

*WILD TRAITS
IN
TAME ANIMALS*



LOUIS ROBINSON

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THE PRIMITIVE NATURALIST.

No. 1712

WILD TRAITS IN TAME ANIMALS

BEING SOME
FAMILIAR STUDIES IN EVOLUTION

BY

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WILLIAM BLACKWOOD AND SONS
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PREFACE.

IT is my hope that this book will be of some service as an introduction to the study of Evolution. Not a few people who have a taste for Natural History seem unable to grasp the application of the Darwinian doctrine to the everyday world about them, and I feel sure that many of these will thank me for showing how interesting some of the most trivial and commonplace facts about animals become when viewed in this light.

Several of the chapters have been founded upon articles which were written originally for young students in the United States and were published in the 'North American Review.' The greater part of that on Dogs appeared in the 'Contemporary Review,' under the title of

“Canine Morals and Manners.” The rest have been chiefly evolved from papers contributed to ‘Blackwood’s Magazine.’ Although all have been entirely re-written, in the hope that they might thus be made more worthy to appear in book form, I have thought it best to retain the somewhat easy and colloquial tone adopted in the original articles. As far as I can see, this need not detract from the value of such a work to more serious students so long as all facts and inferences are set forth with the care and precision demanded by science.

It will be seen by those who read the book that I have put forward several new and perhaps somewhat startling hypotheses. These I wish to be considered as standing only upon such facts as can be adduced in their support. Every reader is at liberty to form his own judgment as to the apparent “protective mimicry” exhibited by the tabby cat, or as to the political significance of the white tail of the rabbit. Still, I think it is not improbable that many competent

naturalists will agree with the views I have advanced.

My thanks are due to the Editors of the Magazines and Reviews above mentioned for their courteous permission to republish the articles. I take this opportunity also of expressing my obligations to several friends who have criticised my work, both from the literary and scientific standpoints, and have enabled me to remove not a few serious defects. Especially do I thank Mr S. T. Dadd for the infinite pains he has taken in preparing the illustrations. In almost every instance (and in all where technical accuracy was important) the sketches were made direct from nature, and were submitted to competent authorities before they were finally completed.

STREATHAM HILL,
LONDON, S.W., *Oct. 4, 1897.*

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WILD TRAITS IN TAME ANIMALS.



CHAPTER I.

INTRODUCTION.

IN spite of the immense stimulus which Darwinism has given to the study of Natural History, I am afraid that hitherto it has proved rather a stumbling-block than a help to a large number of people who take an interest in such pursuits.

Most of these belong to a class who take up some branch of natural history as a hobby for leisure hours. One hardly likes to speak of such students as amateurs; for the term generally savours of contempt when used in connection with the arts and sciences. We owe so much to observers, from Gilbert White downwards, to whom the study of animated nature has been

chiefly a source of recreation, that it would be a great mistake either to hold their work cheap or to make their way needlessly difficult. When, therefore, the word "amateur" occurs in the succeeding pages, it is merely employed to distinguish naturalists of this order from those who have adopted the study of natural science as a profession.

To a certain extent the untoward effect of the new doctrine on many of the older order of naturalists was inevitable. Our ideas concerning nature have been so revolutionised during the last generation, that one can hardly expect mature students to find themselves at home in their novel environment; while any attempts to patch the new doctrine on to the damaged remnants of the old, was like putting new cloth in an old garment. Although, as I shall point out later, the amateurs have themselves to blame to a certain extent, their hindrances have come largely from outside.

