time for lending their aſſiſtance, for if produced too ſoon the young one dies of cold, if retarded too long it is ſuffocated in its priſon.

When the female has done laying, and the whole brood is thus produced, her labours, as well as that of the male, become unneceſſary, and her wings, which ſhe had but a ſhort time before ſo actively employed, drop off. What becomes of her when thus diveſted of her ornaments is not well known, for ſhe is ſeen in the cells for ſome weeks after. The males, on the other hand, having no longer, any occupation at home, make uſe of thoſe wings with which they have been furniſhed by nature, and fly away, never to return, or to be heard of more. It is probable they periſh with the cold, or are devoured by the birds, which are particularly fond of this petty prey.

In the mean time, the working ants having probably depoſed their queens, and being deſerted by the males, that ſerved but to clog the community, prepare for the ſeverity of the winter, and bury their retreats as deep in the earth as they conveniently can. It is now found that the grains of corn, and other ſubſtances with which they furniſh their hill, are only meant as fences to keep off the rigour of the weather, not as proviſions to ſupport them during its continuance. It is found generally to obtain, that every inſect that lives a year after it is come to its full growth, is obliged to paſs four or five months without taking any nouriſhment, and will ſeem to be dead all that time. It would be to no purpoſe therefore for ants to lay up corn for the winter, ſince they lie that time without motion, heaped upon each other, and are ſo far from eating, that they are utterly unable to ſtir. Thus what authors have dignified by the name of a magazine, appears to be no more than a cavity, which ſerves for a common retreat when the weather forces them to return to their lethargic ſtate.

What has been ſaid with exaggeration of the European ant, is however true, if aſſerted of thoſe of the tropical climates. They build an ant-hill with great contrivance and regularity, they lay up proviſions, and,

and, as they probably live the whole year, they ſubmit themſelves to regulations entirely unknown among the ants of Europe.

Thoſe of Africa are of three kinds, the red, the green and the black; the latter are above an inch long, and in every reſpect a moſt formidable inſect. Their ſting produces extreme pain, and their depredations are ſometimes extremely deſtructive. They build an ant-hill of a very great ſize, from ſix to twelve feet high; it is made of viſcous clay, and tapers into a pyramidal form. This habitation is conſtructed with great artifice, and the cells are ſo numerous and even, that a honeycomb ſcarce exceeds them in number and regularity.

The inhabitants of an edifice ſeem to be under a very ſtrict regulation. At the ſlighteſt warning they will ſally out upon whatever diſturbs them, and if they have time to arreſt their enemy, he is ſure to find no mercy. Sheep, hens, and even rats are often deſtroyed by theſe mercileſs inſects, and their fleſh devoured to the bone. No anatomiſt in the world can ſtrip a ſkeleton ſo cleanly as they, and no animal, how ſtrong ſoever, when they have once ſeized upon it, has power to reſiſt them.

It often happens that theſe inſects quit their retreat in a body, and go in queſt of adventures. "During my ſtay," ſays Smith, "at Cape Corſe Caſtle, a body of theſe ants came to pay us a viſit in our fortification. It was about day break when the advanced guard of this famiſhed crew entered the chapel, where ſome negroe ſervants were aſleep upon the floor. The men were quickly alarmed at the invaſion of this unexpected army, and prepared, as well as they could, for a defence. While the foremoſt battalion of inſects had already taken poſſeſſion of the place, the rear guard was more than a quarter of a mile diſtant. the whole ground ſeemed alive, and crawling with unceaſing deſtruction. After deliberating a few moments upon what was to be done, it was reſolved to lay a large train of gun powder along the path they had taken, by this means millions were blown to pieces, and the rear guard perceiving the deſtruction of their leaders, thought proper inſtantly to return, and make back to their original habitation."

The order which theſe ants obſerve, ſeems very extraordinary; whenever they ſally forth, fifty or ſixty larger than the reſt are ſeen to head the band, and conduct them to their deſtined prey. If they have a fixed ſpot where their prey continues to reſort, they form a vaulted gallery, which is ſometimes a quarter of a mile in length, and yet they hollow it out in the ſpace of ten or twelve hours.

CHAP. XI.

OF FLYING INSECTS WITH TWO WINGS.

THESE are commonly known by the name of Flies, and have tranſparent wings like gauze, and on which is no duſt, as upon thoſe of Butterflies; neither have they any caſes to their wings, which diſtinguiſhes them from thoſe of the Beetle kind. All Flies have a diſtinct head,

head, a corſlet and a body; the corſlet is that part on which the wings are placed, and the body contains the guts, the ſtomach, and the parts of generation, with the greateſt number of tracheæ, that is the organs that ſerve for reſpiration: the head is connected to the corſlet by a very ſhort neck, on which it will commonly turn round, as on a pivot. *Reaumur* obſerves, that ſome Flies have two corſlets, diſtinct from each other, of which the firſt is ſmalleſt, and the other is that to which the wings are connected. The corſlet is the roundeſt part, and is generally ſtrongeſt and thickeſt, though ſometimes it is not ſo broad as the body. The Formica Leo and ſome water Moths, are metamorphoſed into Flies, that have a double corſlet. Many naturaliſts have confounded Flies with four wings, with thoſe that have but two; beſides which, they have often neglected to mention the number of wings; but *Reaumur* divides them into two general claſſes, that is Flies that have two wings, and Flies that have four wings; and under theſe he comprehends four ſubordinate claſſes. The firſt claſs comprehends Flies that have a trunk, and have neither teeth nor nippers. The ſecond is compoſed of Flies that have a mouth without teeth. The third conſiſts of Flies that have a mouth furniſhed with teeth; and the fourth thoſe that have both a trunk and teeth. Among thoſe Flies that have a mouth and teeth, there are ſome that have not only teeth on the outſide of the mouth, but within; and theſe might have been placed in a fifth claſs.

All ſorts of Flies that have two wings, belong to the firſt and ſecond claſſes, for there are none of theſe that have the characteriſtics of the two other claſſes. The great blue fleſh flies, and all thoſe that are ſo troubleſome in houſes, as well as Gnats, are of the firſt claſs; there are alſo Flies that reſemble Gnats, which have a mouth without teeth, and theſe belong to the ſecond claſs of two winged Flies. The Flies with four wings belonging to the third and fourth, are very numerous; ſuch as Bees which have a trunk, and two teeth above it, as well as all ſorts of Waſps, which have a mouth and two teeth on the outſide. Many ſorts of Flies with four wings, belong to the ſecond claſs, ſuch as papillionaceous Flies, which proceed from different ſorts of water Moths. Many ſorts of Flies with four wings, belong to the firſt claſs, as the pucerons, called by ſome Vine-fretters, and others a-kin to them, as well as the Graſshoppers.

Reaumur has another ſort, which conſtitutes a fifth claſs, and he calls them Heads in a trunk, becauſe they have extremely long heads, from whence proceeds a very long ſnout, which is only open at the end. However he means that the place where the heads of other inſects terminate, in theſe are prolonged, ſo as to form the ſhape of a trunk, which is ſtiff, and never changes its form or poſition, without changing the head itſelf. It is at the end of this lengthened part, that the teeth are placed, or at leaſt the inſtruments by means of which theſe inſects take their nouriſhments. One of this ſort is the Scorpion Flie, ſo called, becauſe the male generally keeps the back part turned up towards the back, like that of a Scorpion when it is about to ſting. There is another beautiful Flie, which flutters about flowers, that is another inſtance of this kind.

Beſides theſe claſſes *Reaumur* eſtabliſhes a ſecond rank, ſubordinate to the firſt, and whoſe characteriſtics are taken from what appears at

firſt

firſt ſight. Theſe claſſes which are under the former, are characterized from the trunk, or from the mouth void of, or furniſhed with teeth, and having the head made in the form of a trunk. Theſe are three in number, the firſt of which are Flies, with a ſhort body, and more broad than thick; the ſecond is thoſe that have a long body, and the third is the Flies, whether long or ſhort, that have the bodies joined to the corſlet by a ſingle thread.

In order to characterize the kind of Flies which ought to be placed under theſe claſſes, *Reaumur* particularly attends to the conſtant varieties which may be taken from the carriage of their wings, the ſhape of the feelers, the carriage of their trunks, of the other external parts of the body, and more eſpecially from the hinder parts. Flies of different kinds, may be conſidered while they are at reſt, or while they are creeping, as well as in the different carriage of their wings, which is very evident in Butterflies. But there are more Flies that carry their wings parallel to the plane of poſition, than there are that keep them in inclined directions.

Among thoſe that carry their wings parallel to this plane, ſome hold them like oars. Their direction is perpendicular to the length of the body, which is not covered by them at all. Of this kind are many of the long water Flies, and of thoſe that have two wings, beſides ſome kinds of Tipux. Other Flies carry their wings in ſuch a manner, that they cover one part of the body, and not the other, whether the Flie has two wings or four, unleſs one of the upper wings ſenſibly intrenches upon the other upper wing. Among the Flies with two wings, the blue fleſh Flies, and the common houſe Flies, are inſtances of this kind.

The wings of ſeveral ſorts of Flies, croſs each other over the body, and when this is done more or leſs, there ariſes differences eaſy to be obſerved. The wings of ſeveral Flies that croſs the body, are roundiſh, and are not exactly parallel to the plane of poſition. The wing that is the uppermoſt, is more elevated over the line on the middle of the body, than on the ſides. Thus the wings of thoſe are diſpoſed which proceed from the baſtard Caterpillars. Some Flies have wings placed on the back, oneagainſt another, and they are in a plane perpendicular to that of the poſition. Several ſorts of ſmall long water-flies, and ſeveral ſorts of Pucerons, carry their wings in this manner. This is alſo obſervable in the Flie called the Ephemera.

The wings of ſeveral other Flies, are applied obliquely againſt the ſides, and they meet over the body, at the inner edge, forming a ſort of a roof. Such is the manner of the ſmall Lion Puceron. Other Flies have their wings likewiſe applied to the ſides, but then they bend down over the back, making almoſt a flat roof; as, many of the Flies, which in their firſt ſtate, were water Moths. Laſtly, other Flies keep their wings obliquely to the plane of poſition, and in ſuch a manner, that they meet under their bellies.

Other varieties in Flies, proceed from the texture of their wings. They are generally like a ſort of fine gauze, for they have every where a nearly equal tincture and tranſparency; however the wings of ſeveral ſorts of Flies are not very tranſparent, and others are quite opaque; inſomuch, that at a diſtance, they might be taken for the wings of Butterflies. Theſe are alſo called by *Reaumur* Papillionaceous Flies, that have their wings half tranſparent. Among the Flies with four

wings, there are the Papillionaceous, whoſe lower wings are very tranſparent, while the upper are a little opaque, which is obſervable in the Flies of ſeveral water Moths. Other Flies have opaque ſpots on their fore wings, on a very tranſparent ground, theſe may be ſeen in Scorpion Flies. There are alſo Flies with two wings, with dark ſpots thereon, ſeparated by tranſparent ſpaces.

The feelers likewiſe ſerve to diſtinguiſh the ſeveral kinds of Flies from each other. For there is as much difference among the feelers of Flies, as thoſe of Butterflies. In ſome ſort of Flies the feelers are jointed, and as it were compoſed of ſeveral grains, placed upon each other like beads. Theſe are generally thicker at the roots than at the extremities. Other Flies have their feelers compoſed of joints like the former, but then they grow thicker towards the extremities, and theſe are called clavated feelers, that is, they are like clubs. The Flie of the Formico-Leo has this ſort of feelers. Several ſmall ſorts of Flies, as Gnats, and ſome of the Tipulæ, have feelers like feathers, and others again in the ſhape of priſms; but theſe are jointed, and more ſlender at their ends than at the middle. Some Flies have branched or forked feelers, being compoſed of two articulated parts, and ſo each of them ſeem to be double; but theſe are only found in ſome ſort of Butterflies. Others have their feelers very ſhort, but extremely thick, and conſiſt of only two or three joints, and theſe are met with in many ſorts of Flies with four wings. Likewiſe the carriage of the feelers may ſerve for another diſtinction; as for inſtance, the Ichneumon Flie keep the feelers in continual agitation.

Flies may alſo be diſtinguiſhed by their trunks, for ſome have them ſimple, and others armed with teeth or nippers. Some again have a ſheath compoſed of a ſingle piece, while others conſiſt of ſeveral pieces joined together, and ſome have ſcaly ſheaths, and ſome have fleſhy; ſome are terminated with a ſort of large lips, and others have none at all; but in many kinds, theſe varieties cannot be diſtinguiſhed without a microſcope. However the carriage of the trunk may be plainly ſeen by the naked eye; for ſome fold them up when they are not uſed, and others, while they are in action, keep them turned downwards; as for inſtance, Bees and Drones; in ſhort others always keep them at full length, only they can turn them to different ſides, as may be ſeen in Gnats, Graſshoppers, and the like. The ſhape of the head of all ſorts of flies are not alike, for ſome have them almoſt round, others broader than long, and of a leſs diameter before than behind. The Formica-Leones differ from the Pucerons, not only in their feelers, but in their double corſlet. The corſlet of ſome Flies is much higher than in others, inſomuch that it obliges them to turn the head downwards, and makes them appear hunch-backed. All Flies have but ſix legs, but they differ in the ſize in proportion to the body; for ſome have them very long, and others very ſhort; as for inſtance, the Gnats and the Tipulæ ſeem to be mounted upon ſtilts. The legs of moſt Flies are joined to the corſlet, but in ſome, one of the pairs is attached to one of the rings of the body.

Beſides, the latter part of the body ſerves for another diſtinction of Flies, for ſome are armed with ſtings, and others have a ſort of piercer, lodged in a caſe. Others are provided with a kind of ſaw, which does not appear till the body is preſſed. Likewiſe ſome have ſtrings at their tails, as the Ephemera.

Moſt

Moſt Flies are oviparous, that is, they lay eggs; but there are ſome that bring forth their young alive. Some herd together in companies, as Bees and waſps, and others are ſolitary, being generally found ſingle. As for the ſpecies of every kind, they have only ſlight differences, which are not ſo eſſential as betwixt the kinds themſelves.

The *Breeze*, or *Gad-Flie*, is of the ſize of a common blue fleſh Flie, and has black large eyes, with feelers that conſiſt of a long thread like a briſtle, and the body is yellow, only it is ſurrounded with a black belt or ſtripe; the belly is of a tawny colour, except the laſt joint, which is black. The tail is long, bending under the belly, and the wings are whitiſh, and have a black line, with three black ſpots upon each. The female is ſaid to lay her eggs in the backs of cattle, under the ſkin, where it lives in the ſtate of a Maggot all the winter.

The grey *Flie*, or *Trumpet-Flie*, is conſiderably bigger than the common blue Flie, and the body is of a duſky-grey colour, approaching to black; it is ſmooth, except about the breaſt, which is beſet with a great number of yellow long hairs; the wings are large and tranſparent, the body oblong, and the eyes large and black. The female lays her eggs in the noſtrils of Sheep, Deer, and ſome other animals. It is called the Trumpet-Flie, from the noiſe it makes in the hot days of ſummer.

Linnæus has four ſorts of theſe Flies, to which he gives the general name of Oeſtrus; namely, the Ox-Oeſtrus, or Gad-Flie, the Oeſtrus that attacks the Rein-deer, the Noſtril Oeſtrus, and the Hæmorrhoidal Oeſtrus. Others take notice of the larger Bee-like Oeſtrus, the ſmaller round-bodied Oeſtrus, the large black and yellow-bodied Oeſtrus, the black and yellow Oeſtrus, with black legs and tranſparent wings, the long bodied Oeſtrus with long wings, which is ſaid to proceed from a worm that is bred in the guts of horſes. The large roundiſh-bodied Oeſtrus with plain wings, that is ſaid to proceed from a worm bred under water, and is called by ſome the Tabanus Aquaticus. The ſmaller oblong Oeſtrus with a pointed body, the Oeſtrus with ſpotted wings, a variegated body, and ſhort legs; the black and tawny Oeſtrus. Theſe ſort have a ſtyle with a head under each wing, and they are noted for making cattle run about the fields as if they were mad.

The *Hornet-Flie* is as big as a common Hornet, and is ſo like it, that the one may be eaſily taken for the other: the head is large, the ſnout long and black, with a ſharp point, and the eyes are prominent, the breaſt is large and bunched, and of a duſky colour, but the wings, legs, and belly, are of an iron-grey; the body on its upper part, is black and yellow, and conſiſts of ſeven joints, the three uppermoſt of which are black, and the reſt yellow.

The *Waſp Flie* is of the ſize of a common Waſp, and very much reſembles it in ſhape and colour. The head is ſmooth and yellowiſh, the body blunt, and all its joints, at the edges, are of a pale yellow, and the ſnout is long, and pointed at the end.

The Virginian *Hornet Flie* is of the ſize of our largeſt Flies, and has a black head, with a ſilver line that runs from the ſhoulders to the mouth; it has likewiſe large black eyes. It has a long and ſtrong weapon on its mouth, and the ſhoulders are of a blackiſh-brown, with two ſilver wings. At the back part there are ſeven or eight joints, of

a whitiſh colour, but the other parts are blackiſh, except the belly, which is of a yellowiſh aſh-colour, with a greeniſh caſt.

The Muſcovite *Hornet-Flie* has a very long body, with oblong large eyes, that take up the greateſt part of the head. The ſnout is black, hardiſh, and divided into three parts, with which it can penetrate through cloth, and hurt the ſkin of the perſon that wears it.

Linnæus calls theſe ſort of Flies *Aſilus*, of which he has four ſorts, namely, the rapacious Flie, the hairy Aſilus, the Aſilus with round wings, and the Aſilus that pricks the legs through the ſtockings.

Other authors have the long ſlender bodied great Wolf-flie, the great ſmooth black and red *Eaſt-Indian* Aſilus. The black legged ſmooth yellow Aſilus with blue wings. The Aſilus with a blue body, variegated with black ſtreaks. The black hairy Aſilus, with brown legs and white wings. The Aſilus with the body variegated with a black and reddiſh colour. The ſmooth Aſilus with black wings, and a black body. The black Aſilus with roundiſh iron-grey wings. The black Aſilus with white ſtreaks and ſpots. The willow Aſilus with white wings, marked with two tranſverſe black ſtreaks. The ſmooth Aſilus with a black body and grey wings. The ſmooth oval-grey Aſilus.

The common *Horſe Flie* is pretty large, and has a body of an oblong ſhape, and rounded at the end; it is of a grey colour, and has a ſmooth ſkin, with large eyes, and large tranſparent wings. Each of its legs are terminated by four ſhort and ſharp claws, and it has a clavated ſnout, in the ſhape of a cylinder, being blunt at the end, and the tongue is like a briſtle.

The ſwallow's-neſt *Flie* is but ſmall, and has a ſmall head. The breaſt is ſomewhat in the ſhape of a cone, and the body is broadeſt at the extremity. The wings are long, but remarkably narrow, and the legs are all terminated with ſix ſhort claws. The former of theſe is exceedingly troubleſome to horſes and cattle, and ſticks on firmly wherever they lay hold; ſometimes they will make horſes almoſt mad, and the laſt is frequently ſeen on the necks of horſes.

Linnæus calls theſe ſort of Flies Hippoboſca, and has only two ſorts, namely, the common Horſe Flie, and the Sheep Flie, or rather the Hippoboſca without wings. Other authors have the long-bodied duſky-brown Hippoboſca. The black Hippoboſca with an oval body, the Hippoboſca with a round body and ſhort wings. The ſnouts of theſe are all alike.

The great *Horſe Flie* has a greyiſh head, and large black eyes, with large broad tranſparent wings, but of a duſky colour, and marked with iron-grey lines. The breaſt and body are grey, only the back part under the wings, are a little yellowiſh, and in the center of each of the rings, all the way down the back, there is a triangular white ſpot. The thighs are black, and the legs yellow.

The Eaſt-Indian *Horſe-Flie* is a moſt pernicious inſect, and it ſtings or bites moſt terribly. They are about two inches broad, and as much long, and of a brown colour, with a yellow ſtreak along the body. They build their neſts very curiouſly on the rafters of barns or out-houſes, as the *Eaſt-Indian* Waſps do on the twigs of trees; in theſe they lay their eggs, and hatch their young ones, and they feed upon fruits. After they are killed, they have a moſt diſagreeable ſmell.

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The green *Horſe-Flie* was brought from *China*, and has the body and under wings of a fine ſhining green, which have the luſtre of poliſhed metal; the tips of their wings, and their under ſides, are duſky or black, but the upper wings are of a light brown colour, being very thin and tranſparent.

The purple and brown *Horſe-Flie* is a native of the *Weſt-Indies*, and the wings are of a dirty purpliſh brown, with ſome tranſparent ſpots thereon.

The *Burrel Flie* has an oblong body, which is divided into three principal parts, namely, the head, the ſhoulders, and the belly, which laſt is divided into five or ſix joints or rings. It is all over of a whitiſh colour, inclining to black, or rather grey, and it has a ſtrong, brawney, long ſnout. In *July* and *Auguſt* it is very troubleſome to horſes and cattle. *Mouſet* gives us an inſtance of a horſe that was tied with a halter to a tree in a wood, where he was killed in ſix hours time by theſe Flies, which he ſuppoſed was owing to the great loſs of blood, of which they are very fond.

Linnæus calls theſe ſort of Flies *Tabanus*, of which he has only two ſorts, the common Tabanus and the Tabanus that can ſee but very little; but *Ray* has one which he calls the beautiful two-winged Flie, with large white ſpots on the wings. It is of the ſize of the common Houſe-flie, and has a brown head, breaſt, and body, only there is a yellowiſh tincture under the roots of the wings: the eyes are large, of a bright ſhining green, with a few black ſpecks.

Other authors have the black *Tabanus*, variegated with yellow, and with brown legs: the brown Tabanus with iron-grey ſides, and three brown ſtreaks over the eyes: the grey Tabanus with a tranſverſe line over the eyes: the brown Tabanus with grey wings, variegated with ſmall white ſpots, with green eyes, and four brown lines running over them: the long-bodied Tabanus: the Tabanus with a ſhort body, and tranſparent wings: the black Tabanus with tranſparent wings.

The *Flie* with white wings, and a black ſpot on each, has a red large head, and a ſhort blunt black body, and black legs; the eyes are large, and while ſitting, it is conſtantly ſhaking its wings; they are common in orchards upon apple-trees.

The *Hairy-Flie* is of a large kind, and has a body of a black oval ſhape, and its extremities are covered with a great number of yellowiſh hairs, as well as the breaſt: the head and legs are black, and the wings tranſparent, only they are whiteſt towards the baſe, and have each a large iron-grey ſpot towards the outer edge: this is not a very common Flie.

The black *Flie* is pretty large, and has a body of an oval blunt ſhape, the breaſt is oblong, the head and eyes large, and the legs are black: the ſides are marked each with a very large pale-coloured ſpot, and the tail is beſet with black hairs; moreover the ſides of the belly are covered with ſomewhat of a ſhelly ſubſtance.

The green *Flie* is as big as the blue fleſh Flie, and has a black head, with large eyes; the breaſt and body are of a beautiful green, with ſomewhat of a braſſy yellow caſe, which in ſome lights appear bright and ſhining: the legs are black, the eyes brown, and there is a double tranſverſe line on the belly; the body is of an oval ſhape, and has four joints.

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The grey *Flie* is not unlike the common Houſe-Flie, but not half ſo large: the eyes are reddiſh, the breaſt grey, but marked with two ſmaller, and two larger black ſpots: the body is greyiſh, and conſiſts of four joints; the firſt of which is without ſpots, but the ſecond has a three-toothed mark at its baſe, and the third and fourth has ſpots nearly of the ſame kind: this is a very common Flie.

There are ſeveral ſorts of theſe inſects, that are properly called Flies, which we ſhall range under ſeveral claſſes. Of thoſe that reſemble the common Houſe-Flie, are,

1. The common houſe *Fleſh-Flie* with a black chequered body, and with oblong black ſtreaks on the breaſt.
2. The black *Flie* with a white forehead.
3. The black *Flie* with a ſmooth gloſſy body.
4. The ſmooth black *Flie* with iron-grey eyes, and the baſe of the thighs whitiſh: this Flie proceeds from maggots in cheeſe.
5. The ſmooth black *Flie* with the edges of the wings black, and thicker than the other part.
6. The ſomewhat hairy black *Flie* with nervous wings.
7. The grey *Flie* with fine black marks on the breaſt, and three toothed ſpots on the belly.
8. The yellow *Flie* with the belly brown on the upper part, and three black ſtreaks on the breaſt.
9. The yellow *Flie* with black eyes.

Of the ſhining or gilded *Flies* there are,

1. The *Flie* with a ſhining blue breaſt, and a ſhining green body.
2. The *Flie* with a ſhining green breaſt, and a ſhining blue body.
3. The *Flie* with a black breaſt and green body.
4. The *Flie* with a black breaſt and blue body.
5. The *Flie* with an oblong body, of a copper-colour, and a green head, a yellow breaſt, and the wings marked with a brown ſpot.
6. The oblong *Flie* with a braſſy breaſt, and the body yellow on the fore part, and black behind.

It will not be improper to mention here the *North American* Flie, there called the Fire-Flie, becauſe it appears like a ſpark of fire in the dark: they are as long as the Bees called Drones, but much thicker, and are of a browniſh colour: the light proceeds from under the wings, and they are a ſtrange ſight to new comers at firſt. When their wings are broken, and they are placed on a book in a dark room, they ſhine ſo much, that the letters near it may eaſily be diſtinguiſhed: they appear in *May*, and are viſible the greateſt part of the ſummer; there are ſometimes ſuch a multitude of them in the woods, that they yield a very wonderful, and yet pleaſing ſight: they continue flying every hour in the night, but are never ſeen by day.

The *Fire-Flies* of the *Eaſt-Indies*, are about an inch broad, and as much in length, or longer; the head which is brown, has two ſmall horns or feelers, and the neck is red: they have four wings, and ſo do not properly belong to this claſs, the uppermoſt of which are hard and brown, and thoſe underneath ſoft: the ſhining ſubſtance is contained in a black bag on their backs, which they hide with their wings when they ſit. In the rainy ſeaſon there are prodigious ſwarms of them among the trees, and they feed chiefly upon their bloſſoms; there are ſeveral ſorts of theſe Flies in the *Eaſt-Indies*.

The

The Weſt-Indian *Fire-Flie*, *Pere de Tertre* affirms, is like a living ſtar, of which there are great numbers, that in dark nights make the air ſeem full of curious lights, which ſhine and ſparkle more than the ſtars in the ſky: they do not ſhine at all in the day, and therefore are never taken notice of by any that are unacquainted with them: they have ſomewhat of the appearance of dirty Beetles, and they delight to be among rotten wood till the ſun is ſet, and then they fly here and there, ſeeming to be ſo many lighted candles carried in the woods and houſes, by inviſible hands: they will purſue the light of a candle, and other things that ſparkle or ſhine, with ſo much ardour, that they often kill themſelves, like our Moths, eſpecially if a burning coal is laid in their way. He tells us very gravely, and no doubt with ſome truth, that the poorer popiſh clergy, when they want candles or oil, catch one of theſe Flies, by whoſe light they will be able to read their matins as eaſily as if they had a lamp. While they are alive and in full health, a flame ſeems to proceed from all parts of the body; but when they are ſick, it grows weak, and when they die, it is quite extinguiſhed. When they are caught, they live but fifteen days, or three weeks at moſt.

The *Fire-Flie* of *Martinico* mentioned by *Pere du Tertre*, is not ſo large as a common Flie: they yield a ſort of ſparkling golden light, which is extremely agreeable; but they will often hide it for a little while, and then they begin to ſhine again, and thus they continue all the night: this ſhining reſides in a ſort of white ſubſtance, of which they are full, and they can make it appear through the chinks of their ſkin, when they pleaſe.

Of *Flies* which in a worm ſtate feed upon trees and plants, and the inſects thereon, are,

1. The *Flie* with a black oval body, with two marks in the ſhape of half-moons, and three yellow belts.

2. The *Flie* with an oval body, and three pair of whitiſh half moons, called by authors, the Elephant's trunk. It feeds in its worm-ſtate on the pear tree.

3. The oblong yellow-bodied *Flie* with black tranſverſe lines.

4. The oblong yellow-bodied *Flie* with three pair of yellow ſpots.

5. The long-bodied *Flie* with ſix three-cornered yellow ſpots.

6. The *Flie* with the body in the ſhape of a cylinder, with ſix ſpots in the ſhape of half-moons, on the back.

7. The grey *Flie* with four black ſpots on the back.

8. The oblong-bodied *Flie* whoſe hinder legs are largeſt.

9. The *Flie* whoſe body is marked with three yellow circular lines.

Of *Flies* that have variegated bodies, there are,

1. The black *Flie* with the baſes of the wings of an iron-grey.

2. The *Flie* with a grey breaſt, and the baſe of the belly marked with a yellow ſpot, and having the edges of the ſegments whitiſh.

3. The black *Flie* with all the ſegments of the body, except the firſt, yellow, and a black mark in the middle.

4. The *Flie* with a yellow breaſt, with four yellow tranſverſe lines on the belly part, the firſt being larger than the reſt, and interrupted.

5. The *Flie* with four yellow ſtreaks on the breaſt, and three of the ſegments of the belly part yellow.

6. The black *Flie* with a white body, and two black ſtreaks thereon.

7. The brown and ſomewhat hairy *Flie*, with the edge of the belly ſharp, and having three yellow lines, with a triangular ſpot.

8. The *Bee-Flie*, produced from the long-tailed maggot of neceſſary houſes: the black Flie with a velvet body, marked with three tranſverſe lines.

9. The black *Flie* with two yellow belts on the back.

10. The black *Flie* with iron-grey wings, and three white interrupted belts on the back.

11. The brown *Flie* with iron-grey wings, and the edges of the ſegments of the body grey.

Of the hairy *Flies* there are,

1. The black *Flie* with the edges of the wings thin, ſcalloped, and whitiſh.

2. The common hairy dung *Flie* with a ſpot on each of the wings.

3. The black *Flie* with the baſe of the belly-part white, and its extremity brown.

4. The *Flie* with a grey breaſt, and the point of the belly-part white, and the wings marked with an iron-grey ſpot.

5. The *Flie* with a grey breaſt, and a black body, having a duſky iron-grey ſpot, on each of the wings.

6. The F*lie* with a white body, except behind, where it is black, and having white wings, marked with a black ſpot.

7. The F*lie* with a yellow breaſt, and a brown ſpot on the wings.

8. The grey F*lie* with iron-grey wings, and a brown ſpot on each.

Of Flies that have variegated wings, there are,

1. The F*lie* with black wings tipped with white.

2. The F*lie* with two black ſpots on each wing.

3. The F*lie* with white wings and a ſingle black ſpeck on the extremity of each.

4. The unguiculated winged F*lie*, with white wings, and a black ſpot in the middle.

5. The black F*lie* with the wings variegated on the fore part, with black and white.

6. The F*lie* with grey wings, ſpotted with black.

7. The grey F*lie* with unguiculated wings, ſpotted with brown.

8. The F*lie* with white wings, whoſe edges are black, and marked with black ſpots.

9. The *Flie* with white wings, and three brown ſpecks, and a brown ſpot at the end.

10. The *Flie* with white wings, marked with four grey ſtreaks, and as many ſmaller, running alternately between them.

11. The *Flie* with white wings, marked with four ſtreaks, and having five pair of ſpots on the back.

12. The green-eyed *Flie* with white wings, and marked with the letter S, in a double line, of a brown colour.

13. The *Flie* with white unguiculated wings, marked with four brown ſtreaks, and having the extremity of the breaſt yellow.

14. The *Flie* with pale wings, marked with black veins, and two tranſverſe undulated brown lines, and brown tips.

15. The *Flie* with membranaceous wings, ſpotted with black, and three rows of black ſpecks on the body.

Linnæus

Linnæus has only eleven ſorts of theſe Flies, namely, the water Flie, the ſummer Flie, and the Cherry tree Flie; theſe have variegated wings: the dung hairy Flie, the wonderful Flie, the putrid Flie; and the Flie of the neceſſary houſe: theſe three have variegated bodies: the Elephants trunk Flie: the fleſh Flie, the houſe Flie, and the Flie that is bred in cheeſe.

CHAP. XII.

OF THE GNAT AND TIPULA.

(From Goldsmith.)

THESE are two inſects which entirely reſemble each other in their form, and yet widely differ in their habits, manners, and propagation. Thoſe who have ſeen the tipula, or long legs, and the larger kind of gnat, have moſt probably miſtaken the one for the other, they have often accuſed the tipula, a harmleſs inſect, of depredations made by the gnat, and the innocent have ſuffered for the guilty; indeed the differences in their form are ſo very minute, that it often requires the aſſiſtance of a microſcope to diſtinguiſh the one from the other: they are both mounted on long-legs, both furniſhed with two wings and a ſlender body; their heads are large, and they ſeem to be hump-backed; the chief and only difference, therefore, is, that the tipula wants a trunk, while the gnat has a large one, which it often exerts to very miſchievous purpoſes. The tipula is a harmleſs peaceful inſect, that offers injury to nothing; the gnat is ſanguinary and predaceous, ever ſeeking out for a place in which to bury its trunk, and pumping up the blood from the animal in large quantities.

The gnat proceeds from a little worm, which is uſually ſeen at the bottom of ſtanding waters. The manner in which the inſect lays its eggs is particularly curious; after having laid the proper number on the ſurface of the water, it ſurrounds them with a kind of unctuous matter, which prevents them from ſinking; but at the ſame time faſtens them with a thread to the bottom, to prevent their floating away, at the mercy of every breeze, from a place the warmth of which is proper for their production, to any other, where the water may be too cold, or the animals its enemies too numerous. Thus the inſects, in their egg ſtate, reſemble a buoy, which is fixed by an anchor. As they come to maturity they ſink deeper, and at laſt, when they leave the egg as worms they creep at the bottom. They now make themſelves lodgments of cement, which they faſten to ſome ſolid body at the very bottom of the water, unleſs, by accident, they meet with a piece of chalk, which being of a ſoft and pliant nature, gives them an opportunity of ſinking a retreat for themſelves, where nothing but the claws of a cray fiſh can poſſibly moleſt them. The worm afterwards changes its form; It appears with a large head, and a tail inveſted with hair, and moiſtened with an oleaginous liquor, which ſhe makes uſe of as a cork, to

ſuſtain her head in the air, and her tail in the water, and to tranſport her from one place to another. When the oil with which her tail is moiſtened begins to grow dry, ſhe diſcharges out of her mouth an unctuous humour, which ſhe ſheds all over her tail, by virtue whereof, ſhe is enabled to tranſport herſelf where ſhe pleaſes, without being either wet or any ways incommoded by the water. The gnat, in her ſecond ſtate, is properly ſpeaking, in her form of a nymph, which is an introduction, or entrance into a new life. In the firſt place, ſhe diveſts herſelf of her ſecond ſkin; in the next ſhe reſigns her eyes, her antennæ, and her tail; in ſhort, ſhe actually ſeems to expire. However, from the ſpoils of the amphibious animal, a little winged inſect cuts the air, whoſe every part is active to the laſt degree, and whoſe whole ſtructure is the juſt object of our admiration. Its little head is adorned with a plume of feathers, and its whole body inveſted with ſcales and hair, to ſecure it from any wet or duſt. She makes trial of the activity of her wings, by rubbing them either againſt her body, or her broad ſide bags, which keep her in an equilibrium. The furbelow, or little border of fine feathers, which graces her wings is very curious, and ſtrikes the eye in the moſt agreeable manner. There is nothing, however, of greater importance to the gnat, than her trunk, and that weak implement may juſtly be deemed one of Nature's maſter-pieces. It is ſo very ſmall, that the extremity of it can ſcarcely be diſcerned through the beſt microſcope that can be procured. That part which is at firſt obvious to the eye, is nothing but a long ſcaly ſheath under the throat. At near the diſtance of two-thirds of it, there is an aperture, through which the inſect darts out four ſtings, and afterwards retracts them. One of which, however ſharp and active it may be, is no more than the caſe in which the other three lie concealed, and run in a long groove. The ſides of theſe ſtings are ſharpened like two edged ſwords; they are likewiſe barbed, and have a vaſt number of cutting teeth towards the point, which turns up like a hook, and is fine beyond expreſſion. When all theſe darts are ſtuck into the fleſh of animals, ſometimes one after another, and ſometimes all at once, the blood and humours of the adjacent parts muſt unavoidably be extravaſated; upon which a tumour muſt conſequently enſue, the little orifice whereof is cloſed up by the compreſſion of the external air. When the gnat, by the point of her caſe, which ſhe makes uſe of as a tongue, has taſted any fruit, fleſh, or juice, that ſhe has found out; if it be a fluid, ſhe ſucks it up, without playing her darts into it; but in caſe ſhe finds the leaſt obſtruction by any fleſh whatever, ſhe exerts her ſtrength, and pierces through it, if poſſibly ſhe can. After this ſhe draws back her ſtings into their ſheath, which ſhe applies to the wound in order to extract, as through a reed, the juices which ſhe finds incloſed. This is the implement with which the gnat performs her work in the ſummer, for during the winter ſhe has no manner of occaſion for it. Then ſhe ceaſes to eat, and ſpends all that tedious ſeaſon either in quarries or in caverns, which ſhe abandons at the return of ſummer, and flies about in ſearch after ſome commodious ford, or ſtanding water, where ſhe may produce her progeny, which would be ſoon waſhed away and loſt, by the too rapid motion of any running ſtream. The little brood are ſometimes ſo numerous, that the very water is tinged according to the colour

colour of the ſpecies, as green, if they be green, and of a ſanguine hue, if they be red.

Theſe are circumſtances ſufficiently extraordinary in the life of this little animal, but it offers ſomething ſtill more curious in the method of its propagation. However ſimilar inſects of the gnat kind are in their appearance, yet they differ widely from each other in the manner in which they are brought forth, for ſome are oviparous, and are produced from eggs, ſome are viviparous, and come forth in their moſt perfect form; ſome are males, and unite with the female; ſome are females, requiring the impregnation, of the male; ſome are of neither ſex, yet ſtill produce young, without any copulation whatſoever. This is one of the ſtrangeſt diſcoveries in all Natural Hiſtory? A gnat ſeparated from the reſt, and incloſed in a glaſs veſſel, with air ſufficient to keep it alive, ſhall produce young, which alſo, when ſeparated from each other, ſhall be the parents of a numerous progeny. Thus, down for five or ſix generations do theſe extraordinary animals propagate without the uſe of copulation, without any congreſs between the male and female, but in the manner of vegetables, the young burſting from the body of their parents, without any previous impregnation. At the ſixth generation however, their propagation ſtops, the gnat no longer produces its like, from itſelf alone, but it requires the acceſs of the male to give it another ſucceſſion of fecundity.

