

and it remains also for me to offer examples from among the more curious or striking instances of each of these recondite powers, both under a more simple and a more complicated modification. This shall form the basis of our ensuing study. At present I shall only farther observe that instinct may be defined the operation of the principle of organized life by the exercise of certain natural powers directed to the present or future good of the individual; and reason the operation of the principle of intellectual life, by the exercise of certain acquired powers directed to the same end. Both equally answer their object, are equally perfect in their kind, and equally display their common origin.

Whether with Reason or with Instinct blest,
Thus all enjoy the power which suits them best;
To bliss alike by that direction tend,
And find the means proportion'd to their end.
Say, where full Instinct is th' unerring guide,
What Pope or Council can they need beside?
Reason, however able, cool at best,
Cares not for service, or but serves when press'd;
Stays till we call, and then not often near;
But honest Instinct comes a volunteer:
Sure never to o'ershoot, but just to hit,
While still too wide or short is human wit;
Sure, by quick nature, happiness to gain,
Which heavier Reason labours at in vain.
This, too, serves always, Reason never long,
One must go right, the other may go wrong;
See then the acting and comparing powers,
One in their nature, which are two in ours;
And Reason raise o'er Instinct as you can,
In this 't is God directs, in that 't is man.—POPE.

LECTURE V.

ON THE DISTINCTIVE CHARACTERS OF INSTINCT, SENSATION, AND INTELLIGENCE.

We closed our last study by observing that instinct is the operation of the principle of organized life by the exercise of certain natural powers directed to the present or future good of the individual, while reason is the operation of the principle of intellectual life by the exercise of certain acquired powers directed to the same end. Hence reason demands discipline and attains maturity; instinct, on the contrary, neither demands the one nor is capable of attaining the other; it is disciplined and mature from the first, and is as perfect in the infant as in the man.

Instinct, however, has as often been confounded with FEELING OR SENSATION as it has with PERCEPTION, which is the outline or foundation of reason: and hence another source of those perplexities and errors in distinguishing between animal and vegetable life which we noticed in the preceding lecture: perplexities and errors which have been productive of the most absurd and disgusting consequences, and especially in regard to the delicate and elegant science of botany.

Instinct, sensation, and perception are all principles essentially different; they may, indeed, exist conjointly, but each of them is capable of existing separately. Instinct is the common law or property of organized matter, as gravitation is of unorganized; and the former bears the same analogy to sensation and perception as the latter does to crystallization and chemical affinity. Instinct is the general faculty of the organized mass, as gravitation is of the unorganized mass; sensation and perception are peculiar powers or faculties appertaining to the first, as crystallization and affinity are appertaining to the second: they can only exist under certain circumstances of the organized or unorganized matter to which they respectively belong.

This parallel, indeed, may be carried much farther. Gravitation discovers itself under different modifications, different degrees of power, and, conse-

quently, different effects. Instinct evinces an equal diversity in all these instances. Gravitation belongs equally to the smallest and to the largest portions of unorganized matter: instinct, in like manner, belongs equally to the smallest and to the largest portions of organized matter; it exists alike in solids and in fluids; in the whole frame and in every part of the frame; in every organ, and in every part of every organ, so long as the principle of life continues. Sir Isaac Newton established the doctrine of gravitation, and overcame all objections to it chiefly by the modesty with which he propounded and illustrated it. Without inquiring into the nature of its essence, he contented himself with recognising it by its operations and laws. It is the aim of the present study to follow this great example; and leaving all discussions concerning the essence of instinct or of organized life, on which instinct is dependent, and which constitutes its sphere, as matter constitutes the sphere of gravitation, to point out nothing more than the nature of its action, and occasionally to catch a glance at the laws by which it is regulated.

From what has been already said, we see clearly that the power of instinct runs equally through the limits of vegetable and animal life, and consequently, that instinct, sensation and perception, whatever they consist in, are powers or principles essentially different. Instinct is the common property of organized life in all its forms, but life itself is not necessarily connected either with reason or sensation; and it is of no small consequence that we attend to this curious and extraordinary fact, the proofs of which are abundantly in our own possession. The blood is alive, and has all the common properties of life, as was very satisfactorily shown in an antecedent lecture, from the experiments of Mr. John Hunter; but we all know that it possesses neither feeling nor intelligence: the bones, the cartilages, the cellular membrane, and the cuticle are alive; but, in a state of health, they are equally destitute of both these properties, and whether in health or disease, are always destitute of the latter.