In some directions the same fate seems to have overtaken the pursuits of the naturalist which in these strenuous days has overtaken various popular sports. Professionalism has seized them for its own, and has established methods and standards which are beyond the reach of any but the

professional. The impetus given by the new doctrine has not only greatly multiplied the number of earnest professional workers, but it has also increased the mass of our knowledge to such an extent that no little perseverance is necessary to enable a beginner to master the initial details of any branch of natural history in which he hopes to excel. It is one thing to cull fresh knowledge in the open fields, but it is quite another, and requires sterner stuff than a spirit of dilettanteism, to wrestle with dry bones and technicalities in a stuffy library or museum. Again, the increased energy given to research is rapidly using up a great deal of the material upon which our fathers busied themselves. Their happy hunting-grounds have been surveyed, mapped, and annexed by the speculative professor, and the fauna and flora thereon catalogued with a business-like precision which would do credit to an auctioneer. The naturalist who is content with merely collecting and classifying natural objects now finds that he must go very far afield if he is to be more than an imitator of other men's labours.

Furthermore, it must, I fear, be admitted that some things, which are not roses, have been strewn in the path of the amateur naturalist by

certain of his professional associates. This was probably more true ten years ago than it is to-day, and it is to be hoped that advancing civilisation will remove such causes of offence. But any one who has studied the habits of that uncompromising vertebrate, the Learned Official, when he designs to mix with common folk at British Association meetings and elsewhere, will probably have observed that certain members of the order treat their less exalted fellow-workers with a somewhat disdainful patronage. Doubtless this is partly due to a temporary combination of youthfulness and authority among some of the leaders of the new movement, which has resulted from rapid progress. But there seems also a tendency on the part of a larger number of professional naturalists to assume *quasi*-manorial rights in certain regions of nature's kingdom. It is apparently a natural law that wherever the members of a corporation become the licensed exponents of a subject—whether it be divinity, natural science, or what you will—they develop the spirit of the custodian, if not of the proprietor, and tend to regard all others who meddle with it with a certain amount of jealousy.

But it will be a disastrous day for science if

natural history ever becomes a close preserve of specialists and professors. For a brief review of the progress of knowledge in this direction shows that many of the most important discoveries have been made by the despised amateur. Furthermore, it is from the ranks of these enthusiastic volunteers that by far the best material in the great army of regulars is recruited. The true naturalist, like the poet, is born, not made. No amount of scholastic hammering, or Government patronage, or societies for the organisation of research, can evolve a Cuvier or a Darwin.

Yet if it be true that the old-fashioned amateur is trending towards extinction, he has chiefly himself to thank. Should he fail to adapt himself to his changed environment, he must go the way of all flesh which has proved its unfitness in the struggle for existence. His chief weak point hitherto has been his lack of versatility. We shall find the cause of many failures in attempts to apply the principles of Darwinism in this want of power to accord with new conditions. In some cases it is evident that efforts to keep pace with the times have ended in confusion because there has been an attempt to pile new bricks upon an old and sapped foundation. In many others

failure has resulted because the knowledge of evolutionary laws has been merely theoretical and superficial. There has been an immense amount of literature upon the subject of Darwinism poured out during the last thirty years, much of it of a very speculative and evanescent character. One can hardly wonder, therefore, if many students are somewhat bewildered as a result of trying to inform themselves from such sources. If the amateur naturalist is to profit by the new doctrine his information must be thorough and based upon experience, even although it may not be extensive. When we are going to make use of knowledge for some practical purpose, we generally find that it is necessary to have a much more thorough grip of our subject than can be gained from studying verbal statements and formulæ. It is often absolutely impossible to obtain from books the kind of knowledge which is demanded in practice. What traveller about to undertake an expedition in which a knowledge of horsemanship or cycling was necessary, could expect to reach his goal if he contented himself with reading exhaustive treatises on these arts? The very act of walking, which we deem so simple, would, if taught in an abstract and aca-

demic way, tax the faculties of a Newton or a Kelvin. I once knew a learned gentleman—no longer young—who felt it advisable to add proficiency in dancing to his many attainments. Not wishing to make himself ridiculous by practising before others, he shut himself up in his study and bent his whole soul upon a handbook professing to teach such accomplishments. He had abilities of no mean order, and had already gained fame as a physicist; but after puzzling out—with the aid of intricate diagrams—all the mysteries of the *quadrille*, he stuck at the *pons asinorum* (or shall we say *chêvaux de frise*?) of the *lancers*, and confessed that the whole thing was utterly beyond him. What would have happened if, at the risk of a mental breakdown, he had persevered to the end and had then appeared in a ballroom, I will leave to the imagination of my readers.