The gnat of Europe gives but little uneaſineſs; it is ſometimes heard to hum about our beds at night, and keeps off the approaches of ſleep by the apprehenſion it cauſes; but it is very different in the ill-peopled regions of America, where the waters ſtagnate, and the climate is warm, and where they are produced in multitudes beyond expreſſion. The whole air is filled with clouds of thoſe famiſhed inſects, and they are found of all ſizes, from ſix inches long, to a minuteneſs that even requires the microſcope to have a diſtinct perception of them. The warmth of the mid-day ſun is too powerful for their conſtitutions; but when the evening approaches, neither art nor flight can ſhield the wretched inhabitants from their attacks, though millions are deſtroyed, ſtill millions more ſucceed, and produce unceaſing torment. The native Indians, who anoint their bodies with oil, and who have from their infancy been uſed to their depredations, find them much leſs inconvenient than thoſe who are newly arrived from Europe; they ſleep in their cottages covered all over with thouſands of the gnat kind upon their bodies, and yet do not ſeem to have their ſlumbers interrupted by their cruel devourers. If a candle happens to be lighted in one of thoſe places, a cloud of inſects at once light upon the flame, and extinguiſh it; they are therefore obliged to keep their candles in glaſs lanthorns; a miſerable expedient to prevent an unceaſing calamity.

CHAP. XIII.

OF FLIES OF THE GNAT KIND, WHICH HAVE VERY SLENDER SNOUTS OR TRUNKS, LIKE THREADS.

(FROM BROOKES.)

THESE ſort of *Flies* are much more troubleſome in hot climates, than with us, though in low marſhy places, our countrymen have ſufficient reaſon to complain of them; however their bite is not near ſo painful as thoſe of the Gnats between the *Tropics*: there is one ſort in *Peru*, which are called Muſkitoes, that are ſo ſmall, they are almoſt imperceptible, and yet their bite gives a ſenſation, like the burning of hot iron. Other Muſkitoes are like our Gnats, and are of two ſorts, whoſe bits are much more painful, and raiſe large bumps on the ſkin: they are ſo numerous, that they darken the air by their multitude, inſomuch, that thoſe who travel in the woods are obliged to have a cotton covering, or net, to keep them off, and the pooreſt *American* is never without one.

Pere du Tertre obſerves, that in the *Caribbee-Iſlands*, there are Flies, not unlike our common Gnats, and probably are the ſame as thoſe juſt mentioned. Whenever they get to the ſkin, they ſuck out the blood, and are always bred in marſhes and ſtanding waters. At firſt it is a ſmall worm, not thicker than a hair, and of the length of a grain of corn. After they are changed into Gnats, there are ſuch vaſt numbers of them, that they darken the air, eſpecially in the morning, two hours before the riſing of the ſun, and as many after he is ſet. When any one ſtops, theſe little tyrants come buzzing about his ears in ſuch a troubleſome manner, that he often loſes all patience. If he wants to go to ſleep, they fix upon every part of his body that is uncovered, and thruſt their ſmall ſnouts, which are ſo fine that they can hardly be ſeen, into the pores of the ſkin, and as ſoon as they meet with a vein, they are ſure to ſuck out the blood, and if they are let alone, they will ſwallow ſo much, that they can hardly fly after it: the original natives of theſe iſlands, make a fire under their beds, that the ſmoke may drive them away; and even ſome of the *European* inhabitants, that live in low grounds, and upon the edges of woods, are obliged to make uſe of a remedy, and even to ſmoak their houſes with burnt tobacco. But the beſt method to keep them off, is to hang cotton nets round the bed with ſmall meſhes; for theſe ſmall inſects, having large wings, are not able to get through them. He alſo obſerves, that ſome Muſkitoes are no larger than pin points, and yet they always leave purple marks on the ſkin. However theſe are only met with on the banks of rivers, where the wind ſeldom or never blows.

It will not be improper in this place, to take notice of ſome other Flies, common in the *Weſt-Indies*, but not known in *Europe*. One of theſe is an inch and a half long, and an inch broad: they are alſo flat, and not much unlike Beetles: they have ſuch hard and ſtrong teeth, that they will gnaw and eat a paſſage into the heart of the very hardeſt trees, where they make their neſts. Another ſort of Flie are only ſeen buzzing

buzzing on the ſurface of the earth, immediately after rain, when the ſun ſhines: they are remarkable for the manner of making their neſts, which are built with the leaves of trees, which they make of a round figure with their teeth, in ſuch a manner, that of two leaves they form a ſort of baſket, by laying them one upon another, taking care that there be a hollow ſpace between them, in which they conceal themſelves, and lay their eggs.

And now we are ſpeaking of the *Weſt Indies*, this may be as proper a place as any, to take notice of the Hornet-Flie, which is not unlike a Flying ſtag, a Flie ſo called, with branched horns like a ſtag: they have a black ſmall head, covered with orange-coloured hair, as ſoft as ſilk: their eyes are round, as clear as cryſtal, and the ſize of ſmall peas; and they are ſo hard, that there is no breaking them, without the help of a hammer: this ſmall head terminates in the ſhape of a horn, turned up, and armed with four teeth, like the nippers of a cray-fiſh: this horn is black, as hard and as well poliſhed as jet, and about two inches in length. But the moſt remarkable thing of all, is its having a joint above the eyes, which has a motion; for the head is covered with a ſort of helmet from the head to the wings, where it terminates in another horn, three or four inches long, and bending downwards, reaches the joint of the other, and makes a ſort of nippers like thoſe of a cray-fiſh: this horn is of the ſame ſubſtance as the firſt, except its being bordered with a ſhort hair, as ſoft as velvet: they can lift up, or let down the helmet at pleaſure; but it is obſerveable, that the males only wear them.

There are two other ſorts of *Flies* at *Martinico*, the firſt of which is horned like the former, only the two horns are of an equal ſize, and placed on each ſide the head, though they meet together like nippers, when the inſect pleaſes: theſe are probably their feelers: the other ſpecies is only an inch and a half long, and one broad, and the upper part of their wings are hard, and of a grey colour, only they are ſtriped with ſilver rays.

The *Walking-Leaf* is an inſect brought from the *Spaniſh Weſt Indies*, and has a very flat body, of a reddiſh colour, like that of certain dry leaves; that is at ſome times of the year, for at firſt it is green. It is produced from a green egg, as big as a coriander ſeed, from which in a few days proceeds a little black inſect, like an Ant when juſt hatched: the wings are at firſt like a green leaf, and have fibres run along it, from the inward edges to the outward, much like thoſe of many leaves, and they branch into ſubdiviſions, as they come nearer the edge. On the fore part of the body there are four other ſmall wings, which though they differ among themſelves, each pair being of a different ſhape, yet they exactly reſemble ſome ſort of leaves: the larger wings being ſhut, it exactly reſembles a leaf, which has been the reaſon why it is called the Walking Leaf: the eyes are ſmall and prominent, and the mouth is forked; the head is round, and about the neck there is the reſemblance of a ring, of the ſame colour with the body. Behind this the neck enlarges again, inſomuch that it looks almoſt like another head, but larger. It is above three inches long, and an inch and a half broad. But to return to the Gnats.

Some place the *Tipula* among the Gnats, but improperly, though they cannot be diſtinguiſhed from each other, without the aſſiſtance of

a microſcope. *Reaumur* informs us, there are three ſorts of Gnats in the fields about *Paris*, the largeſt of which has a body variegated with white and black, and on the breaſt there are black and very brown undulations. A leſſer kind reſembles the former, in the colour of the breaſt and eyes, but the body is brown: the third kind is leſs than either, and is moſt common. It has a light reddiſh brown breaſt, and a whitiſh body; but under the belly, on each ring, there is a brown ſpot, and the reſt is grey; the eyes are of a very fine green.

Gnats in general, have a longiſh body, nearly in the ſhape of a cylinder, and it conſiſts of eight rings: the corſlet, though ſhort, is conſiderable for its ſize, and to this the legs and wings are connected, beſides the two ballances or mallets: there are alſo four marks, placed much in the ſame manner as other Flies; for the two firſt of which are pretty near the head. When the Gnat is at reſt, it generally keeps one of its wings croſſed over the other, ſo as to cover it: the feelers are finer in the males, than in the females, and in ſeveral kinds, there are two ſmall longiſh bodies on the head, of a round ſhape, which have ſome reſemblance to the feelers of ſhort bodied Flies. *Reaumur* calls them Barbs, becauſe the trunk of the Gnat is placed underneath them: the trunk of the Gnat is a very fine inſtrument, and is different from that of the Flie, for its ſting or prickle, or rather ſtings, are contained in a ſheath. It ſeems to be deſigned purpoſely to bore the ſkin, and to ſuck out the blood. *Swammerdam* calls the ſting a kind of a reddiſh ſhining thread; but *Reaumur* has diſcovered, that it conſiſts of ſeveral threads, which may be divided from each other: the ſheath for this ſeems to be a cylindric pipe. though in reality, it is cloven almoſt throughout its whole length, and the edges of the cleft recede from each other, when there is occaſion.

When a *Gnat* ſucks the blood without diſturbance, he ſeldom quits the place till he has filled his ſtomach and guts with blood. When the bite of a Gnat is perceived immediately, there is no better remedy to cure it, that to moiſten the liquor with water, which is left upon the wound; and this may be eaſily done, by rubbing in the water immediately; or the wound may be opened a little, and then it needs only be waſhed. But if the bite is not perceived till ſeveral hours after it is done, this remedy will have no effect.

Gnats proceed from a ſort of water Worms, that are found neither in rivers nor brooks, but in ponds and ſplaſhes of water in marſhes, from *May* till the beginning of the winter; for this reaſon, all marſhy places are terribly infeſted with Gnats, and rainy ſeaſons produce more than dry: the body of the worm is longiſh, with the head joined to the firſt ring of the body, by a ſort of neck: this ring is thicker and longer than the reſt, and ſeems to be a kind of corſlet, which is ſucceeded by eight others; that is, there is nine in all, and they gradually grow leſs to the end of the tail. It changes to an Aurelia, with a whitiſh body, and a greeniſh corſlet, which ſoon turn brown.

The great *Gnat* is twice as big as the common Gnat, though it is much of the ſame ſhape; for it has a long ſlender grey body, and large thin tranſparent wings, without ſpots: the ſnout or trunk is prominent and ſlender, and its ſheath is forked at the top, or formed into two leaves, which are hairy, and of the ſhape of a lance. It is very common about the waters, and while in its worm ſtate, lives in the water.

The

The humble-bee *Flie* is placed in this claſs, on account of the ſtructure of its ſucker or ſnout. It is very like a common Humble-bee, in its ſhape, and even its ſize, being covered with extremely thick down; its body is ſhort, roundiſh, and obtuſe, and its colour black, but of a reddiſh-brown on the ſide: the trunk or ſucker is long, which it always carries thruſt out, the wings are partly brown, and partly whitiſh, and a great deal of down on the body is white, which with the blackneſs below, has a very uncommon effect. It is very common in gardens, where it ſucks the honey out of the flowers.

The little *Gnat* is conſiderably ſmaller than the common Gnat, and has an oblong ſlender blackiſh body, with a large head and eyes; the wings are long, narrow, and of a dull white, and three duſky ſpots near the outer edge. Its bite is attended with pain, and makes a mark that remains for ſome time. It is common in woods, and about waters.

Linnæus takes notice of ſix kinds of Gnats, namely,

1. The duſky *Gnat* with a forked ſnout: this *Ray* takes to be the female of the Domeſtic Tipula, becauſe it does not bite or ſting. It is of an aſh colour, and twice as large as the following. It has no points on the wings, and from between the jaws there proceeds, or more properly from the trunk, a forked dart.

2 The aſh coloured *Gnat* with eight rings on the body, is the common Gnat, which is met with almoſt in all parts.

3. The *Gnat* with wings of the colour of water, marked with three black ſpots. Some call it the leaſt Gnat with blackiſh ſpots, it being no bigger than a ſmall flea, of a brown colour; but the wings are white and narrow, marked on the outer edge with three dark ſpecks. When the wings are ſhut, it appears like three brown ſtreaks.

4. The black *Gnat* with the wings of the colour of water, black feet, and a white ring: there are prodigious numbers of theſe in *Lapland*, in the duſk of the evening, and they make a great a noiſe: they will bite any part, even the eyes, mouth, and noſe, and they are not eaſily driven away. It is very ſmall, is in ſhape like a common Flie, and is of the ſize of a Flea.

5. The downy *Gnat* with wings in part of a duſky colour: this is found in gardens, where they fly about without ceaſing, and ſeem to delight in the ſmell of the flowers. It is called by *Ray* the Gnat ſhaped like a ſilk worm Moth, all over hairy and black, with a blunt hinder part of the body, and red ſides.

6. The black *Gnat* with a duſky body, and a white forehead. In the tranſactions of *Upſal*, it is called the blood-ſucking leaſt Flie, with white wings. It is very troubleſome to horſes in the ſummer ſeaſon, eſpecially in *Northland*, where it gets among the hair and ſucks the blood. It is more fond of horſes than men, and cannot be driven away: the feelers are like threads, though it is in the ſhape of a Flie; and the head, feet, and breaſt are black, only on the ſides of the breaſt it is of an aſh colour, and there is a white ſpot above and below the eyes.

CHAP.

CHAP. XIV.

OF FLYING INSECTS OF THE TIPULA KIND.

(From Brookes.)

BY *Tipula* was formerly underſtood nothing but the Water Spider, of which they knew only two ſorts; but now the catalogue is greatly enlarged, and it is plain from *Linnæus*, that other ſorts are meant, beſides thoſe that frequent the water; though he mentions only ſeven, namely, the variegated Tipula, that of roots, that in the ſhape of a Gnat, the febrile Tipula, that of the Aſparagus, that with bended wings, and that of the Juniper tree. He makes the characteriſtic of this kind to be the mouth, furniſhed with crooked and jointed feelers.

That deſcribed by *Mouſet*, is almoſt in the ſhape of a ſpider, with an oblong ſlender body, and four legs fixed to the breaſt. Near the mouth there are two arms, which ſome take to be feelers, and are moſt probably really ſo; for this inſect makes no uſe of them when it runs, and they are twice as ſhort as the other feet. It has four very weak wings, which ſeem to be of no great uſe in flying, though they are for leaping: they are ſhorter than the body, and the upper pair are thicker and broader than the lower, and are of a duſky blackiſh colour: the lower wings are leſs, more ſlender, and of a ſilver colour: they are often ſeen leaping upon the water, but ſo lightly that they ſeem to make no impreſſion on it at all; however they are not conſtantly in motion, but by ſtarts. It does not dive into the water, unleſs forced thereto, and then their bodies do not ſeem to be at all wet with it. It is to be met with in ſtanding waters, where there is but little wind throughout the ſummer. It is ſometimes met with in rivers, eſpecially near the banks, and under the ſhade of ſome tree, as for inſtance the willow; and there are generally many of them together.

There is an odd ſort of a Worm or Caterpillar, which was firſt taken notice of by *Mairan*, in the memoirs of the Academy of Sciences for 1717, which was afterwards more fully deſcribed by *Frych*. It is found in holes near the ſurface of the ground, about nine inches in length, and in the lower parts the Caterpillar is concealed in a houſe of its own ſpinning, and cloſed at the mouth with the ſame ſort of thread of which the neſt is compoſed. It is of a browniſh black colour, with yellow feet, and a ſhield near the neck; as alſo another of a black colour on the tail, with a very ſhining edge. It can hide its head in that about the neck, almoſt as far as the forehead; and it has twenty folds or furrows on the back, whereas others have generally but ten. It is provided with ſo great a number, that it may more readily creep into holes, by moving its body more nimbly: this Caterpillar does not make theſe holes for the ſake of food, for there is nothing fit for them there; and if there was, they might get at it without making theſe holes, becauſe with the head and fore-feet it can quickly throw the earth on each ſide, ſo as to be able to hide itſelf in a very ſhort time. Nor are theſe holes made for its more ſpeedy return, much leſs for the ſake of breathing,

breathing, for they meet with air enough in whatever place they lye; but the Butterflie which is the dam of this Caterpillar, ſeeks for a place like all other inſects, where there may be ſufficient nouriſhment for its offspring, and there it lays its eggs, by thruſting the ſharp part of its belly, which is long and prominent, into the chinks of the earth. Theſe Caterpillars, as ſoon as they are hatched, preſently weave themſelves a covering or houſe, from which it can creep to the moſt proper place to find food; and by this means it is the better defended from other inſects that feed in the ſame places, particularly from the voracious ſubterranean Beetles, that wander upon the ground, and yet carefully ſhun theſe neſts, as Flies do a Spider's web. They firſt lengthen their hole in proportion to the ſize of their body, and as the moiſture fails, they increaſe it to above a foot in length, fixing their webs thereto, and lining it, as it were, that it may retain the moiſture the longer, and be more ſtrong and firm, and at the bottom of which theſe Caterpillars generally lye.

The nippers of the mouth with which it eats, are dentated, and generally by night it proceeds from its burrow to the ſurface of the earth, in ſearch of food, and when it fails, it works its hole to the next place, that the food may be always near it. It grows to the length of a man's thumb, and in *May* its Aurelia changes into a Butterfly, which is of a ſilver ſhining colour, marked all over with very ſmall black ſpecks, and there are ſometimes black marks or ſpots, which ſeem to be made up of ſmall ſpecks. The undermoſt wings are the whiteſt, and the head is of a dun colour, with feelers on the ſides, ſtanding at right angles. The hinder feet are the longeſt, and are armed with prickles, on account of the roughneſs of the earth, where it is to lay its eggs.

Inſects of this kind of other authors, are,

1. The *Tipula* with whitiſh wings, and is the moſt beautiful of this kind; it has a body that is oblong and ſlender, of a greyiſh-brown colour, and a cloven tail. The legs are long and ſlender, the head large, and the eyes like net-work; the wings are large and very beautiful, and they have a brown line running down the outer ſide, from which proceeds another ſmaller towards the other ſide; between theſe there is a large ſnow-white ſpot. It is called by *Ray* the greateſt Tipula with large wings, variegated with brown and white.

2. The painted *Tipula* has a long ſlender body, beautifully variegated with a deep gloſſy black, and a bright yellow, and the breaſt is alſo of the ſame fine black, ſpeckled with yellow. The wings are large and browniſh, with duſky veins, and an obſcure ſpot on each, towards the edge; but the legs towards the top, are yellowiſh. It is called by *Ray*, the beautiful Tipula with a black back and ſhoulders, and a ſaffron-coloured belly.

3. The *Sea Tipula* is very like a Gnat, and has an oblong brown body, with a large beautiful green breaſt; the feelers of the male are feathery, and of the female ſhaggy. It proceeds from a long ſlender bright-red worm, compoſed of twelve joints. It lives in the ſea, in clayey or ſandy caſes, of a great length.

4. The *Tipula* with wings beautifully variegated with brown.

5. The *Tipula* with whitiſh wings, with a brown line on the edges.

6. The *Tipula* with whitiſh wings, with a few white ſpots.

7. The *Tipula* with grey wings, marked with black lines and ſpots.

8. The *Tipula* with a black body, black legs, and blue wings.
9. The *Tipula* with grey wings, marked with brown lines and ſpots, and the belly part blackiſh on the upper ſide.
10. The *Tipula* with a grey back and whitiſh wings, marked with brown ſpots.
11. The *Tipula* with a black and yellow body, and white wings, marked with faint ſpots.
12. The *Tipula* with a black body and brown wings.
13. The yellow *Tipula* with a brown back.
14. The *Tipula* with paleiſh brown wings ſpotted with black, and a black body.

The following *Tipulæ* reſemble *Gnats*.

1. The brown *Tipula* with the fore part of the body green.
2. The *Tipula* with very large fore legs, formed like feelers, and a white circle on the body.
3. The *Tipula* with the fore legs formed like feelers, and tipped with white.
4. The *Tipula* with white legs, and wings variegated with white and grey.
5. The green *Tipula* with white wings without any ſpots.
6. The *Tipula* with a yellow body, and black eyes, breaſt, and back.
7. The black *Tipula* with a bunched breaſt, and large hind legs.
8. The ſmooth black *Tipula* with feelers ſhorter than the head, and with the fore legs furrowed on the inner part.
9. The brown *Tipula* with the baſe of the wings grey.
10. The oblong hairy *Tipula* with black wings.
11. The black velvet *Tipula*.
12. The *Tipula* with a red body and white wings, black on the outer edge.
13. The *Tipula* with grey bended wings, ſomewhat oval like the end of a lance.
14. The black *Tipula* with white wings, and a white ſpot on the fore part of the abdomen.
15. The *Tipula* with blue wings, hairy on the inner edge.
16. The *Tipula* with a reddiſh body, and a black breaſt.
17. The *Tipula* with a black head, and the feelers longer than the body, which is of a pale red.

CHAP. XV.

OF CATERPILLARS.

CATERPILLARS are the inſects that appear firſt in the ſpring, and they proceed from the eggs of Butterflies. Whoever takes a walk in fine weather, will readily find them upon different trees and plants; but their condition is tranſient, for they all will in a ſhort time become winged inſects, and theſe changes that they undergo, is one of the moſt ſingular parts of natural hiſtory.

The

The bodies of Caterpillars are longer than they are round, and they are compoſed of rings, whoſe circumference is pretty near circular or oval; they are generally twelve in number, and are all membraneous, by which Caterpillars may be diſtinguiſhed from divers other inſects, whoſe bodies conſiſt of twelve rings. The head of the Caterpillar is connected to the firſt ring, and between the head and this ring, there is a neck, generally ſo ſhort, that it is ſcarcely viſible. All the covering of the head in Caterpillars, ſeem to conſiſt of a ſhell, and they have neither upper nor lower jaw; for they are both placed exactly at the ſame height, and armed with ſuch a large thick tooth, that they both are equivalent to all the large teeth that other animals are furniſhed with. When the mouth is ſhut, theſe teeth are always uncovered, ſo that it is with eaſe that the Caterpillars cut the leaves in pieces, when they feed upon them.

Caterpillars have ſix ſmall black grains, placed on the circumference of the fore-ring, and a little to the ſide of the head. Three of theſe are larger than the reſt, and are convex and tranſparent; theſe Mr *Reaumur* takes to be the eyes of the Caterpillar; but *Valniſnieri* will not allow them to be ſuch.

There are a great variety among Caterpillars, one of the moſt remarkable is, that ſome have more legs than others, and theſe are of two kinds; thoſe that are ſhelly, ſo called, becauſe they are covered with a ſort of ſhining griſtles; and the other membraneous, becauſe their ſkins are ſoft and flexible. All theſe Caterpillars have ſix ſhelly legs, three on each ſide, which proceed from the three firſt rings, and theſe are called by Mr *Reaumur* the fore legs; but all Caterpillars have not an equal number of membraneous legs, for ſome have two, others four, others ſix; and others again eight.

Reaumur divides Caterpillars into ſeveral claſſes; the firſt of which are thoſe that have eight intermediate legs, four on each ſide; that is to ſay ſixteen in all. Their eight intermediate legs are connected to the four rings that follow each other. The largeſt Caterpillars, and thoſe that are moſt commonly ſeen, are of this firſt claſs.

The ſecond and third claſſes, conſiſt of thoſe that have only three intermediate legs on each ſide, that is to ſay, fourteen in all. Theſe are generally remarkable for their induſtry; and the difference between theſe two claſſes, is principally taken from the different arrangement of their feet: the ſecond comprehends Caterpillars that have no feet on the fourth, fifth, ſixth, tenth, and eleventh ring; and the third conſiſts of thoſe that have the fourth and fifth ring unprovided with feet, and yet have a pair on the ſixth, ſeventh and eighth, but none on the ninth, tenth, and eleventh.

The fourth claſs contains *Caterpillars* that have fourteen feet, ſix of which are ſhelly, and the eight intermediate ones membraneous, placed as in thoſe of the firſt claſs, and on the ſixth, ſeventh, eighth, and ninth ring. The fifth claſs comprehends thoſe that have four intermediate feet, that is twelve in all. In the ſixth claſs he places thoſe that have but two intermediate feet, or ten feet in all.

The *Caterpillars* of the fifth claſs, have but four rings that follow each other, which have no feet, and thoſe of the ſixth claſs have ſix rings, which are placed between the ſcaly legs and the intermediate legs. Theſe two claſſes comprehend Caterpillars that walk in a diffe-

rent manner from the reſt; for they proceed as if they were meaſuring the ground as they go; for which reaſon they are called ſurveyors.

The ſeventh claſs have no intermediate feet, they having but eight in all, that is ſix that are ſhelly, and the two hindermoſt. Mr *Reaumur* places in this claſs, the greateſt part of Moths, they having only ſix ſhelly, and ſix hinder legs, that is ſpeaking in general, for ſome have eight intermediate legs. He will not allow any to be Caterpillars, that have not eight legs at leaſt; though *Ray* places in that number, ſome that have leſs than eight.

There is a very great difference among Caterpillars, the principal of which is the ſize and colour. Thoſe of the middle ſize, are about an inch long, and the diameters of their bodies is little leſs than a quarter of an inch. Some are only of one colour, others of different colours, ſome of which are very lively and well determined, others are placed in ſtreaks of different kinds, running ſometimes one way, and ſometimes another; and ſometimes again undulated or ſpotted. Theſe differences of their colours, and the manner of their being placed, ſerve to diſtinguiſh their kinds; though there are ſome that are entirely green, and others all over brown.

Caterpillars are alſo diſtinguiſhed into thoſe that are naked, and hairy; for the ſkin of moſt part of the firſt kind is ſoft to the touch, but the others are rough, with hard grains; for which reaſon, they are called by ſome ſhagreened Caterpillars; and ſeveral of theſe have a horn on the eleventh ring, which characteriſes a diſtinct kind. Some place thoſe among the naked kind, that are full of round tubercles, and which comprehends moſt of the large kinds, that produce the moſt beautiful Butterflies.

The thorny *Caterpillars* are ſo called, becauſe they are rough with ſuch hard and thick hair, that they reſemble thorns or prickles, exactly like thoſe on plants. The hairy Caterpillars are ſo very different, ſome of them being extremely beautiful, and others exceeding ugly, that they may be looked upon as diſtinct kinds, though they are generally known among us by the name of Palmer Worms.

With regard to the ſhape of *Caterpillars*, ſome are more ſlender before than behind, and others the contrary. Some are in the ſhape of fiſh, and the bodies of others terminate in a kind of fork.

Some *Caterpillars* when you are about to take them, roll themſelves up in rings; and when thoſe that are hairy do the ſame, they look like ſmall hedge-hogs. Others fall to the ground when the leaves are touched on which they are feeding; and others again endeavour to ſave themſelves by running away.

When *Caterpillars* are metamorphoſed firſt, they have neither feet, wings, nor motion, nor do they take any nouriſhment; and then they have the name of a Chryſalis, Nymph, or Aurelia. The Chryſalis which proceeds from the ſlough of a Caterpillar, is tender and ſoft at firſt, but becomes ſo hard at length, that it is brittle. Some of theſe Aurelias are all over hairy, and others ſeem to be ſhagreened; there are likewiſe varieties in their ſhapes, in their ſizes, and the arrangement of the prominences on their bodies; they are alſo of different colours.

The *Caterpillar* of the apricot-tree is of a purple colour, and marked with red points. It has four tufts of red hair on its back, like the oars of a boat; and there are two more on the head, which make a

ſort

ſort of horns, and one on the tail. It turns to a nocturnal Butterfly, whoſe female is without wings; and the male is of a red colour, with the wings before marked with a white ſpot.

The *Caterpillar* of common worm wood is adorned with a white ſtreak and brown ſpots. The ſides are of a paliſh green, with brown ſtreaks, and over each joint there is a ſmall white ſpot on the fore part of the body, ſix ſmall claws, eight in the middle, and two behind. In *May* they turn to black Aurelias, from whence proceed ſmall nocturnal Butterflies, whoſe head and upper wings are reddiſh, variegated with ſtreaks and ſpots that are black and brown. There is alſo a ſmall white ſpot that ſhines like ſilver in the middle on the upper wings, but the lower are brown. Theſe Butterflies have ſmall black horns, and two ſhining eyes; they fly only in the evening.

The ſame plant nouriſhes a ſmall long greeniſh *Caterpillar*, which has a remarkable walk; for it joins the hind part of the body to that before, making a ſort of hump, and proceeds forward in that manner. About the end of *July* theſe Caterpillars turn to Aurelias, and fourteen days afterwards ſmall nocturnal Butterflies come out, whoſe head, body, and upper wings, are adorned with green, and variegated with white, black, and brown ſpots and ſtreaks; but the lower wings are of a bright brown. They have alſo two ſmall horns of a bright brown, and four little feet ſpotted with brown; and they fly very ſwiftly.

Albin and *Liſter* ſpeak of another *Caterpillar* that feeds on wormwood, which is of an olive colour, inclining to brown, which changes in *July* to an Aurelia, and becomes a nocturnal Butterfly in *September*. *Goedard* alſo ſpeaks of a Caterpillar that feeds on the leaves of wormwood, and which changes into the Solitary Flie. The ſame authors alſo mention another ſort of Caterpillar that feeds upon the leaves of ſea-wormwood, and which changes into a moſt beautiful Butterfly, which will be hereafter deſcribed.

The *Caterpillar* found upon ever-green privet, is a beautiful inſect, being of a dark purple mixed with red and brown. It changes to an Aurelia in *May*, and in *July* becomes a fine red nocturnal Butterfly, whoſe upper and lower wings are croſſed with black lines.

The *Caterpillar* of marſh mallows, becomes a reddiſh nocturnal Butterfly. There is alſo a ſmall white inſect, ſpotted with black, which feeds upon this plant, which changes into a ſmall winged animal that leaps like a Flea.

The pine-apple *Caterpillar*, is of a greeniſh colour, with a red and white ſtreak running through the length of the body. It becomes a Butterfly, which beheld through a microſcope, ſeems to have the wings covered with ſcales, like thoſe of a fiſh, each of which has three teeth, with ſome very long hairs; and they are diſpoſed in ſuch a manner, that they may be very eaſily counted. The whole body ſeems to be covered with a ſort of feathers mixed with hairs.

The *Caterpillar* of the columbines is ſmall, and feeds on the flowers of this plant, turning afterwards to a ſmall black Flie. There is likewiſe another Caterpillar belonging to the columbines, that rolls itſelf up like a ball. It hides itſelf in the earth before it undergoes its change, and two Flies have been ſeen to come out of the Aurelia.

The *Caterpillar* of the tree called Areck, is very large, and is to be met with under the branches of this foreign tree. It feeds on the flowers

ers and the fruit, and becomes a fine Butterfly, the upper part of whoſe wings are black, and beneath of a golden colour, bordered, ſpotted, and ſtreaked with black. The back of the Butterfly is adorned with ſmall red ſpecks.

The meadow pink *Caterpillar*, is of a bright brown colour, mixed with black and white ſpots. It gets into the earth before it is changed to an Aurelia, and in the month of *June* becomes a nocturnal Butterfly, with yellow under wings.

The Arrach *Caterpillar* becomes a ſmall red nocturnal Butterfly in *June;* and it is of a blue green; but the Butterfly is of a bright brown.

Wild Arrach feeds ſeveral ſorts of Caterpillars; for *Merian* ſpeaks of a Caterpillar of a bright green, that feeds on the leaves of this plant. She continues in the ſame ſtate till *Auguſt*, when ſhe is transformed to a brown Aurelia, and on the following night the Butterfly proceeds therefrom, of the colour of a faded leaf. There is another Caterpillar belonging to this plant, of a blueiſh green, which is very ſlow, and changes her ſkin four times, aſſuming a new one as ſhe quits the old. On the fourth of *September* one of theſe produced a maggot, that was in continual agitation, which continued for fourteen hours, and then ſhe appeared of a duſky pale colour. She continued in this condition till the 26th of *September*, and then a Flie came out, of a common form, with long feet, flat at the end, and a large head. She died on the third of *October*. *Albin* ſpeaks of another belonging to the garden-arrach, which continued feeding till *September*, and then ſhe hid herſelf in the earth, and did not turn to an Aurelia till *July* following; from whence proceeded a nocturnal Butterfly, of the colour of a faded leaf.

The *Caterpillar* of Jeruſalem artichokes is of a brown colour, with a yellow belly, with an aſh-coloured line that parts the brown from the yellow. She likewiſe feeds upon other plants, and does a great deal of damage in gardens. She changes into a Butterfly with yellow wings ſpotted with black. *Goedard* ſpeaks of another Caterpillar, that feeds upon the leaves of this plant, and produces a Butterfly with wings as white as ſnow, and a body of a light yellowiſh colour. This Butterfly flies about, and is fond of liberty. The ſame plant nouriſhes a hairy Caterpillar, that was obſerved to change her ſkin the 13th of *Auguſt*, and on the ſixth of *September* ſhe began to feed again. She began to change on the 10th of the ſame month, but the metamorphoſis was not changed again till the ninth of *May* following, and then it became a white Butterfly.

The *Caterpillar* of the white thorn, is of ſeveral colours, and alſo feeds upon the leaves of fruit-trees. It ſpins a grey cod, and changes into a brown Aurelia. When touched it rolls itſelf up, and a white nocturnal Butterfly proceeds from it, that dies after laying yellow eggs.

The *Caterpillar* of the alder-tree is white, variegated with white ſtreaks and ſpots; the head is black, and on the fore part of the body there are ſix feet, in the middle twelve, and behind two, that are ſmall. Towards the end of *June*, it changes into an Aurelia, that becomes a white nocturnal Butterfly fourteen days afterwards, ſpotted with black. This tree feeds ſeveral other Butterflies, one of which has two hooks, of a yellow colour, and ſo is the reſt of the body, with a mixture of ſame colour. A Butterfly proceeds from hence, variegated with divers

colours.

colours. Another of these is hairy, and of a green colour. In *October* it begins to change, and at the end of *June* in the following year, it turns to a dusky Butterfly, spotted with white. Another Caterpillar again is green, and produces a very beautiful Butterfly, variegated with several colours.

The *Caterpillar* of the Ballia, a plant of Surinam, is of two kinds; the first is yellow and white, with black streaks, and turns to a nocturnal Butterfly, with black spots: the other is yellow, striped with black, with a brown head, that turns to a small Butterfly of an oker colour.

The bananoe *Caterpillar* is of a brown colour, and the back is armed with four prickles: the tail is cloven to the feet, is red, and the head seems to be adorned with a crown. It changes to a Butterfly, called the little Atlas. It breeds another Butterflie of a bright green, which in *May* turns to a nocturnal Butterfly.

The venelloe *Caterpillar* is brown, striped with yellow, and turns to a fine Butterfly, the under part of which is of a saffron colour, and the upper variegated with yellow, red, and brown, and silver spots. A green Caterpillar of the same plant, turns to an ash-coloured Butterfly.

The burdock *Caterpillar* is brown on the back, spotted with black, and under the belly it is of a pale yellow. On the fore part of the body there are six small feet, and in the middle there are eight. In *June* it turns to an Aurelia, of the colour of silk, from whence proceeds in *July* a small nocturnal Butterfly, with the head and upper wings of the colour of silk, variegated with brown and golden spots. It has six brown feet, and flies only in the evening.

The potatoe *Caterpillar* is of a square shape, and a greenish-yellow colour, covered with small round red studs. It turns to a brown winged insect, streaked with a yellow golden colour: there are other Caterpillars belonging to this plant, of a green colour, which become white and yellow Butterflies, whose wings are bordered with brown.

The low parsnip *Caterpillar* is of a bright green colour and changes to an Aurelia, that turns to a Butterfly, of a dusky olive colour.

The corn *Caterpillar* is usually met with in corn fields, and feeds upon the roots of tares. It is of a bright brown colour, streaked and spotted with one that is darker. In *September* it turns to a nocturnal Butterfly, with the fore part of the body and the wings of a greyish ash-colour, adorned with black, and on the wings there may be plainly seen the *Roman* letters B.C.V.M. on the fore part of the head there is a long brown snout, which is divided into two parts at the end, each of which is moveable every way: the hinder part of the body is of a bright red, streaked with black, and there is another streak of a greyish ash-colour: the middle of the body is hairy, and it flies in the night, making a buzzing with its wings.

The grass *Caterpillar* is adorned with small black streaks, and has the head and hinder joint of the same colour. It casts its skin six times, and then changes to a bright brown Aurelia, which in the month of *August* turns to a nocturnal Butterfly, with the head and upper wings brown, adorned with black. It has six black horns, and the hinder part of the body, and lower wings, are of a greyish ash-colour.

The birch *Caterpillar* often lyes upon the leaves in a semi-circle, and it spins a white web, changing into an Aurelia, of a bright brown colour;

lour; from whence proceeds a ſmall nocturnal Butterfly, ſpotted with a light colour and brown.

The burrage *Caterpillar* is of a green colour, with ſix ſmall feet before, and four behind. It alſo feeds upon collyflowers in *Auguſt*, and ſpins a white web, after which it changes into an Aurelia of different colours, ſome of which are brown, and others of a dark green. From theſe laſt proceed inſects of a black colour, that fly like Waſps, having yellow feet, and tranſparent wings. From the black Aurelias proceed ſmall Nocturnal Butterflies, variegated with black ſtreaks, and long black ſpots: there is another burrage Caterpillar, that ſpins a very fine web, wherein it continues till *March* the next year, and then changes to a bright brown Aurelia, from whence in *April* proceeds a nocturnal Butterfly, variegated with black and white ſtreaks and ſpots. It has two little grey horns, and four ſmall feet.

The bramble *Caterpillar* becomes a nocturnal Butterfly; and there is another that is black, ſpotted with orange, that changes to a Butterfly ſtreaked with grey.

The chocolate plant *Caterpillar* feeds on the leaves of that tree, and is black ſtreaked with red; and the ſtreaks are ſpeckled with white. It changes to a nocturnal Butterfly, variegated with black ſtreaks and ſpots: there is another large Caterpillar that feeds on the leaves of the ſame plant, and has a body covered with green and yellow ſharp hair. It is very venomous, and becomes a nocturnal Butterfly, of a roſe colour, with wings ſpotted with white underneath, and bordered with black; and in the middle there are two black ſpots, the one large, and the other ſmall and triangular: there is another belonging to this plant, with little or no hair, of various colours; and over all the body there are black lines and circles. It becomes a very beautiful Flie, variegated with grey, ſea-green, and ſilvery ſpots.

The *Caterpillar* of the rennet, an herb ſo called in *America*, has a body marked with ſeveral round raiſed white ſpecks, and on each of its ſides there is a white ſtreak. On the hinder part of the body there is a horn, half white and half blue, with ſix ſmall feet before, eight in the middle and two behind, of a fleſh colour. In *July* they turn to Aurelias, which in *Auguſt* change to ſmall Butterflies, whoſe head, fore part of the body, and upper wings are brown, with dark ſpecks; but the hinder part is white, adorned with tranſverſe ſtreaks, and ſmall black hair: the lower wings are of an orange-colour, and the eyes are black, with ſmall black horns; and it has a trunk for the ſucking of flowers. It flies ſo ſwift by day, that it is hard to be caught.