Sensation and perception, so far as we are capable of witnessing, can only exist in appropriate organs, as nerves, or modifications of nerves, which are the only known seat of the one, and the brain, or some modification of brain, which is the only known seat of the other. In the higher classes of animals, as mammals, birds, amphibials, and fishes, the nerves take their rise from the brain, or rather from some particular part of it. But this is not an indispensable law of life; for, in insects, we meet with nerves, but no brain; and in most zoophytic and many other tribes of worms, with neither brain nor nerves. And hence, wherever these organs or either of them are discoverable, it is consistent with right reason to infer, that the faculty also exists to which they respectively give rise. But, on the contrary, where neither of these organs exists, as in plants, and a multitude of the lowest tribes of animals, which in the zoological system of Lamarek are on this account denominated *apathic* or insentient,* we have the same reason for inferring that, though life is present, and, indeed, in many instances, peculiarly tenacious and vigorous, there is neither intelligence nor sensation; and that the whole of the vital functions and operations are performed, like the semblances of intelligence in the preceding case, by the common law of instinct; which, operating in different ways, in different organs, and beings of different structures, appertains to living matter of every kind.

These observations will apply to the vegetable as well as to the animal kingdom; for plants have a close analogy to the senseless tribes, the tubipores, madrepores, sponges, and infusory worms, we are now contemplating in their structure and origin, as well as in the limited range of their powers; these animals being in many instances equally simple in their make, and equally destitute of locomotion, and equally propagating their kinds by the generation of buds or bulbs, instead of by that of seeds or eggs. Like these low kinds of animals, plants, moreover, are altogether without organs either of sense or intelligence; and it is consequently correct to infer, that they are

* Philosophie Zoologique.

equally without the faculties which it is the sole property of such organs to develop. And hence, again, however curious and astonishing the powers they occasionally evince, they are powers that can only be resolved, as in the case of zoophytic worms, into the ever present and ever active law of instinct or organized life. We hear, indeed, at times, of the ascription of mental or corporeal passions to vegetables; of general feeling and ideas; of love and languishment, and desire and aversion. But all this is fancy, and proceeds from an erroneous and contracted view of the general nature of the law of instinct, and its extraordinary power of supplying the place of sense and reason, where these, or the organs in which they reside, are not present. We hear, in like manner, occasionally, of the brain, stomach, lungs, and nerves of vegetables; but all this is still more imaginary than the preceding; it is a mere fancy built upon a mere fancy: nobody has ever been capable of pointing out the probable or even possible seat of such organs, and they have only been idly conjectured because the faculties to which they give rise have been conjectured antecedently.

Is there, then, no such thing as instinctive feeling?—a term in every one's mouth, and which every one, till he tries, supposes he comprehends? What but an instinctive feeling is the love of life, the dread of death, the economy of pairing, and the desire of progeny?

Wherever feeling exists, these, in a certain sense, may unquestionably be called instinctive feelings; but it should be remembered that the expression is, in every instance, of a compound character, and involves two distinct ideas, which may exist either separately or conjointly: and we have the same reason for using the phrase *instinctive intelligence* as *instinctive feeling*: for we can only mean, or ought only to mean, *instinct* combined with *intelligence*, or *instinct* combined with *feeling*, according to the nature of the case before us.

Combinations of this kind, indeed, are not unfrequent; and I shall presently proceed to produce examples of them: but it becomes necessary to observe, in the present place, that all the operations we are now adverting to, and which are usually characterized as instinctive feelings, as self-preservation, attachment to life, resistance of destruction, reproduction of the whole or of separate parts of the system, and even the economy of pairing, though often united with feeling, and not unfrequently with intelligence as well, occur, nevertheless, in a multiplicity of instances in which we have either direct proofs, or the most cogent reasons for believing, that there is neither feeling nor intelligence whatever; and that every thing is the result of pure, unintelligent, insentient instinct.

I have just observed that the blood is alive: it has all the *common* properties of life; irritability, contractility, and a power of maintaining its natural scale of heat, whatever be the temperature of the atmosphere by which it is surrounded: and it is perpetually showing its attachment to life by the due and discretionary exercise of these properties with a view of preserving life. It equally resists every excess of cold or of heat that may be injurious to it, and hence sometimes raises the thermometer and sometimes depresses it: it contracts itself, like the muscular fibre, upon the application of an appropriate stimulus, and conveys the principle of life, and powerfully assists in applying that principle to parts in which the vital action is languid, or has altogether ceased. There is no part of the animal system that evinces in a more eminent degree the faculty of self-preservation, or self-production, of attachment to life, or of resistance to whatever is injurious, than the blood; and yet every one knows that this faculty is pure, unmixed instinct, equally destitute of feeling or intelligence: it is, as I have already defined instinct to be in every instance, a "simple operation of the principle of organized life by the exercise of certain natural powers directed to the present or future good of the individual."*

In the new-laid egg we have an equal proof of the same faculty of self-

* Compare here Girtanner's Mémoires sur l'Irritabilité, considérée comme Principe de Vie dans la Nature organisée.—Journ. de Physique, 1790.

preservation, the same attachment to life, and resistance to destruction. For, like the blood of a healthy adult, the new-laid egg, the few and simple vessels of which are merely in a nascent and liquescent state, and which can scarcely be regarded otherwise than as a fluid, is capable equally of counteracting heat, cold, and putrefaction, and does forcibly counteract them for a considerable period longer than an egg that has been frozen or in any other way deprived of its vital and instinctive principle. It is this vital and instinctive principle that alone matures the egg, and shapes the matter of which it consists into distinct and specific lineaments, and calls forth the power which it does not yet possess, of sensation and perception. In what way these attributes are produced we know not; but we see them issuing from the matter of the egg alone, when aided by the additional and cherishing power of simple heat. And, provided it be properly regulated and applied, it is of no importance from what quarter such heat is derived; for we have already had occasion to observe, that the warmth of a sand-bath or of an oven will answer as effectually as that of the mother's sitting over it.