But if there are a good many amateur naturalists whose knowledge of evolution is too imperfect to be of any practical value, there are probably still more who may be said to possess none at all. If any one doubts this statement, let him commence a discussion on Darwinism with any average schoolboy, sportsman, or country parson, and it will meet with abundant support. I mention

these three classes because from them, probably more than from any others one can name, are drawn the people who make a hobby of some branch of natural history. The failure of the schoolboy is owing partly to the inveterate conservatism of our educational methods, and partly to the slovenly way in which science is still taught in schools. To the sportsman, as a rule, reading is uncongenial; and books bristling with new and technical terms and full of half-digested theories are an abomination. As to the average country parson, he still seems to think not only that the Darwinian theory is a disputable doctrine, but that, unless filtered and diluted by ecclesiastical wisdom, it smacks of infidelity.

By-and-by, when doctrines which are still novel to most people (although forty years old, and to many of us as much a matter of course as the laws of gravitation) find a place in the elements of knowledge absorbed by every youth, we may expect most of these difficulties to disappear. But in the meantime they may be depriving us of some second Gilbert White, who, from his country parsonage, might send us news of a thousand delightful and invaluable facts which would be beyond the reach of any but a cultured observer who lives among the fields and woods.

For the latter day Gilbert White must be an evolutionist down to the tips of his toes. The Darwinian way must be as familiar to him as the footpath from his rectory to his church. His very spectacles must be tinged with the doctrine, and his mind must employ its methods as easily as his lungs breathe the air. There is every reason to hope that the future will bring us seers of this type, and it is with the desire that I may in some slight measure hasten their advent that I here invite attention to the light which Darwinism throws upon the everyday world about us.

It will be a good way to show how wonderfully the amateur student may gain both in pleasure and knowledge from the new philosophy—and at the same time will be consistent with the methods I am recommending—if we briefly discuss some points in the natural history of the naturalist himself. Undoubtedly his passion for outdoor life, and for watching and recording natural phenomena, dates back to the time when the existence of our forefathers depended upon success in hunting. We are all of us aware that only a few thousand years ago the ancestors of the modern European and American had only reached a stage of culture still found among savages which depend entirely upon the chase. Plentiful evidences are

discovered in limestone caves, in the banks of ancient rivers, and in the shell-mounds around the Danish coast, that prehistoric Europeans lived almost precisely the life now lived by the Fuegians or the Australian blacks. But few of us, I imagine, have realised the enormous length of the epoch throughout which this stage of utter savagery lasted. It is utterly impossible to measure its length in years; but every geologist and anthropologist will support me when I say that, when compared with the historical period, it was of inconceivable duration. Probably it would be no exaggeration to say that if you took the last leaf of this book as representing the era of civilisation, you might take all the other leaves as representing, in equal proportion, different stages of the epoch of pristine savagery. Now since man had to live by the chase, and by the chase only, throughout the greater part of this period, it is no wonder that all his faculties of mind and body became moulded to the environment of the hunter. To such primitive savages the habits of taking note of everything around them and of drawing conclusions from what they observed were absolutely essential. Under the immemorial *régime* of the Stone Ages these were just

as much *business habits* as are those which now lead to success in any branch of commerce. Indeed they were even more so, for nowadays if one becomes bankrupt there are many mitigating circumstances; but in prehistoric times there were no poor laws or charities, and failure in business meant extinction. Even the miscarriage of a single enterprise, such as the throwing of a spear at a cave-bear or a bison, often involved a death penalty.