The green *Caterpillar* deſcribed by *Albin*, is ſpotted with black, and near the head, on each ſide the body, there are ſpots like eyes; and there is a kind of black horn on the head. When this Caterpillar has done feeding, it draws in its head like a ſea-turtle.

The elephant *Caterpillar*, ſo called, becauſe it has a ſort of a trunk, is of a dark brown colour, with rings and lines on the body, of a brighter brown. It has a kind of a horn, like the former, which is placed on the tail. It changes to a very beautiful nocturnal Butterfly, of an olive green colour, mixed with that of roſe.

The calamint *Caterpillar*, often becomes a prey to the Titmouſe, that bird being very fond of it. It is always ſlimy like a ſnail, leaving a mark behind it. It is very fearful, and hides itſelf in the leaves of the plant,

on which it feeds, which is always by night. In *October* it builds a cell with dirt and ſand, and in *March* it turns to a Butterfly, beautifully variegated.

The rampions *Caterpillar*, does not change into an aurelia till the following year, when it becomes a ſmall Butterfly.

The acajou *Caterpillar* is a native of *Surinam*, and is hairy, and as white as ſnow, which in *March* turns to a tranſparent Butterfly. There is another of a red colour, belonging to the ſame plant, which turns to a Butterfly of the colour of wood.

The caſſava *Caterpillar* is large and black, with the hinder part of the head as red as blood. Theſe Caterpillars do prodigious miſchief among the plants called caſſava, of which the inhabitants make bread. They change to nocturnal Butterflies, beautifully variegated with black and white, and the upper part of the body is ſpotted with orange.

The chervil *Caterpillar* is of a ſhining green, ſtreaked with white. It ſpins a ſlender cod, and becomes a cheſnut coloured aurelia, which in fourteen days turns to a nocturnal Butterfly.

The *Caterpillars* of cherry-trees, are of different kinds, that is, as many as there are different ſorts of cherries. That on the cherry-trees with double bloſſoms, when it is ready to be metamorphoſed, ſpins an oval cod, which ſhines like ſilver, and as ſtiff as parchment. It turns to a nocturnal Butterfly.

The rough cherry-tree feeds two ſorts of *Caterpillars*; the firſt is brown, and rolls up the leaves, in which it encloſes itſelf. It creeps very ſwiftly, as well backwards as forwards, and when it is touched, it deſcends to the ground by a thread drawn from its mouth. It ſpins a white cod, which turns to a brown aurelia, and in *October* it turns to a Butterfly, of a bright brown. The ſecond Caterpillar is yelloviſh, and rolls itſelf up in green leaves. It deſcends to the earth like the former, and gets up again by the thread as ſwiftly. It ſpins a white cod, which in *October* is metamorphoſed to a Butterfly, of a bright brown.

The great cherry-tree with ſweet fruit, likewiſe nouriſhes beautiful *Caterpillars*; there are ſtreaks that run croſs the back, which ſeem to be bordered with pearls. In *July* they ſpin a cod, which ſhines like ſilver; which changes to an aurelia, from whence in *Auguſt* proceed beautiful nocturnal Butterflies, variegated with black, white, and grey, orange, and roſe-colours. It feeds another Caterpillar of a ſea-green colour, which changes into an aurelia in the beginning of *Auguſt*, which at the end of the ſame month turns into a Butterfly. There is alſo another, which is long, and of a yelloviſh green, it changes to a ſmall nocturnal Butterfly, whoſe lower wings are brown, and the upper green, as well as the body, which is adorned with white ſpots, and ſmall brown points. *Albin* takes notice of two Caterpillars of different colours, found upon cherry-tree leaves. One is yellow, marked with lines of a deeper yellow, and on each ring there are red ſpots. They have both red heads, but the ring on the neck is yellow. They retreat under ground, where they firſt become aurelias, and then nocturnal Butterflies, and lay their eggs in the chinks of trees. Some call them *Loopers*, becauſe they bend their bodies in ſuch a manner, as to make a loop.

Geodard ſpeaks of another that feeds upon cherry-tree leaves, one of which began to change to an aurelia on the ſixth of *June*, and on the fourteenth of the ſame month, it became a Butterfly, of a very odd colour; for it ſeemed to be cloathed with a patched garment, and the neck was like a piece of cloth, made up of a mixture of white and black.

The *Caterpillar* of our ladies thiſtle, are of ſeveral kinds, ſome of which become ſmall black Flies, and others beautiful little Butterflies. *Goedard* ſpeaks of one covered with down, and very fearful, that cannot bear cold nights. It is blackiſh, with prickles on the back of the ſame colour, only they are a little yellow at the points.

The beech *Caterpillar* is of a yellow colour, variegated with black ſpots and ſtreaks, and having on the fore part of the body ſix black feet, eight in the middle, and two yellow ones behind. It is very ſlow, and ſtands ſtock ſtill when touched. It produces a ſmall nocturnal coloured Butterfly, whoſe ſpots on the upper part are croſſed with others that are red, that ſhine very much, and the lower wings are ſpotted with red. It ſeldom flies, but keeps among the graſs and on the flowers; the eggs are yellow.

The oak *Caterpillar* is ſtriped with yellow and green, and when it caſts its ſkin, it becomes brown; likewiſe when it caſts its ſkin again, it becomes of a dark red. It feeds on oak leaves till *September*, and then turns to a brown aurelia, which in *December* is changed to a brown nocturnal Butterfly, ſpotted with yellow and white.

Albin takes notice of ſeveral oak *Caterpillars*, one of which is yellow, with a black angular line, running along the back. It changes to a beautiful nocturnal Butterfly, whoſe upper wings are of a gold colour, and the belly and lower wings of the colour of cream, clouded with gold and roſe colours. Another is of a bright yellow, with reddiſh ſpots, and ſeveral points on the tail. It wraps itſelf up in the oak leaves, and in *September* it turns to an aurelia, which in *April* becomes a nocturnal Butterfly, with a back and upper wings of a pale green, and the inner ſide of the edges of a ſcarlet colour.

The ſame author ſpeaks of another, which changes its ſkin twice, and then becomes of a bright brown, inclining to an aſh-colour, and afterwards to a nocturnal Butterfly, variegated with white and black. Another oak Caterpillar is of a bright brown; another of a pale red, a third green, and a fourth yellow. This laſt is of an extraordinary ſhape, which in *June* becomes a butterfly, whoſe ſurface is of a dark brown, and ſeems to be laid on a purpliſh blue.

Redi acquaints us, that on the twelfth of July an oak branch was brought to him, on whoſe leaves were above thirty Caterpillars, placed in a regular order: they were clothed with white ſhort hair, and their bodies were ſpeckled with ſeveral colours, as yellow, orange, grey, and black: they had a yellowiſh creſcent on the head, which was of a ſhining cheſnut colour: they ſeemed to be all motionleſs, and were put into a large box, where in two days time they caſt their ſkins, and began to eat oak leaves; they continued to feed till the twenty ſecond of the ſame month, when they retired to the corner of the box, and became motionleſs again: they continued ſo two days, and then caſt their ſkin a ſecond time, after which they became lively, their bodies being larger, and their hairs more long: they fed very greedily till the firſt of *Auguſt*, when they left off, became weak and ſmall, and their hair

hair fell off. In ſhort they ſeemed extremely ſick and weak, and continued ſo till the fourth of *Auguſt*, when ſix of them caſt their ſkins a third time, and became black aurelias, and looked like children in ſwadling cloaths. The next day in half an hour's time, they turned to Butterflies, but laid their eggs ſoon after, to the number of forty, which were of a pale blue, and had a little black ſpeck in the middle.

The honey-ſuckle *Caterpillar*, in *Auguſt* turns to an aurelia, which does not change to a Butterfly till *June* the next year. There are other Caterpillars of this plant, that become Flies.

The dog-graſs *Caterpillar* in *July* ſpins a green web, and turns to a grey aurelia, from whence a Butterfly proceeds in *Auguſt*, of a dark orange-colour, that lays green eggs.

The cabbage *Caterpillar* does a great deal of miſchief among thoſe plants, in dry ſeaſons, but it is killed by the rain. It caſts its ſkin twice a year, and turns to a white Butterfly. It is of a pale green ſpotted with black, and on the back there is a yellow ſpot or ſtreak; but the belly is marked with ſmall yellow ſpecks. It turns to an aurelia in *September*, and in *April* turns to the white common Butterfly.

When cabbages are young and tender, they are devoured by a Caterpillar of a meadow-green colour, with a yellow ſtreak running along the back, and on both ſides of each joint there is a ſmall yellow ſpeck. When it arrives at its full growth it turns to a pale brown aurelia, ſpotted with black, and fourteen days after it changes to a ſmall Butterfly. *Albin* ſpeaks of a green cabbage Butterfly, with a yellow line on each ſide, which he found on a cabbage-leaf in *June*, that turned to an Aurelia in *July*, and in the ſame month became the great common white Butterfly.

The colly flower breeds a yellow *Caterpillar* ſpotted with green and black, and it devours the leaves, leaving nothing but the ribs. *Goedard* affirms, he has known ſome colly-flower Caterpillars turn to very ugly Butterflies, and others to Flies. *Redi* gathered great numbers of the cabbage Butterflies, that were of a greeniſh colour, marked with white and black, and put them in boxes. In four days time, they all became immoveable, after they were fixed to the top of the box. They left ſmall yellow eggs behind them, which in *March* following, turned to ſmall blackiſh Flies. *Valiſnieri* diſcovered that theſe were very ſmall ſilken cods, made by ſmall inſects that feed on the bodies of the Caterpillars. The above Caterpillars ſtuck to the box by the means of a ſilken thread which came from the extremities of their tails; there were alſo two other threads on their ſhoulders, and a fourth that proceeded from the under part of the mouth. They lay all the winter in this condition, but in *March* they left their ſkins ſticking to the box, and came out in the form of Butterflies, of a bluiſh-green colour, with two black round ſpots on the upper wings, and two ſmall yellow horns on the head.

The *Caterpillar* of the citron-tree, is of a beautiful yellow, but red towards the belly; on the tail there is a double ſtreak in the ſhape of a flame. Its thread is a kind of ſilk, more ſhining, and in greater abundance than that of Silk-worms; and if theſe Caterpillars were common, they would yield more ſilk than Silk-worms themſelves. It becomes a very large nocturnal Butterfly, of a red and golden colour, with white ſtreaks on all the wings, on each of which there is a bright

tranſparent ſpot, that is ſurrounded by two circles, the one within, and the other without; one of which is white, and the other black.

Merian ſpeaks of another inſect that feeds upon citron-leaves, which is quite different from a Caterpillar, and its feet are covered with a ſkin, with which it adheres thereto. This is a very numerous inſect, for when it touches the ſkin, it certainly inflames it; however it changes to a beautiful nocturnal Butterfly.

The leaves of the hazel-tree feed *Caterpillars* of different kinds, one of which is of a ſaffron colour, and turns to a nocturnal white Butterfly, ſtreaked and variegated with brown ſpots. *Ray* mentions the great hairy Caterpillar, with thick tufts of hair, or pencils of a red colour, that feeds upon the leaves of this tree. It is of a yellowiſh-green, and produces a ſmall green Butterfly. *Albin* gives the figure of a monſtrous Caterpillar, which according to *Aldrovandus*, is of a middle nature, between a Caterpillar and a Spider. *Albin* has another beautiful Caterpillar, of a grey colour, variegated with black ſpecks on the back. It retires into the ground before it turns to an aurelia, and afterwards becomes a nocturnal Butterfly. Another turns to a nocturnal Butterfly with wings furrowed like a cockle-ſhell. There is alſo a green Caterpillar, which turns to a Butterfly, nearly of the ſame colour.

The *Caterpillar* found on the leaves of garden-creſſes, are black on the back, and white under the belly. It has ſix black feet before, and eighteen behind, that is nine on each ſide. In *June* it ſpins a ſlender cod, and changes to a brown aurelia, from whence a nocturnal Butterfly proceeds ſoon after, ſpotted with brown

The ſea-green *Caterpillar* feeds on the herb by ſome called the peacock's creſt, and changes to a nocturnal Butterfly, of an aſh-colour, that feeds on the honey of flowers.

The dandelion *Caterpillar* is of a brown colour, and has two ſorts of hairy horns on its head. And on the back there are five ſmall tufts of hairs, but all the reſt of the body is covered with yellow hair. In *May* it produces a grey Butterfly.

The *Caterpillar* of the flea-ſeed, a plant ſo called by the *French* in *America*, is green, ſtriped with roſe-colour and it has two ſmall horns. It changes into a brown Butterfly, variegated with yellow.

The eglantine *Caterpillar* is very ſlow and idle, for it will ſooner ſuffer itſelf to be cruſhed to pieces, than run away. It turns to an aurelia in *September*, and in *May* following it turns to a beautiful Butterfly.

There are ſeveral *Caterpillars* that feed on the *white thorn*, one of which has a gilded back, and changes into a Chryſalis, which becomes a Butterfly, with black veins. It is of the colour and ſhape of the large cabbage Butterfly: there is another ſpotted with white on the ſides, and the furrows between the legs are black; but the reſt of the body is of a browniſh-black; this turns to a nocturnal brown in the middle of the wings, and two white ſpots on the upper wings. There is a third black Caterpillar, with brown ſpots, and the rings of a ſaffron colour. It becomes an aurelia in *May*, and in *Auguſt* a nocturnal Butterfly, of a bright grey colour. There are ſeveral others, one of which is beautifully variegated with different colours, and becomes a nocturnal yellow Butterfly, with different ſpots. Another is brown, and the Butterfly it changes to is partly red, and partly yellow. A third is of

a duſky colour, with a red head, and turns to a nocturnal Butterfly of a bright yellow colour, with darker ſhades, and ſpots of the ſame. A fourth is of a ſea-green colour, and the upper wings of the Butterfly are of a bright brown, and the lower of a bright yellow. A fifth is green, and turns to a nocturnal Butterfly, of a greeniſh blue. A ſixth is of a blackiſh brown, and is metamorphoſed to a white nocturnal Butterfly. A ſeventh is of a deep black, with ſpots of different colours, and the Butterfly is of a dirty grey; and a ninth is green, which turns to a nocturnal yellow Butterfly.

Goedard ſpeaks of one that feeds upon the leaves of the white thorn, and hides itſelf under them, to avoid the heat of the ſun. He had one of theſe that caſt his ſkin three times; but on the twelfth of *June* turned to an aurelia, which produced on the fourth of *July* a beautiful white Butterfly.

The barberry-buſh *Caterpillar* is of a golden colour, with a black head, on which the Ichneumon Flie lays its eggs, which become worms, that feed on theſe ſort of Caterpillars. There is another with a green back and yellow belly, from whence proceeds a brown Butterfly. There is another of a blackiſh brown, with red ſpots, which changes to a white nocturnal Butterfly, whoſe upper wings are ſpotted with black.

The maple *Caterpillar* is of a dark brown, and turns to a beautiful yellow Butterfly.

The fennel *Caterpillar* is green, with ſtreaks as black as velvet, and ſpotted with orange, and feelers of the ſame colour. It turns to a green aurelia, and then to a beautiful Butterfly, of a yellow colour variegated with black.

The *Caterpillar* of the ſweet bean plant of Surinam, is covered with black and yellow hair, and turns to a Flie, with brown wings, and the body is ſpotted with red, green, gold and ſilver colours. On the ſame plant there is a white Butterfly, armed with black points at the back, and the feet are likewiſe black. It afterwards turns to a beautiful Butterfly.

The fig *Caterpillar* is at firſt green, ſtriped with yellow, and afterwards orange, with red ſtreaks all over the body, but the head and tail are black. It turns to a brown nocturnal Butterfly.

There is alſo a large *Caterpillar*, mottled with various colours, that feeds on the leaves of the fig-tree, and has two orange-coloured horns, which are venomous, and cauſe ſharp pain. It becomes a nocturnal Butterfly, variegated with dark brown, green, and ſilver colours. There is alſo a green Caterpillar belonging to this tree, ſtriped with white, which changes to a nocturnal Butterfly, variegated with yellow, white, and grey.

The raſpberry buſh *Caterpillar* becomes a brown Butterfly, whoſe wings have a whitiſh round ſpot in the middle.

The aſh-tree *Caterpillar* rolls itſelf up under the leaves, to ſhelter itſelf from the heat of the ſun. One of theſe was obſerved to be metamorphoſed into an aurelia on the twenty-fourth of *June*, and to become a ſort of a Moth the twenty-ſixth of *September*. The black Cray-fiſh, is a Caterpillar, ſo called, belonging to this tree, becauſe the hinder part in ſome ſenſe, reſembles a Cray-fiſh; but the fore-part is like a ſnail, and it is all over black. It turns to a grey Flie.

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The fern *Caterpillar* is of a beautiful bright green, and changes to a nocturnal Butterfly, of a bright brown, whoſe upper wings are brown and white.

The *Caterpillar* of the German broom, is green, with a black ſtripe running along the back, and under it on each ſide, there is a white ſtripe. It ſpins a web in the middle of *June*, with meſhes like a net, and at the beginning of *July* it changes to a ſmall nocturnal Butterfly, of a bright green. The wings are marked with tranſverſe white ſtreaks, inclining to green, and it flies very ſwiftly. There is another Caterterpillar belonging to this ſhrub, which is black, and on each joint there is two ſmall blue ſpots, adorned with a tuft of hair. The head, and all the feet, are of an oaker colour. At the end of *June*, it ſpins a grey web, and turns to a brown aurelia, with a head covered with black hair. In the middle of *July* it becomes a nocturnal Butterfly, of a dark yellow colour, ſtreaked with brown, and the horns reſemble feathers.

The gum gutta *Caterpillar* is very large, and ſtreaked with green and black; it feeds on the leaves of this plant, and becomes a ſtately Butterfly.

The graſs *Caterpillar* is of a bright green, and on each ſide of the body before, there are ſix ſmall feet, eight in the middle, and two behind. It turns to a green aurelia, from whence proceeds a ſmall beautiful Butterfly, variegated with brown and black ſtripes and ſpots. It has two ſmall horns, ſpotted with white and black, and two fine green eyes. It flies very ſwiftly. There are other Caterpillars belonging to the different ſorts of graſs; one of which is of a bright brown, ſpotted with black and yellow. It ſleeps by day, and by night is in continual motion.

Another is green, and changes to what is called the brown meadow Butterfly. Another again is yellow, with a brown head, and changes to a nocturnal Butterfly, called the Wood Leopard. On the graſs of marſhes there are two, one of which is of a dark red, and changes to a nocturnal Butterfly or Moth, and the other green, changing to a nocturnal Butterfly, of a reddiſh colour.

Merian takes notice of a large brown Caterpillar, that feeds upon common graſs, which is variegated with yellow and white, and has a ſmall tuft of black hair on the head, on the tail there is a prickle reſembling a ſmall horn, and on each ſide there are ſmall tufts of white hair that cover the legs. It delights in moiſt places, and in the middle of *June* ſpins a yellowiſh cod, from whence proceeds a nocturnal Butterfly or Moth, at the end of the month. It is of a faded yellow colour, and acroſs each wing there is a brown ſtreak, with two white ſpots, and a narrow border of brown. It lays white eggs.

The grenadier *Caterpillar* feeds upon a plant ſo called, in *Surinam*. It is of a yellow colour, and in *May* turns to a fine Butterfly, of a blueiſh ſilver colour, bordered with a brown ſtripe, marked with white half-moons; but underneath it is brown, ſpotted with yellow. It appears through a microſcope to be covered with blue tiles, like thoſe that cover houſes. The largeſt feathers are ranged in a beautiful order on the wing, and look like thoſe of a peacock's tail, being very brilliant.

The *Caterpillar* of the white gooſeberry-buſh, has a grey body, with a black ſtripe on the back: they are hairy, and the head is yellow.

Behind

Behind the head on each ſide, there are five blue ſpecks, and others along the body that are red. In *Auguſt* they turn to a bright brown Aurelia, and from it in *September* there proceeds a nocturnal Butterfly or Moth, ſtreaked with white, yellow, and black.

On the common gooſeberry-buſh there is a *Caterpillar*, yellowiſh on the fore part, and on the hinder white above, and yellow below: the Aurelia reſembles a child in ſwaddling-cloaths, which ſhine with gold and ſilver. At the end of *June* it turns to a Butterfly, whoſe upper part is ſpotted with a deep yellow and brown, and the under adorned with black ſpots.

On the prickly gooſeberry-buſh there is a brown *Caterpillar*, in *April*, ſtreaked with black, and ſpotted with white. In *June* it ſpins an oval cod, of a dark yellow, and turns to a brown aurelia; and the Moth that proceeds from it has a white ſpot on each wing: there is another green Caterpillar on the ſame plant, that ſticks ſo cloſe to the leaves, that it cannot be taken off without hurting it. In *May* it turns to a brown aurelia, and fourteen days afterwards to a white and brown Butterfly, with ſeveral ſpots.

The red gooſeberry-buſh feeds a ſort of grey *Caterpillar*, which in *December* changes to a cheſnut coloured aurelia, and in *February* to a white Moth, ſtreaked with black, and that lays greeniſh eggs.

Albin mentions a whitiſh-yellow *Caterpillar* variegated with black and red ſpots, that hides itſelf in the ground, where it changes to a red aurelia, and becomes a nocturnal black and white Butterfly, mixed with yellow. This Caterpillar has been found on the gooſeberry-buſh, and is called by *Ray* the middle-ſized Phalæna, with large wings, marked with many black and white ſpots, and yellow, tranſverſe, variegated lines.

Merian takes notice of the *Caterpillar* that feeds on the red gooſeberry buſh, which differs from others, in not having the feet in the middle of the body, but at the extremity. It changes to an aurelia the firſt of *April*, and turns to a fine Butterfly the latter end of *June*; but it is too weak to live long. *Goedard* ſays he has met with one that turns to a grey Flie, and lives but four days, and there is another that becomes a black and yellow Flie.

Goedard has obſerved another on this buſh, that feeds on ſmall inſects; that run about its body; it turned to an aurelia the ninth of *June*, and on the thirtieth it became a Flie.

The guava *Caterpillar* of Surinam, is green, with ſix white ſtreaks on each ſide, and a black round ſpot on each joint. On the hinder part it had a red horn, and became a nocturnal Butterfly, with aſh-coloured wings, marbled with white and black. The body was marked with ten orange-coloured ſpots, and on the head there was a long red trunk, which it made uſe of for the ſucking of flowers. There are other Caterpillars on the ſame tree, that are covered with hair, on ſome white, and on others red. They are all venomous, and when touched, they cauſe a ſwelling, with pain. They have four feet, and turn to ugly ſmall Flies.

He alſo mentions another ſort, with a black head and back, that turn white by little and little, and afterwards become of a fine yellow. The fore and hind parts are covered with black hair; but that under

the

the belly is brown. It becomes a nocturnal Butterfly, with a white body, ſpotted with a yellowiſh brown.

He likewiſe takes notice of a large dark brown *Caterpillar*, with a black ſtreak from the head to the tail, and black rings round the body. On the belly there are ſmall white ſpecks, and the head and tail are of a purple colour. It becomes a large nocturnal Butterfly, with a white ſtreak on its body, and four black ſpots on each ſide, beſides four black oblique lines, and four others that are white. The upper wings are ſpotted with white and brown, and the lower are yellow above, and dark brown below.

The purple *Caterpillar* feeds on all ſorts of herbs, but more particularly pinks. They are of a browniſh-purple above, and of a bright yellow below; in *Auguſt* they change to aurelias, and fourteen days after to Moths. The black Caterpillar feeds on all ſorts of herbs and leaves, and rolls itſelf up when touched; it turns to a Butterfly, ſpotted with black in three different places.

The hop *Caterpillar* has half the back and belly of a tawny colour, and the other half white. It turns to an aurelia in *Auguſt*, and towards the end of the ſame month, becomes a dark red Butterfly. *Ray* calls it the Butterfly like that of the Elm, but leſs, with laciniated wings, and the lowermoſt marked with a crooked black line.

The hyſſop *Caterpillar* is found on that plant, when it is in flower. When a leaf is touched, it throws itſelf down, and gets into the earth. It changes its form in *Auguſt*, and three days after there proceeds from the ſkin three ſmall worms, which change in a ſhort time to eggs, and then to Flies in *September*; but they live only three days.

The knap-weed *Caterpillar* is found on the flowers of this plant, and is of a brown colour, and hairy. It ſpins itſelf a cod, which turns black, and in *March* following changes to a white Moth, ſtreaked and ſpotted with black. *Albin* acquaints us, that there is another Caterpillar which feeds on the leaves that turns to a Moth, of a deep brown colour, with a mixture of dirty grey on the wings.

The *Caterpillar* of the oriental hyacinth, is black, hairy, and very nimble; but when touched, it rolls itſelf up. It ſpins a cod, which turns to a black aurelia, and fourteen days after to a Moth, with brown upper wings, and the lower of a pale red, ſpotted with black. It is found in *Surinam*.

The rag-wort *Caterpillar* is of two kinds, the firſt of which is of a citron-colour, with black wings, and changes to a red and black Moth. Small worms proceed from its body, which turn to Ichneumon Flies. The other is an autumnal Caterpillar like the former, but how it changes is not known.

The java *Caterpillar* is large and white, ſtreaked with black. On each ſide there are five ſhining ſpecks, of a red colour, which ſome take to be eyes. It turns to a Moth, ſtriped with black and white. There is another green Caterpillar, that feeds on the ſame leaves, and becomes a tranſparent Butterfly ſpotted with black.

The crowned *Caterpillar* feeds on the leaves of the *Indian* jeſſamin, and becomes a fine undulated Butterfly, with ſix white ſpots on the wings, whoſe under parts are red and black. There is a Caterpillar on the common jeſſamin, of a green colour, with red ſtripes, but they are very uncommon, as *Albin* acquaints us.

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The *Caterpillar* of the ſea bull ruſh, is a very ſlow inſect, and on the ſecond of *June* there was a worm obſerved to proceed from the hinder part of its body, which on the twelfth became a very ſmall Flie. This Caterpillar turned to an aurelia the fifth of *June*, and on the firſt of *Auguſt* became a Flie, with wings ſo cloſe to its body, they can ſcarcely be ſeen.

The *Caterpillar* of the garden iris, with large leaves, is green, and very ſwift; it changes to an aurelia in *October*, and in *March* following, to a brown moth, with a white ſpot on each wing. There are alſo blueiſh Caterpillars on this plant, which in *September* turn to bright coloured moths. *Merian* affirms, he has found a green Caterpillar at the roots of the iris, which in *June* turns to a grey moth.

The *Caterpillar* of the dame violets, is a long ſlender inſect, which when it creeps, turns up its tail near the head. It changes in *May* to a grey aurelia, which in *June* becomes a fine Butterfly, with the head, lower wings, horns, and feet, of a bright yellow; and the eyes are black *Merian* mentions a green Butterfly, of the ſame plant, with a black head, and ſix feet before, ſix in the middle, and two behind. At the end of *April* it ſpins a yellow web, which turns to a green aurelia, ſpotted with black, from whence a white Butterfly proceeds in *May*, that can ſcarce fly from one flower to another.

The *Caterpillar* of the ſow thiſtle has the upper part of the body grey, and it is ſtriped with brown, and ſpotted with white; but underneath it is of a fleſh colour. It turns to a bright brown aurelia in *July*, and the next *June* becomes a yellowiſh moth, variegated with green and black.

The lettuce *Caterpillar* is brown and green under the belly, with ſix feet before, eight in the middle and two behind. Towards the end of *Auguſt*, it turns to a brown aurelia, with black eyes, and the body variegated with black. A grey Caterpillar feeds on the cabbage-lettuce, and on its back there is a dark yellow ſtreak. It turns to a brown aurelia in *Auguſt*, and to a moth in *September*, with the upper wings brown, and the lower blueiſh, as well as the body. There is a venomous hairy Caterpillar belongs to the ſame plant, which the birds will not meddle with, and which turns to a large handſome Butterfly, ſpotted with fine red. *Goedard* mentions another that is green, which turns to a grey Butterfly with a long trunk.

The white archangel breeds a green *Caterpillar*, ſtreaked with white lines, which turns to a moth, whoſe upper wings have a dark ground, and part of them ſhining like burniſhed copper; the lower are of a dirty white.

The *Caterpillar* of dog's tongue, a weed ſo called, is ſtreaked with black and yellow, and the wings are marked with different colours. It enters the earth in *May*, where it changes to an aurelia, that produces a very fine moth, with the back and upper wings of a bright green, ſpotted with white and ſaffron-colour. The upper part of the belly is red, with a black ſtreak, and the lower wings are alſo red, ſpotted with black.

The *Caterpillar* of the lavas, an herb ſo called, is named by *Goedard* the Centinel, becauſe it continues in the ſame poſture for ſome time, and ſeems to be looking about. In *June* it turns to a browniſh-grey Butterfly.

The ground-ivy *Caterpillar* is green, and when touched, rolls itſelf up. It turns to an aurelia in *July*, and in *Auguſt* to a moth, whoſe upper wings are of a wood colour, and the lower ſtriped with green. There is another that feeds on this herb, which turns to a fine Butterfly in *May*, of a ſhining golden colour, and on its head there are two fine tufts like feathers.

The *Caterpillar* of the blue lilac, is green, and in *May* ſpins a white cod, which turns to a bright aurelia, and before the end of the month changes to a bright brown moth. There is another green Caterpillar belonging to the ſame tree, that in *October* turns to a moth ſtriped with green and white.

The *Caterpillar* of the lemon-tree, is brown, with a white ſpot, and they lye in heaps on the leaves of that tree On the head there is a yellow horn, which is their defence, and in *April* they turn to blackiſh Butterflies, ſpotted with white and red.

The flax *Caterpillar* is of a greeniſh brown colour, and under the belly of a bright green, with a black ſtreak on each ſide. It turns to an aurelia in *Auguſt*, and in *May* following to a greyiſh aſh coloured moth, with wings variegated with black, and black eyes.

The *Caterpillar* of the orange flower de luce, has the upper part of the body brown, ſtreaked with a darker colour, and it is yellow underneath. In *June* it turns to an aurelia, and in *Auguſt* to a moth, variegated with light and dark brown. There is another Caterpillar on the ſame plant, that turns to a ſky-blue Butterfly with violet-wings, and four golden ſpots on the back.

The *Caterpillar* of the red flower de luce, is bred in *Surinam*, and covered with black hairs as hard as iron. The head and feet are red, and the body is full of blue ſpots, ſurrounded with a yellow circle. It turns to a fine moth, whoſe wings before are of a bright brown, and behind of an orange colour, ſpotted with black.

The ſcammony *Caterpillar* is large, and of a bright green colour. It turns to a bright aurelia, and in *Auguſt* to a ſmall moth, of a greyiſh aſh-colour, variegated with dark brown. *Merian* ſpeaks of another of a bright green, that turns to a roſe-coloured aurelia, and fourteen days after to a ſmall flying inſect.

The *Caterpillar* of the maure, ſo called by the *French*, is ſmall and green, with white ſtreaks; it firſt changes to an aurelia, and the day after to a ſmall Butterfly. There is another larger, that feeds on the flowers, and in *Auguſt* turns to a whitiſh Butterfly. There are Caterpillars that feed on the leaves of wild maure, that turn to brown aurelias, and the next *May* to ſmall moths.

The feverfew *Caterpillar* is brown, and turns to a brown moth.

The *Caterpillar* of the brown mellilot, is bred in *Surinam*, and is large, and of a bright green, with brown ſpots. It has ſix feet before, eight in the middle, and two behind, and on each ring of the lower part of the body, there is a blood coloured ſpot. It ſpins a white web, and turns to an aurelia, of a bright violet-colour, from whence in *June* proceeds a moth, with the head, body, horns, and upper wings grey, and variegated with black and white ſpecks and ſtreaks; but the lower wings are of a fine vermilion colour.

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The *Caterpillar* of the water-melon is blue before and behind, and green in the middle. The feet are covered with a ſlime like a ſnail, and in *Auguſt* it turns to an ugly moth.

The *Caterpillar* of garden mint, is white, ſtreaked with green, and ſpins a fine web, or cod, which turns to a brown aurelia, and in *Auguſt* to a moth, that ſhines like gold. There is another of a yellow colour, that changes to a moth of a roſe colour, which quickly dies. *Albin* mentions a green Caterpillar, that feeds upon mint, that turns to a Moth, marked with the letter Y on the middle of each upper wing.

The *Caterpillar* that feeds on French mercury, and falls to the ground as dead, when the leaves are ſtirred. In *Auguſt* it turns to a Butterfly that has a ſort of a ſmall mantle ſpread on its wings, which covers all the fore part of this inſect, and ſerves both for an ornament, and for defence.

The night-ſhade *Caterpillar* is green, and turns to a light brown Butterfly, that flies very ſwiftly. *Albin* has two belonging to this herb, one of which is of a yelloviſh green, ſpotted with a bright yellow, the other of a dark grey, ſpotted in the ſame manner, and with a line of a ſaffron colour. They both turn to moths, of a reddiſh brown. From the bodies of theſe Caterpillars worms proceed, which turn to Ichneumon Flies.

The *Caterpillar* of the mulberry-tree, has been largely deſcribed under the name of the Silk-worm.

The *Caterpillar* of the muſk plant, is green, ſtreaked with black, and turns to a white moth.

The *Caterpillar* of the myrtle-tree, has a brown head, adorned with four red ſpots, and a double black whiſker, the body is brown, variegated with ſmall red and yellow ſtreaks, and one large black ſtreak along the back, on which there are four tufts of yellow hair, and a black tuft on the hinder ring, which is yellow on the top. The fore and middle legs are yellow, and the pair behind black. It turns to a ſmall moth. *Merian* ſays he has kept ſome of them in a box, which changed to vile ſmall flying inſects, with a black head and body, and legs of a dark yellow. Others which are caught in *Frieſeland*, turned to Flies, and others again to ſmall yellow moths. There was likewiſe another black Caterpillar, with a tuft of yellow hair on each ring, and on each ſide of them a ſmall white ſpeck. It turned to a white moth, adorned with ſhining black and brown ſpecks and ſpots.

The medlar *Caterpillar* is yellow, ſtreaked with roſe colour, and the head brown. Each ring is armed with four black prickles, and the legs are likewiſe of a roſe colour. It turns to a beautiful Butterfly, of a browniſh ſilver colour, acroſs which there are ſhining blue, green, and purple ſtreaks. On each wing there are three round ſpots, of an orange yellow colour, bordered with a black circle, and this ſurrounded with one that is green. The extremity of the wings is of an orange yellow, with black and white ſtreaks.

The *Caterpillar* of the hazel nut tree is ſmall and green, and becomes a ſmall Butterfly; but there are other green Caterpillars that turn into Flies. There is one that is not ſo common, of a green colour, and ſtreaked with white, and a white ſtreak on each wing. It ſpins a fine white web, and turns to a brown aurelia, and afterwards to a ſmall moth, with the lower wings, feet and horns brown; but the upper

wings are adorned with ſmall white ſtreaks, and the body is of a bright colour, but the eyes are black, and the lower wings ſhine like gold. *Albin* takes notice of a yellowiſh green Caterpillar, with a red head, that turns to a moth of a red and brown colour.

The pink *Caterpillar* feeds on the flowers of that name, and hides itſelf in the ground in the day time. In *July* it turns to an aurelia, and in *September* to a Butterfly, before taken notice of.

The *Caterpillar* of the orange tree has a yellow ſtreak on the body, and each ring has four ſpecks of an orange colour ſurrounded with very fine hair. It becomes a moth, with a ſpot on each wing, that reſembles talc.

The *Caterpillar* of bear's ear, produces a green worm, that ſucks its body dry. This worm afterwards changes to an aurelia, which becomes an Ichneumon Flie.

The elm *Caterpillar* ſpins a ſmall web or cod, and at the end of nine months turns to a Flie. Some call it the Graſshopper Caterpillar, becauſe it leaps from one place to another.

There are ſeveral *Caterpillars* fed on elm-leaves, one of which taken notice of by *Albin*, is of a bright green, inclining to blue, with white lines, and the lower part marked with black ſpecks, but the head is red. It retires into the ground, where it becomes an aurelia, that changes to a bright brown moth. There is another of an olive colour, adorned with red and yellow ſpots round its wings. It turns to a black and white moth. There is ſtill another, which is very beautiful, inclining to blue, and marked with yellow ſpecks. It turns to a Butterfly, called the great tortoiſe-ſhell Butterfly

Goedard affirms there is a *Caterpillar* on the leaves of the elm tree, that fixes itſelf thereon with a thread, in ſuch a manner, that it bends the two extremities of the leaf, cloſing them together with its web, and leaving an opening before and behind. When it is touched never ſo ſlightly, it falls down, holding itſelf by a thread, and moves about as ſwift as an eel. There are two ſorts, one of which becomes a Butterfly, and the other which is larger, produces worms that have killed the Caterpillar. Theſe are thirty two in number, and lay each an egg, which turns to a ſmall Flie.

The ſame author takes notice of another, which wraps itſelf up in a dry leaf, falling to the ground, and covers it with a web, that ſhines like ſilver. It turns to a Flie.

Goedard has ſtill another, which produces a Flie that is able to kill Spiders, though all other Flies become their prey, and ſeems to take pleaſure in it. It will break off all the legs, and then drag it along, carrying it off.

There is ſtill another, mentioned by the ſame author, that feeds on elm leaves, and before it turns to an aurelia, gets into ſtables and houſes among boards. It hangs with its head downwards, and ſeems to be a round ball when the ſkin begins to crack. It turns to a beautiful Butterfly. The *Caterpillar* of the large ſtinking nettle, is of a black colour, and turns to a yellow aurelia, from whence proceeds a Butterfly, brown without, and within of a dark orange, variegated with a mixture of black and purple. There are others of a bright green, and others brown; but they are all adorned with white and black ſtreaks, and many of them ſpin a white web. They at length change

into

into blue Flies with red heads; though there are ſome that in *February* are metamorphoſed to grey and brown moths, variegated with black and white.

Albin ſpeaks of ſeveral *Caterpillars* that feed upon nettles, one of which is black, and has the upper part marked with white ſpecks, and covered with hair. Another ſort is alſo covered with hair, and is of a yellow colour, but ſpotted. It turns to a Butterfly, called by *Ray* the greater blackiſh Butterfly, with wings beautifully adorned with red and white ſpots. Some call it the Admiral. Another Butterfly fed by nettles, is called the Butterfly like the eye of a peacock's wing, and it is named by *Mouſet* the *queen of Butterflies*. The caterpillar it proceeds from, is called by *Ray* the greater black Caterpillar, ſprinkled with white ſpots, and beſet with black prickles.