But let us not rest here: let us proceed to examples of the renewal or propagation of life, from parent stocks; to examples of the reproduction of the whole, or of separate parts of the system, in cases in which there is as obvious a destitution of sensation or intelligence; and where, as in the preceding instances, the whole must be the result of pure insentient instinct.

There is not a single organ in the animal frame but what is perpetually reproducing itself, alternately dying and renewing; so that the same man of to-day has not an individual particle belonging to him of that which constituted his corporeal frame ten, fifteen, or twenty years ago. And yet the whole of this important change, this entire reproduction of the material system, though occurring in sentient and even in intelligent organs, occurs at the same time without any kind of feeling or consciousness in the individual, or the organs that constitute the individual.

This very curious fact is still more obvious in the generation of new matter of every kind,—muscular, glandular, bony, and even nervous, upon the death of a considerable portion of an organ in consequence of external injury or other violence. The nice and admirable law by which the dead substance is carried off, and its place supplied by the gradual reproduction of fresh matter of the very same nature and properties, I have already explained.* In the separation of the dead from the living parts, there is generally, though not always, some degree of pain, from the increased local action that takes place, and more especially from the tension given to the skin by the secretion of sound and healthy pus, in order to effect its bursting; but in the actual generation of the new material that is to fill up the cavity, and supply the place of what is lost, there is no pain or sensation whatever in a healthy process; while, as I have likewise already observed, the pointing of the abscess, like the pointing of the seeds of peas or beans, in what direction soever they are sown, will be uniformly towards the surface,† whatever be the obstacles that must be overcome in order to reach it.

The generation of life, then, no more necessarily demands or implies the existence of sensation, than attachment to life, or a self-preserving principle: it may be combined with it, but it may also exist separately or without it. Monro, indeed, has distinctly proved by experiment, that the limb of a frog can live and be nourished, and its wounds healed, without any nerve whatever, and, consequently, without any source or known possibility of sensation.

Let us apply this reasoning, which I admit is thus far drawn from individual parts of the system alone, to a regeneration or reproduction of the entire system.

The lungs or gills of an animal are precisely analogous to the leaves of a plant. All these, as I have already observed, are perpetually changing by a nicely balanced alternation of decay and reproduction. In animals and ever-green plants this change is so gradual as to elude all notice. In deciduous plants, on the contrary, it is sudden and obvious to every one; yet the same

* Series I. Lecture xiv.

† Series II. Lecture iv.

instinctive power that produces the one change produces also the other; and as in the former case we have a perfect consciousness that the effect takes place without any sensation or intelligence, no man will be so extravagant as to maintain that there is any sensation or intelligence concerned in the latter. But the very same process that produces the leaves or shoots of plants produces also their buds; the vegetable vessels are the same; there is no new principle employed, but merely an adaptation of the one common principle of instinct or the law of simple life to the production of a different effect; for the very same eye may, by too much or too little pruning of the wood, be converted into a shoot or into a bud. The buds of plants, however, are their proper offspring; and in many cases as perfectly so as their seedlings, or those reared from seeds. In other instances we find a progeny equally perfect produced by a separation of bulbs or roots, or by radicles shooting out from creeping joints, as in the strawberry. In all which it would be absurd, even if plants were possessed of a nervous system, which they are not, to contend that a sense of feeling was more exerted than in the reproduction of the separate organs of an animal, to support the common wear and tear of animal life.

Why, then, should it ever have been contended that such a kind of sensation is necessary in the formation of seeds, by the conjoint action of what have been denominated a male and female organization? The stimulus of moisture, of light, heat, and air, evolves equally the specific flower; and the ever-present and all-pervading law of Nature determines the different parts of the flower, or the different flowers themselves, to be of different characters: the farina is secreted from the anther, a part which is called the male organ; and as it drops upon the open tube of the pistil, which is denominated the female organ, it becomes a new stimulus, and excites to a new action. But neither stimulus nor action are necessarily sensation, nor the sources of sensation. The pistil, or rather the receptacle which lies at the bottom of the pistil, in consequence of this new excitation, evolves or produces a new material, which we call a seed; but during the formation and evolution of this seed, from first to last, there is no more necessity for supposing the existence of any thing like sensation, than during the antecedent stimulus of the light, and heat, and moisture, upon the parent stem by which the flower itself became evolved; or during the same stimulus upon the joints or bulbs of the plant by which an equally healthy and perfect progeny has, perhaps, been produced from these different organs.