We owe our instinctive liking and aptitude for naturalising in the open air to the fact that the practical study of natural history was at one time of saving value to our race. Not only did such accomplishments stave off imminent death—as when the recognition of a footprint or a faint sound in the forest told of the presence of some terrible enemy—but they acted surely if slowly in many other ways to the advantage of their possessor. Among the Esquimaux the hunter who could be depended upon to bring home his seal at the end of a day's business on the ice-floe could not only have the pick of the girls in marriage, but gained other privileges which tend to make a family prosperous.

Now let us inquire somewhat more in detail as

to the faculties which every savage hunter must possess in order to be successful. First of all, he must have a general knowledge of natural phenomena, accurate and inconceivably extensive; so that when he is afield, every item among his innumerable surroundings is so familiar that the least unusual circumstance at once arrests his attention. Next, he must have acquired, in addition to his general knowledge, a complete mastery of the complex arts of tracking and stalking, so that he may approach near enough to his wary game for his rude weapons to take effect. If we go no further than this, we find that the untutored savage in his native wilds almost comes up to that formula which defines culture as "knowing something of everything and everything of something." But other gifts are required beyond mere knowledge and skill. There must be an infinite capacity for taking pains (which has been given as a definition of genius), and also, and above all, there must be a power to reason accurately from the facts observed. I think that many people who have spoken with contempt of the mental capacity of the Bosjesmen and the Black Fellow can never have estimated the mental resources required for ordinary "spooring."

Each minute item of evidence — often so faint that civilised senses can no more apprehend it than the unassisted eye can detect the microbes in a drop of water—has not only to be observed but to be weighed, and given its exact value in a long and intricate argument.

If I may be allowed to digress from the “spoor” of our present argument for a moment, I should like to point out what seems to have been one exceedingly important factor in the development of the human intellect. In the next chapter I shall discuss, in comparing a man’s mental processes with a dog’s, the probable psychic effect of the comparative size of the *olfactory lobe*. I mean by the *olfactory lobe* that part of the brain—so remarkably developed in the *canidæ* — which receives impressions from the nerves of smell.

Now why has man no olfactory lobe to speak of? And what may possibly be the outcome of the deficiency? The answer to the first question is, that man’s progenitors were fruit - eating creatures which lived in trees. Now a frugivorous animal obviously does not need a keen power of scent for detecting and following prey. It usually discovers its food by means of the eye,

and one finds that Nature has adapted herself to this state of things by making most fruits of conspicuous colours. Although this may partly explain why man and all the apes have the organ of smell so very slightly developed, it is plain that hereditary vegetarianism will not fully account for their olfactory poverty. For we find that very many graminivorous animals—such as antelopes, deer, wild horses, and wild cattle—have an exceedingly acute power of scent, and can detect the approach of an invisible enemy at several hundred yards' distance. But a little thought will show that the life of a creature living high in the trees is never threatened by a foe approaching stealthily from afar off, and hence such a means of protection is unnecessary. And, moreover, in such a situation this sense would be very untrustworthy, for air among the tree-tops moves in eddies and veering gusts, owing to the continual obstructions it meets with, and hence would not tell the direction from which the taint of danger came. Now when man left his trees and his vegetarianism behind him and became an amateur carnivore, there was this great distinction between him and the predatory beasts whose habits he was imitating—viz., that whereas they were able both to

detect and to follow their quarry by scent, he found his nose practically of no use as an aid to a living. Had he developed, during his early earth-walking career, olfactory powers anything like equal to those of the dog, I make bold to say that all of us, if we were now existing, would be getting our livings by sniffing for roots and grubs like a badger, or by yelping along a trail like a pack of jackals! Because, happily, he could not profitably follow his nose, primitive man was obliged to exercise his wits. Where the dog or the wolf gallops blindly and without thought along the tainted line left by the feet of his quarry, the primeval hunter had, from the first, not only to learn to notice each displaced twig, or shifted stone, or shaken dew-drop, but had also—from these and a thousand other data—to infer what had passed that way, when it had passed, and often, in the case of one wounded animal in a herd, *how* it had passed, and whether it were sufficiently disabled to make pursuit a profitable speculation. As far as I can see, this faculty, engendered and necessitated by olfactory shortcomings, formed the basis of much of our vaunted reasoning power.