There is another produced by the *Caterpillar* of the nettle, termed by *Ray* the leſſer Phalæna, with oblong wings, variegated with white and blue, and yellowiſh at the roots. There is yet another, called by *Ray* the greater Butterfly with large wings, the upper being brown, and beautifully variegated with white and red ſpots and lines.

Liſter takes notice of another that never feeds in the day time, for fear it ſhould be devoured by birds, which produces a Moth, with ſaffron coloured wings, adorned with black ſtreaks, and two black ſpots; as alſo red ſpots on the upper wings

The ſorrel *Caterpillar* is hairy, black, and ſpotted with white and red. It produces a Moth, with the body and lower wings yellow; and the head, upper wings, ſmall horns, and feet brown, ſpotted with black.

The *Caterpillar* of the peliſade, a plant ſo called, in *Surinam*, is yellow ſtreaked with black, and armed with ſix prickles. It firſt changes its ſkin to one of an orange colour, with a black round ſpot, but ſtill retains its prickles: ſome days after it caſts its ſkin again, loſing the prickles, and in *June* it becomes a moth.

The *Caterpillar* of palma chriſti, a plant ſo called, is of a greeniſh colour, covered with long white hair. It turns to a black Butterfly, whoſe upper wings are of the colour of brimſtone, and the other of ſaffron. The ſame plant breeds another Caterpillar, of a black colour, ſpotted with yellow, that is ſhut up in a caſe of dry leaves. It changes to an ugly moth, which is very troubleſome

The *Caterpillar* of the palm of the downs, an herb ſo called in the low countries, has two tails, and when it is angered, it ſhoots from each a red ſting. In *September* it begins to turn to an aurelia, and continues in that ſtate till next *June*; and then there come out five ſmall Flies, out of five diſtinct cells, which when opened, they had no appearance of the ſkin, or any part of the aurelia.

The *Caterpillar* of the palm tree is red, ſpotted with brown: they ſpin a ſort of bags on the plam tree leaves, in which they lodge in the night, going out to feed in the day. They turn to yellow Butterflies, ſpotted with brown, and are bred in *Surinam*. There is another little hairy brown Caterpillar, bred upon this tree, that turns to a tranſparent Butterfly, ſpotted with black.

The *Caterpillar* of the papaw-tree, is yellow and green, and becomes a moth, that buzzes with its wings. There is another of the colour of raddle, ſtreaked from the head to the tail with red and yellow; and on the head there is a buckler, of a ſemicircular form, which ſhines like

a diamond. It turns to a buzzing moth, mottled with iron-grey and white, and the body is ſtreaked on each ſide with bright red, and on the back with black.

The *Caterpillar* of the paſſion flower, turns to a ſmall Butterfly; and there is another that changes to a red and brown inſect; beſides a third that is metamorphoſed to a ſpotted Flie, furniſhed with delicate cloven feet.

The dock *Caterpillar* is of a deep yellow, with dark brown ſtreaks, placed in the form of a croſs. In *May* it turns to a brown aurelia, and in *June* to a moth, ſtreaked with white and brown. *Merian* fed a Caterpillar with this plant, that was at firſt ſtreaked with dark green, which by little and little, turned to a yellow, and then brown. It changed in *May* to a ſmall aurelia, of a bright brown, whoſe upper part reſembled the head of a bird. Fourteen days afterwards it became a ſmall moth, with red eyes, and a red ſtreak on every wing, round which there was a red border.

The poppy *Caterpillar* is black and yellow, from whence a moth proceeds in *June*. The ſame plant feeds worms, that afterwards become Flies.

The *Caterpillar* of the peach tree, has a head and back of a bright brown, and turns to an aurelia, which becomes a moth, and on whoſe upper wings there are white lines.

The *Caterpillar* of the poplar tree, has a brown back, and a pale red belly; it becomes a beautiful Moth, of a dark brown, ſtreaked with white. *Goedard* takes notice of another that is white, which turns to a beautiful white Butterfly.

The *Caterpillar* of the lark's foot, an herb ſo called, is of a curious colour, variegated with ſtreaks and ſpots, in *July* it changes to a brown aurelia; and in *May* following to a roſe coloured moth, adorned with black and white. The flowers feed a green and white Caterpillar, which turns to a brown moth

The plantain *Caterpillar* is of a green colour, but turns to a brown aurelia and in *December* becomes a brown moth. The ſmall plantain feeds a bright green Caterpillar, ſtriped with white the length of the body, and each ring is adorned with a white ſpot; at the end of *July* it becomes a brown aurelia, and in *Auguſt* a moth, with the upper wings white, and the lower grey; but the eyes are black, as well as the horns.

The *Caterpillar* of the pear tree, has a blackiſh body furniſhed with yellowiſh tufts, and on the fore part of the body there are three claws, in the middle eight feet, of an oaker colour, and behind two more of the ſame colour. It changes its ſkin, ſeveral times, after which it ſpins a white web, and turns to a brown aurelia, and fourteen days afterwards it becomes a beautiful bright brown Butterfly, ſtreaked and ſpotted with divers colours. On the ſame tree there is a white Caterpillar with a black head, which goes out of its cell in a morning to feed, and then returns back; when it is full grown, it ſpins a white web, that turns to an aurelia, and then becomes a moth, which lays its eggs and dies. There is another white Caterpillar, when this tree is in bloſſom, with red ſpots on the back, and a brown head. In the middle of *July* it turns to an aurelia, and at the end of that month to a white moth, variegated with black. The lower wings are of a bright brown,

brown, and the body of a fleſh colour, with little white horns, covered with brown hair, and the eyes are black.

The *Caterpillar* of Indian pepper, is a handſome large inſect, with a long red ſtreak on each ſide, and a white one on the back. The laſt ring is armed with a roſe coloured horn, and on ſome other rings there is a yellow ſpot, bordered with roſe colour. It turns to an aſh-coloured moth, on each ſide of which there are five gold coloured ſpots.

The *Caterpillar* of the apple tree is brown, and turns to a brown moth. Another on the ſame tree changes to a grey moth; and a third which is greeniſh, is metamorphoſed to a moth. Another author affirms there is a fourth, of a browniſh colour, with red and blue ſpecks on each ring. It weaves itſelf a cod, and turns to a brown aurelia, which changes to a white moth, ſtreaked with brown. When it has laid its eggs, it covers them with a yellowiſh down, which keeps them ſafe from the cold of the winter.

Merian found upon an apple tree in bloſſom, a yellow hairy Caterpillar, adorned with tranſverſe ſtreaks, and the head was brown; behind the head there were two blue ſpots, and on each ring ſpots of a fleſh colour. The feet were of the ſame colour, and it was furniſhed with ſmall tufts of brown hair. In *July* it ſpun a yellow web, with meſhes like a net; and the aurelia became a white moth, variegated with black; and it had two broad red horns, reſembling feathers, and on the hinder part of the head there was a red ſtreak.

The *Caterpillar* of the pompelmous, a tree ſo called in *Surinam*, is white, with a blue head, and the body is covered with long hair as hard as iron-wire. It turns to a beautiful black Butterfly, variegated with green, blue, and white, ſhining like gold and ſilver.

The *Caterpillar* of the plumb tree, is green, ſpotted with black, and has a black head. When it is touched, it deſcends to the ground, by means of a thread drawn from its mouth, by the help of which it gets up again. It is concealed in a leaf, rolled up, and in due time ſpins itſelf a cod, which turns to a bright brown moth, with the back part and under ſides, of the wings white.

The *Caterpillar* of the damacene plumb, is green, ſtreaked with black, ſpeckled with yellow. It weaves itſelf an oval cod, that ſhines like ſilver, and is as ſtiff as parchment, which turns to a brown aurelia, which becomes a moth, whoſe lower wings are ſtreaked with brown and yellow. There is likewiſe another Caterpillar belonging to the plumb tree, which is of a beautiful yellow, and adorned with ſeveral tufts in the ſhape of rods, on the back, and on the tail there is a red ſpot. When it ſtretches itſelf out, four hairy black ſtreaks may be perceived, that run acroſs the body. Some of theſe turn to grey moths in *September*, and others do not change till the next *April*; but the moths are the ſame.

The *Caterpillar* of the wild plumb tree, is brown, and adorned with white ſtreaks. It changes to a moth of a dull yellow colour, with white wings and feet, and black eyes. It covers its eggs with down, to preſerve them from the ſnow, rain, and cold. There is another that is black, ſtreaked with yellow, and has a ſhining body; it turns to a white and yellow Butterfly, with wings adorned with black ſtreaks, but the eyes and feet are black.

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Albin ſpeaks of one that is of a ſea green colour, which turns to a Butterfly, called the hair-ſtreaked Butterfly. He likewiſe mentions a black Caterpillar, ſpotted with brown, the whole length of the back, and ſtreaked with yellow. It turns to a moth, with the back and upper wings brown. There is likewiſe another beautiful black Caterpillar, with yellow hair, which *Ray* calls the large Caterpillar, with long, thickſet, hoary hair, variegated with dun and black, and having whitiſh lines on the rings. It turns to a large moth, of a whitiſh and dun colour, with ample oblong wings, beautifully variegated, the lowermoſt of which are reddiſh, with black ſpots.

Albin deſcribes ſix more, which are,

The bright green *Caterpillar*, which changes to a moth, with reddiſh brown wings.

The bright olive colour *Caterpillar*, that is metamorphoſed to a bright yellow moth.

The *Caterpillar* of the colour of an ozier branch, which turns to a ſaffron coloured moth.

The hunch backed *Caterpillar*, that turns to a white moth, ſtreaked with black.

The green *Caterpillar*, which becomes a moth, with the upper wings partly yellow, and partly white, and the lower of a chefnut colour.

The dark grey *Caterpillar* with yellow ſpots, changes to a moth, whoſe females have no wings.

Goedard deſcribes one that has four yellow tufts like bruſhes, on its back, and two horns on the head like a ſnail; on each ſide there are two prominences, like oars, one of which is yellow, and the other black; and there is likewiſe a tuft of hair on the extremity of the body. It changes to a ſort of inſect, that is neither a worm nor a Butterfly

Redi ſpeaks of a *Caterpillar* of an orange colour, ſo large, that it weighed three quarters of an ounce. He was compoſed of thirteen rings, between each of which there were ſeveral ſmall eminences, of an azure colour. Likewiſe there were two white ſpots on each, ſurrounded with a black line. It ſpun itſelf a large cod of the colour of moſs which looked more like hair-cloth, than any thing elſe. It became a very large Butterfly, near the latter end of *April*.

The *Caterpillar* of the American white grape tree, is very voracious, and becomes a beautiful green and red moth, with ſtreaks of a colour, inclinable to chefnut; but the horns and trunk, are of the colour of gold. There is another belonging to the ſame tree, that draws itſelf up when touched, and throws out a froth; it turns to a beautiful moth, ſpotted with brown, and ſtreaked with white, and the trunk is of a gold colour.

The *Caterpillar* of the ranunculus, has an orange coloured back, and a pale yellow belly; but the other parts are black, and a little hairy. In *May* they make a cod, which turns to an aurelia, that hangs on a leaf, and fourteen days after it becomes a beautiful moth, with the body, head, and upper wings black, ſpotted with red. A few days after they lay eggs and die.

The *Caterpillar* of the meadow ranunculus, turns to a black aurelia, and that to a fine Butterfly, with the upper wings of a bright yellow, ſpeckled with black, and the lower orange, with black ſtreaks.

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The knot-graſs *Caterpillar*, is brown and grey under the belly; in *July* it turns to a bright brown aurelia, and in *Auguſt* to a grey moth, ſtreaked with black. There is another that is green, with three yellow ſtreaks along the body, and ſeveral black ſpots; but what it turns to is not ſaid. There is alſo a third, that is yellow, ſtreaked with brown, and in *September* turns to a white moth, adorned with red and brown ſtreaks.

The *Caterpillar* of the rocu an *American* tree, is brown, ſtreaked with yellow, and covered with red hair; it becomes a browniſh green moth.

The *Caterpillar* of the briar, is of ſeveral ſorts, which are as follow: the greeniſh brown Caterpillar, which turns to a beautiful Butterfly, variegated with green and brown: the green Caterpillar with a blue head, changes to a very beautiful moth, variegated with green and brown: the green Caterpillar becomes a moth, with the upper wings green and the lower grey: the hairy Caterpillar is brown and red, and changes to a moth, called by the *Engliſh* peaſants the devil's Gold ring: the green and yellow Caterpillar, is metamorphoſed to a moth, variegated with white and black: the aſh coloured Caterpillar turns to a ſtraw coloured moth.

The *Caterpillar* of the rocket, was put into a glaſs veſſel, and was obſerved every night to change its colours ſucceſſively, it being firſt of the colour of gold, then blue, afterwards black, and laſt of all purple; they were all undulated when the inſect crept along. It had two teeth made like ſickles, and the rings of its body were ſupported on each ſide with crooked feet. Each ring was covered with hair, which was long in the laſt, and in the form of prickles. It turned to an aurelia, of the ſize of a walnut, of a greeniſh colour, and pointed at the ends, in which ſtate it continued a month, and then became a Butterfly of the largeſt and moſt beautiful kind: the extremities of the wings were turned upwards like a hook, and the edges were fringed, and of various colours; likewiſe the wings were ſpotted with black, red, and blue, which looked like eyes, as fine as thoſe in a peacock's tail.

The *Caterpillar* of the roſe buſh, is of different kinds, ſome of which turn to moths, others to Flies: thoſe that are half green, and half roſe coloured, become little brown Butterflies: the bright green Caterpillar with white ſtreaks along the body, has each ring marked with a white ſtreak above, and a yellow ſtreak beneath; but what it turns to, is not ſaid; but there is another, which had ſix feet before, eight in the middle, and two behind, that turns to a brown aurelia, and in *July* to a bright brown moth, whoſe lower wings ſhine like gold.

Albin obſerves, that of the *Caterpillars* of the wild roſe tree, ſome are brown, and others green, with a red head; they turn to moths of a browniſh black colour. On a branch of the dog roſe, there was a fleſh coloured Caterpillar, with a hump back, that turned to a fleſh coloured moth: there was alſo another that was green, with a white line on the back, that turned to a flie, called the black headed Bee Flie.

Merian took notice of a green *Caterpillar* that fed on the roſe buſh, with a black head. When it was touched, it let itſelf down by a thread, and got up again by the ſame. In *May* it turned to an aurelia, and fourteen days after to a ſmall Butterfly, that ſhone like gold.

The *Caterpillar* that feeds upon rue, is green, and variegated with red, yellow, and blue ſpots; and it changes to a yellow Butterfly, ſtreaked and enamelled with black, as well on the body as wings. On

the extremity of the lower wings there are two round red ſpots, and others that are blue, terminated by a hairy violet line. At the extremity of the edge there are two ſmall appendages, which look like tails to the wings, and on the head there are two horns or feelers, which are long, blackiſh, moveable, and thicker at the extremity, than at the root. It dies in four days time.

The *Caterpillar* of the willow, is large, and turns to a grey moth: the black water willow, feeds a Butterfly with ſmall ſpecks, which turns to a grey moth, that lays green eggs. Another willow Caterpillar turns to a grey and red Butterfly, and a third is armed with horns, and changes in *July* to an aurelia, which becomes a moth in the *April* following. A fourth is metamorphoſed to a flying inſect, and a fifth, which is half yellow, and half green, becomes a yellow Flie.

Merian mentions a very beautiful green *Caterpillar*, ſpeckled with white, and a white ſtreak running acroſs each ring. It turns to an aurelia, and the next *May* to a moth, with head, body, and upper wings brown and white, variegated with yellow and black; but on the lower wings there are two large black eyes in the middle, ſurrounded with a blue circle: the upper part is of a bright brown, and the lower of a roſe colour. It has ſmall black eyes, and little horns.

He takes notice of another that is ſmall, and of a bright green, adorned with white ſtreaks, which turns to a brown aurelia, and fourteen days after to a ſmall moth, of a greyiſh aſh colour, adorned with white ſtreaks.

The *Caterpillar* of the red willow, is green, and turns to a dark brown aurelia, which in *Auguſt* changes to a bright brown moth, with wings ſtreaked with brown: the ſame tree breeds another of a ſmall ſort, that turns to an aurelia, and then to a Flie, whoſe body, head, and horns are black, with two wings tranſparent, and ſix yellow feet.

Albin ſpeaks of ſeveral ſorts of *Caterpillars* found upon the different kinds of willows, which are as follow: the green and yellow Caterpillar, called by *Ray* the moſt beautiful double tailed Caterpillar, and which turns to a moth, that the ſame author terms the great and moſt beautiful moth, with large external aſh coloured wings, elegantly variegated with black ſpots and lines: the beautiful green Caterpillar, whoſe moth *Ray* names the middle ſized domeſtic moth, becauſe in *July*, *Auguſt*, and *September*, it comes into houſes: the olive coloured Caterpillar, which turns to a yellow Butterfly, with wings variegated with black: the fleſh coloured Caterpillar, that becomes a bright yellow moth, with ſhades and ſpots of a darker colour: the green and red Caterpillar, from whoſe two extremities a Flie proceeds: the yellow Caterpillar that turns to a Beetle: the dark brown Caterpillar that changes to a moth, with the upper wings yellow, and the lower of a yellowiſh white: the ruddy Caterpillar that turns to a moth, called by ſome the moth with red lower wings: the purple Caterpillar with red and yellow ſpots, changes to a white moth, ſtreaked with black: the green Caterpillar with ſmall red lines on the back, becomes a white moth, ſtreaked with black.

Goedard takes notice of a *Caterpillar* of a bright yellow colour, variegated with a little black, which bears ſomething on its head like an eſcutcheon gules, with a cheveron of gold. It turns to an aurelia in *Auguſt*, and in the ſame month of the following year, it becomes a ſtrong vigorous Butterfly, and yet it lives but two days.

The

The *Caterpillar* of thyme, has the back marked with longitudinal ſtreaks of different colours, that is, blue, purple, yellow, red, and black; beſides which there are many ſmall ſpecks. It turns to aurelia, like a ſilk worm, from whence four Flies proceed, which are probably the eggs of the Ichneumon Flie: they are larger than common Flies, with blueiſh heads and wings; but every where elſe of a purple colour.

The nightſhade *Caterpillar* turns to a red aurelia at firſt, which by degrees becomes black, and is transformed to a large Butterfly, which makes a noiſe with its wings like a Bat. It is of a yellow colour, variegated with black on the wings, back, and belly. On the head, which is black, there are two tufts, of a little lighter colour; but the eyes are of a chefnut colour, and the trunk black and curled: the ſix feet are hairy and yellow, and each of them terminate in a hook. What this changes to, *Redi* gives no account.

The marygold *Caterpillar* is of a dark colour, with black lines, and the belly of a bright green, with a white line that parts the dark colour from the green, it retires into the ground, where it turns to an aurelia, and then changes to a duſky moth, marked with a white ſpot on each upper wing: there is another breeds upon this plant, with a black back, and the head and the belly of a dirty green, with red ſpots like eyes: the moth that proceeds from it has two round ſpots upon each upper wing, ſurrounded with a white circle, and there is a white ſtreak on their extremity.

The *Caterpillar* of the elder tree, is of a bright yellow, with two black ſtreaks that run acroſs the back, and three others that run longways behind. It has black teeth, and changes to a bright brown aurelia, which becomes a white moth, ſtreaked with brown: there is alſo a green Caterpillar belonging to this tree, which becomes a bright brown moth.

The *Caterpillar* of the ſycamore tree, is yellow, and covered with ſaffron coloured hair. When diſturbed, it draws itſelf up like a hedgehog; it changes to a grey moth.

The *Caterpillar* of the tabruba, a *Surinam* tree, is yellow and black, and covered with hair, like a bruſh; it becomes a ſort of Bee, ſtreaked tranſverſely with yellow and black.

The *Caterpillar* of the lime tree, is a very large and beautiful inſect, of the colour of ſilk, ſpotted on the back with white; but the lower part of the body is of a deep yellow. On the hinder ring there is a blue horn, and behind that a yellow ſpot. It turns to a black aurelia, and ſeems to be dead till *May* in the following year, and then changes to a pale yellow moth, ſpotted with black.

The *Caterpillar* of turnſole, hides itſelf in the ground all day, and in the evening comes out to feed. It turns to an aurelia in *May*, and in June the year following, becomes a Butterfly, with the letter O on its wings.

The trefoil *Caterpillar* is red and yellow, and turns to a whitiſh Moth.

The *Caterpillar* of the aſpen tree, is of a golden yellow colour, and changes to an aſh coloured Moth, with the extremity of the upper wings of a copper colour.

The *Caterpillar* of the purple tulip, though mentioned by *Merian*, is not deſcribed; but it turns to a Moth, whoſe upper wings are reddiſh, and the lower, with the reſt of the body grey.

The valerian *Caterpillar* is of ſeveral kinds, ſome of which become grey Moths, and others brown Butterflies.

The *Caterpillar* of the vine, is of two kinds, the one being brown, and the other green; they are both ſtreaked and ſpotted with black and white. That that is brown, changes in *July* to a bright brown aurelia, and continues in this ſtate till the next *May*, when it becomes a beautiful Moth, with the head, body, and upper wings of a roſe colour, variegated with green ſtreaks and ſpots. The lower wings have each a black ſpot, and the eyes are of a yellowiſh green. It has a long ſlender trunk, of a yellow colour, and curled at the end. It is one of the moſt beautiful and remarkable of this kind.

Albin mentions an olive coloured *Caterpillar* that feeds upon the leaves of the vine, and becomes a grey mottled moth, with two white ſpots on the upper wings.

The *Caterpillar* of the vine of Surinam, is brown, ſpotted with white, and there is a black ſpot on the laſt ring, in the middle of which there is a white ſkin, that ſhines like cryſtal, and which riſes and falls when this inſect breathes. It becomes a beautiful green moth, with the ends of the wings painted with red and blue.

Goedard takes notice of one that feeds on the vine, which he calls the Elephant Caterpillar, it having a trunk like that animal, but what it turns to is not known.

The violet *Caterpillar* is of a dark brown, with a white ſtreak on each ſide the body, and the head and fore feet are yellow. It turns to an aurelia in *Auguſt*, and the next *April* to a moth, with the head, body, and wings variegated with a bright yellow; as alſo with black ſpots: the eyes are black, and the horns and legs are of the ſame colour. There is another of a pale green, ſpotted with yellow, which in *June* turns to a greeniſh aurelia, and ſoon after to a white moth, variegated with grey ſpots; likewiſe the horns and feet are grey.

The *Caterpillar* of the holm oak, is covered with exceeding long hair, partly black, and partly of the colour of ruſty iron, and there are fourteen prickles on the rump, placed in the ſame form as the petala of the flower of a red daiſy. It turns to a reddiſh aurelia, which afterwards becomes black; and then turns to an inſect like the Flie of the Silkworm, of a blueiſh cheſnut colour, ſpotted with black. It has two large black tufts on its head, and a ſmall one of black ſilk at the extremity of the belly.

The *Caterpillar* of the zurſach, a Surinam plant, is large and green, and turns to a large Moth, whoſe body is adorned with ſix round orange colour ſpots. It has four wings, and ſix feet; and is black, but curiouſly ſpotted. Its trunk conſiſts of two pipes, which are uſed to ſuck the honey out of flowers; and after it has done, it rolls it up in ſuch a manner, that it can hardly be ſeen. It is not eaſily killed, and it lays a vaſt number of white eggs. This plant alſo feeds a green Caterpillar, which becomes a white and black Moth, with a double trunk, like that of the former.

The *Caterpillar* of an anonymous plant, is green, ſpotted with white, black, and red, and becomes an aſh colour moth, ſpotted with black. *Merian* ſays this plant grew in his garden, and yet he could not meet with any one that knew its name.

The

The feathered *Caterpillar*, is ſo called, from having a ſmall brown feather on its rump, and it turns to a white vigorous Butterfly: there are ſeveral other Butterflies on different kinds of trees and plants, which are taken notice of by travellers, but in ſo vague a manner, that little or nothing certain can be ſaid about them

The ſea *Caterpillar* with coloured ſhining hairs on the ſides like a rain bow, is by ſome called the ſea Porcupine, by others the ſea Mouſe, and by others again the golden Worm. It is an uncommon inſect, and is chiefly to be met with in the *Weſtern* ocean. *Linnæus* informs us, that the mouth is furniſhed with threads like the hairs of animals, and have the ſhape of feelers; the body is in the form of an egg, covered with purple ſhining points or prickles, and gloſſy hair of the ſame length, of a greeniſh yellow colour; at the center there is a ſmall opening, and under the ſkin of the back there are folded membranes, which reſemble the gills of crabs. It has forty feet on each ſide, like ſo many parallel cones, connected to the edges of the body, terminating in points, and as crooked as a ſickle; but in the inſide there is a ſort of ſoft hair. This inſect, properly ſpeaking, is not of the Caterpillar kind; at leaſt we are ignorant of any transformation it undergoes.

The dirty brownish yellow *Caterpillar*, is compoſed of nine or ten joints or rings, beſides the head and tail; the head is roundiſh, and terminates in a ſnout or mouth, conſiſting of two ſharp points. It is adorned with four rows of knobs, which riſe like the heads of ſmall braſs nails, and are of a yellow metalline colour; but they are ſo bright and glittering, that it is impoſſible to imitate them by art, for they as much excel poliſhed gold, as that metal does braſs. It was communicated to Mr *Edwards* by doctor *Mead*, and was doubtleſs brought from ſome diſtant country.

Fryſch has, 1. The thin haired *Caterpillar*, variegated with divers colours, that lays its eggs about the bud of trees, in a ſpiral line, and fixes them thereto with a gummy ſubſtance.

2. The *Caterpillar* with blue and reddiſh briſtles upon the back.

3. The willow *Caterpillar* with thin hair, and yellow ſpots upon the back.

4. The cheſnut *Caterpillar* with yellow ſhaggy hair, and yellow ſpots upon the back

5. The aſparagus *Caterpillar*, that is of the ſmall kind, and has a ſmooth body, which afterwards changes into a Beetle.

6. The camel *Caterpillar*, ſo called, on account of a bunch on its back.

7. The variegated *Caterpillar*, whoſe young are wrapped up in leaves, which hang to the boughs of trees in the winter time.

8. The white *Caterpillar* variegated with black and white ſpots, and is of that kind which has but few feet.

9. The green *Caterpillar*, with few feet, ſpotted with black.

10. The ſmall aſh coloured willow *Caterpillar*.

11. The ſmall aſh coloured *Caterpillar* of apple trees.

12. The *Caterpillar* that feeds on the flowers of woodbind or honeyſuckle.

13. The duſky and hairy *Caterpillar* is to be found on nettles, and ſtinking gladden.

14.

14. The brown, large, ſmooth *Caterpillar*, is to be met with on fruit trees.

15. The green *Caterpillar* of the ſmaller ſpecies, that feeds upon cabbage-leaves.

16. The great green many footed *Caterpillar*, with ſeventy rings, that feeds upon willows and alder trees.

17. The *Caterpliar* with yellow and whitiſh lines, that hang at the ends of branches of trees in winter time.

18. The willow *Caterpillar* with two white ſpots on its back.

19. The green *Caterpillar* marked with the character of the conjunctions of the planets,

20. The green *Caterpillar* with only two feet on the belly, and three white lines on each ſide.

21. The green *Caterpillar* with four feet on the belly, and ſix white lines on the back.

The *Huntreſs*, a name given by *Goedard* to a Caterpillar which is found upon the downs of *Holland*, and which lives upon all kinds of graſs and herbs, without ſeeming to like one more than the other. The author had one which became a Chryſalis on the twelfth of *July*, and a Butterfly on the fifth of *September* following.

There are a ſort of hairy *Caterpillars*, which in *England* have the name of Palmer Worm, becauſe they wander from place to place, like palmers or pilgrims; ſome call them bear Worms, becauſe they are all over hair, and others Millers, but for what reaſon is uncertain. Many of theſe feed on all ſorts of greens indifferently, though ſome of them do not.

The *Palm-Tree Worm* is a native of the *Weſt-Indian* iſlands, and is bred in the heart of a ſort of palm tree, after it is cut down: they are as thick as a man's finger, and about two inches long; they appear to be nothing but a bit of capon's fat, covered with a fine tranſparent ſkin. There ſeems to be no entrails nor guts when viewed with the naked eye; but with a microſcope they may be diſcovered: the head is black, and fixed to the body without any neck: they are eaten by the *French*, after they have been roaſted before the fire, when a ſmall wooden ſpit has been thruſt through them. When they begin to be hot, they powder them with a cruſt of raſped bread, mixed with ſalt, and a little pepper and nutmeg: this powder keeps in the fat, or at leaſt ſucks it up; and when they are done enough, they are ſerved up with orange juice: they are highly eſteemed by the *French*, as excellent eating. When they have been ſometime laid in the ſun, they yield a ſort of oil, which is excellent for cold pains, and eſpecially for the piles.

The blackiſh-bodied *Palmer Worm* with white ſpots on the ſides, has the hair on the under part of the body of a ſort of ſaffron colour, but that upon the upper parts is grey, three rows excepted, on the neck near the head, which are of the ſame colour with thoſe on the belly: this firſt changes to an aurelia, and then to a Butterfly, which has been before deſcribed.

The black *Palmer Worm*, has a yellow coloured belly, and ſpots of the ſame colour on the ſides. It turns to a duſky aurelia.

The browniſh yellow coloured *Palmer Worm*, is all over of thoſe colours, except the ſtripes on the ſides, that run obliquely from every joint, and the head is of a crimſon colour.

The

The duſky *Palmer Worm*, is of a browniſh black colour on the belly; but the back and upper parts are of a duſky yellow, and it has a forked line on the face, of the colour of whey.

The reddiſh bay *Palmer Worm*, has the ſides of the belly of a greyiſh colour, and the body is variegated with yellow ſpots, which are of a deep black colour above: there are hairs like rays proceed from them, of a yellowiſh colour, which are harſh, and grow to a point from the middle. It does a great deal of miſchief among graſs and corn.

The grey *Palmer Worm* is all over of that colour, except in the inciſures, ſome of which are black, and others white, and there are ſpots of the ſame colours here and there: the briſtles both above and below, are placed like the teeth of a ſaw, and are very rough and ſtrong, but of the ſame colour with the body.

The black *Palmer Worm* with yellowiſh hairs, has a ſort of pencil on each ſide the forehead, and another upon the rump, as black as a crow, there is alſo hair like wedges on the back, with white roots; but the other parts are blackiſh

The murrey coloured *Palmer Worm*, has as it were, ſeven tufts of hair, in the ſhape of wedges, on the back.

The variegated *Palmer Worm*, have all the inciſures of different colours, and yet there is not one entirely of the ſame colour, but there is a ſort of a ſilver ſtud upon each.

The *Palmer Worm*, variegated with black, blue, green, and yellow lines, running longways, ſeems to have golden ſpots between them: the hair is very ſoft, and is of a very pleaſant green; but when it becomes an aurelia it has a purple caſe.

The green *Palmer Worm*, is of the colour of a green leek, only the inciſures are whitiſh, and the hair in the middle of a brighter green.

The haſle *Palmer Worm*, is all over of a duſky green, except a few black ſpots, and the horn that grows out of the rump, which is of an agreeable roſe colour. It is chiefly met with on the leaves of haſle trees: there are two kinds of them, one of which is of a deep, and the other of a pale green.

The negro-faced *Palmer Worm*, ſeems to have an embroidered coat, very artificially worked. On the forehead there are two hairy horns, inſtead of feelers, and perhaps ſerve for the ſame purpoſe; and there are the like upon the rump or tail: the ſkin is of all the colours of the rainbow, and is variegated with roundiſh ſpots, of a purple colour, which ſeem like ſo many ſtuds, running along each ſide: the hair ſhines greatly, and ſtrikes the eyes pretty ſtrongly on a ſun ſhiny day.

The blue faced *Palmer Worm*, is variegated with white, red, and blueiſh ſpots, furrows, and the hair is of a ſhining gold colour.

The black-headed hedge-hog *Palmer Worm*, has a very black head, and a body variegated with dark blue ſpots, but the hair is of a ſhining ſaffron colour.

The pear tree *Palmer Worm*, has a head as black as ink, and a body furrowed with black, red, and milk-white colours. From the ſhoulders almoſt to the end of the back, there are livid tubercles ſpeckled with white: the egg from which this proceeds, is of a reddiſh bay, as is alſo the aurelia, and the colour of the hair. It feeds upon the buds of pear trees: there is another of this kind, with only one tubercle or hump upon the back.

The

The duſky yellow *Palmer Worm*, is of that colour, from the head to half way on the back, and then becomes of a white lily colour. On the belly there are a ſort of ſtuds, of a yellowiſh aſh colour.

The nettle *Palmer Worm*, has feet of a dull yellow colour, but all the reſt of the body is black; the hairs are erect, and terminate in a ſort of points, which will wound the fingers when touched, cauſing an itching at firſt, and afterwards an intolerable pain. From its ſtinging in this manner, it has its name.

The cabbage *Palmer Worm*, has a blueiſh head, and two raiſed yellow lines on each ſide the body, between which there is a grey ſpace, ſpeckled with black: the hair is of an aſh-colour, and ſo is the aurelia.

The hedge *Palmer Worm*, has a head of a ſaffron colour, only on the ſnout there is a whitiſh triangle: the body is variegated with red, white, yellow, and black ſtripes, or ſpots, placed in no regular order, but the hair is of a yellowiſh colour. It lives among hedges, and ſtrips them of their leaves.

The leſſer hedge *Palmer Worm*. has a blueiſh face, and all the reſt of the body is blue: the hair is of the ſame colour as the former.

The crane's hill *Palmer Worm*, is of a pretty large kind, and is adorned with black belts, ſpotted with white; ſo that at firſt ſight they appear to be of an iron grey: the belly and feet are white, and the ſpaces between the belts or girdles, are of the colour of green leeks. It feeds upon weeds, and more particularly the herb called crane's bill: the Palmer Worm, with a variegated body, is from the head to the third inciſure, of a whitiſh colour, like chalk, but the five next following, are of an iron grey, and the three laſt of the colour of ceruſs: the feelers conſiſt only of hairs, at the end of the tail there ſeem to be two more. Beſides theſe, there are four upright tufts on the back, conſiſting of hairs, placed in a dentated order.

The ragwort *Palmer Worm*, has a head and legs of a dull purple colour, and the belly of a paliſh green; but the body is of an unpleaſant green, variegated with black, yellow, and flame coloured ſpots: the colour of the hair is the ſame as that of the belly.

The hedge-hog *Palmer Worm* has a body chequered and variegated with black and yellow, and it has ſpines or thorns that are yellowiſh. In the beginning of the autumn, they change into an aſh coloured aurelia.

The variegated hedge-hog *Palmer Worm*, has the fore part of the body, as far as the middle of the back, of a yellowiſh black colour, but the hinder part is of a whitiſh yellow, and it has hard thick ſpines or thorns, of a blueiſh colour.

The bramble *Palmer Worm*, is of a blackiſh aſh colour, and on each ſide there are three paliſh yellow furrows; it is but thin of hair, which is black.

The horned *Palmer Worm*, is variegated with green and yellow, but the hair on the middle of the back is grey, and the horn is notched.

There are other *Palmer Worms*, that feed upon vervain, hops, liquorice, night-ſhade, the elder tree, the elm tree, figwort, baſil, and dill, but as they contain nothing very particular, we ſhall paſs them over; however we ſhall take notice of one, called the ſtinking Palmer Worm, mentioned by *Geſner*. It is like the horned Palmer Worm, and has ſo ſtrong a ſmell, that any one would take it to be venomous. When it is angered

angered it holds up its head, and the two fore feet, and ſeems to be blind. It is about as long and as thick as a man's finger, and has a few hairs ſcattered over the back and ſides: the back is black, and the belly and ſides of a roundiſh yellow colour: the body conſiſts of fourteen joints, and there is a furrow on each, that runs along the whole length of the body; it has a black hardiſh head, and a forked ſerrated mouth, with which it lays hold of any thing, as with nippers. It has ſixteen feet, in the ſame manner as moſt Caterpillars, and is doubtleſs of a poiſonous nature.

The *Sphondyle*, called in the North of *England* an Andever, and in the ſouth a Wurl Worm, is as long and as thick as a man's little finger, has a red head, but the reſt of the body is white, unleſs on the upper part, where it is blackiſh. It does a great deal of miſchief in gardens and orchards, for it gnaws the bark off the fruit trees; it will alſo eat the roots of the wild cucumber, the wild vine, birthwort, centory, and other plants, which no other inſect will touch. The next year after hatched it turns into a *May* Beetle, which feeds upon the roots of trees, even of the poiſonous ſorts, and cauſes them to wither away; which when the gardiners perceive, they dig about them, and take them out to kill them. They do moſt miſchief in *April* and *May*.

Theſe Worms are of different ſorts, for ſome are in the ſhape of a croſs, of a whitiſh aſh colour, and a blackiſh head; but when they are touched, they fold themſelves up like a ball, or rather like a wheel that women make uſe of in ſpinning. Another of this ſort is of a red colour, and was found two feet deep in the ground; it had a very black head, a forked mouth, a yellowiſh red neck, a ſcarlet back, and the ſix fore feet of a reddiſh colour; but the belly, and the reſt of the body, were quite yellow, only on each ſide there were eight reddiſh ſpecks. It is as long as a man's middle finger, and in the ſummer it changes to a Flie.

Another of this kind has a ſhining thick body, which from the middle of the back to the tail, is of a blueiſh colour, but the fore part is greyiſh, and it has a yellow head and feet, with a reddiſh forked mouth. It ſtirs its body in an odd manner, like the motion of waves, without changing its place, and then it ſeems to alter it colour. While it remains in the earth it is all over whitiſh, but when it is angered, it appears to be livid. This is much in the ſame ſhape as the former, only it rolls itſelf up. From this worm, a very large Flie proceeds, with four wings.

There is another inſect of this kind, found at the roots of onions, and is much of the ſame ſhape as the former, with a green head, fourteen feet, and a horned whitiſh green tail. The body is variegated with green, yellow, and murrey colour. It is called by ſome the Onion Worm.

CHAP. XVI.

OF INSECTS OF THE SPIDER KIND.