I have already observed, that in the lowest class of animals we meet with instances of reproduction equally varied, and of the very same nature: sometimes by buds or bulbs, as in the case of the polype; sometimes by slips or lateral offsets, as in one or two species of the leech; and sometimes, and perhaps more generally, by seeds or ova. But as, in the tribes I now refer to, we meet with neither nerves or nervous system, and as the reproduction of living matter does not necessarily demand the existence of a nervous system, or of that corporeal feeling to which alone, so far as we are acquainted with nature, a nervous system is capable of giving birth; we have the strongest reason for supposing that the generation of progeny is, in these cases, as unaccompanied with passion or sensation as in the instance of plants.

I have dwelt the longer upon this subject, as being anxious to divest one of the most elegant and interesting branches of natural history of the grossness and indelicacy with which it has been incrustated by the language and opinions of many modern physiologists; and to open it as widely as possible to the study and pursuit of every one.

It must be obvious, I think, that instinct has no more necessary connexion with feeling or sensation than with intelligence; and that even the faculties of attachment to life, resistance to destruction, the economy of pairing, and the process of generation, though often combined with both sensation and intelligence, are not necessarily combined with either of them; that intelligence is not more discrepant from sensation than sensation is from instinct; that either may exist separately, and that all may exist together.

Whence derive the young of every kind a knowledge of the peculiar powers that are to appertain to them hereafter, even before the full formation of the organs in which those powers are to reside? To adopt the beautiful language of the first physiologist of Rome,

Cornua nata prius vitulo quam frontibus exstent,
Illis iratus petit, atque infestus inurguet:
At catulei pantherarum, scymneisque leonum,
Unguis, ac pedibus jam tum morsuque repugnant,
Vix etiam quom sunt dentes unguisque createl.
Alitum proporso genus alis omne videmus
Fidere, et a pennis tremulum petere auxillarum.*

The young calf whose horns
Ne'er yet have sprouted, with his naked front
Buts when enraged: the lion whelp or pard
With claws and teeth contends, ere teeth or claws
Scarce spring conspicuous; while the pinion'd tribes
Trust to their wings, and from th' expanded down
Draw, when first fledg'd, a tremulous defence.

In like manner an infant, in danger of falling from its nurse's arms, stretches out its little hands to break the fall as though acquainted by experience with the use of such an action. We here meet with an instance of pure instinct; but we pursue the same conduct in adult age, and we have then an example of instinct combined with intelligence; and intelligence, instead of opposing the instinctive exertion, encourages and fortifies it. So when caterpillars, observes Mr. Smellie, are shaken from a tree, in whatever direction they descend, they all instantly turn towards the trunk and climb upwards, though till now they have never been on the surface of the ground.

The vegetable kingdom offers us examples of simple instinct equally singular and marvellous. Thus the stalk of the convolvulus twines from the left or east by the south to the west, the face being towards the south: the phaseolus *vulgaris*, or kidney-bean, pursues the same course: while the honey-suckle and the hop take a perfectly reverse direction. Who will reveal to us the cause of these differences?

In the following instances the cause is obvious: it proceeds from the peculiar structure and power of the different animals to which they relate: and it would perhaps be as obvious to us in the preceding, were we as intimately acquainted with the nature of plants as of animals. The squirrel, the field-mouse, and the very curious bird called nut-hatch (*sitta Europaea*), live equally on hazel-nuts; but each of them opens them in a very different manner. The squirrel, after rasping off the small end, splits the shell in two with his long fore-teeth, as a man does with his knife: the field-mouse nibbles a hole with his teeth as regular as if drilled with a wimble, and yet so small that it is wonderful how the kernel can be extracted through it; while the nut-hatch picks an irregular ragged hole with his bill; but as this artist has no paws to hold the nut firm while he pierces it, like an adroit workman he fixes it, as it were, in a vice in some cleft of a tree or in some crevice; when, standing over it, he readily perforates the stubborn shell; and while at work makes a rapping noise that may be heard at a considerable distance.†

The sphex or ichneumon wasp, in its perfect state, feeds on the nectary of flowers; but as soon as she is fitted to deposite her eggs, she becomes actuated by an appetite of another kind. She first bores a small cylindrical hole in a sandy soil, into which, by accurately turning round, she drops an egg: she then seeks out a small green caterpillar that inhabits the leaves of the cabbage-plant, and which she punctures with her sting, yet so slightly and delicately as not to kill it; she then rolls it up into a circle, and places it in the sandy nest immediately over the egg. She continues the pursuit till she has counted twelve; and has, in like manner, deposited twelve caterpillars one over the other; and repeats the same process till she has exhausted herself of her entire stock of eggs. She immediately closes the holes and dies,

* De Rer. Nat. v. 1035.