When we analyse, not only the hobby of the

naturalist, but almost any other form of pastime, we find that it is founded upon certain primitive tastes or instincts which we possess in common with the uncivilised races. Civilised man when at play always reverts somewhat towards the condition of the savage.

The play instinct is one of the characteristics of immaturity, and most of our efforts at recreation involve attempts to revive or prolong the youthful spirit. Now all young creatures, whether of our own species or not, tend both in bodily structure and in mental attributes to resemble remote ancestors.

Who can doubt that the passionate delight in "killing something" displayed by so many of the more vigorous specimens of our race is traceable to the old destructive instincts which all savages possess in common with their chosen exemplars, the Carnivora?

Having traced the impulse both of the sportsman and the field-naturalist to their pristine basis, let us endeavour to picture one of our prehistoric ancestors engaged in his everyday pursuits; and we shall, I think, get a hint from him as to the way in which the Darwinian doctrine may greatly enhance the value of natural

history as a source of recreation. As I have said above, we are able, with a fair amount of certainty, to reproduce the savage European of ancient days by comparing him with modern primitive races with whom the traveller and the anthropologist have made us well acquainted.

Probably if any difference existed other than that of colour between the earliest Britons or Frenchmen of whom we have any traces, and the American or Australian aborigines, it was in the direction of a greater doggedness of character, and perhaps of a superiority in reasoning from the evidence of the senses.

The sun has risen over the great eastern plain that now constitutes the German Ocean. From his dwelling-place, consisting of a river-side cave, the entrance of which is closed by roughly interlaced branches, strides our primitive forefather. He is a brawny, hirsute savage, hard-featured and ruddy like a modern tramp, with his face and naked limbs stippled over with tattoo-marks. His dress, such as it is, is made of skins of the deer and wild cat, and is drawn together by a belt holding a flint axe. In his hand is his bow, and hanging behind his left shoulder a rough quiver of flint-tipped

arrows. After a keen look at the sky and up and down the valley, he moves stealthily away among the bracken and brambles towards a spot where the spotted deer of the forest are wont to drink at the stream. As he steps silently along, his eyes and ears are alert for the least indication of the presence of prey or of dangerous neighbours. A hundred facts have already been observed and commented upon (although perhaps unconsciously) before he arrives at the river-bank. He has, in fact, during this short "journey to business" been reading his morning paper, including the Weather Forecast, the News of the Night, and the State of the Markets as they affect his own special calling. As in the case with most of us when we read our modern newspapers, many of the items displayed before his eyes do not awake any interest. For instance, the varnished petals of the buttercups which reflect the golden sunlight are there to catch the attention of the wild bees which are already fussing around them. Such advertisements do not concern him at all, and he does not trouble himself about them any more than we trouble ourselves about wants of people with whom we have no points of contact. As he

nears the trampled spot where the thirsty herds approach the water, he hears the shrill cackle of a blackbird away in the forest some two hundred paces beyond the deer-path, and the screech of a jay accompanied by the warning "pink pink" of a pair of chaffinches coming from a spot nearer to him. Instantly he slips behind the bole of a tree and stands motionless and alert, with an arrow upon the string, for he has received sure intelligence that some beast of prey is prowling near, and it is necessary that he should gain the fullest information before proceeding. As he stands there, still as the tree-trunks about him, do you imagine that his mind (although the nearest alphabet is ten thousand years off in the future) is sluggish or inactive? It would be well for us if we could bring such keen and apposite thoughts to bear upon our avocations whenever we wished as those which are now coursing through his brain! A dozen different theories, suggested by the signs, are being sifted with lightning rapidity and with masterly discretion by the machinery inside of that rugged, weather-beaten head. At the same moment every faculty is keenly astretch for further information which may aid in the con-