THE moſt common *Spiders* in theſe parts of the world, are the houſe Spider, which weaves its web in neglected rooms. The garden Spider, that weaves a little round web, in the center of which he keeps in the day time: the black Spider, that inhabits the holes of old walls: the wandering Spider, that has no abode, like the reſt; and the field Spider; beſides many others that we ſhall take notice of as we go along. All theſe Spiders have ſomewhat in common among themſelves; and they have alſo a characteriſtic which diſtinguiſhes them from each other. Every Spider conſiſts of two parts, the head and the breaſt, which is ſeparated from the hinder part, or the belly, by a ſlender ſtring: the fore part is covered with a hard ſhell, as well as the fore paws or legs, that adhere to the breaſt: the hinder part is cloathed with a ſupple ſkin, beſet all over with hair: they have ſeveral eyes on different parts of the head, generally eight in number, and ſometimes only ſix, two before, two behind, and the reſt on the ſides of the head: they have all eye-lids, and are covered with a hard poliſhed cruſt. As their eyes are immoveable, they are furniſhed with ſuch a number of eyes, that they may ſee what is doing all round about them.

They have two prickles on the fore part of the head, or rather two branches, rough, with ſtrong points, or dentated like two ſaws, and terminating in a claw, like that of a cat. A little below the point of the claw, there is a ſmall hole, through which it ſeems to emit a very active poiſon: this is the moſt dreadful weapon they have againſt their enemies, and they can cover, or ſtretch them out, as they have occaſion. When they do not make uſe of theſe claws, they lay them down on the branches like a ſickle on its handle: they have all eight legs, articulated like thoſe of Lobſters, and at the end there are three crooked moveable claws, namely, a ſmall one on the ſide, placed like a cock's ſpur, by the aſſiſtance of which they adhere to the threads of their webs; and there are two others larger, the inſide of whoſe hook is dentated, and ſerves to fix them on any thing they pleaſe, or to walk up the ſide of a wall, and even with their backs downward: the moſt poliſhed bodies, ſuch as looking glaſſes and marble, have ſuch inequalities, that they can lay hold of them with their claws. But they do not always make uſe of theſe, there being near the claws two tubercles, or a ſort of ſpunges, on which they can walk in a ſofter manner, reſerving the former for other purpoſes, wherein ſharp claws are required.

Spiders, beſides the eight legs already mentioned, have two before, which may be called arms, becauſe they are of no ſervice in walking, but are uſed in holding and managing their prey: though they are thus armed, they could not go to war with ſucceſs, if they were not as well furniſhed with toils to catch their game, eſpecially as they have no wings to fly after it. For this reaſon Spiders have the art of ſpinning threads, with which they weave their webs, which are a ſort of nets, ſpread out on purpoſe to take their prey; and they lay them in thoſe places where the Flies are moſt likely to paſs and repaſs almoſt continually: the

Spider

ſpider lies in ambuſh behind the net, and patiently waits for its enemy, who is not aware of it.

Spiders have five tubercles or nipples, at the extremity of the belly, whoſe aperture they can open and ſhut, enlarge, or contract, juſt as they pleaſe. It is through theſe apertures that they ſpin the gluey ſubſtance with which their bellies are full. In proportion as the ſpider lets this glue paſs through one of the apertures, the head grows longer, as ſhe recedes from the place to which ſhe had fixed the end. When ſhe contracts the apertures of the nipples, the ſpinning ceaſes, and ſhe remains hanging thereto. She afterwards makes uſe of the thread to re-aſcend by the help of her claws, much in the ſame manner, as ſome men will ſwarm up a rope. However this is not all the uſe which ſhe makes of this thread.

When a houſe *Spider* is to begin her web, ſhe firſt chuſes a place where there is a cavity, ſuch as the corner of a room, that ſhe may have a clear paſſage to paſs freely on each ſide, and to make her eſcape if there be occaſion. She throws upon the wall a ſmall drop of this glue or gum, and lets ſome more paſs through a ſmall aperture, and the thread lengthens as ſhe draws back, and till ſhe has got to the other ſide, where ſhe would fix her web; than ſhe lets another drop fall, by which ſhe fixes it to the place; thus ſhe paſſes and repaſſes, till ſhe has made it as large and as ſtrong, as was firſt deſigned: thoſe that have ſeen them at work, affirm, ſhe makes more threads than one at the ſame time, that ſhe may finiſh her net the ſooner. However it is obſervable, that the firſt row of threads, which may be called the warp, lye all parallel to each other; after which ſhe croſſes them with another ſet, which may be named the woof, and by a particular art that ſhe has, ſhe faſtens them to each other, which perhaps is entirely owing to the gluey ſubſtance ſhe makes uſe of.

A *Spider* ſeems to know very well, that if ſhe appeared openly, or in ſight, ſhe would miſs of her prey; and therefore ſhe weaves a ſmall cell for herſelf, where ſhe lies hid, and keeps upon the watch: there are two paſſages, out of it, the one above, and the other below, that ſhe may walk out which way ſhe pleaſes, to viſit her work, and keep every thing clean; for ſhe takes away from time to time, the duſt that is got upon it, or rather ſhakes it off, by giving it a ſtroke with her paw, which if ſhe did not do, it would ſoon be over-loaded and conſequently the fabrick would be deſtroyed.

There are generally a ſort of threads, that proceed like rays from the center, where ſhe is hid, and where ſhe ſtands centinel; ſo that ſhe can readily preceive when any part of the threads are touched, when the game is at hand, upon which ſhe immediately falls upon it. Another advantage ſhe receives from the mechaniſm of her cell, is to have a retreat, where ſhe may devour her prey in ſafety, and conceal their carcaſſes, that they may no prevent others from falling into the ſame ſnare.

The magazine of the gum or glue, does not always laſt, for when the ſpider grows old, it is entirely exhauſted; and then to get her living, ſhe goes to the web of a young one, who either out of kindneſs, or fear, gives place, and weaves herſelf another.

The labour of the garden *Spider* is quite different from the former, and yet is not performed with leſs art. Many people believe that ſhe flies

from one tree to another, but this is a miſtake, for when ſhe fixes one end of a thread to a branch, or any other ſubſtance, then with her two hind paws ſhe draws out one or more threads from the nipples, three or four yards in length, which ſhe lets float in the air: theſe threads being driven by the wind on one ſide or other, to ſome neighbouring body, as for inſtance, a houſe, a rail, or a tree, or a ſtake on the other ſide of a river; this thread fixes itſelf thereto, by its natural clamminеſs; then ſhe draws it a little, to ſee whether it is faſt or not, and then this becomes a bridge, on which the Spider can paſs or repaſs at pleaſure: this done, ſhe doubles or triples the thread, according to her own fancy; and then advancing towards the middle thereof, ſhe there fixes another, and lets herſelf down with it, till ſhe meets with a ſtone or plant, or any other ſolid ſubſtance, on which ſhe may reſt. She re-aſcends on the ſecond thread to the firſt, and then begins a third, which ſhe fixes in the ſame manner. When ſhe has thus fixed three threads, ſhe ſtrengthens them, by making them double: then ſhe endeavours to find out a ſquare place, which is not very hard to do, and which is owing to the artificial management of the threads. However it is remarkable, that ſhe never leaves off ſpinning, while ſhe paſſes backward and foreward: then ſhe goes to the right and left, and by this means forms a ſquare, or a figure approaching thereto; then ſhe weaves a croſs in the ſame manner, whoſe point in the middle, becoming the center, from which ſhe lays all the reſt of her threads, like ſo many ſpoaks of a wheel. She places herſelf at the center, where all theſe threads croſs each, and then ſhe forms a ſmall circle round about it, and then another, and ſo on, proceeding always in a circular manner, till at length ſhe comes to the large threads, which ſupport the whole work.

The net being thus ſpread, ſhe places herſelf at the center of all theſe circles, with her head downwards, becauſe her belly, which is fixed to a very ſlender neck, would fatigue her too much in any poſture; whereas in this, her paws and breaſt ſupport the belly. There ſhe waits for her prey, but ſeldom very long; for the air being full of Flies and Gnats, that paſs backwards and forewards, ſome of them ſoon fall into the net. When the Flie that is taken is ſmall, it is diſpatched upon the ſpot, but when it is large, and makes ſome reſiſtance, the Spider wraps it up with her web, binding it ſo faſt, that it is not able to ſtir either legs or wings, and then ſhe carries it to her neſt, which is underneath the web, and ſhe hides it under leaves, or a tile, or ſome other commodious ſhelter, to keep it from the rain.

As for the black *Spider* that lodges in cavities, ſhe only weaves a ſort of a web about the mouth, leaving a round hole in the middle, as a door to go in and out at. When an inſect paſſes near the place, it never fails to move one of the threads which run out on all ſides, like ſo many rays; which the Spider having notice of where ſhe lies in wait, immediately runs to catch it. This Spider is more miſchievous than the reſt; for if ſhe is taken up with two ſticks, or otherwiſe, ſhe will be ſure to bite the inſtrument that holds her. She is alſo much harder than the reſt, ſo that a Waſp for inſtance, which by its ſting, and by the hardneſs of its body, puts the other ſort to a great deal of trouble, can make no impreſſion upon this; for the black Spider cannot be penetrated

netrated with its ſting; but on the contrary, ſhe can break the bones and the ſcales of the Waſp, with her nippers.

The wandering *Spiders* are of ſeveral ſorts and colours. They generally run and leap; but as they have not thread enough to wrap up their prey upon occaſion, much leſs to ſtop the motions of the wings and legs of the Flie, nature has furniſhed them with two fore paws or arms, with two tufts of a ſort of down, with which they can reſtrain the motion and agitation of the wings of their enemy. There is another black ſort, leſs than this, which weaves her web in *September* and *October*, among the graſs in the meadows, or in ſtubble, which remains after the harveſt; however ſhe lets ſome of the threads be carried in the air by the wind, inſomuch that it is often full of them. Theſe threads unite, lenghen, and ſtop, at any place they are driven to, and the Spiders make uſe of them in ſuch a manner, that one would think they could fly, or they are carried along with them by the wind. There is nothing more remarkable in theſe, than the extreme length and firmneſs of their legs; for as they are deſigned to live among ſlender graſs, and weeds, the ſmalleſt blade would ſtop and embarraſs them, if they had not theſe long legs, to raiſe them higher than the common graſs, and to run ſpeedily after its prey.

With regard to their laying of their eggs, they have more care and foreſight than is generally thought; for they are ſo far from leaving them to chance, that they weave a very ſtrong web wherein to lodge them. Of this they make a ſtrong bag, wherein they lay their eggs, and it is hardly credible what pains and trouble they are at, in performing this work. This bag is often ſeen joined to the hinder part of their bodies, in ſuch a manner, that many take it to be a part thereof; if by any accident it happens to be ſtruck off, the Spider never fails to join it thereto again by their natural glue. When the eggs are hatched, they get upon the old one's back in ſuch a manner, that without a nice examination, you would take them to be part of their body, though perhaps there are a thouſand in number.

Another ſort of *Spider* lays her eggs in a bag, made like a cap, which is ſometimes fixed to a wall, and ſometimes to a leaf, where ſhe ſits upon them night and day, and ſhe would ſooner ſuffer herſelf to be killed, than abandon them till they are hatched.

There is yet another ſort, that make two ſmall bags, of a reddiſh colour, which they hang up with threads, and before them they place a tuft of leaves to hide them from birds and Waſps, which would otherwiſe fall upon the bags, which are full of eggs; for the wind keeping them continually in motion, it prevents them from taking notice of what hangs behind. It is wonderful to conſider the ſtrength which all Spiders in general endow their bags with; and they generally hang them up againſt a wall.

The *Tarantula* has ſome reſemblance to a houſe Spider, but it is the largeſt yet known in *Europe*, and is a native of that part of *Italy*, called *Apuglia*. Its body is three quarters of an inch long, and of the thickneſs of one's little finger; the colour is generally of an olive brown, variegated with one that is more duſky. It has eight legs, with three joints each, and eight eyes; from the mouth proceeds a pair of nippers, dentated or ſerrated on the inſide, which are ſolid, and ſo very

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ſharp, that they can eaſily pierce the ſkin therewith. Between theſe and the fore legs, there are two little horns or feelers, which it is obſerved to move very briſkly, when it approaches its prey. It is covered all over the body with a ſort of ſhort ſoft down, and propagates its ſpecies like other Spiders, by laying of eggs, which ſometimes amount to an hundred or more. In the ſummer months, particularly in the dog-days, the Tarantula creeping among the corn in the fields, bites the mowers, and paſſengers; but in winter it lurks in holes, and is very ſeldom ſeen: the part which is bitten, is ſoon after diſcoloured with a livid black or yellowiſh circle, attended with an inflammation. At firſt the pain is ſcarcely felt, but a few hours after there comes on a violent ſickneſs, difficulty of breathing, fainting, and ſometimes trembling: the perſon who is bit, after this does nothing, but laugh, dance, and ſkip about, putting himſelf into the moſt extravagant poſtures; but this is not always the caſe, for he is ſometimes ſeized with a dreadful melancholy. At the return of the ſeaſon in which he was bit, his madneſs begins again, and the patient always talks of the ſame thing; ſometimes he fancies himſelf a ſhepherd, a king, or any other character that comes into his head, and he always talks in a very extravagant manner: theſe troubleſome ſymptoms ſometimes return for ſeveral years ſucceſſively, and at length terminate in death. Gentlemen who have travelled into *Italy*, affirm, that this odd diſtemper is cured by a remedy altogether as odd, which is muſic; for this only will give them eaſe, and they make uſe of the violin in particular: the muſician plays ſeveral tunes, till at length he happens to find one that makes a great impreſſion upon the patient, at which time he begins to dance, and continues ſo doing, till he is all over in a ſweat, which forces out the venom that did the miſchief: this dancing ſometimes continues for three or four hours before the patient is weary, and before the ſweating is copious enough to cure the diſorder.

The *Spiders* of the *Weſt-Indies*, have much the ſame properties as thoſe of *Europe*, for they have almoſt all a ſort of bags, which ſeem to be made of fine leather, though it is woven with their threads; in theſe they lay their eggs, and either ſit on them to hatch them, or to preſerve them from being devoured by other inſects. However in the woods there are ſome that are not common, for they are an inch and a half long, and an inch broad; the fore part is made like a cuſhion divided into ſmall ſquares, and the belly or hinder part is of an oval ſhape, variegated with ſpots and lines: they are all grey, and have very long legs, which are hard and hairy like the paws of a flying ſtag.

The Martinico *Spider* is divided into two parts, and the belly, or hinder part is almoſt as large as a hen's egg, and covered all over with pretty long hair: the fore part is the ſhorteſt, and not quite ſo thick, and in the middle of the back there is a ſmall round opening, which will hold a pea, ſurrounded with hair, a little longer than that on the other parts of the body. From each ſide of this part there proceeds five legs, longer than a man's finger, all hairy, and conſiſting of four joints, and each has a pair of nippers, very hard, and have the appearance of red horn; it has two teeth in the mouth of the ſame ſubſtance, about half the length of a common pin, and they are crooked, and as ſharp as needles: they have two ſmall black, ſhining eyes, which are not much larger than pin's points: they make a bag as large as an egg-ſhell,

egg-ſhell, whoſe outer covering has the appearance of fine leather; but within there is a down as ſoft as ſilk, in which they lay their eggs: this bag is placed underneath their bellies, and they always carry them along with them: there is another ſort like pine-apples, but not quite ſo big, and part of the hair on the top of the body is green: the inhabitants are very much afraid of this inſect, and affirm, that it is more dangerous than a Viper. When they are irritated and put into a paſſion, they throw out a venom, which would render a man blind, if it ſhould fall on his eyes; and even the hair of this inſect is venomous, and if it is touched while alive, it ſtings like nettles. If it be taken up and preſſed never ſo little, it ſtings with a weapon not ſo big as that of a Bea but ſo venomous, that recourſe muſt be had to the ſame remedies that cure the bites of ſerpents.

Boſman in his account of *Guiney*, tells us, that he met with a Spider of a monſtrous ſize, with a long body and a ſharp head, and broader in the fore part than behind, but not ſo round as moſt Spiders are. It had ten legs that were hairy, and as thick as a man's little finger. This Spider is called Ananſe by the *Negroes*, who fooliſhly believe that the firſt man was made by this inſect.

The *Bermudas Spider*, is of a very large kind, whoſe body conſiſts of two parts, the one flat, and the other round, and they are ſo large when their legs are extended, as to cover a man's hand: they are beautifully variegated with divers colours, and they have an orifice on their backs, like thoſe in the *Weſt-Indian* Spiders already taken notice of: their mouths are covered with a ſort of grey hair, intermixed with bright red, and they have a crooked tooth on each ſide, of a fine poliſhed ſubſtance, extremely hard, and of a fine bright ſhining black colour; inſomuch that they are often ſet in gold and ſilver to ſerve for tooth-picks. When theſe inſects grow old, they are covered all over with a kind of browniſh black down, which is very ſoft and ſmooth, and ſhines like velvet: the round part is much of the ſhape of a large pigeon's egg, and under that, which is flat, their legs grow, five on each ſide, with four joints and claws at the end: they caſt their downy ſloughs every year, as well as the two fine teeth above-mentioned: they live upon Gnats and Flies, and ſpread their webs from tree to tree, which are very large and ſtrong. In the Philoſophical Tranſactions it is ſaid, that theſe Spiders will ſpin their webs between trees that are ſixteen yards diſtant from each other, which they do by ſpirting their web into the air, and the wind carries it from tree to tree: this web when finiſhed, will catch a bird as big as a Thruſh, if this account is to be believed; but we are of opinion, that moſt readers will think it to be altogether improbable.

There are many ſorts of *Spiders* in the *Eaſt-Indies*, of a very different bigneſs, ſome of which are four inches long, and have very thick legs. Others have eight feet, a thick ſpeckled body, and a round head, with brown legs: theſe have two teeth like hooks, wherewith they bite very ſtrongly: they make tooth-picks with theſe teeth, in the ſame manner as *Bermudas*.

At the *Cape* of *Good Hope* likewiſe, they have ſeveral ſorts of Spiders, which differ in bigneſs, ſhape, and colour, as well as in the manner of making their webs. Some of theſe are venomous, and others not, and ſome delight to be in houſes, while others keep always

in the fields. But there is a ſmall ſort, more dangerous than the reſt, being no larger than a ſmall pea, and it is black, and very active. It fixes itſelf on the walls of houſes, or to planks, and in the fields it ſpins its web on the graſs. Its bite is ſo venomous, that it would infallibly kill, without a proper remedy. A *Negroe* bitten by one of theſe Spiders, neglected the wound too long, and died in a few days: this inſect likewiſe attacks pretty often, herds of large and ſmall cattle, and does them a great deal of damage, for this reaſon the *Europeans* take a particular care in keeping their houſes, and the ſtables clean, to preſerve themſelves and their cattle from the bites of theſe dangerous animals.

The large *Spider* of *South-America*, make their neſts on guava trees, in the ſhape of the webs of ſome Caterpillars: their bodies are covered all over with hair, and they are furniſhed with ſharp-pointed teeth, which give dangerous wounds; for at the ſame time they diſtil a liquor into them of a malignant nature: they generally feed upon Ants, and ſometimes they will take the young of ſmall birds out of their neſts, and ſuck their blood. In particular, they are great enemies to the Humming-birds, which they will often attack and kill: they ſhed their coats or ſlough's every year, like the *Bermudas* Spiders.

The ſmall ſcarlet *Spider*, is a native of *England*, and is found in gardens and orchards, on the bodies of trees. It is not much bigger than a large Flea, nor is it divided into two parts, like moſt other Spiders; but it has a ſmall round head, that ſtands from the body, furniſhed with two long feelers: the body itſelf is oval, and has three legs on each ſide; but though it is ſo ſmall, it is accounted venomous.

The reddiſh cheſnut coloured *Spider*, is very remarkable for its legs and feelers. It has eight of the former, four on each ſide, and each joint ſeems to be placed in a ſocket: the feelers are globular, and hairy at the ends, encircled with yellow, which gives them the appearance of a ſmall ſtone ſet therein It has eight eyes, placed in a ſemicircular form, and about them the colour is black, but the upper part joining to the belly, is of a reddiſh cheſnut: the upper ſide of the belly is of a dark aſh colour, and the legs are reddiſh.

The ſmall long-legged *Spider*, is ſo finely marked, that it is impoſſible to deſcribe it either in words or colours, there being ſo fine a mixture of green, red, and black, interchangeably put together in curious ſhapes. It has eight legs, which are very long, and marked in the ſame curious manner: the body is perfectly oval. It being without any diviſions in the body, and the head does not ſtand out therefrom: the eyes are ſo ſmall as not to be diſcerned.

The dark coloured *Spider*, has a broad ſtreak of light hair-colour, in the middle of the back, and a mark of the ſame, in the ſhape of a diamond, on the upper part of the belly. It has ſix eyes, two clavated feelers, and eight long legs, which are finely ſpotted. It is divided into two parts, as other ſpiders, but the head is not diſtinct from the fore part of the body. In *June* it carries its egg-bag under its belly.

The houſe *Spider* with legs finely ſpotted with black, has hairs or briſtles growing from each joint, and it has eight eyes, eight feet, and two clavated feelers: the fore part of the body is almoſt round, and that behind perfectly oval; ſome give the webs of theſe Spiders for the cure of agues.

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The jumping *Spider*, that is one ſort of them, is of a very ſmall kind, and has eight eyes, placed in a circular form; and it is obſervable, that all thoſe that have their eyes placed in this manner, catch their prey by jumping upon it, as a cat does at a mouſe: the belly part of the body is of an oval form, and it has two clavated feelers, and four legs on each ſide, fixed to the breaſt. When beheld through a microſcope, it appears to be beautifully variegated with black, cheſnut, reddiſh, and white colours, all over the back, belly, legs, and feelers, and it is all over rough and hairy. Mr *Evelyn* found one of this ſort near *Rome*, which was ſpeckled with black all over the body, and through a microſcope appeared like the feathers on a Butterfly's wing. It is very nimble by fits, ſometimes leaping like a Graſshopper, then ſtanding ſtill, and ſetting itſelf on its hinder legs, will very nimbly turn its body, and look round itſelf every way. If it eſpies a Flie at three or four yards diſtance, it will not make directly to her, but conceal itſelf as much as poſſible, till it arrives directly under her, and then creep ſlowly up to her, ſeldom miſſing its aim, and it jumps directly upon the Flie's back. But if in the mean time, the Flie takes wing, and fixes upon another place, it will whirl about very nimbly, by which means it always keeps its head towards its prey. It has been ſometimes ſeen inſtructing the young one's how to hunt, and when any of the old ones miſſed a leap, it would run out of the field, and hide itſelf in crannies, as if aſhamed. In ſhort, nothing can be more diverting to a naturaliſt, than to obſerve the cunning and ſtratagems it uſes in hunting.

The beautifully ſtreaked *Spider*, is ſpeckled with black all over its body and legs, which are very long. It has eight eyes, ſtanding in the form of a ſegment of a circle; and it has two feelers very ſlender at their roots, and of a long oval ſhape at the ends. Both parts of the body are of an oval ſhape, and the tail is forked: there are two ſtreaks on the back of the belly part, alternately ſpotted with white and black: the forks at the tail appear like feathers ſtanding up, which it can open and ſhut like a fan, at pleaſure.

The *Spider* with a tranſparent back and legs, has eight eyes, and the belly part of the body is vaſtly larger than the breaſt; on the back of it there is a dark ſpace or mark, that runs two thirds of the length as far as the tail, and the back and legs appear tranſparent, like clear horns. It has two pretty long feelers, which are ſmaller at the root than at the end, and the legs which are long, are alternately variegated with different colours, though not very diſtinct, on account of their tranſparency, and there are four on each ſide of the breaſt.

The *Spider* marked with white ſpots and lines, in a curious regular manner, has yelloviſh and very hairy legs, ſpotted with a dark brown; the feelers alſo are ſpotted, and are ſhort and thick at the ends: the breaſt or fore part, is very ſmall, in proportion to the belly part, the back of which laſt is regularly marked with white ſpots. Near to the breaſt part there are four ſpots like pearls, placed exactly in the form of a croſs, and where they meet, there is a ſmall white one. Next to that there are two other ſpots, in the ſhape of pearls, placed tranſverſely, in the middle of which, there is another ſmall one. Near the back part there are three ſpots on each ſide, like half moons, and between them, others, placed in a very regular order. It has ſix eyes,

placed in an oval form, and may be met with in gardens, at the latter end of *July*.

The hair-coloured *Spider*, has on the upper ſide of the belly part, a yellow mark, in the ſhape of a croſs, and round it there is a broad ſtreak, of an oval ſhape: the legs are of a light hair-colour, ſpotted with black, and there are briſtles of the ſame colour at the joints. It has two feelers, ſmall at the root, and pretty thick from above halfway to the ends; the belly part is oval, and the breaſt part ſquare, and it has ſix eyes.

The *Carter*, or long-legged *Spider*, has legs of a prodigious length, and there is no diſtinction of the back and belly part, for the whole body appears to be nearly round, and marked with ten ſpots about the edges: the feelers are ſmall at the root, and become gradually thick to the ends: there are two particularities belonging to this Spider, which may be diſcovered by a microſcope; one is the curious contrivance of the eyes, which are only two, and placed on the top of a ſmall pillar or hillock, riſing out of the middle on the top of its back, or rather the crown of its head; for they are placed on the very top of this pillar, back to back, with tranſparent pupils looking towards each ſide, but ſomewhat more forewards than backwards: they have a very ſmooth, and a very protuberant horny coat, and in the midſt of it the very black pupil is ſeated, being ſurrounded with a ſort of grey iris, and the pillar, or head and neck, ſeems to be covered with a cruſty ſhell: theſe eyes do not appear to have knobs or pearls, like thoſe of other inſects.

The other peculiarity, is the prodigious length of its legs, in proportion to its body, which are jointed exactly like thoſe of a crab, and terminated by a ſmall caſe or ſhell, faſtened to the body in a very wonderful manner, and which include a very large ſtrong muſcle, whereby this little animal is not only enabled to ſuſpend its body upon theſe eight legs, but to move very ſwiftly over the tops of graſs and leaves: the mouth is like that of a crab, the ſhell is ſpeckled with a ſort of feathers or hairs, and the legs alſo are hairy; in ſhort it has ſome reſemblance to a crab in moſt particulars, except the length of its legs.

The *Spider* called the *Phalangium*, is of a venomous kind, and is very large, but in ſhape it is like an Ant: the head is red, and the reſt of the body black, ſpeckled with white: there is another Phalangium, in ſhape ſomewhat like a black grape, having a round, black, ſhining, globous body, with very ſhort feet or legs, which ſeem to be imperfect, and yet it can run very ſwiftly with them.

The common houſe *Spider*, has a round body, or rather oval, which is almoſt tranſparent: the colour is pale, and when it ſtands erect upon its feet, it is not unlike a painted ſtar: the ſkin is ſoft, ſmooth, and poliſhed, inſomuch that ſome have imagined they have ſeen their own faces reflected from it: the legs are long, round, and ſlender, and of a very quick ſenſe of feeling, being eight in number. It is not venomous, nor any way hurtful, for its bite will cauſe a ſort of tickling, rather than pain: this is certain, that they may be ſafely taken inwardly, as country people often experience, when they ſwallow them for the cure of agues. When it is well fed, it will caſt its ſkin, not once a year, but almoſt every month.

The roſe *Spider*, ſo called, from weaving its web in roſe buſhes, has an oval body, and a ſmall forked head, under the belly, and the back,

is marked with many white ſpots. It will grow in a ſhort time, from the ſize of a ſmall pea, to above an inch in length.

The brown *Spider* is ſomewhat tranſparent, when placed between the eye and the ſun. It is to be met with in woods and hedges, and weaves a very thick web, that it may withſtand the force of the rain and wind. It has a forked mouth furniſhed with feelers, over which, on the head, there are two ſmall whitiſh ſpots, which perhaps may be the eyes, and the whole body is a little hairy.

The wild marjoram *Spider*, has a body as round as a ball, with its back marked with fifteen white ſpots, and the vent is of a quadrangular ſhape. It weaves a very rude ſort of a web, among the leaves of wild marjoram.

There are three wall *Spiders*, which inhabit old walls, and the ruins of houſes; they weave but ſmall webs, and wander out in the day time, in ſearch of prey, which they fall upon with great force, and drag them into their holes: the largeſt is of a duſky colour, with an oval head, and a round globous body, each ſide being adorned with two little ſhort white lines, but about the middle of the back it is more whitiſh, and the legs are variegated with blackiſh ſpots: that of the middle ſize, is of a greyiſh colour, and on the middle of the back there are three white ſpots like pearls, and that next the neck is the largeſt and longeſt: the third is of a blacker colour, and the back is marked with a white right angled croſs, for which reaſon, it is called by ſome, the holy Spider. In this particular it reſembles one above deſcribed. It is of the leaping or jumping kind, and is very voracious, for it will lay up nothing for the next day.

The ſhort black *Spider* carries a ſnow white egg-bag under its belly, and runs very ſwiftly; when this bag is broken, a great number of ſmall Spiders come out, which go abroad in the day time to feed, and in the evening get upon its back, where they reſt all night: there are jet black Spiders among rotten wood, and in the holes of trees, with very ſhort feet.

The white *Spider*, has a compreſſed broadiſh body, of a white colour, and long ſlender legs: the forehead is marked with a ſpot, and each ſide with a reddiſh line: there are blackiſh red Spiders, with an oblong body, and a ſharp tail; and there are red Spiders of two kinds, one of which lies in holes of the earth, and has a red breaſt, with reddiſh yellow feet, and the tail and body of a duſky colour, with a yellowiſh caſt.

Linnæus takes notice only of ſix Spiders, namely the greateſt Spider; the houſe Spider; the bag bearing Spider; the water Spider; the bird Spider and the Tarantula.

CHAP. XVII.

OF SCORPIONS, CENTEPEES, GALLY-WORMS, AND HOG-LICE.

A SCORPION is an inſect with a body in the ſhape of an egg, which ſeems to be covered over with ſoot, and its tail conſiſts of

ſeveral globous bodies or joints, the laſt of which is the longeſt, and is armed with a ſingle or double prickle or ſting, a little bent at the end. It has eight feet or legs, and claws not unlike thoſe of a Lobſter, armed with nippers: the head ſeems to lie hid at the top of the breaſt, with ſuch ſmall eyes, that authors take no notice of them.

Old authors take notice of ſeven kinds of Terreſtrial *Scorpions*, the firſt of which is whitiſh, and not at all deadly; the ſecond has a reddiſh mouth, and its ſting produces heat, a fever, and intolerable thirſt: the third is blackiſh, and its ſting cauſes odd motions of the limbs, and a laughter like that of fools: the fourth is greeniſh, and its ſting is attended with cold and ſhivering, and gives the patient a ſenſe of being in very cold weather. It has eight or nine joints at the tail, which is the reaſon that it inflicts a deeper wound: the fifth is of a livid pale colour, with a large ſtrutting belly; this not only ſtrikes with the tail, but bites with a venomous tooth: the ſixth is like a ſea Crab, though it does not want a tail; but it has a large roundiſh body, which makes it look like a tailed crab: they are of various colours, ſome being black, others of an iron grey, and others green: the ſeventh is nearly in the ſhape of a crab, with two large nippers, and it lives in holes by the ſea ſide. When it is boiled it becomes red like a Lobſter.

The South-American *Scorpions*, are in the ſhape of the *European*, but their ſting is not ſo fatal, for the wounds they inflict are eaſily cured: they lurk in houſes, behind old ſtools, benches, and cheſts, and are very large, ſome being five or ſix inches long: the tranſlator of *Nieuhoff* affirms, they are five or ſix feet long; but this muſt needs be a miſtake for inches. A Carpenter was ſtung by one in the *Weſt-Indies*, when he was repairing a church, and it produced no greater diſorder than the ſting of a Waſp; it was ſoon cured by laying a compreſs on it dipped in rum: the females lay their eggs in a web, which they ſpin from their bodies in the manner of Spiders: the eggs are no larger than pins points, and they carry the bag along with them till they are hatched, at which time they get upon the back of the old one, which turns her tail over them, and defends them with her ſting. However there is another ſort in ſome of the iſlands, whoſe ſtings are much more dangerous than thoſe of the former, for which reaſon they are very much dreaded by the inhabitants. It is certain that they change their ſkins, as Crabs do their ſhells, becauſe there are many of them found quite whole, though empty, in the places where they uſed to lurk, except a cleft under the belly, through which their bodies come out.

At *Batavia* in the *Eaſt-Indies*, there are *Scorpions* a quarter of a yard in length; but thoſe of a leſſer ſize are ſo common, that you can ſcarce move a ſtool, bench, cheſt, looking glaſs, or picture, without being in danger of being ſtung by them: the ſmall ones are about a finger's length, and compoſed of many joints of the thickneſs of a gooſe-quill: the colour is yellow, variegated with brown ſtreaks, and the fore claws have two ſharp pinchers; their tail is long, and lies turned upon the back, at the end of which there is a ſting, which ſometimes does a great deal of miſchief: they have eight long legs, not unlike thoſe of a Cray-fiſh, and the ſting is accounted mortal, unleſs prevented in time. Many believe that they are greatly peſtered with Ants; but theſe are only the young Scorpions, that get upon the back of the old ones.

The

The *Scorpion* at the *Cape of Good Hope*, is from two inches and a half, to three inches long, and its colour is a greenish brown, ſpeckled with black. It is in ſhape exactly like a Cray-fiſh, except the tail, which is more long and ſlender: the ſting is very painful, and often puts a perſon's life in danger.

The *Scorpion* on the coaſt of *Guiney*, is upwards of three inches in length, and has four legs on each ſide, beſides two claws armed with nippers, which make a very formidable appearance, they being very thick and ſtrong, and between the nippers and the head there are three globous joints: the body conſiſts of nine joints, and the tail of ten, which has a hooked weapon at the end, wherewith it ſtings: there are ſome on this coaſt as big as ſmall Lobſters, and have the ſame ſort of claws and feet; but their bodies are covered all over with long hair. Some of them have a ſmall bladder full of poiſon, of half a finger's breadth, at the end of their tails, which they ſpirt out when they ſtrike either man or beaſt, and the venom produces certain death.

The coal black *Scorpion*, is accounted the moſt venomous of all, and is very common in *Perſia*. It is of the thickneſs and length of a man's finger, and the body has ſome reſemblance to an egg; but altogether it is ſhaped like a Cray fiſh, only it has a blunter head, and a leſs body. It has eight legs and two claws, with a long knotted tail, whoſe knots appear like ſo many little bladders, at the end of which is a very venomous ſting. In ſome parts of *Perſia*, the inhabitants dare not ſleep in ground rooms, for fear of theſe inſects.

The Barbary *Scorpion*, when full grown, is ſix or ſeven inches long, its body is covered with a firm ſkin, which is brown, with a mixture of yellow, or flame colour. It is of an oval ſhape, and has ſmall eyes, with eight legs, that are not very ſtrong; each of theſe is compoſed of ſix joints, and terminated by a pair of ſharp claws: the legs are paler than the body, and are a little hairy: the claws, with nippers, are like thoſe of Crabs, and are large, and of a black colour, each of which is compoſed of four joints: the body conſiſts of ſeveral joints, divided by denticulations, as is alſo the tail: the laſt joint is terminated by a pointed weapon, which is a little crooked, bending a little downwards, as in moſt of the other kinds.

Linnæus takes notice of four *Scorpions*, the *Indian*, the *African*, the *Italian*, and that of *Barbary*.

The *Centepee*, or *Centipes*, is ſo called, from its great number of feet, for which reaſon, in ſome places, they are called Millepedes, or thouſand feet; but improperly, becauſe that term is always beſtowed upon Hog-lice by naturaliſts. In *Latin* the name is Scolopendra, and it is very common in many parts of the world, eſpecially between the Tropics: there are ſeveral ſorts of them in the *Weſt-Indies*, one of which bits very dangerouſly; they are longer than a man's finger, and as thick as a gooſe quill, but more flat, and of the colour of ruſty iron: they have a round head, with two ſmall, but very ſharp teeth, and the whole body is divided into ten or twelve joints, and as many tranſverſe black lines; at the bottom of each of which there are two pretty long feet: there are two ſmall horns on the head, and the tail is forked; they live among rotten wood, and when they are touched, they are ſure to bite: the wound produces the ſame effect as the ſting of a Scorpion, and the ſame remedies muſt be made uſe of to cure it.

The

The *Centepee* of the *Eaſt-Indies*, are about five or ſix inches long, the thickneſs of a man's finger, and of a ruddy colour: they conſiſt of many joints and bones, and have two claws or pinchers, wherewith they wound as dangerouſly as the Scorpion, occaſioning inexpreſſible pain: they lurk like them in holes, behind old cheſts and benches.

Theſe inſects are very common at the *Cape of Good Hope*, ſome of which are red, and others white; they are three inches long, and about half as thick as a man's finger: they are covered with hair, and ſeem to have no eyes; but there are two feelers on the head, which they make uſe of to find out the way they are to paſs: this is a very venomous animal, and the bite is as dangerous as that of a Scorpion; a ſailor that was bit by one on board a ſhip, felt an exceſſive pain, and his life was ſuppoſed to be in danger; however he recovered, by the application of three roaſted onions to the part that was bit, and he ſoon was quite well.

The African *Centepee*, is four inches and a half long, and as thick as a ſwan's quill; the colour of the whole body is of a ſhining browniſh black, and to each diviſion or inciſure a foot is annexed, of a yellowiſh colour, ſixty on each ſide. If this inſect ſhould be cut in two, it is affirmed that both parts will live. When it is irritated it will bite very hard, inſomuch that though a man has a glove on, the teeth will penetrate quite through. It has a forked mouth, and two feelers like the former.

The American *Centepee* has a flame-coloured line that runs down the back, and the ſides reſemble braſs; it has a vaſt number of feet like hairs, and an exceeding ſmall head; and they move ſo readily backward or forwards, that ſome have fancied they have two heads. Another that was brought from *Cape Auguſta*, was ſomewhat larger than the former, and had ſeventy livid diviſions or inciſures, and twice as many feet.

The common *Centepee* is to be met with in *England*, and is about an inch long, with a flat thin body, of a browniſh colour: the legs are ſhort and yellowiſh.

The *Centepee* with thirty feet or legs, is not above half an inch long, and no thicker than a wheat ſtraw: it is flat, and of a red colour, and the laſt pair of legs are very long, which makes it ſeem to have a forked tail.

Linnæus has only three ſorts of *Centepees*, that with ſeventy feet on each ſide, that with fifteen, and that with twenty.

The *Gally Worm*, is called in Latin *Julus*, becauſe it is ſuppoſed to be like the catkins of walnut, and haſle trees, which have the ſame name in Latin: they are a ſort of ſhort Centepees, and have more feet than any other inſect, except them. Some of theſe are ſmooth, and others hairy, and one of the former was found on a cabbage-lettuce, about the thickneſs of a ruſh, and near two inches long. It had a black head, and a back of a golden yellow colour; the belly was of a bluiſh ſilver colour, with a great many feet, like hairs.