† See White's Nat. Hist. of Selbourne.

intrusting her eggs to the parent heat of the sun. The egg in each separate cell or aperture is soon hatched, and finds its food duly prepared for it, and from its enfeebled state incapable of resisting its attack, though preserved from putrefaction by the little life that has remained to it. It feeds progressively on the twelve caterpillars; and by the time it has exhausted them, becomes fitted for, and converted into, a chrysalis; in due time it awakes from its dormancy, works its way to the surface of the earth, throws off its chrysalid investment, finds itself accommodated with wings, rises into the atmosphere, feeds on the honey of plants instead of on maggots; and at length pursues the very same train of actions to provide itself with a progeny which was pursued by the parent insect of the year before.

In what I have thus far advanced, I have chiefly proved, however, that instinct may exist separately: I will next proceed to a few examples, in which it will be clear to every one that it may exist in conjunction with each of the other two principles of sensation and intelligence.

And, first, as to its union with sensation. Wherever a nervous system is to be traced, which alone is the source of sensation, we have abundant proofs of such an alliance. We meet with it, without having language by which to describe it, in the glow and elasticity of health, in the satisfaction of a cheerful meal, and in the refreshment of sound and natural sleep after fatigue; and we meet with it still more obviously, and in diversities which language is capable of characterizing, in all those natural emotions to which we have just adverted, and which, in consequence of such alliance, have obtained the popular name of instinctive sensations or feelings, but which in reality are peculiar instincts combined with peculiar feelings.

Let us select a few other examples. We are told by Galen,* that on opening a goat big with young he found one of the young ones alive, which he hastily snatched up, and took into a room where there were various vessels severally fitted for the purpose with wine, oil, honey, milk, grains, and fruits. The little kid first rose upon its feet and walked; then shook itself, and scratched its side with one of its hoofs; it next smelt alternately at all the dishes before it, and at last fixed upon and licked up the milk. In this case the sense of smell went distinctly in aid of the instinctive search after food, and determined the particular kind: so that the instinct and the sensation co-operated. Thus rabbits, when left to the operation of pure instinct, dig holes in the ground for warmth and protection: but after continuing for some time in a domestic state, and finding that they can obtain a more comfortable asylum by other means, and with less labour, they seldom pursue, even when they have an opportunity, the instinctive process, but burrow in the straw, or whatever material is provided for them.

In this case the sense of superior comfort combines itself, as in the preceding, with the instinct, and pursues the same end, though by a change of the means. So again, the new-born young of all animals, in whatever way they take their food, are at first stimulated by instinct alone. The lamb sucks, the chicken pecks, and the nestling of the sparrow gapes. In like manner, the mother secretes or selects its food from an instinctive stimulus alone. The udder of the dam swells and becomes painful, the crop of the pigeon does the same; and there are some birds, whose common food is grain, that during this season devour for their young, spiders and other insects, which nothing could induce them to touch at any other time. This sweet intercourse of natural action lays a foundation for something that in a short time shows itself to be superior to instinct, though it has often, but erroneously, been so denominated. The young of two different mothers, if interchanged as soon as they are born or hatched, are as satisfied with the foster or supposititious as with the natural parent: and the mothers, unless made suspicious of the deception, are as satisfied with their foster or supposititious young. But let the same interchange be attempted a week or a month afterward, and in no case will it succeed. Short as has been the intervening period, there

* De Locis, lib. vi. cap. 6.

has been a birth of feeling as well as a growth of form; the rising sense has united itself with the already mature instinct; and the natural nurse and the natural nursling will pine equally, if separated from each other.

The poet we have just adverted to, who may pre-eminently be called the poet of nature, has beautifully illustrated this remark by the yearning affection of the cow for her young calf when it has strayed from her or she has been robbed of it; hunting after it with intense anxiety in every direction, mourning for it with a cry that cannot fail to wind itself into every feeling heart, and equally refusing the fattening glebe and the refreshing stream.* The female dugong or sea-cow of the Sumatra coast, whose general history we have already given a glance at,† evinces a like degree of maternal affection; insomuch that when its young has been entrapped or speared, the mother pursues it so closely and so fearlessly as to be taken with the greatest ease. The young sea-calves have a short, sharp, pitiable cry, which they frequently repeat; and, like the stricken deer, are also said to shed tears, which, Sir Thomas Raffles tells us, are carefully preserved by the common people as a charm, the possession of which is supposed to secure the affections of those to whom they are attached in the same manner as they attract the mother to her young.‡

The instinct of this early age, however, belongs to such early age alone, and to the purpose of such early age alone: and when it has answered that purpose it ceases, and we meet with no more trace of it: but the feeling which follows so close upon it, and to which, perhaps, it has given birth, is of a higher order, and continues for a much longer period of time; and for a period of time, indeed, directly proportioned to its intensity, or, in other words, to the ascending rank of sentient or percipient life in which it makes its appearance.