There is another kind quite black, except a white line that runs from the head to the tail, along the middle of the back: there is a third kind, of a dull yellow colour, only the head is reddiſh, as well as the feet; and the feelers, as well as the hairs near the tail, are livid: there is a fourth ſort, of a reddiſh black; but the feet and feelers are of a lighter colour. Some of theſe lye hid in the moſs growing on the barks of trees, and others under ſtones, and among rubbiſh.

Mouſe

Mouſet never ſaw but two of the hairy kind, one of which was ſomewhat above an inch long, and had a body that tapered from the head to the tail, and of a whitiſh colour, though the hairs were black, and very ſhort: the other on the back and belly was of a ſomewhat livid colour, ſpotted with a diſagreeable yellow; but the mouth was ſomewhat reddiſh, the eyes black, and the hair grey. It is found on decayed trees, between the wood and the bark; as alſo among ſtones that are covered with moſs. They all when touched, contract themſelves, or roll themſelves up like a ball: they are not venomous, as is generally ſuppoſed, for they have been handled and irritated

There is another ſort that is very ſmall, and is uſually found about hollow trees, and ſtakes fixed in the ground. It is of the colour of braſs, and has many feet; when it creeps along, it bends the middle part of its back like a bow, and if it be touched with a cane or ſtick, it rolls itſelf up: the body is ſlender, and ſome are above three inches long: there is another kind no thicker than a briſtle, and of a light dun colour, and yet it has a vaſt number of ſmall feet, and is near four inches long. It is to be met with among rotten timber and old ruins.

The ſhining *Gally Worm* is ſometimes to be ſeen on heaths, and may be diſcovered by its luſtre, like a Glow Worm: theſe are not only found in *England*, but in *Germany*, and there is one much of the ſame kind in *New Spain*.

The brown *Gally Worm* has an hundred legs on each ſide, and grows to the length of two inches; the body is brown, and there runs a double iron grey line along the back, but the legs are of a paler brown: the back is roundiſh, the belly ſmooth, and the ſkin is ſomewhat gloſſy; the feelers are ſhort, and conſiſt of five joints. It is found a little below the ſurface of the earth, in the north of *England*.

The grey *Gally Worm* is three quarters of an inch long, and has an hundred and twenty feet on each ſide; its back is roundiſh, its belly flat, and its colour of a pale grey, only there are two iron grey lines on the back, and every joint of the body is ſtreaked longways. It conſiſts of about ſixty joints, and has whitiſh feet. It is called by *Ray* the Gally Worm, marked with livid and white circles, and is found under large ſtones, and on old trees.

The red *Gally Worm* is an inch and a half long, with a very ſlender body, of a reddiſh colour: the back is almoſt flat, and the belly is quite ſo; but it has yellowiſh feet, with a red caſt, which are ſeventy on each ſide. It is called by *Ray* the very ſlender long Gally Worm.

Linnæus has only three of theſe inſects, that with ſeventy feet, that with an hundred and twenty, and that with ninety-ſix.

The common *Hog Louſe* is ſeldom above half an inch long, and a quarter of an inch broad; the colour is of a livid black, eſpecially when found about dunghills, and on the ground; but thoſe that are to be met with under tiles, and in drier places, are of the colour of the hair of an Aſs. It has fourteen feet, ſeven on each ſide, and they have only one joint each, which is ſcarcely perceivable. It has two ſhort feelers, and the body is of an oval ſhape. When it is touched, it rolls itſelf up into a ſort of ball, and the ſides near the feet, are dentated like a ſaw. It is often found among rotten timber, and on decayed trees, for which reaſon it is by ſome called a Wood Louſe: the eggs that they lay are white and ſhining, like ſeed pearls, and very numerous.

In

In winter they lye hid in the crevices of walls, and all ſorts of buildings. When the eggs are firſt hatched, they appear like a ſort of Worms of a whitiſh colour, and ſeem ſcarce able to ſtir; but they ſoon feed, and become very briſk: this inſect is of great uſe in medicine, for it is very diuretic and aperient, for which reaſon it is good in the dropſy, and is often given with ſucceſs for dulneſs of ſight.

The water *Millepedes* is about half an inch in length, and nearly a quarter broad; the colour is a pale browniſh grey, and the whole body is ſo thin it ſeems almoſt tranſparent. It conſiſts of ſeven joints, beſides the head and tail, and that at the tail is roundiſh, a little flat, and larger than any of the reſt: the tail is forked, and each fork is divided into two parts at the end; the legs are ſlender, pretty long, of a pale brown and tranſparent, being ſeven in number on each ſide: the feelers conſiſt of three joints each, and this inſect is common in ponds and ditches.

The greater livid *Millepedes* is half an inch long, and of an oval ſhape, and is livid all over, except at the edges of the ſegments, which are whitiſh, and on each ſide there is a whitiſh ſpot near the hinder legs, and its ſkin is tough and gloſſy; its legs are ſhort, and its tail blunt, being without any diviſion.

The ſea *Millepedes* is an inch long, and half an inch broad; it is of a whitiſh colour, with a roundiſh back, a flat belly, and ſharp ſides: the legs are ſeven on each ſide, and the three pair before are ſmall and ſmooth, but thoſe behind large, pretty long, and hairy on the ſides. It has two pair of feelers, and the body conſiſts of ſeven joints, beſides the head and tail, which laſt is three quarters of an inch long, ſomewhat of a triangular ſhape, being marked with two convex parallel rays on each ſide.

In the *Weſt Indies*, there is an inſect, which the *French* call *Poux de bois*, that is Wood Lice, though they perhaps may be placed more properly among the Ants; for they only have their name from gnawing and eating holes in the wood that they fix upon: they are of a whitiſh colour, and are ſuppoſed to be a very great delicacy, becauſe all ſorts of ſmall birds, domeſtic fowls, and little lizards. are very fond of them: they build in the earth a ſort of ſmall galleries or roads, a little larger than the barrel of a quill, in which there are ſo many turnings and windings, that at length the whole building makes a hillock as large as a kilderkin.

Within this habitation there is a ſort of little republic, where they are ſecure from all the attacks of their enemies. If any breach is made in their walls, they immediately all ſet to work, to repair the damage as ſoon as they can, and it is a great pleaſure to behold them ſo buſily employed about it: the roads may be eaſily ſpoiled, by pouring oil of a Sea-cow thereinto, or even ſprinkling it upon their whole building, for this will cauſe them to forſake their habitation. When theſe inſects grow old, they begin to have wings like Ants, and then they have their places of abode in the earth, that is the hillocks which become black, dry up, and burn like a candle. Some call them Negroe's heads, becauſe they are round, and ſeem to be curled like a Negroes head. Some ſurgeons make uſe of this earth, in the cure of dropſies, making the patient ſweat, by means of the ſmoke that proceeds from it. The ſavages uſe it for baking their earthen pots, by placing them in it, and covering them with it on all ſides; after which they ſet it on fire, and though it burns but ſlowly, it will bake them as well as if they were put in an oven.

CHAP.

CHAP. XVIII.

OF FLEAS, LICE, AND OTHER INSECTS.

THE *Flea* is ſo well known, that it hardly needs any deſcription; however it may be obſerved, that it has a roundiſh body, that is blunt at the end, and a ſmall head, with large eyes: the feelers are ſhort, and are compoſed of four joints. When ſeen through a microſcope, it appears to be all over adorned with a ſuit of curiouſly poliſhed ſable armour, neatly jointed, and beſet with multitudes of ſharp pins, almoſt like Porcupine's quills: the head on each ſide, is beautified with a quick, round, black eye, and it has ſix legs, the joints of which are ſo adapted, that it can, as it were, fold them up, one within another, and when it leaps, they all ſpring out at once, whereby it exerts its whole ſtrength. Between the feelers there is a ſmall probe or ſnout, and there are two jaws or nippers, ſomewhat like thoſe of an ant.

The young Fleas are firſt a ſort of nits or eggs, which are round and ſmooth, and from theſe proceed white worms, of a ſhining pearl colour. In a fortnight's time, they come to a tolerable ſize, and are very lively and active; but if they are touched at this time, they roll themſelves up into a ſort of a ball. Soon after this, they begin to creep like Silk Worms that have no legs, and then they hide themſelves as much as poſſible, ſpinning a ſilken thread from their mouths, wherewith they form for themſelves a ſmall round bag or caſe, as white within as writing paper, but dirty without. In this they continue for a fortnight, after which the inſect burſts out, transformed into a perfect Flea.

The *Louſe*, when viewed with a microſcope, is an inſect of a very odd ſhape, with a prominent head, and two black ſhining goggle-eyes, looking backwards, and are placed where the ears ſtand in other animals, having ſeveral ſmall hairs round about them. It has two horns where the eyes of moſt inſects are uſually ſeated, each of which conſiſts of four joints, which are ſtringed as it were with ſmall briſtles: the head is very round and tapering, terminating in a very ſharp ſnout or trunk, which has a hole, through which it ſucks the blood. It has ſix legs, covered with very tranſparent ſhells, and jointed exactly like thoſe of crabs, each being divided into ſix parts by theſe joints, and have here and there ſeveral ſmall hairs. At the end of each leg, there are two claws, by which it is enabled to lay hold of the hairs on which it climbs: the belly is alſo covered with a tranſparent ſubſtance, and is grained all over, juſt like the ſkin of a man's hand.

Some have affirmed that a Louſe will not live within the torrid zone, but this is a great miſtake, for the Negroes that live in that climate, though they are almoſt naked, are generally full of them. One reaſon of which may be for want of combing their woolly hair, which cannot eaſily be done, it being ſo entangled together. Thoſe in the *Weſt-Indies*, make uſe of a ſort of oil, with which they kill them, for otherwiſe they would be almoſt eaten up alive. However the white inhabitants in thoſe parts, are not much troubled with them, on account of their changing their linen frequently; beſides it is thought their plentiful ſweats kill them.

The *Crab Louſe*, is ſo called, for having ſome reſemblance to the ſhape of a crab. It has a ſhorter and thinner body than the common ſort. They ſeem to be generated in the pubes of thoſe that are troubled therewith.

Beſides theſe inſects that infeſt men, moſt animals are ſaid to have a peculiar ſort; only the Fleas are common to many other creatures, particularly Dogs. However it is affirmed by many, that Aſſes are never troubled with either of theſe ſort of animals, which ſome ſuperſtitious people pretend, is owing to the riding of Chriſt upon an Aſs; but others with more reaſon affirm, it is becauſe that animal ſeldom or never ſweats. However they are both miſtaken, becauſe theſe vermin are not generated by ſweat, as the ancients ſuppoſed, but proceed from eggs, which we call Nits, like other inſects.

The Lion is ſaid to be mightily infeſted with a ſort of Lice in the hair over his eyes, and as is pretended, they plague him ſo much, they ſometimes make him run mad. The Horſes are well known to be troubled with vermin of this kind, which have red heads, and the reſt of the body whitiſh. Thoſe of Oxen and Calves are black, and they may be ſeen in great numbers on thoſe that are lean: they are almoſt like the Lice of Hogs, only they are ſhorter, and a little thicker. Thoſe of Hogs are ſo large and hard, that they can hardly be killed with the fingers. Dogs have ſome of theſe kind of animals, though very ſeldom, and they look like nits, with a whitiſh head; but the reſt of the body is of a blueiſh black; they have been particularly taken notice of in Lap-dogs. The Lice of Sheep are very ſmall, and have red heads, with whitiſh bodies; thoſe of Goats differ very little from theſe. The Deer when they have ſhed their horns, are troubled with great itching in the eye-brows, which proceeds from Lice of the ſame colour as the head.

Linnæus takes notice of ſeveral kinds of Lice, namely the common Louſe, the Crab Louſe, thoſe of Oxen, thoſe of Crows, thoſe of Ravens, thoſe of Thruſhes, thoſe of Starlings, thoſe of Cranes, thoſe of the bird called Avoſetta, thoſe of Turkeys, thoſe of Fowls, that called the Death-watch, and two or three more; to which might be added an immenſe catalogue, if it was worth while to obſerve them.

The *Death-watch* has an oblong flattiſh body, of a pale browniſh white colour, with an annular brown mark thereon, and a brown ſpot behind towards the vent: the head is oblong, the eyes are large and yellow, and the feelers are as long as the whole body: the ſize is about that of a common Louſe, and there are ſpots all down the ſides, of a reddiſh colour, that is one on every ſegment of the body. It has its name from the ticking it makes, reſembling that of a watch, which ſome ſuperſtitious people have thought to have been a forerunner of death.

The *Monoculus*, or one-eyed inſect, is peculiar to watery places, and has the legs or feet before, divided into branches, with which it either ſwims or leaps, and the body is covered with a cruſt or ſhell. It has but one eye, or more properly three that are placed cloſe together.

The cruſtaceous water *Inſect*, is very ſmall, and is ſometimes of a browniſh, and ſometimes of a reddiſh colour: the body is nearly oval, only it is ſmaller towards the tail, which is long, ſlender, and forked at the end, and under it on each ſide, there is frequently a large cluſter

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of eggs, covered with a ſkin, of a yellowiſh colour, and often as large as the inſect itſelf. It has two pair of feelers, and the eye is large, black, and placed in the very middle of the head. It is common in ditches, and other ſtanding waters.

The teſtaceous water *Inſect*, is covered with a ſhell of an oblong oval ſhape, and of a duſky brown colour. When it is taken out of the water, it ſhuts the ſhell cloſe up, and reſembles the ſeed of ſome plant; but when it is put into the water again, it opens like ſhell fiſh, of the bivalved kind: the feelers appear from one end of the opening, and the legs from the other; the eye is large and black, and its motion is very ſwift. It is common in ditches, and other ſtanding waters.

The aboreſcent water *Flea* of *Swammerdam*, is of a blood-red colour, and ſometimes are in ſuch multitudes on the ſurface of ſtanding waters, as to make them appear all over red; whence many fanciful people have thought that the water has been turned into blood, and prognoſticated ſome terrible misfortune. It has ſemicircular feelers, and a crooked tail.

The water *Inſect* of *Fryſch*, is without feet, and has a forked tail, like two briſtles. Beſides theſe, there are the ſhort water inſect, with ſemicircular horns, and a flat back: the long-bodied water inſect: the ſmall-eyed water inſect, and the ſhort water inſect with a tail cloven into ſeveral parts.

The *Sheep Tick* is a ſmall inſect, which is common at the beginning of the ſummer in paſture grounds. It has a very compreſſed ſmooth body, covered with a tough ſkin, and is of a ſquareiſh ſhape: the colour is of a ſhining black, or of a blackiſh brown. When it fixes its head in the ſkin of any animal, and particularly ſheep, it ſucks out the blood, upon which it ſwells, and grows large and round in a very ſhort time. Sometimes it ſucks the blood of men, and cannot be got out of the ſkin without difficulty. It has ſix feet fixed to the neck, and a ſhort but very ſharp ſnout. It is an inſect well known to country people.

Mouſet informs, that ſome have miſtaken it for the Sheep Louſe, from which it is greatly different; for this has a longer ſnout, and the body is never ſo ſwelled with blood, as that of the Sheep Tick, but is always flat; beſides the feet are of a dark reddiſh colour, and the back of an aſh colour, marked with three exceeding ſmall blackiſh points, and its ſhape is like that of a heart. It never thruſts its head into the ſkin, though it ſucks out the blood by fits, and its excrements tinge the wool with a greeniſh colour, which is ſo laſting, that it can hardly be got out, by waſhing it with ſoap. They will live in a fleece after it is ſheared, for a year together, which is a certain ſign that it can live without blood.

The *Chegoe*, called by the *French Chique*, and by the *Spaniards Nigas*, is a very ſmall black animal, which is met with in all places where there are aſhes, and where they live naſtily. It will penetrate pretty eaſily through thin ſtockings, and generally fixes under the toe nails, and the moſt prominent parts of the ſkin. The pain that it cauſes when it firſt enters is like the bite of a Flea; and after it is once got in, it eats into the fleſh ſo gently, that it cauſes no more at firſt than a ſlight itching; it becomes bigger by degrees, till at length it is the ſize of a large pea, and then it produces Nits, which lodge about the old one, and increaſe in the ſame manner, if there is not care taken to get

them out; and then they cauſe putrefaction of the fleſh round about them, producing malignant ulcers, and ſometimes a gangrene.

Theſe inſects not only attack men, but Monkeys, Dogs, and Cats: the beſt way to prevent them from entering the ſkin, is to wear good ſtockings and to waſh the feet often, particularly with ſea-water.

There is an inſect in the valleys of the province of *Popayan* in *South-America*, which though not particularly deſcribed, is proper to be taken notice of, on account of its dangerous effects. It is called *Coyba*, and is of a fiery red colour; its ſize does not exceed that of a middling Bug, and it is commonly found under ſtones, and among the graſs. When this inſect is cruſhed, or burſt upon the ſkin of any animal, its venomous juices enter the pores, mix with the blood, and immediately produce a very dangerous ſwelling, the conſequence of which, if no proper remedy be applied, is certain death.

The native *Americans* take the dried ſtems of a particular herb that grows in theſe vallies, ſetting them on fire, and ſinging the patient all over, as ſoon as the body begins to ſwell. However if this inſect be cruſhed in the palms of the hands, no bad effect will follow, which perhaps may be owing to the thickneſs of the ſkin. Inſtinct teaches the cattle that feed in theſe vallies, always to blow ſtrongly upon the graſs before they eat it; and yet notwithſtanding which, the Mules ſometimes happen to eat them, the conſequence of which is always a ſwelling, and immediate death.

At *Martinico* there is another red inſect, which is very ſmall, and is generally met with in the ſavannahs or meadows, which are not very wet: they are no larger than a pin's point, and appear as red as fire: they get through the ſtockings, and fix themſelves to the ſkin, where they cauſe a dreadful itching. Horſes and others that graze in theſe paſtures, have ſometimes their head covered over with them, and then they rub them againſt ſtones and trees ſo roughly, that one would think they would tear their ſkins to pieces: to cure them the inhabitants make baths with odoriferous herbs, wherewith they waſh the legs and feet.

The cheeſe *Mite* has a roundiſh oval body, with a whitiſh ſmooth ſkin, and a ſmall head; the legs, and parts about the mouth are a little browniſh, and much harder than the body, on which there are hairs.

The *Louſe* of the Beetle, is a very minute inſect, with a reddiſh round body, covered with a firm hard ſkin, the head is very ſmall, but the legs are pretty long, and the pair before are longer than the reſt. It runs very ſwiftly for its ſize, and may be frequently ſeen on the bodies of Beetles, particularly the black Beetle, and other large inſects. It is called by *Liſter*, the yellowiſh Louſe that infeſts Beetles.

The ſcarlet-tree *Mite*, has a roundiſh body, and ſmooth ſhining gloſſy ſkin, which ſeems ſo ſwelled, as to be ready to burſt; it is of a bright red colour, and has a very ſmall head, with ſhort legs. It is marked on each ſide with a ſmall duſky ſpot near the breaſt, and there are a few hairs ſcattered over the different parts of the body. It may be frequently ſeen on currant buſhes, running over the fruit.

The ſtone *Mite*, is of a bright red colour, with a round ſwelled body, and a ſmall pointed head; the legs are pretty long, and of a paler red than the body; the feelers are much longer than in any inſect of this kind. It is common upon old ſtone walls and rocks, and runs very briſkly.

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The ſcarlet water *Mite*, has a body of an oval ſhape, and a depreſſed back; it is of a bright ſtrong ſcarlet colour, and has a ſmall head; but the legs are pretty long, and are of a paler red than the body. It is common in ſmall ſwift currents, where it runs very nimbly at the bottom. It is called by ſome the ſmall red water Spider.

The itch *Mite*, has an oval lobated body, and a ſmall pointed head; it is of a whitiſh colour, and has two ſemicircular duſky lines at the back, but the legs are ſhort and browniſh. It has been ſometimes found in the puſtules of the itch, but is not the cauſe of it, as ſome imagine, for then it might be always ſeen therein.

The Scorpion *Mite*, has a roundiſh inflated body, of a whitiſh colour, and it is covered with a thin ſmooth ſkin, the head is very ſmall, and of a duſky colour towards the mouth; but it is moſt remarkable for having claws like thoſe of a Scorpion. It is not uncommon in old rotten wood, and it is called by ſome the Scorpion Spider.

The little ſcarlet *Spider*, has a roundiſh body, or rather ſomewhat oval, with a depreſſed back; it is of a fine ſcarlet colour, and the body is covered with a ſort of down like velvet. It has a very ſmall head, with two very little eyes, and the legs are ſhort, and of a paler red, and there is a ſmall black ſpot near the inſertion of thoſe before.

The ſhepherd *Spider*, is the largeſt of the Acarus kind, and has a roundiſh body, which is of a duſky brown on the back, marked with a darker ſpot, of a ſomewhat ſquare ſhape near its middle: the belly is whitiſh, and the legs are extremely long and ſlender. On the back of the head there is a ſmall eminence, furniſhed with a ſort of double creſt, which ſeem to be formed of many ſlender ſpines. It has two eyes, which are ſmall and black. Some call it the long legged Spider, though it has only two eyes; however it may be obſerved, that few authors keep exactly to that diſtinction.

Linnæus alſo takes notice of an *Acarus*, that is hardly viſible without the help of a microſcope, and which is found on Chaffinches. It has a head like a cone, with the point cut off, and on its hinder part there is a ſegment almoſt ſeparate from the reſt of the body, to which belong two ſmall crooked portions, and under it there is a longiſh brown ſpot. It has eight feet, conſiſting of different ſegments, and at the extremity of the fore feet there are four clear veſicles or bladders, which become flat when this inſect treads upon any thing; theſe are connected to a ſmall long part, which ſeems not to belong to the leg, juſt where there are two ſtrong prickles, which are ſuppoſed to enable this inſect to adhere to whatever it treads upon: the two hinder feet are like thoſe before, only the two prickles are wanting. But the feet that lye between the ſecond and fourth pairs, are the moſt ſingular, for they are thick and ſhapeleſs, and have at their extremities, inſtead of veſicles, two ſaws, one of which is very ſhort: the inſect can move them, but not ſo nimbly as the reſt, and therefore it does not uſe them for walking, but drags them after it like two tails: they ſeem to be deſigned to keep it cloſe to the feathers of Birds. Several parts are hairy, and the hairs through a microſcope, ſeem to be long and ſtiff, of a whitiſh brown colour.

Linnæus has another kind of ſmall inſect, which he calls *Podura*, and the *French Puceron*; in general they have a ſhort roundiſh body, with a crooked forked tail, which aſſiſts its leaping, or rather it is entirely for that uſe, for it only walks with its legs, which are ſix in number.

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It has two eyes, each of which conſiſt of eight others. *Linnæus* has only four ſorts, the water Puceron, the ſnow Puceron, the grove Puceron, and the dung Puceron.

The common *Puceron*, is of the ſize of a Flea, and of a bright green, or blueiſh green colour: the body is nearly oval, and is largeſt and moſt convex on the hinder part; the breaſt is very ſmall, and the head is blunt and green: the eyes may be ſeen very plainly, they being prominent on the fore part of the head, and of a ſhining black colour; near to theſe, there is a black line on each ſide, and the legs are very ſlender, and are all of the ſame length, and of a whitiſh green, but the feelers are crooked. Some call it the green Flea of plants. It is frequently ſeen on the ſtalks of orache.

The toad-ſtool *Puceron*, is of the ſize of a ſmall grain of wheat, and it has a ſhort roundiſh body, covered with a black gloſſy ſkin, and the vent is remarkably protuberant: the head is ſmall, as well as the eyes, but the feelers are as long as the body, and black, with white ends.

The currant *Puceron*, is ſomewhat larger than a Flea, with a body of an oval ſhape, and a ſmall head, furniſhed with little bright eyes: the legs are very ſlender, and the feelers long. It is of a grey colour, variegated with black lines and ſpots.

The *Puceron* with white legs, has a roundiſh body, of a deep black colour, with a ſmall head, and eyes that are ſcarce diſcernible; the legs are ſhort, ſlender, and white, as well as the forked tail. It is common in woods, about old beech trees.

The water *Puceron*, is of the ſize of a ſmall Flea, which it reſembles in colour, being black and gloſſy, with a purpliſh tinge: the body is roundiſh, and the head ſmall, the eyes very little, and the feelers ſhort; but the legs are longer than in moſt of this kind. It is common in ponds, and other ſtanding waters, and in calm days of the autumnal ſeaſon, the ſurface is almoſt covered over with them.

Fryſch obſerves, that the inſect which the *French* call *Puceron*, is by the *Germans* named *Meeltan*, which is as much as to ſay Moth-dew; but he thinks they may be more properly called Blat Læuce, that is a leaf Louſe: they all bring forth their young alive, and the fœtus, when it is ready to be brought forth, entirely fills the belly of the female, and its fore parts are excluded firſt, then the hinder: the fœtus does not begin to move till the horns or feelers appear out of the body of the old one; and by their motion it firſt ſhews ſigns of life, by moving them every way, and bending all the joints: then they begin to ſtir their two fore feet, as being moſt active, next to the horns; after this the middle feet, and thoſe behind: the female lets the fœtus ſtick to her hanging in the air, till its ſmall and ſoft members become harder; but as ſoon as ſhe finds that it has ſufficient ſtrength, ſhe moves from the place where ſhe was ſitting, and as it were forces the fœtus to ſtand upon its legs, and then ſhe leaves it.

The weaker the leaves and buds of plants are, that is the leſs juice they contain, they are always more full of theſe kinds of Lice, inſomuch that they are often quite covered with them. But they are not the cauſes of the weakneſs of the plant, but the ſign; though it is true, that by picking and ſucking it, they encreaſe the diſeaſe, eſpecially of that leaf or bud whereon they ſit.

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As theſe inſects are viviparous, they muſt neceſſarily lurk ſomewhere in the winter, where their bodies may be defended from the cold; but this is always near the trees or plants that ſerve to nouriſh them in the beginning of the ſpring; for they are always found thereon, as ſoon as the leaves and buds begin to open. However they do not hide themſelves in the earth, like many other inſects, becauſe they have no part of their bodies fitted to remove the earth, nor are their feet ſo ſhort, as to ſuffer them to creep into any chink, beſides their bodies are ſo tender, that the leaſt rough particle of hair would hurt them; nor yet is there any thing elſe which is common to other inſects, that can enable them to conceal themſelves in the earth. Hence it is plain, that they get into the chinks of the bark, and into the cavities of the ſtronger ſtalks, from whence they ſally out upon the branches and leaves, when the warmth of the ſun begins to be felt. Neither the cold of the autumnal ſeaſon, nor the leſſer degree of heat in *October* or *March*, ever hurts them; for which reaſon they do not ſeek for hiding places, before the fall of the leaves, by whoſe juice theſe Lice are nouriſhed; however ſome hide themſelves ſooner, and ſome later.

They caſt their ſkins like many other inſects, four ſeveral times, and the males have wings, but the females have none: they have long legs, not only that they may be enabled to creep over the long hairs of plants and leaves but that they may travel from tree to tree, that ſtand at a diſtance from each other: their feelers conſiſt of ſix joints, of which that at the extremity is roundeſt, and they have a very fine ſenſe of feeling: the trunk or ſnout which lies under the breaſt, they thruſt into the pores of the plant, to ſuck out the juice; for they do not gnaw them, but ſo hurt them by ſucking, that the leaves become ſpotted, and as it were over-run with ſcabs, for which reaſon their edges always turn up towards the middle.

The breaſt is covered with a ſort of ſquare tick, ſo hard, as to reſiſt the friction of the body againſt any thing when they creep: the two forward feet are placed before the horny Tick, near the neck, and the four hinder behind it. On the laſt ſection of the body, except one, there are ſoft horns on each ſide, which are ſharper in ſome kinds, and bluntter in others; but they do not move theſe like the feelers, and yet they have a fine ſenſe of feeling, as may be eaſily known by touching them in the gentleſt manner.

It has been ſaid that theſe inſects are often carried off, and devoured by Ants; but this *Fryſch* could never obſerve: the Ants indeed are fond of thoſe trees where there is a great number of theſe inſects; but then it is only to ſuck the juice which flows from the leaves that have been lately bored; and this more particularly in the heat of the ſummer, when other moiſture is wanting; but they never hurt or carry away any of theſe inſects while they are alive, nor yet are they able, for when they find any Ants coming behind them, they will kick them away with their hinder feet.

The males have four wings, of which the uppermoſt are the largeſt, and thoſe below leaſt; the ſtripes made by the veins or nerves, are the ſame in all kinds of *Pucerons*, only there is ſome difference in the angles of their extreme parts. However there is one kind to be excepted which leaps like a Flea, and this is not what the *French* call a Puceron; for they differ from them in the ſtripes of the wings, as well as in

in the mouth. But theſe inſects differ from each other in their colour, which perhaps is owing to the quality of the juice of the trees and plants by which they are nouriſhed: thoſe that feed upon pot herbs and plumb trees, are of an aſh colour, only they are greeniſh when they are young: thoſe that belong to the alder and cherry tree, are black, as alſo thoſe upon beans, and ſome other herbs: thoſe on the leaves of apples and roſe trees, are white; but as they leap like Graſshoppers, they are not properly placed among the Pucerons: the moſt uncommon colour is reddiſh; and Pucerons of this ſort, may be found on the leaves of tanſey, and their juice, when rubbed in the hands, tinges them with no diſagreeable red: this may furniſh a hint to the more ſkilful phyſicians, and botaniſts, for a farther examination; for it is very certain, that obſervations of this kind, may point out the way to uſeful diſcoveries.

The three principal and conſtant enemies to theſe inſects, are firſt a a ſort of Flie, whoſe ſhape may be known from moſt authors, who have given an account of inſects, and ſome have taken notice of their changes; however there is in none a very exact deſcription of their nature: this Flie lays its eggs upon the leaves where the Pucerons are in the greateſt number; there is generally only one at a time, which produces a worm, which with its ſharp mouth, ſeizes upon the Pucerons that lye next it, and holding them up, ſuck their bellies, and afterwards devours them: the next enemy is a ſort of worm, which though taken notice of by authors, has not been fully deſcribed; this devours the Puceron, not only while it continues to be a worm that has an oblong brown body, marked with red ſpots, and ſix creeping feet, but after it is turned to a ſmall roundiſh Beetle, of no unpleaſant colour, there are a great number of this ſort, which differ in the colour, and the ſituation, and the number of the ſpots upon the wings: the third enemy is the Ichneumon Waſp, which is of a ſmall ſize: this gets into the middle of the Pucerons, and with its horns ſeek for one of the plumpeſt of the females, and lays an egg upon her, from which a worm proceeds, that enters into the body of the Puceron through a pore: this done, the Puceron ſeems to adhere more ſtrongly to the leaf with its claws, and ſo continues till the worm grows within its body, conſumes all the juice, and ſo kills it: the colour of the ſkin is then changed into the whiteneſs of a pearl, to the ſhape of which the ſwelling body is not unlike; it then becomes harder, and defends the ichneumon worm againſt the injuries of the Ant. After ſeven days, the worm begins to creep; and this generation is performed twice every year.

The other kinds of *Podura* are, 1. That with feelers, conſiſting of numerous joints. 2. The ſhort horned Podura. 3. The round bodied bright Podura. 4. The long bodied larger Podura. 5. The downy Podura. 6. The long legged Podura. 7. The lead colour Podura. 8. The ſmall black legged Podura. 9. The very ſmall white Podura. 10. The ſhort bodied blue Podura. 11. The duſky greyiſh Podura. 12. The ſhort tailed Podura. 13. The ſpreading tailed Podura. 14. The large headed Podura. 15. The long Podura with ſlender legs. 16. The ſlender horned Podura. 17. The larger water Podura. 18. The long bodied blueiſh water Podura. 19. The ſubterranean Podura. Part of theſe are to be met with on the branches of various buſhes and plants, and the other part in ditches and ponds.

CHAP.

CHAP. XIX.

OF WORMS WITH NAKED BODIES, WITHOUT LIMBS.

THE *Guinea Worm*, is ſo called, becauſe it was firſt more generally taken notice of in that part of *Africa*, though it was mentioned long before, that is, by *Jenkinſon*, in the year 1557, in his voyage to *Boghar* or *Bucharia*. He ſays there is a little river running through the midſt of *Boghar*, whoſe water is ſo unwholeſome, that it breeds worms between the ſkin and fleſh of the legs, of an ell long: the ſurgeons in thoſe parts take them out with great dexterity; for when the worm firſt begins to ſhew its head, they pull it gently out a little way, that is about an inch, and roll it up; the next day it will come out as much farther, and ſo on, till it comes quite out. But it does not kill the perſon when it breaks, at leaſt not always, though he affirms the contrary; for they have been often ſeen to break in *Africa*, in drawing them out, and yet the patients have not died. It is about the thickneſs of the large ſtring of a violin, and ſometimes much thicker, and the colour is white and ſhining like ſilver. *Jenkinſon* adds that ſtrangers are moſt peſtered with theſe worms; but this is not true in *Guinea*, for many negroes are afflicted with them, while the white men generally eſcape: the manner of taking them out in that part of the world is to wait till the head appears through the ſkin, after which they draw it out a little way, making it faſt to a ſtick, about which they wind a ſmall part of it every day, till they have at length entirely brought out the whole, and then the patient is freed from pain. But if the worm happens to break, the negroe is put to a double torture, for it either rots in the body, or breaks out in ſome other place. Some negroes have nine or ten of them at once, and they are common all over the coaſt of *Guiney*: though ſome of theſe are an ell long, agreeable to what *Jenkinſon* affirms, yet many of them are much longer, growing almoſt to the length of two ells: this worm is omitted by moſt of our modern writers; and thoſe that do mention it, give a very erroneous account thereof, affirming that it is no thicker than a horſe hair, and of a pale yellowiſh white all over, except the head and tail, which are black and gloſſy: the head indeed is of a pretty dark colour, but the tail is of a ſilvery white, like the reſt of the body. It is pretended that doctor *Liſter* has ſeen many of them alive in the body of a black Beetle; but it may be doubted whether the phyſician took it to be the *Guinea* Worm or not, for certainly he could not be guilty of ſo egregious an error; for if it was a native of cold climates, we ſhould certainly meet with it in the legs of the inhabitants, eſpecially in the hot ſeaſons of the year. *Bucharia* is not indeed within the torrid zone, but the heats in that country are ſometimes very exceſſive. Dr *Friend* was the firſt *Engliſh* phyſician that took notice of it in his hiſtory of medicine; but he did not ſeem to know that *Jenkinſon* had mentioned it before. It has alſo been obſerved by other travellers that have been in hot countries, and therefore it is very ſtrange that no better account of it has been given hitherto by *Engliſh* writers.

The earth *Worm*, is of an oblong form, and is like the round Worm that is bred in human bodies: the largeſt ſort are ſix inches long, and may be ſtretched to be a foot in length: they are of a reddiſh fleſh colour, and moſt of them have a ring round the neck, or rather a ſort of a necklace, in which there is a little blood. Some of theſe ſort have been ſeen ten inches long, and above an inch in diameter: this is by ſome called the lob Worm, and the dew Worm, and is to be met with in gardens and other places, by the aſſiſtance of a lanthorn, late in a ſummers evening. In great droughts they never appear, and therefore if any of them are wanted as baits for fiſh, they may be forced out of the earth, by pouring the juice of walnut tree leaves, mixed with a little water and ſalt, into their holes.

The *Brandling*, *gilt tail*, and *red Worm*, are all to be found in old dung-hills, or the rotten earth that is near them; but the beſt for fiſhing, are thoſe found in tanners yards, under the heaps of bark, which are thrown out after they have done with it; but the Brandling is moſt eaſily found in hog's dung.

The marſh *Worm*, is to be met with in marſhy places, near the banks of rivers, and is of a bluiſh colour: the Tag-tail is of a pale fleſh colour, with a yellow tag on its tail, almoſt half an inch long: they are to be found in fields that have been manured with marle, and in meadows after a ſhower of rain. *Mouſet* obſerves, that Worms in general are of a more whitiſh colour, after heavy ſhowers of rain: they have the parts of generation belonging to both ſexes; but they do not wind about each other like Serpents, when they are joined. When a lob Worm has been opened, there has been found a ſort of an annulated gut, covered with a thin membrane, which had a very ſtrong ſmell: the eggs lye over the gut near the mouth, and they are of a whitiſh colour. Some ſuppoſe that they feed chiefly upon earth, becauſe there is always ſome found within them when they are opened; however it is certain they are fond of crumbs of wheat bread, and will feed upon them greedily when they lie in their way. Many of them are deſtroyed in very dry ſummers, and by the cold in winter: they are very often ſo numerous in gardens, that they do a great deal of miſchief; but they may be eaſily taken and deſtroyed, in the manner above mentioned.

The ſea *Worm*, is above a foot in length, and as thick as a man's finger. It is of a pale red colour, and compoſed of rings, or annular joints, like the earth Worm; but the ſkin is rough, for all the ſkin is covered with little prominences. It is found in the mud upon the ſea ſhore, and ſerves for food to many ſorts of fiſh: the common earth Worms in *Peru*, are larger than theſe, for they are as long as a man's arm, and thicker than the thumb.

The round *Worm*, bred in the inteſtines of a human body, conſiſts of rings like the earth Worm, it being without feet, and much of the ſame ſhape; but it differs from it in being of a white colour: they are not only bred in the guts, but in other parts, and particularly in the heart, for there are inſtances of their having been found therein: they have alſo been met with in the guts of horſes, oxen, calves, dogs, hogs, and hawks, beſides many other animals, inſomuch that it is hard to ſay whether any ſpecies of animals are free from them or not: they cauſe various diſorders and diſeaſes in human bodies, for they not only produce pain, but conſumptions, convulſions, fevers, and pains like

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the pleuriſy. There is another ſort, that have a ſnout or trunk, with a kind of crooked claws, wherewith they ſometimes gnaw and tear the membranes of the ſtomach, cauſing inexpreſſible pain, anxiety, and a ſtinking breath; but they more generally reſide in the gut called the ileum, becauſe it is free from the gall, for they cannot bear its bitterneſs: the bellies of children are ſometimes ſtrangely diſtended with them, and they render the excrements like cow dung, and full of ſubſtances, like cucumber ſeed: the round Worms are generally of the length of a palm, or longer; and yet a certain blackſmith threw one up by vomit, a foot and a half long, with a red ſmooth head, about the ſize of a pea, and the body, was covered over with a ſort of a down, with a tail in the ſhape of a half-moon. At *Rome* a man afflicted with Worms, which gave him inexpreſſible pain, at length voided one that was black and hairy, of the length of five feet, and about the thickneſs of a reed. Another brought away one not above a palm in length which was pretty like the round ſort, only the back of it was covered with red hair or down: they have been ſeen of all colours, as red, yellow, black, and variegated with white and black; but of theſe the green are moſt uncommon. However theſe are all uncommon productions, and never have yet been placed by naturaliſts in any regular claſs.

The *Aſcarides* are alſo Worms bred in a human body, and ſome pretend they have ſeen them in the mud, at the bottom of rivers and ponds. It is of an oblong form, ſlender, and covered with a very tender ſoft ſkin, and are not unlike book Worms. It is of the thickneſs of a ſmall pin, with a ſmall ſharp head, and a pointed tail: there is always a vaſt number of them together, and they are ſometimes voided out of human bodies in large quantities: their ſeat is in the great guts, and particularly the rectum. They produce inflations of the belly, ſickneſs, and leanneſs, and are attended with great itching of the anus. Some of theſe Worms are larger than others.

The tape *Worm* grows to a ſurpriſing length, being ſometimes two or three ells or longer, and it is divided throughout its whole length by knots or joints. Some have formerly thought that it was the inward ſkin of the guts, which comes off throughout their whole length; but this is a miſtake, for it has been ſometimes ſeen to move after it was voided. It has ſomewhat the appearance of the links of a chain, the joints being a third of an inch long, and the ſkin is ſmooth, and of a whitiſh colour. It is found in the inteſtines of many other animals, beſides men, not excepting birds and fiſh. In the year 1725, it was epidemical among the geeſe in *Germany*; ſome of them were voided a foot and ſome inches in length, with the dung, and many of the geeſe were cured by accidentally feeding upon the remains of ſage and hyſſop after they were diſtilled. There have been fiſh opened, that have not only one tape Worm, but three at a time, and theſe three times the length of the fiſh themſelves. Mr *Fryſch*, a *German*, who gives us this account, affirms, that theſe ſuppoſed joints are real knots, which he has been at the pains to untye, which when done, rendered the Worms a great deal longer. He farther obſerved, that they had a ſort of an artery, which run from the head to the tail, and was plain enough to be ſeen, it being of the colour of blood, and the body itſelf white: the breadth of the body grew leſs and leſs to the end of the tail, and end-

ed in a ſharp point; and the mouth, or fore part, which it could draw in, was formed in ſuch a manner, that it appeared to be cut off.

In the bowels of the fiſh that have tape Worms, there have been found ſmall creeping Worms upon the liver, almoſt an inch long: they had the ſame colour and ſhape as earth Worms: theſe, when they have been thrown into cold water, have been ſeen to ſwell, to grow ſtiff, and to enlarge themſelves, ſo as to break the ſkin of the Worm; and then the dead tape Worm has been found to lye at the bottom, thrice the length of the former.

Mr *Fryſch* has been as careful in examining the Worms of a human body, and he affirms, that they conſiſt of three parts, the outermoſt of which is the ſkin, and the innermoſt two guts, one long, and the other ſhort: the ſkin is thick, and beſides the aperture of the mouth, no hole can be found in it: this mouth is moſt diſtinct in the leſſer ſort, and the lips may be plainly ſeen, by which it adheres to the inteſtines like a Leech: the greater have a hooked mouth, and ſomewhat in the ſhape of a blunt wedge, which is very hard; and with this hook it ſticks ſo cloſe to the inward cuticule of the inteſtines and pylorus, that a tubercle or callus may be ſeen here and there thereon: the nearer the Worm is to the ſtomach, the callus is always the greater, eſpecially in ſows, to the middle of which the head of the Worm ſticks by its hook, in ſuch a manner, that the deſcent of the aliment from the ſtomach, though never ſo plentiful, could not force it off: the tail or lower part of the Worm is ſolid, for the cavity of the belly is not continued to the extremity. It has no vent, or one ſo ſmall, that the excrements could not be forced out by preſſing the body; but from the mouth it will void when touched gently, a ſort of a watery liquor, that is found in the belly, where there is a ſpace between the two guts, eſpecially between the navel and the mouth. He calls a ſort of ligament the navel, which is the ſixth part of the body in length from the mouth, and keeps the long gut ſuſpended by its middle and fuller part, leaſt the watery liquor that lies about it, ſhould fall into the lower part of the belly, and preſs the finer parts that are not ſo full. By this longer gut, which may be likened to a ſtomach, the Worm is nouriſhed with a pure and white juice, like chyle: the ſhort gut ſeems deſigned for the excrements, it being full of matter, that ſmells like the human fæcis; this is black, and has no fold or bending.

When theſe Worms are ready to undergo their transformation, they are fuller of this white fluid, and appear of a more ſhining white; but the leſſer become more red, and are much of the colour of the ſkin: this white gut, which is the principal inner part of the Worm, he ſuppoſes to be the tape Worm, which receives its nouriſhment in the ſkin of the former, till it is come to a proper ſize, and then it caſts its ſlough, much in the ſame manner as a Butterfly: the tape Worm is always three times the length of the former Worm, and is of a white colour; and he has often ſeen theſe Worms that have been killed by mercury, voided with the ſkin broken as above; and what confirms this conjecture is, that thoſe found in fiſh, when thrown into cold water, which breaks the ſkin, always produces tape Worms, three times the length of themſelves: theſe Worms, that is before they are changed, do not ſeem to have any parts of generation, which are plain and evident in earth Worms.

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The gourd *Worm*, is two thirds of an inch in length, when full grown, and its breadth is nearly equal to two thirds of its length: the ſkin is ſoft and whitiſh, with a tincture of brown; and the ſhape is flattiſh, but a little rounded on the back, and it has two rows of eight deep longitudinal furrows: the hinder part of the body is roundiſh, and at the other extremity it has a large mouth. It is not unlike the ſeed of the common gourd, from whence it has its name. It is ſometimes met with in the inteſtines of men, and other animals.

The common *Leech*, is a water inſect, having the figure of a large Worm, and it is as long as a man's little finger: the mouth is furniſhed with three ſharp ſtrong teeth, with which it is capable of piercing, not only the ſkin of a man, but alſo that of a horſe and ox. It has a ſmall head, and a black ſkin, edged with a yellow line on each ſide, and the belly is a little reddiſh; it has alſo ſome yellowiſh ſpots on the back. It produces its young alive, which is only one at a time, in the mouth of *July*. It is made uſe of to draw blood, and muſt be kept in clean water a few days before it is made uſe of for that purpoſe: they will ſuck the blood till they are almoſt ready to burſt, and then fall off; but they will ſometimes continue on too long, and then if a little ſalt is thrown upon their bodies, they will let go their hold.

The horſe *Leech*, is larger than the former, and has a ſmooth gloſſy ſkin, black on the back, ſpotted with grey: the belly is of the colour of theſe ſpots, with a tincture. It is common in ponds and rivers.

The ſnail *Leech*, is about an inch in length, and of a very flat ſhape; its ſkin is ſmooth and gloſſy, and of a whitiſh colour: the back is a little raiſed, and the ſides ſo thin, and they look as if they had an edge. It is common on ſtones, and at the bottoms of puddles of water.

The broad tailed *Leech*, grows to an inch and a half in length, and has a ſmooth gloſſy ſkin, of a duſky brown colour: the back is raiſed into a ſort of ridge, but the belly is flat, and the tail remarkably broad, with which it ſticks to ſtones very ſtrongly. It is common on ſtones in ſhallow running waters.

The black naked *Snail*, is ſomewhat in the ſhape of a cylinder, and perforated on the ſide; and it has four feelers, on two of which there ſeem to be eyes. It is about three inches long, half an inch in diameter, and the head and tail are ſmaller than the middle; the back is convex, the belly flat, and the whole body is furrowed and wrinkled very conſiderably. It is all over of a deep black colour, except the belly, which is ſomewhat grey: the feelers are not always viſible, for it thruſts them out occaſionally, and the body is covered with a ſort of ſlime, ſomewhat like that of an Eel. It is of both ſexes, and can impregnate, and be impregnated at the ſame time. It is common in the woods, and under hedges, and is ſometimes ſeen in cellars, and other cool places, eſpecially in damp weather.

The reddiſh *Snail*, is about two inches long, and is ſmaller in proportion, than the black Snail; its body is covered with a great number of ſlight furrows or wrinkles, and it is all over of a duſky red except on the belly, where it is of a light grey. It is covered with a thick ſlime, and moves along very ſlowly, always leaving a track behind it, made with the ſlime, which dries into a thin gloſſy film.

The yellow ſpotted *Snail*, when full grown, is about an inch and a half long, with a prominent back, a hollowiſh body, and a ſmall head.

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All the ſurface is ſlightly furrowed or wrinkled, and covered with a ſlimy juice; the colour is of a gloſſy yellow, with a browniſh caſt, and is all over variegated with ſpots of a greyiſh colour. It is very uncommon, though it is ſometimes ſeen in the woods of the north of *England*.

Beſides theſe, there are the large grey *Snail*, ſpotted with a duſky brown; the little ſhort grey Snail without ſpots, the reddiſh brown Snail with a reddiſh body; the ſmall duſky brown furrowed ſnail; the deep chocolate coloured Snail.

CHAP. XX.

OF SHELL SNAILS.

A Shell *Snail* has a ſingle valved ſpiral ſhell, which is very hard, and light at the ſame time; by the help of this, the animal is defended from all injuries, and can carry its houſe or lodging with it wherever it pleaſes. At the beginning of winter it retires into a hole, and then a ſort of ſlime or glew proceeds from its body, which entirely ſhuts up the mouth of the ſhell. Under this ſhelter it paſſes the winter, like many other inſects, without trouble, and without want. When the ſpring appears, and the warm weather comes on, the ſnail opens the door of its houſe, and roves abroad to ſeek its fortune. It is obliged to move along, and that very ſlowly, as it always carries its ſhell upon its back; and being thus obliged to crawl along, if its eyes were placed low on the body, which is dragged on the earth, it could not ſee the objects it is in ſearch of; at leaſt they would be expoſed to dirt and mud every now and then; for this reaſon, nature has provided it with four eyes, which may be likened to teleſcopes, wherewith it may ſee what is doing all round about it.

Some have imagined theſe eyes are horns, and yet they are in reality four tubes, with a glaſs at the ends; but to ſpeak more properly, they are four optic nerves, on each of which there is a very beautiful eye; and many imagine this to be the caſe of Snails without Shells. It not only lifts up its head to look about, but it raiſes up the optic nerves ſtill higher, with the eyes placed at the ends; for it can lengthen and direct them at pleaſure.

However, authors are not wholly agreed about the reality of this, for ſome think that the ſhorter horns are only the organs of ſmelling. But be this as it will, the eyes on the other two are very plain to be perceived. One would at firſt imagine, that any diſcovery it can make would be of very little ſervice to this inſect, ſince it is without legs; however inſtead of theſe, it has two large muſculous membranes or ſkins, which it can contract or lengthen at pleaſure. It firſt wrinkles up the ſkin before, by which it drags the hinder part after it; then it contracts or wrinkles the ſkin behind at the ſame time, extending that before, which being repeated alternately, this animal can crawl along with eaſe. But perhaps ſome may think this mechaniſm is not ſufficient for its purpoſe; for as it has no wings to fly, when it meets with danger,

danger, it ſeems to be expoſed to falls from the brinks of precipices, or into the water, and then it would certainly be drowned. However, to remedy this, nature has provided it, very plentifully, with a thick clammy liquor or ſlime, which will ſecure it from falls by its gluey quality; nor yet can it be hurt by rain or moiſture, becauſe it has an oil that ſtops up all the pores of the ſkin. It ſeems to know the great uſe this oil is of, for which reaſon it takes care that the ſun ſhould not dry it up, and as for moiſt places thoſe cannot do it any harm.

Hence it is plain, there is nothing to hinder its going in queſt of nouriſhment; and when it has found any, it has two mouths armed with teeth, with which it ſometimes does a great deal of damage to the very beſt fruits, to the tender buds of plants, and even to leaves on which the preſervation of the fruit depends.

But what is moſt wonderful in theſe animals, is, that they are all hermaphrodites, and have at ſame time the parts of generation of both ſexes, inſomuch that they uſually fecundate each other, as was before obſerved in treating of the naked ſnails: they have a ſort of courtſhip, and when that happens, one of them lets fly a ſort of a little arrow at the other, which has as it were four wings, or rather four edges: this arrow is entirely ſeparated from the ſnail that darts it, and it either pricks the other, or falls to the ground, after it has performed its office: the other ſnail darts his at the other, but this mock fight is immediately followed with a perfect reconciliation: this dart conſiſts of a ſubſtance like horn, and they are always to be met with near them at the time of their conjunction, which happens three times in the year, and in the ſpace of ſix weeks, each of them after this, in eighteen days time, goes to depoſite its eggs in the earth, and covers them with a great deal of care.

When the eggs are hatched, and the young Snails appear, they have each of them a ſhell, which increaſes as their bodies increaſe; for at firſt it is of a ſize proportionable to its ſmall inhabitant: this ſhell is as it were the rudiments of that which is ſo viſible afterwards to the naked eye; but as the body of this inſect cannot grow longer, except towards the opening, it is likewiſe that way that the ſhell receives its increaſe: this is done by the ſubſtance that is in the animal's own body, and it is compoſed of a ſort of a glue, and very fine ſtony particles: theſe ſubſtances paſs through a multitude of ſmall canals, and at laſt reach the pores, which are very evident on the ſurface of the body. When the animal perceives that all the pores are ſhut up under the ſhell, it directs them towards the parts of the body which lye out of the ſhell, and are quite naked: theſe ſandy particles and glue, tranſpiring outwardly, then grow thick, and adhere to, and dry on the edges of the ſhell. It forms at firſt a ſimple ſkin, to which it fixes another, and then a third; and when all theſe layers are united, they form a ſubſtance exactly like the reſt of the ſhell. As this animal increaſes, and its body is not ſufficiently covered, it continues to tranſpire, and build again in the ſame manner: this is certainly the method by which it faſhions, builds, and repairs its houſe; for if you take Snails and break their ſhells, without hurting their bodies, and then put them under glaſſes, with earth and graſs, you will ſoon perceive that part of their body which is left quite naked, will ſoon be covered with a kind of froth or ſweat, which proceeds immediately from the pores: this ſweat or froth is ſoon puſh-

ed

ed forward by another underneath, and ſo on, till it comes to be on a level with the old ſhell.

That you may be certain that this ſhell proceeds from the pores, you need only take film on the inſide of an egg-ſhell, and ſlide it gently between the body of the Snail, and the extremity of the fracture, and you will find the ſhell continue in the ſame ſtate as it was after it was firſt broken; and ſtill to make this more plain, you will find that the ſubſtance which was to repair the ſhell, will ſtick to the film, and there form another ſhell.

The great garden *Snail*, is the largeſt of the common ſort, it being about three quarters of an inch in height, and as much in diameter, and the body of the ſhell is rounded: the mouth of the ſhell is large, and nearly round, but it is in part filled up by the ſucceeding turn of the ſhell: the clavicle or tail, has four turns, and is blunt at the extremity: the colour of the ſhell is of a duſky brown, except a broad ſtreak which runs along it, following the ſpiral turn of the ſhell. Sometimes there are two others more faint, and above and below that in the middle, there run ſeveral broad and ſhort oblique lines or clouds, of a different brown. It is almoſt every where to be met with in the ſpring, in the gardens and orchards throughout *England*.

The brown clouded *Snail* with a round body, was not a native of *England* till very lately, it being originally brought from *France*, as a medicine for a gentleman; at which time many of them were turned alive into his garden, from whence the adjacent parts have been furniſhed with them: that is in the county of *Surry*. It is above an inch in height, and as much in diameter, and the ſhell is conſiderably firm and ſtrong. Its colour is of a deep duſky brown, variegated with clouded ſpots, and oblique ſtreaks, of a paler colour: the body of the ſhell is rounded, and the mouth nearly round, only a part of it is filled up by the ſucceeding turn of the ſhell: the clavicle is high, and has four turns.

The yellow *Snail* with a round body, is about three quarters of an inch high, and as much in diameter: the body of the ſhell is rounded, as in the two former kinds; but the mouth is more depreſſed, and the clavicle has four turns, and is terminated by a little round button: the ſhell is conſiderably thick and firm, and the general colour is of a duſky yellow, only it has a ſingle broad ſtreak of a deep brown, following the ſpiral turn of the ſhell, and placed exactly in its middle. It has alſo ſome other faint variegations of brown, and the mouth is ſurrounded with a thick rim of white. It is not very common, but may be met with under hedges in the weſt of *England*: there are three other ſorts of the common large Snail, namely the brown and white Snail, with a depreſſed clavicle: the great brown Snail with a few variegations, and a raiſed clavicle; and the large blueiſh Snail.

The plain yellow *Snail*, is of the ſmaller ſpecies, it being no more than half an inch in height, and about as much in diameter: the body of the ſhell is not ſo diſtinct from the clavicle, as in the larger ſorts, and yet there may be five turns, which are eaſily diſcovered in the whole ſhell, and the clavicle riſes from the reſt of the ſhell, but it has a blunt termination: the mouth is large, and is nearly round, but it is depreſſed, and is partly filled up by the ſucceeding turns of the ſhell: the colour is generally of a plain bright yellow, without variation, only

only the lip or verge of the mouth is of a lighter colour than the reſt, being ſometimes whitiſh. It is every where to be met with in gardens, orchards, and hedges.

The yellow *Snail*, has a very beautiful ſhell, which is nearly half an inch in diameter, and almoſt as much high. It conſiſts of five turns, and has a depreſſed mouth, with a whitiſh rim or lip: the colour of the ſhell is yellow, only along all the ſpiral turns, there runs a broad ſtreak, of a deep purpliſh brown colour: this is alſo to be met with in gardens, orchards, and hedges.

The yellow *Snail* with three ſtreaks, is near half an inch in diameter, and as much high, with a roundiſh depreſſed mouth: the ſhell is compoſed of five turns, and the clavicle terminates in a button: the general colour is yellow, except the three ſtreaks, which run along the ſpiral turns of the ſhell, of a purpliſh brown colour: the middlemoſt of theſe is broad, and the two outermoſt narrower, this is alſo common in orchards, gardens, and hedges.

The yellow *Snail* with four ſtreaks, is of the ſame ſize as the former, and has the ſame number of turns, and it has likewiſe a button at the extremity of the clavicle: the mouth is large and roundiſh, but depreſſed and encompaſſed with a thin rim, of a whitiſh colour. The general colour of the ſhell is yellow, only there are four narrow ſtreaks or lines, of a purpliſh colour, that follow the whole ſpiral turn of the ſhell, running along the middle thereof: this may be eaſily met with in fields and gardens.

The yellowiſh *Snail* with five lines, is of the ſame ſize with the former, but has a thinner ſhell, which is very brittle, and the clavicle terminates in a whitiſh button: the mouth is large and depreſſed, and is encompaſſed with a thin whitiſh lip, the general colour of the ſhell is a whitiſh yellow, according to its ſpiral turn, there run five ſtreaks or lines to the top of the ſhell, through the center of each turn: they are not ſo plain as in the former.

The fleſh coloured *Snail* is one of the depreſſed kind, and is near an inch in diameter, and yet no more than the third of an inch high; the ſhell conſiſts of four ſpiral turns, and the clavicle, which is very flat, is roundiſh at the extremity: the mouth is large, roundiſh, and encompaſſed with a thin round lip. It is of a faint reddiſh or fleſh colour, and is beautifully radiated with a deep purpliſh brown: this Snail is common in *Germany*, and it is ſaid to have been ſeen on the buſhes in *Lancaſhire*.

The whitiſh flatted *Snail*, is about three quartes of an inch in diameter, and more than a third of an inch high. It conſiſts only of three ſpiral turns, and has a roundiſh depreſſed mouth, encompaſſed with a thin rim: the general colour is a pale whitiſh grey, only it is faintly radiated with lines and clouds of an obſcure purpliſh brown. It is common in *France* and *Germany*, and ſome ſay it is to met with in *Yorkſhire*.

The whitiſh depreſſed *Snail* with a dentated mouth, is about half an inch broad, and its height no more than the third of an inch. It conſiſts of three or four ſpiral turns, and has a flat clavicle: the mouth is above a quarter of an inch long, and about as much broad, which makes the figure nearly roundiſh. It has a pretty broad lip, of a pearly white, and is ſlightly dentated on each ſide: the colour of the whole

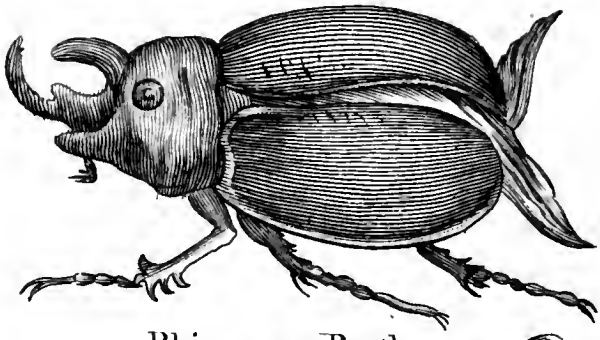
ſhell is whitiſh, without any variegation. It is ſaid to be met with in *Charlton* foreſt in *Suſſex*, and is pretty common in *Italy*.

The Jamaica ribband *Snail*, is an inch and a half in diameter, and yet is not above half an inch high: the ſhell conſiſts of three or four ſpiral turns, the outermoſt of which is conſiderably large, and the reſt grow gradually ſmaller, as they approach the centre: the clavicle is very little raiſed, and has a blunt termination: the mouth is roundiſh, and the general colour of the ſhell is of a pale brown, except a white ſtreak or ſtripe, that runs according to the ſpiral turns of the ſhell, which is of a white colour, and appears ſomewhat like a ribband.

The white depreſſed Jamaica *Snail*, is about an inch and a quarter in diameter, and about the third of an inch high: the ſhell conſiſts of four evident turns, but the clavicle is very little raiſed, and it has a blunt termination: the general colour is white, only there is an orange coloured ſtreak runs along all the ſpiral turns: the mouth is placed tranſverſely, and has a very large and broad lip, deeply dentated on both ſides.

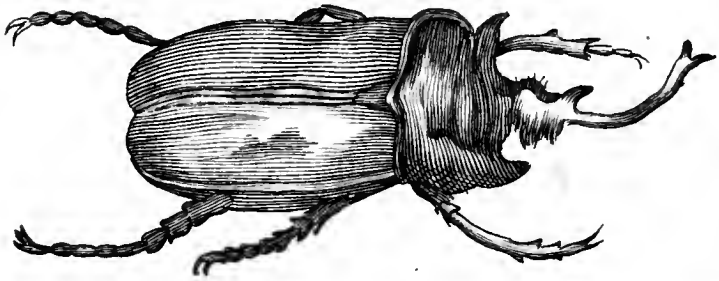
I N I S.

Elephant Beetle.

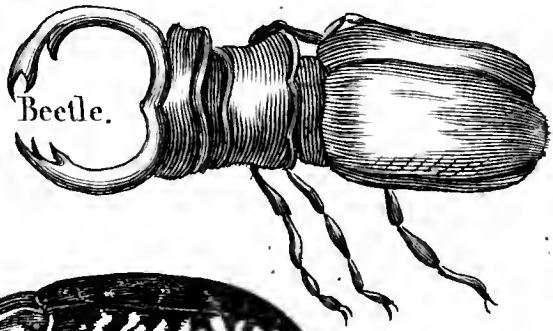


Rhinoceros Beetle.

Another Rhi.s B.

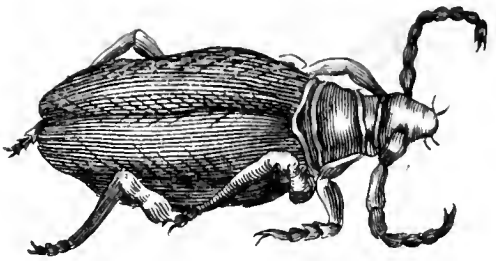


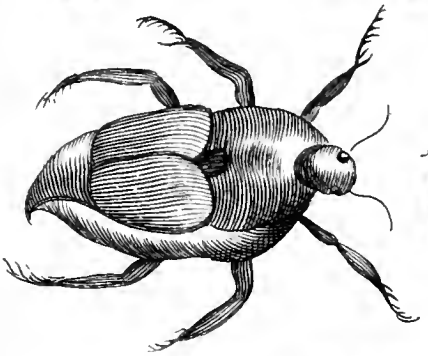
Stag Beetle.

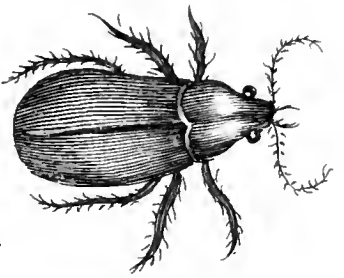


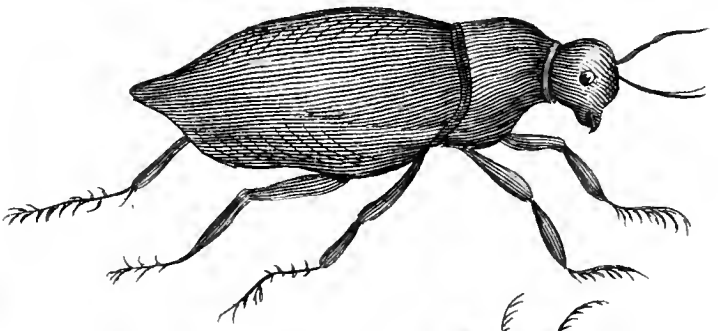
J. Fraler fc.

Several sorts of Beetles.







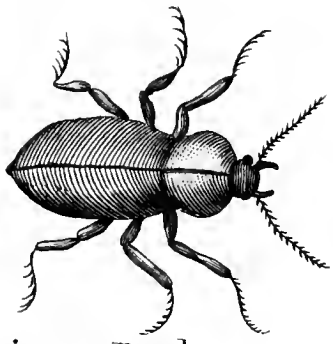


A Dorr.

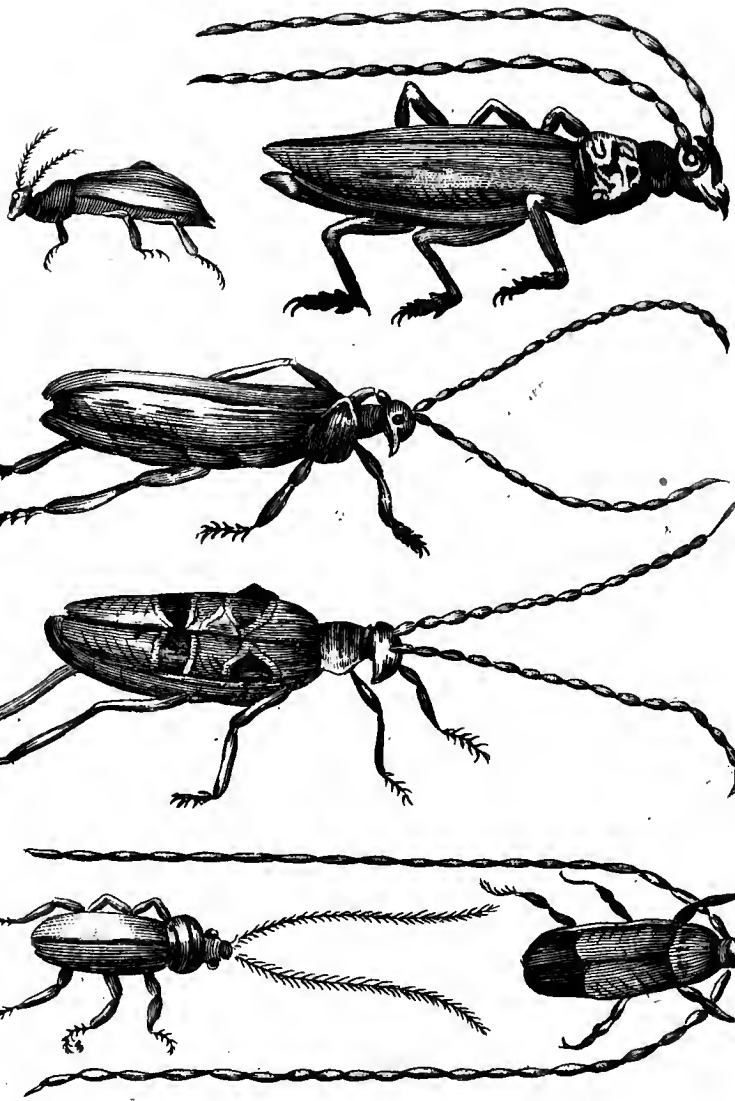
Sort of
May Bug.

J. Frater fc.

Pill Beetle.

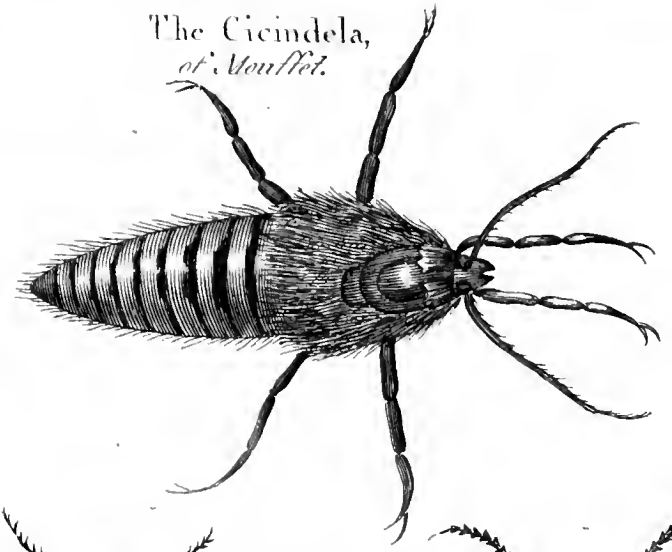


Capricorn Beetles.



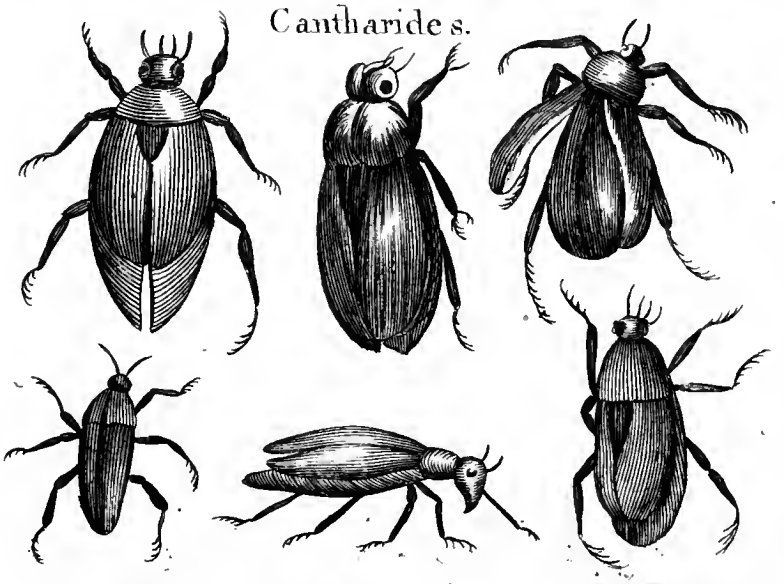
J. Fraser fc.

The Cicindela,
or Mouffet.



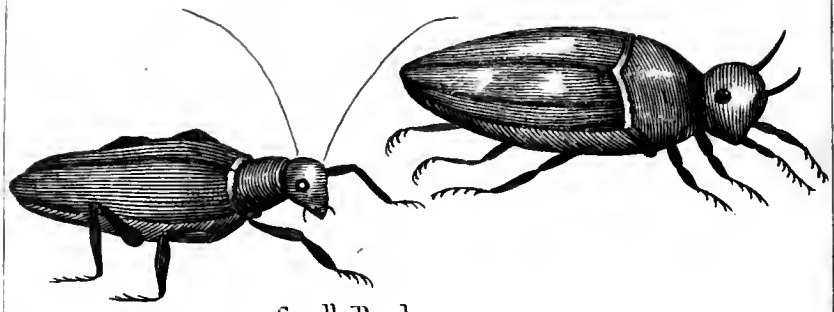
Gadflies *or* Burncows.

Cantharides.

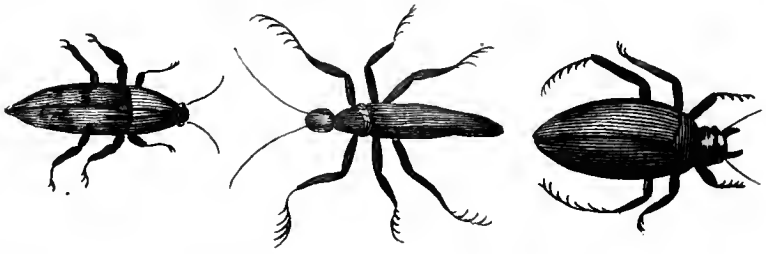


J. Fraser Sc.

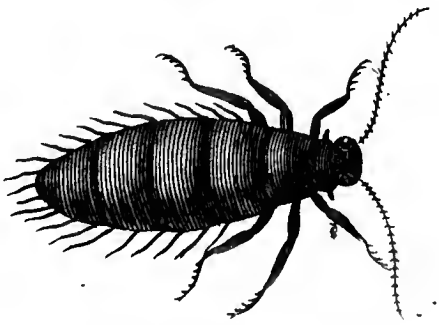
Green Chafers.



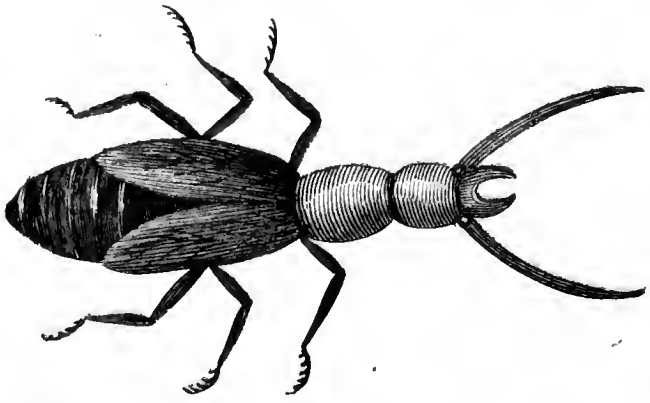
Small Beetles.



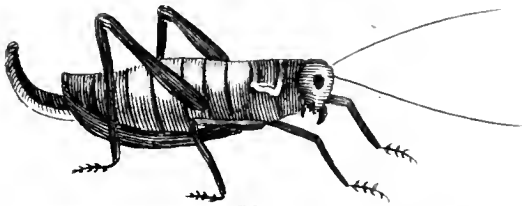
Oil Beetle.



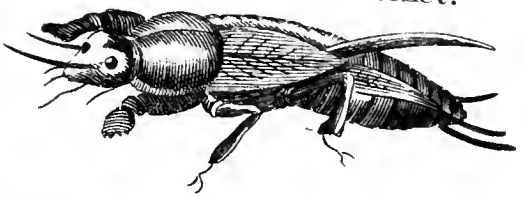
A Pro-Scarabee.



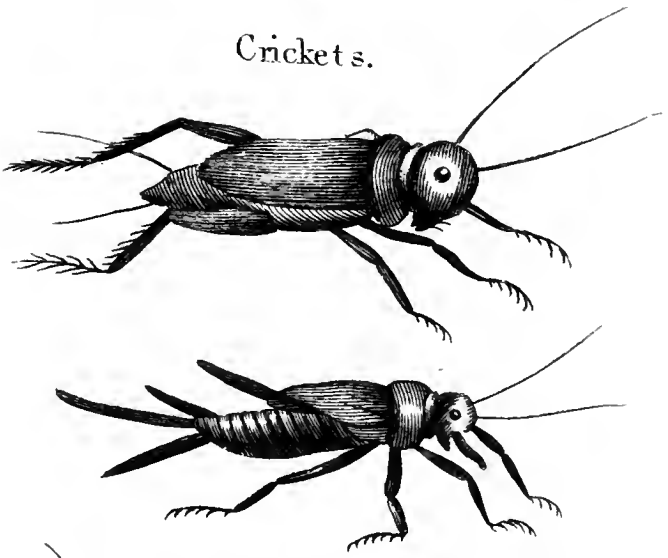
J. Fraser fc.



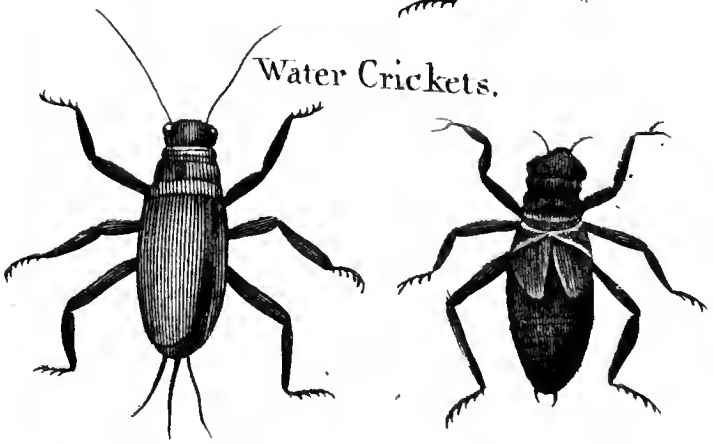
Field Cricket.



Crickets.

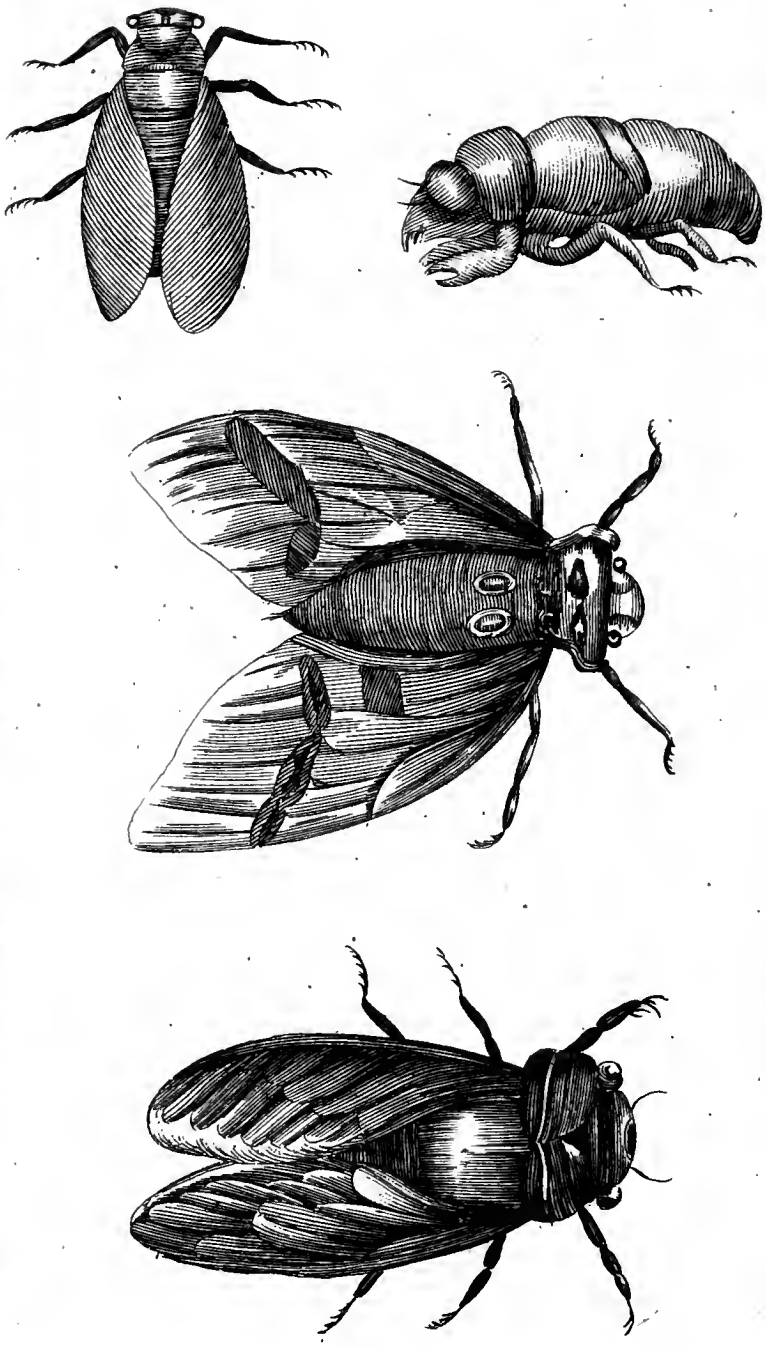


Water Crickets.