Hence in the two lowest classes of animals, we meet with nothing of the sort whatever; the young of insects and worms having a foreign food provided for them without the intervention of the mother: and hence, too, in various quadrupeds and birds the feeling progressively dies away as the young become independent; while in man we behold the principle of intelligence, in its most lovely and interesting character, a moral and internal feeling, a sense of gratitude and veneration on the one side, of keen complacency and delight on the other, and of active affection on both, catching hold of the two preceding principles, and producing a strong cord of interunion that can never be broken but with the cords of the heart itself.

Something of the kind is occasionally, indeed, to be met with in quadrupeds, as I have formerly observed in the case of the seal and lamantin tribes (*trichecus Manatus*), which pass through life in families of single male and single female, never deserting or deserted by their young, till the latter, having reached the term of maturity, separate to found families of their own.

In these cases we see examples of all the three principles of instinct, sensation, and intelligence in a state of union: and we occasionally meet with still more extraordinary examples of the same fact. One of the most extraordinary, perhaps, is that related by Mr. Gilbert White, in his very interesting History of Selbourn, of the gratitude and affection of a young hare towards a cat by which it had been suckled and brought up; the leveret following the cat about the garden, playing with her like a kitten, and bounding towards her upon her purring or uttering any other call of tenderness.

We see something of the same kind of internal feeling, and often exalted to a still higher pitch, in the gratitude and affection of the fond and faithful dog for a kind and indulgent master; occasionally, indeed, rising superior to, and openly triumphing over, the strongest instinctive feelings of the animal frame, over thirst and hunger, and the love of life itself; and inciting him to perish voluntarily by the side of his master and share his grave, rather than abandon his corse, when, in the course of a solitary journey, he has suddenly fallen a victim to accident or violence. The late Bishop of Landaff has a

* De Rer. Nat. ii. 352.
† Phil. Trans. 1820, p. 161.

‡ Series II, Lecture II. p. 192.

striking anecdote to this effect in his very interesting *Life*, in which he relates the sudden disappearance of a man, who, it seems, had perished on the top of Helvellyn; his body was found two months afterward in this exposed and desolate spot, with his faithful dog still sitting by it.* And he adds a similar tale, told him by the duke of Northumberland, concerning a young antelope that had perished by a fall, whose mother immediately quitted the pasture in which she was feeding, sat piteously by the side of the body, which she refused to quit, and died of grief and hunger.

I will only adjoin another case of a like interesting kind, that occurred not long since in my own family. A favourite cat, that was accustomed from day to day to take her station quietly at my elbow, on the writing-table, sometimes for hour after hour, while I was engaged in study, became at length less constant in her attendance, as she had a kitten to take care of. One morning she placed herself in the same spot, but seemed unquiet; and, instead of seating herself as usual, continued to rub her furry sides against my hand and pen, as though resolved to draw my attention and make me leave off. As soon as she had accomplished this point she leaped down on the carpet, and made towards the door with a look of great uneasiness. I opened the door for her as she seemed to desire; but instead of going forward, she turned round and looked earnestly at me as though she wished me to follow her, or had something to communicate. I did not fully understand her meaning, and being much engaged at the time, shut the door upon her, that she might go where she liked. In less than an hour afterward she had again found an entrance into the room, and drawn close to me; but instead of mounting the table and rubbing herself against my hand as before, she was now under the table and continued to rub herself against my feet; on moving which, I struck them against a something which seemed to be in their way; and, on looking down, beheld, with equal grief and astonishment, the dead body of her little kitten covered over with cinder-dust, and which I supposed had been alive and in good health. I now entered into the entire train of this afflicted cat's feelings. She had suddenly lost the nursling she doted on, and was resolved to make me acquainted with it,—assuredly that I might know her grief, and probably also that I might inquire into the cause; and finding me too dull to understand her expressive motioning that I would follow her to the cinder-heap on which the dead kitten had been thrown, she took the great labour of bringing it to me herself, from the area on the basement floor, and up a whole flight of stairs, and laid it at my feet. I took up the kitten in my hand, the cat still following me, made inquiry into the cause of its death, which I found, upon summoning the servants, to have been an accident in which no one was much to blame; and the yearning mother having thus attained her object, and gotten her master to enter into her cause, and divide her sorrows with her, gradually took comfort, and resumed her former station by my side.

Yet, not unfrequently we meet with instances of the union of intelligence alone with instinct alone; of design and contrivance directed to extraordinary occasions, no moral or internal feeling being necessary.

The rook usually and instinctively builds her nest in the tallest branches of the tallest trees: in Welbourn churchyard, however, as we learn in a letter to Dr. Darwin, from a relative, a rookery was not long since formed on the outside of the spire, and the tops of the loftiest windows. There had formerly been a row or grove of high trees in the neighbourhood, but they had been cut down; and their aerial tenants being dispossessed of their proper mansion, had betaken themselves to the church-spire and windows, as the most appropriate building for their purpose; and had thus manifestly evinced the

* Sir Walter Scott has, with much judgment, selected a similar, perhaps the same story, as the basis of one of the most impressive and popular ballads in the English language:

I climb'd the dark brow of the mighty Helvellyn,
Lakes and mountains beneath me gleam'd misty and wide,
All was still, save, by fits, when the eagle was yelling,
And starting around me the echoes replied, &c. &c.

alliance of instinct with intelligence.* So the jackdaws of Selbourn, according to Mr. White, not finding a sufficiency of towers and steeples, and lofty houses, on which they usually hung their nests in this pleasant village, accommodated themselves to the occasion, and built them in forsaken rabbit-burrows.