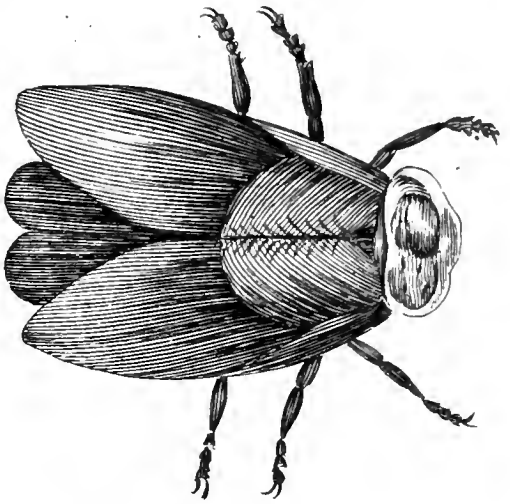
I. Prater sc.

A sort of Grafshopper.

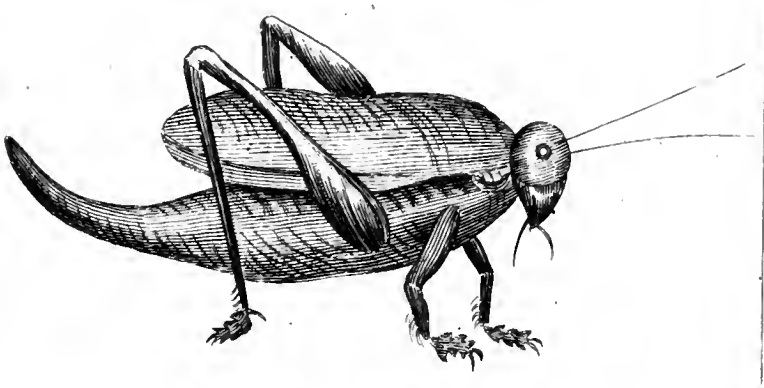


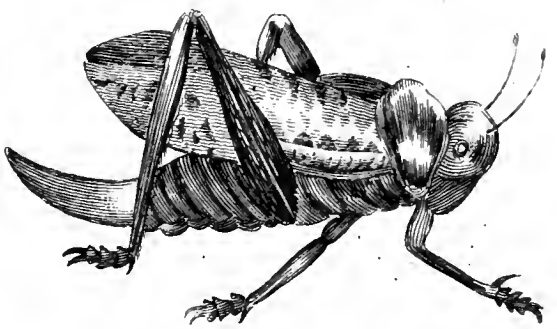
J. Fraser fc

A sort of Grafshopper.



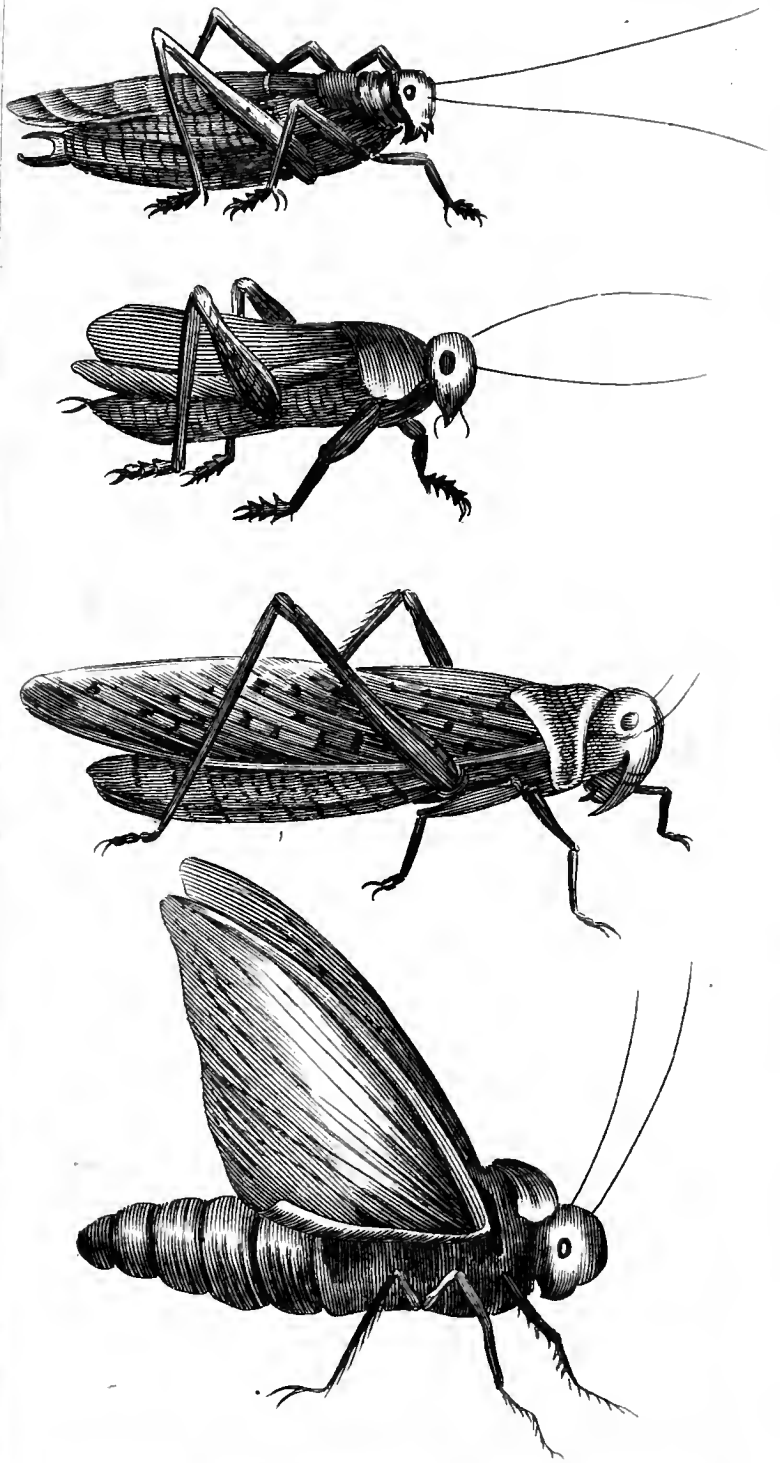
Locufts.





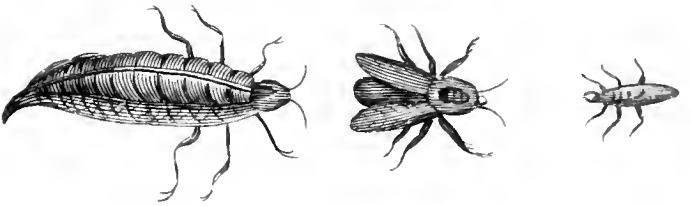
J. Fraser fc

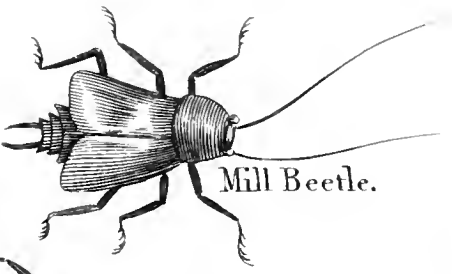
Locusts



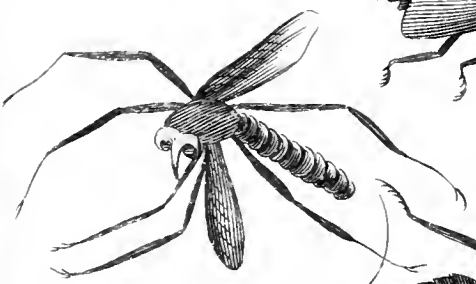
J. Fraser fc

Three Cicindelæ.

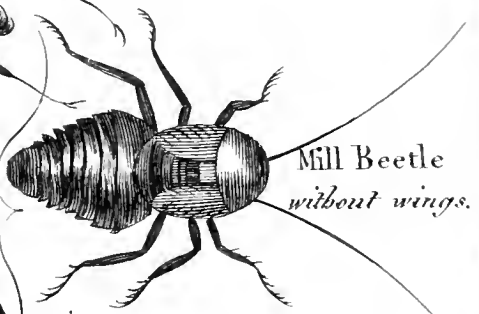




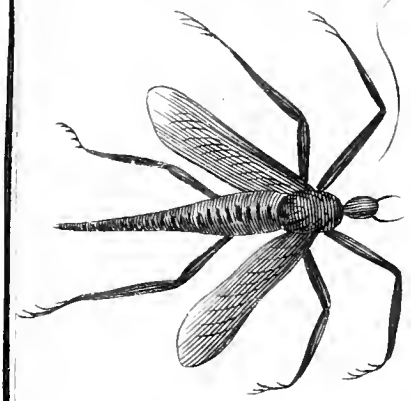
Mill Beetle.

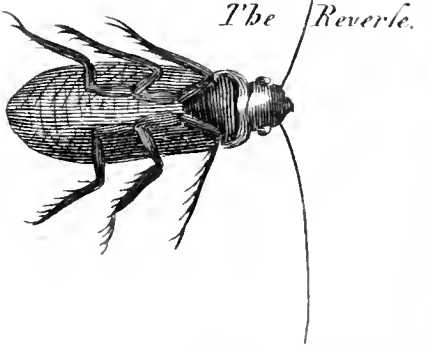


Two Crane Flies
a Sort of Libellulæ.



Mill Beetle
without wings.





The Reverse.

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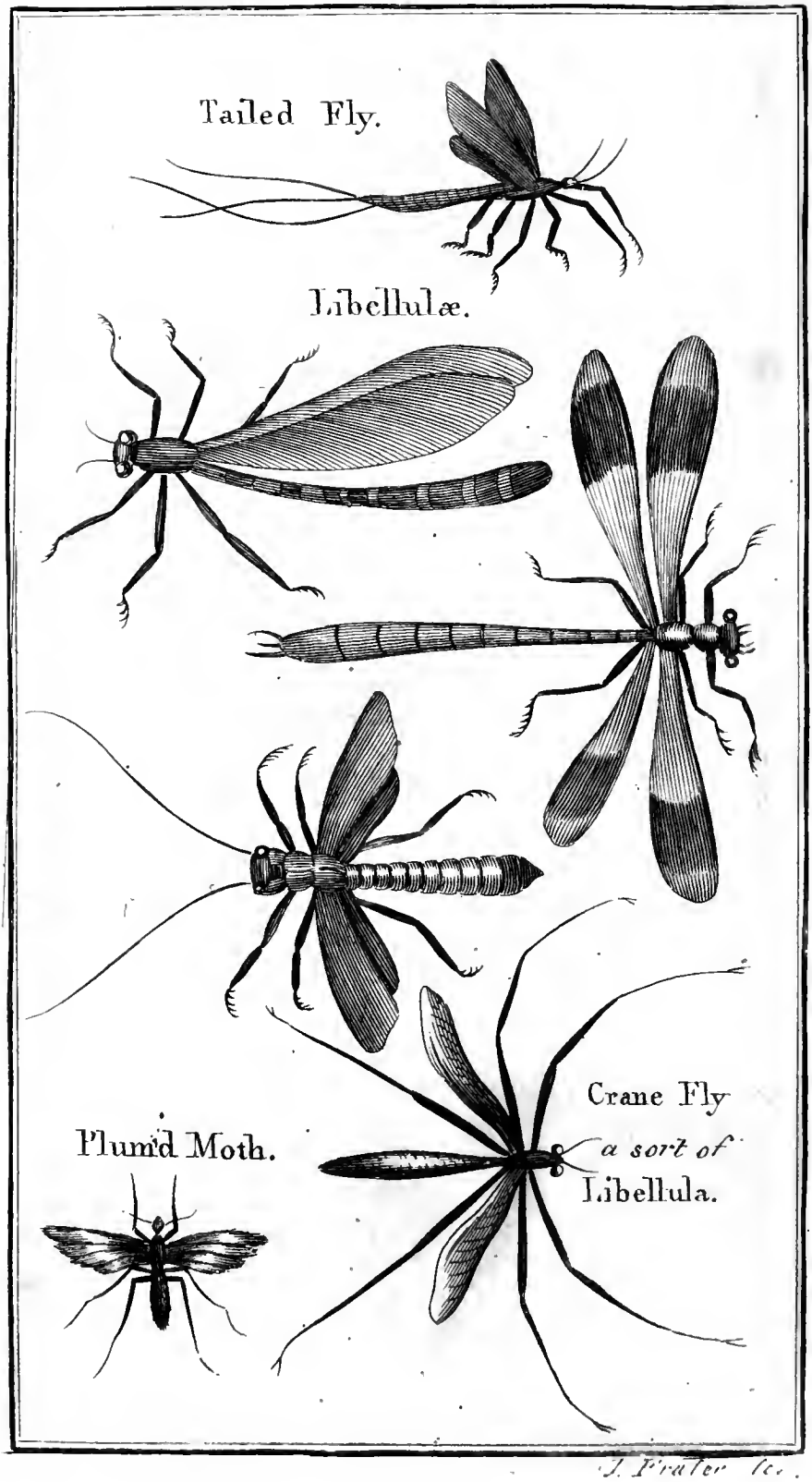
Tailed Fly.
Libellulæ.
Plumed Moth.
Crane Fly
a sort of
Libellula.

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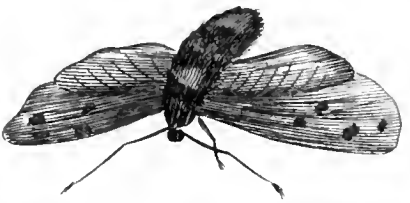
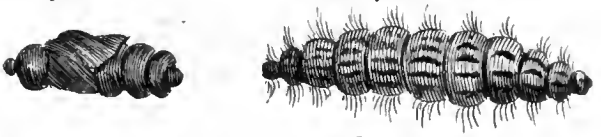
Burnet Moth.



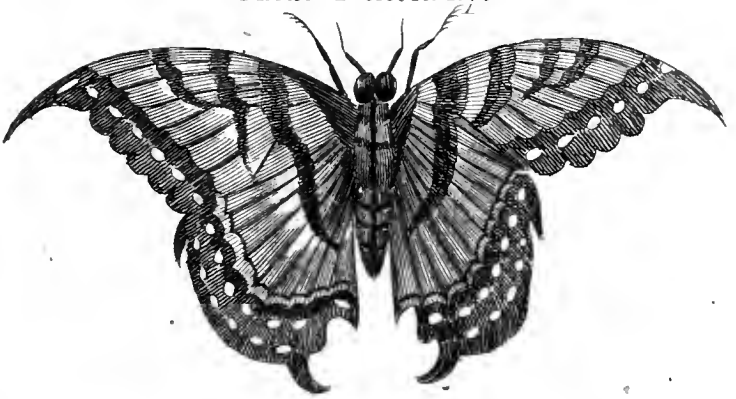
Chrysalis. *Caterpillar.*



Common Butterfly.

Chrysalis. *Caterpillar.*

Great Butterfly.



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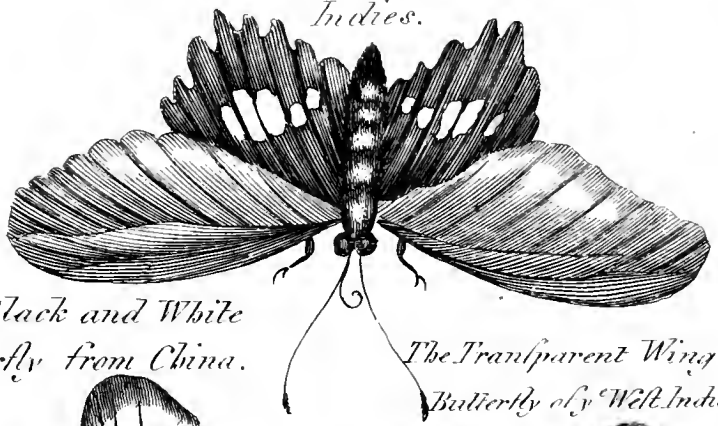
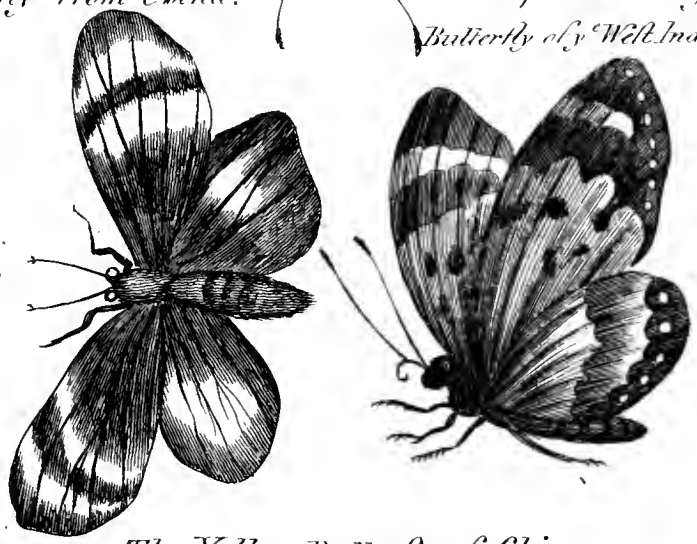
The Black Butterfly of the West Indies.

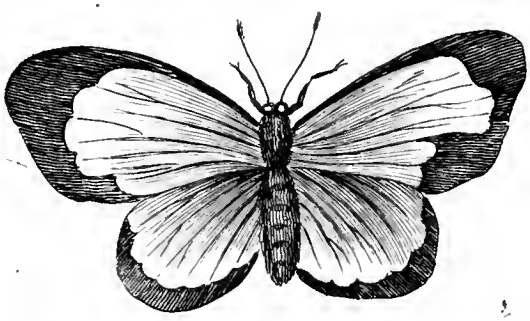


The Black and White Butterfly from China.

The Transparent Winged Butterfly of y^e West Indies.



The Yellow Butterfly of China.



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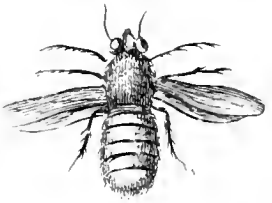
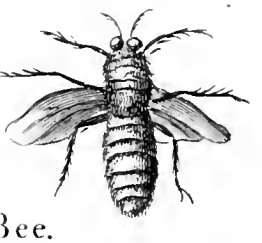
Drone.

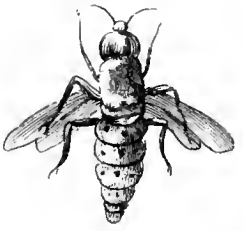


Queen Bee.



Working Bee.

Female.

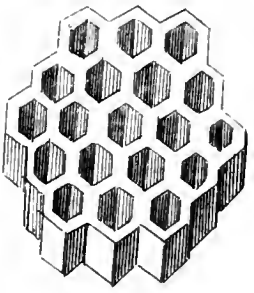


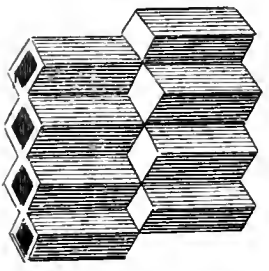
Female.

Working Wasp.

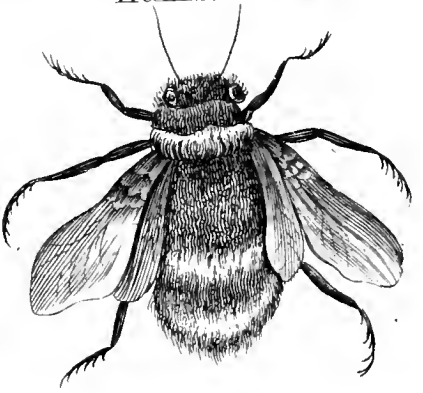
Male.

Comb.

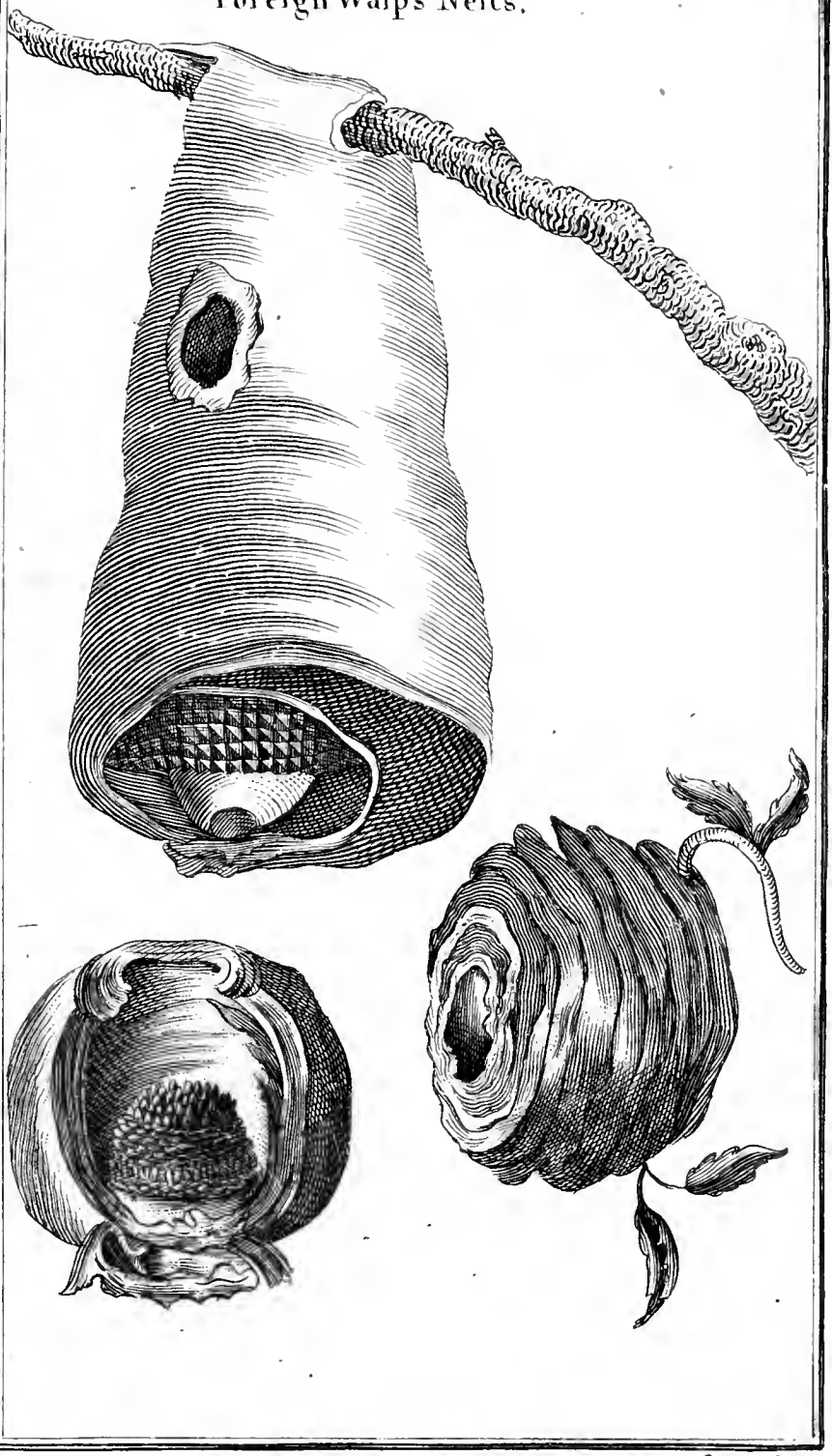




Humble Bee.



Foreign Wasps Nests.



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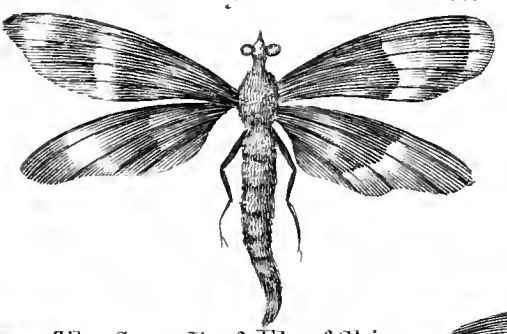
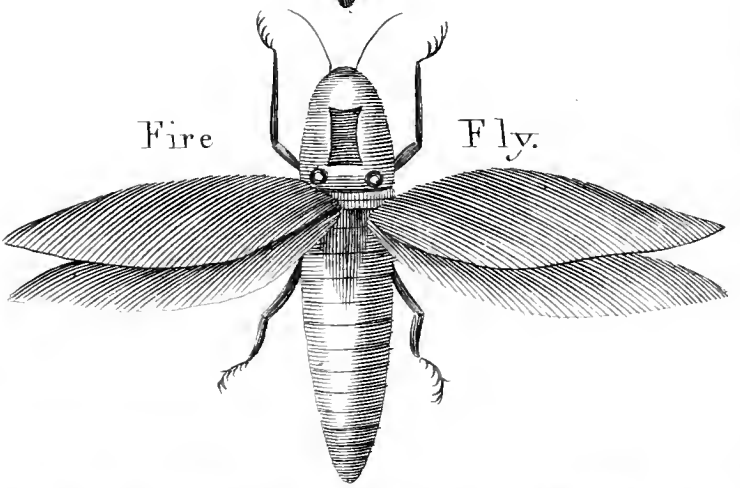
Two Horſe Flies.

The Horſe Fly of the Weſt Indies.

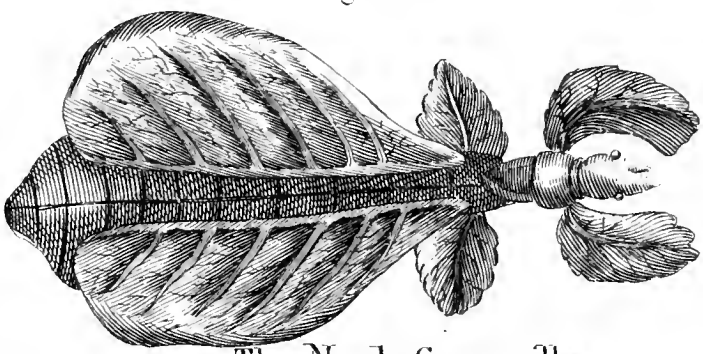


The Green Horſe Fly of China.

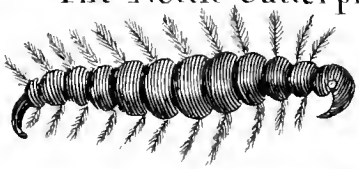
Fire Fly.



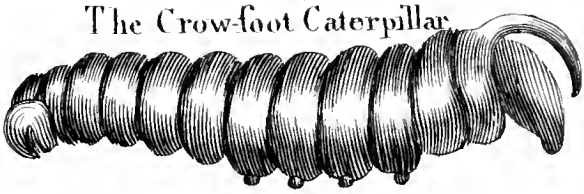
The Walking Leaf.



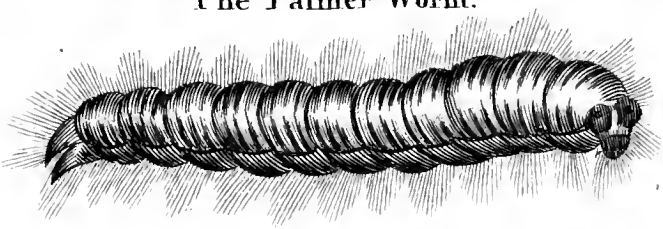
The Nettle Catterpillar.



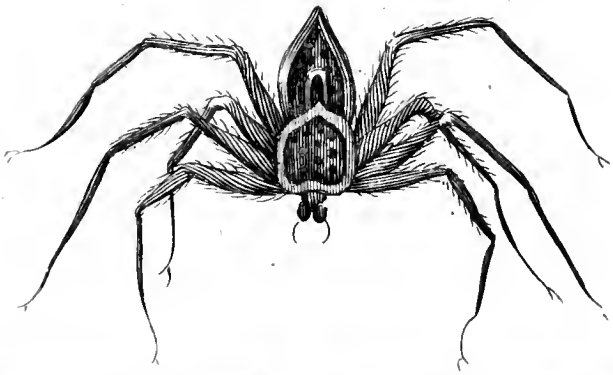
The Crow-foot Caterpillar.

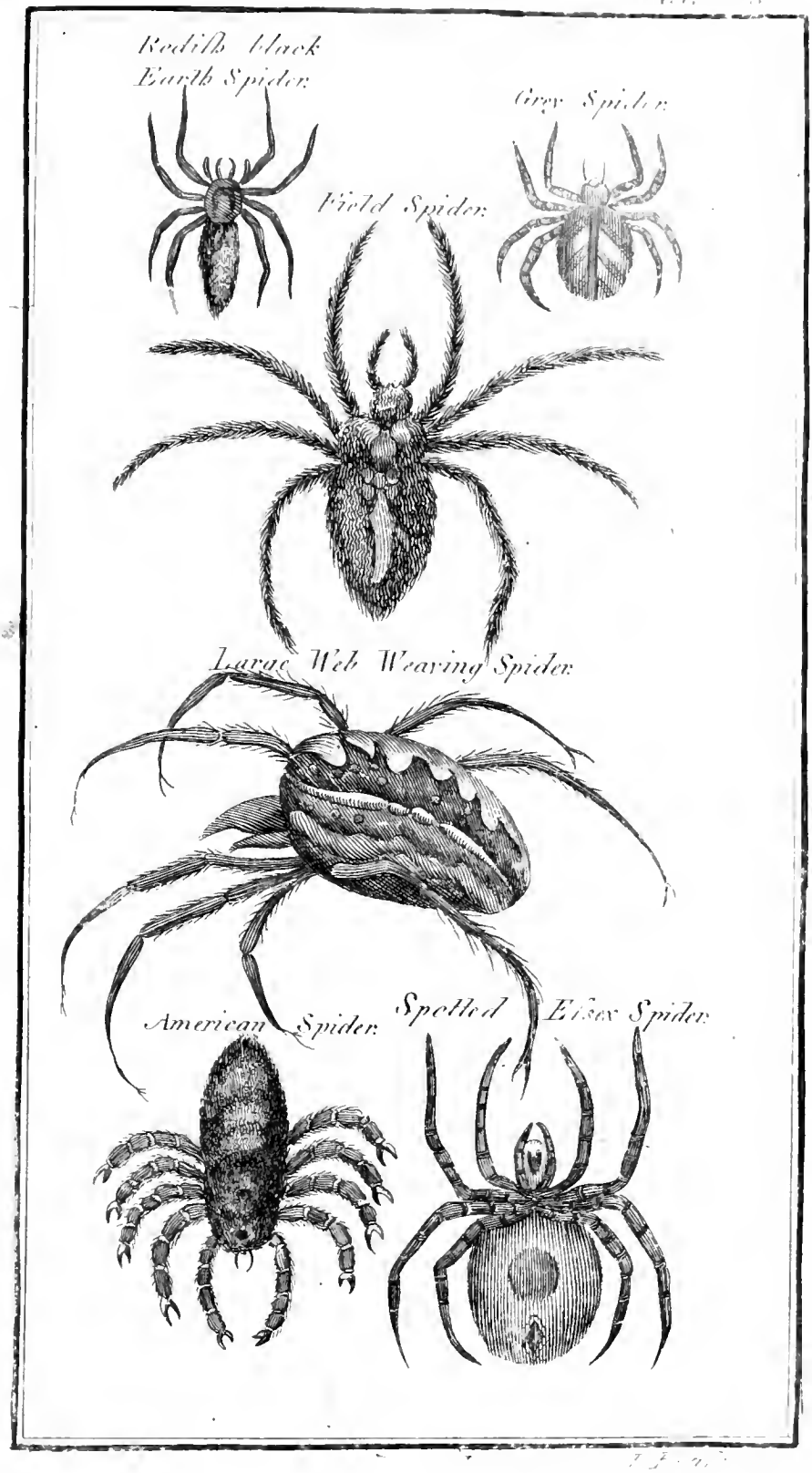


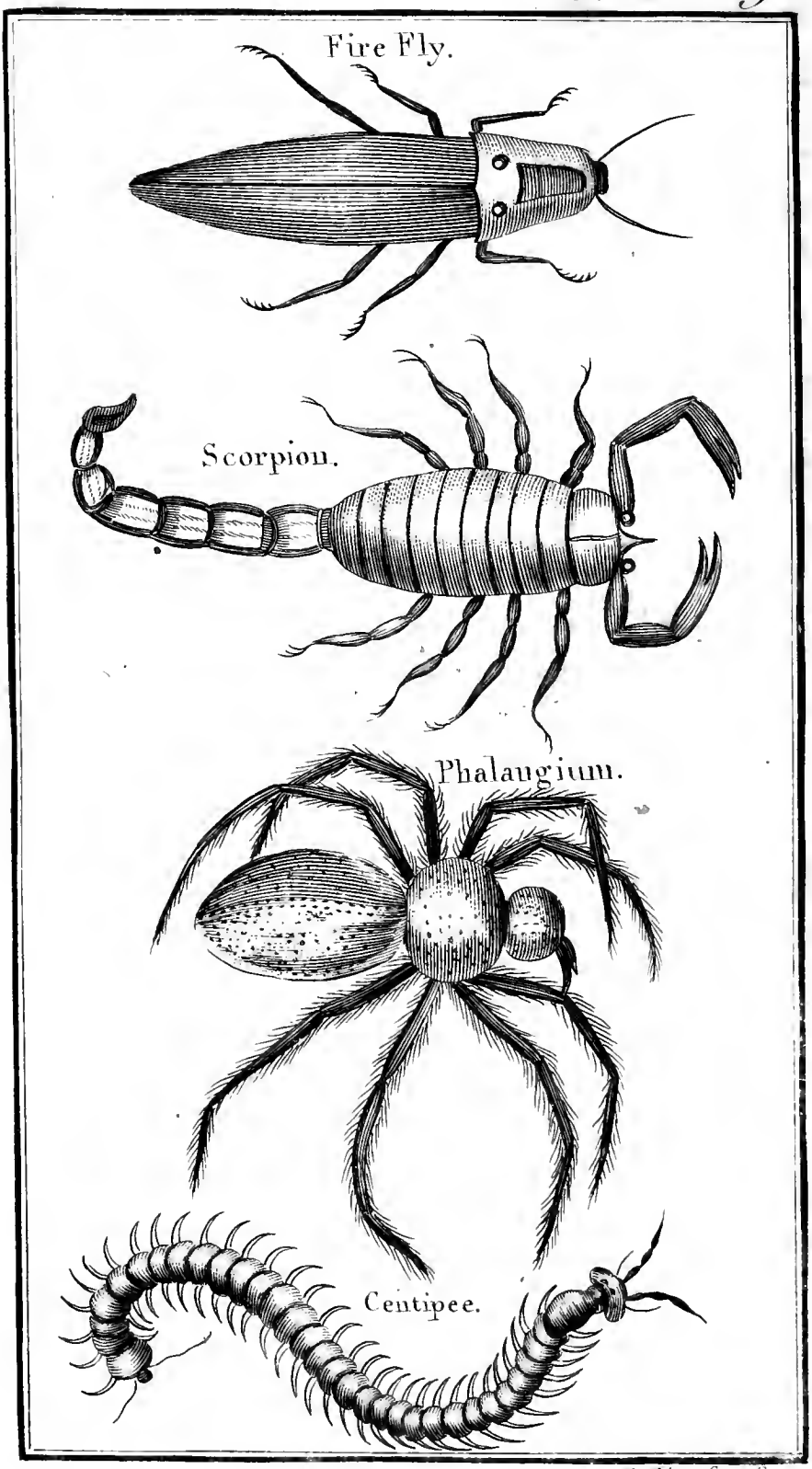
The Palmer Worm.



West Indian Spider.




Reddish black
Earth Spider.
Grey Spider.
Field Spider.
Larae Web Weaving Spider.
American Spider.
Spotted Essex Spider.



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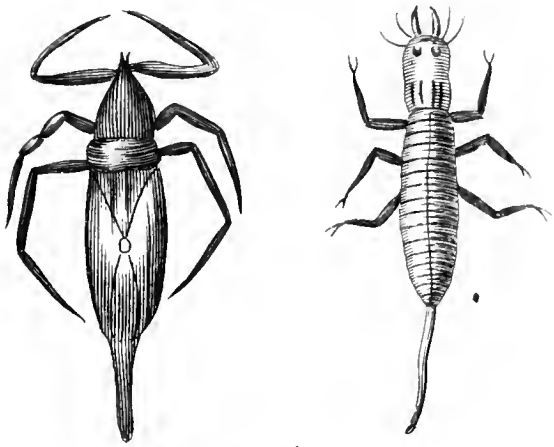
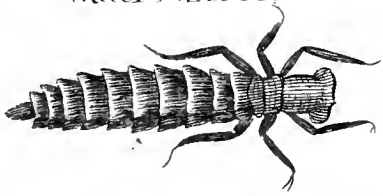
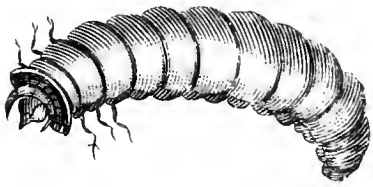
Water Insects.



Water Pulices.



Timber Worm.



Horse Leech.