The ostrich is accused of a total want of natural feeling, because she abandons her eggs to be hatched by the heat of the sun: when incubation is necessary, however, the ostrich instinctively employs it, and that, too, in conjunction with an intelligence which is rarely evinced by other birds. Thus in Senegal, where the heat is still great, she relinquishes her eggs during the day, but sits upon them through the night; and at the Cape of Good Hope, where the heat is less considerable, she sits upon them, like other birds, both day and night. In like manner ducks and geese, though not renowned for sagacity, cover up their eggs when they quit them, till their return to the nest; and there are few birds that do not turn and shift their eggs at different periods of the tedious process of incubation, so as to give an equal degree of warmth to every part. We have already observed, however, that the accommodating power of the instinctive principle to particular circumstances, which so wonderfully enables it to supply the place of reason, gives it, in many instances, a striking assumption of its character. It is, hence, possible that one or two of the examples here noticed may be referrible to this accommodating faculty; but the exercise of a certain extent of reason, as a distinct principle, must be admitted in several of them, in which there is not only a display of design and contrivance towards the accomplishment of this new object, but apparently of design and contrivance as the result of a general convention and discussion of the question submitted to the tribe assembled on the occasion, and whose common interest is at stake.

Generally speaking, the principle of instinct is perfect and infallible in its guidance; there is, however, an occasional aberration, perhaps a playfulness, in this as in every other part of nature. Thus the light of the candle is, by flies and various other insects, mistaken for the light and warmth of the sun, often to the loss of limb or even life itself. So the flesh-fly and blow-fly (*Musca carnifica* and *M. vomitoria*) are deceived by the smell of the carrion-flower (*Stapelia hirsuta*), and often deposit their eggs upon it instead of upon putrescent meat; in consequence of which the grubs die almost as soon as hatched, for want of proper nourishment.

In like manner we find, occasionally, a few migrating birds in countries where they were never seen before, and which have evidently mistaken their course.

There are various instincts, connected, for the most part, with a singularity of configuration, that are either peculiar to the birds, or altogether anomalous. But they show, at least, that the great Author of nature is the lord and not the slave of his own laws, and is at all times capable of producing definite effects by a diversity of means. Thus the *Didus solitarius*, or solitary dodo, in general esteemed almost as stupid a bird as the ostrich, divides the labour of incubation with his female, and alternately sits upon the eggs during her absence. The hen of this tribe has a protuberance on each side the breast, like the teat of quadrupeds. When the young of the turtle-dove are hatched, and capable of receiving nutriment from the crop of the mother, the male parent experiences an equal change and enlargement in this organ, secretes the same nutritive material, and equally contributes to the support of its nestlings.

I have already observed that insects in general deposit their eggs in places admirably suited to the future wants of the nascent larvae, and then for ever take leave of their embryo progeny: but the forficula *auricularia*, or common ear-wig, broods over her young like a hen, and only quits them at night, which is the usual period in which this genus flies in pursuit of food or recreation.

* Darw. Svo. i. p. 241.

Among migrating birds it is not very uncommon for the males alone to dare the dangers of a distant voyage, and to leave the females behind them: but in the fringilla *Celebs*, or chaffinch, we find this rule completely inverted; for the female chaffinches of Sweden quit their males and migrate to Holland towards the winter, and duly return to them in the spring; while many of the males indulge in a profound sleep during the greater period of their absence.

Most vegetables indulge in a winter-sleep of the same kind; but there are some that sleep still longer. Thus the tuberose root of the ferraria *Ferrariola*, an ornamental herbaceous plant of the Cape of Good Hope, remains torpid every alternate year, and sometimes continues in this state for two years together, without putting forth either leaf or fibre.

Let us close these observations with a momentary glance at the very singular instinctive powers of the cancer *ruricola*, or land-crab. This is an inhabitant of the tropical regions, and especially of the Bahama islands: it is gregarious, and associates in large bodies that preserve an orderly society, for the most part, in the recesses of inland mountains, though they regularly once a year march down to the seaside in an army of some millions, to deposit their spawn in the ocean. The time selected for this expedition is usually the month of May, when they sally forth from the stumps of hollow trees, the clefts of rocks, and subterranean burrows, in enormous multitudes. The whole ground, indeed, is covered with this reptile band of adventurers; and no geometrician could direct them to their destined station by a shorter course. They turn neither to the right hand nor to the left, whatever be the obstacles that intervene: and if they meet with a house they will rather attempt to scale the walls than relinquish the unbroken tenor of their way. Occasionally, however, they are obliged to conform to the face of the country; and if it be intersected by rivers, they pursue the stream to its fountain head. In great dearth of rain they are compelled to halt, when they seek the most convenient encampment and remain there till the weather changes. They make a similar halt when the sun shines with intense heat, and wait for the cool of the evening. The journey often takes them up three months before they arrive on the seacoast; as soon as they accomplish which, they plunge into the water, shake off their spawn upon the sands, which they leave to nature to mature and vivify, and immediately measure back their steps to the mountains. The spawn, thus abandoned, are not left to perish: the soft sands afford them a proper nidus; the heat of the sun, and the water, give them a birth; when millions of little crabs are seen crawling to the shore and exploring their way to the interior of the country, and thus quitting their elementary and native habitation, for a new and untried mode of existence. It is the marvellous power of instinct that alone directs them, as it directed the parent hosts from whom they have proceeded; that marvellous power which is co-extensive with the wide range of organic life, universally recognised, though void of sensation; consummately skilful, though destitute of intelligence; demanding no growth or developement of faculties, but mature and perfect from its first formation.

The general corollary resulting from these observations is as follows: that instinct, as I have already defined it to be, is the operation of the principle of organized life by the exercise of certain natural powers, directed to the present or future good of the individual; while reason is the operation of the principle of intellectual life by the exercise of certain acquired powers directed to the same object: that it appertains to the whole organized mass, as gravitation does to the whole unorganized; equally actuating the smallest and the largest portions, the minutest particles and the bulkiest systems; every organ and every part of every organ, whether solid or fluid, so long as it continues alive: that, like gravitation, it exhibits, under particular circumstances, different modifications, different powers, and different effects; but that, like gravitation, too, it is subject to its own division of laws, to which, under definite circumstances, it adheres without the smallest deviation; and that its sole and uniform aim, whether acting generally or locally, is that of perfection, preservation, or reproduction.

Of its mode of existence we know nothing: but as little do we know of the principle of gravitation or of mind. We can only assure ourselves that they are distinct powers, perhaps distinct essences; and we see them acting, as well separately as conjointly, for the general good. Under their accordant influence we behold the plastic and mysterious substance of matter, which we must be especially careful not to confound with themselves, rising from "airy nothing" into entity; ascending from invisible elements into worlds and systems of worlds; from shapeless chaos and confusion, into form, and order, and harmony; from brute and lifeless immobility, into energy and activity; into a display of instinct, feeling, perception; of being, and beauty, and happiness. One common design, one uniform code of laws, equally simple and majestic, equally local and comprehensive, pervades, informs, unites, and consummates the whole. The effect, then, being one, the mighty cause that produced it must be one also; an eternal and infinite unity—the radiating fountain of all possible perfections—ever active, but ever at rest—ever present, though never seen—immaterial, incorporeal, ineffable: but the source of all matter, of all mind, of all existences, and all modes of existence. Whatever we behold is God—all nature is his awful temple—all sciences the porticoes that open to it: and the chief duty of philosophy is to conduct us to his altar; to render all our attainments, which are the bounteous affluents of his spirit, subservient to his glory; and to engrave on the tablet of our hearts this great accordant motto of all natural and all revealed religion, of Athens and of Antioch, of Aratus and of St. Paul, "in him we live, and move, and have our being."

Ἐκ Διὸς ἀρχόμεθα—
πάντη δὲ Διὸς κεχρημέθα πάντες·
Τοῦ γὰρ καὶ γένος ἐσμέν.*

LECTURE VI.

ON SYMPATHY AND FASCINATION.

We have now summarily contemplated several of the most important phenomena both of organic and inorganic nature; and have traced out something of the laws by which these phenomena are produced and regulated. Among the most extraordinary facts that have occurred to us may, perhaps, be enumerated the occasional production of effects by causes which do not appear to be immediately connected with them; the operation of one body upon another remotely situated, and which, so far as we are able to trace them, have no medium of communication. The sun is perpetually acting upon and influencing the earth, the earth the moon, the moon the ocean: the magnet operates upon iron, whatever be the sheet of substance interposed; and if the iron be divided into small filings, so that the different particles may move with facility, communicates to each an obvious polarity, and gives to the whole a peculiar and beautiful arrangement. And the repulsive and attractive powers of the electric fluid are supposed to act upon each other, not only where two or more particles of this fluid are perfectly or very nearly in contact, but between all particles of it, at all distances, whatever obstacles may lie between them.†

Chemical science lays open to us a wonderful field of similar affections and affinities. Within the range of its peculiar regions, we behold almost every substance evincing a determinate series both of inclinations and of antipathies, strongly attracted by one kind of material, indifferent towards a second, and powerfully avoiding a third. From these extraordinary endowments proceeds unquestionably the union or separation of different bodies,

* Arat. Phenom. 1. 4, 5.

† Young's Lectures, vol. i. p. 659.