clusion he must come to before he stirs hand or foot. Is it merely a belated fox slinking home to his earth in the oak-grove? He knows that fox well and all his kindred within an area of several square miles. Or is some larger and more terrible beast, some huge brindled *machairodus*, or cave-bear, prowling among the woods in front of him? Within a few minutes, while he stands there scarcely moving an eyelid, he has received reports enough from the disturbed birds and beasts in the valley to fill a column in the 'Times.' By comparing the different notes of alarm which reach his ears he learns at length that there are two sources of provocation afoot: one is comparatively near to him, and is merely a fox or wild cat, he cannot tell which—for the chaffinches and the jays have the same name for both; but the other, where first he heard the blackbird's vehement outcry, is a larger beast, which, from the shifting cries of protest, seems passing slowly down the river-bank. As far as he can judge, considering its beat and the time of day, it is a sabre-toothed tiger on the prowl for deer. These conclusions have been come to, not only through the gathering of innumerable facts, but by means of elab-

orate logical processes, and a power of judging the comparative value of evidence which would do credit to a modern Lord Chancellor.

At length he cautiously moves forward and comes upon the slot of the antlered herd. A glance tells him that they have been startled before reaching the brook, and have made their way at headlong speed back into the forest. Further scrutiny of the ground reveals the fact that a huge *machairodus* has leaped from behind a bush, has clawed the flank of one deer without seizing it, and after galloping clumsily some twenty yards after the herd, has given up the pursuit, and turned down the river-bank in the direction from whence came the blackbird's shriek of warning. The keen eyes of the savage wander over the ground in search of one further piece of evidence of the utmost importance. At length he sees where the hoof of a flying hind has displaced a pebble. Bending down and shading his eyes from the dazzling sunlight, he examines the damp surface of the stone intently; and when he rises, ten seconds later, he could tell you, if you were to ask him, that the events recorded in the writing on the ground happened almost exactly half an hour

before he arrived at the spot! If he were ready to reveal his methods, you would probably learn that in making this calculation he took account of the temperature of the air, the direction of the wind, the character of the pebble and of the soil in which it had lain embedded. Plainly such problems could not be solved with success without an immense and most accurate knowledge of natural phenomena, an alert imagination, and logical ability of no mean order.

We will now wish him "good hunting," and return across the centuries. For, although it would be very interesting to accompany him on his day's round and watch his method of getting a living, we have "other fish to fry," and having, I think, captured what we want for the purpose during our early excursion, we will no longer embarrass our archaic progenitor with our clumsy civilised ways.

Whether or no this imaginary family portrait is correct in its details, I think we may be tolerably positive as regards one particular. It was an invariable and essential mental habit with him not only to gather facts, but to read their meaning, both immediate and remote. Now, if we are justified in ascribing the delight

which the study of natural history gives to the fact that, when we are engaged in such pursuits, we are obeying an inherent impulse derived from our innumerable hunting ancestors, it follows that the more closely such primitive instincts are obeyed the more enjoyment will the naturalist be likely to get from his pursuits. If, in addition to merely collecting specimens and classifying them, we are able like our skin-clad forefathers *to regard each item as part of an argument or a narrative*, we shall reawaken more fully the keen delight in outdoor pursuits which was the daily portion of the savage.

Now this is exactly what Darwinism has enabled us to do. Even if we are among those who go no further than did most of the older naturalists, and content ourselves with merely observing and recording, our pursuits gain infinitely in zest. For the most trivial scrap of knowledge, which at one time would only have been one more item added to the chaotic dust-heap of useless lore, may now turn out to be a diamond beyond price. Many times of late years has some small and apparently valueless discovery enabled the man of science to establish some widely reaching law. No single character

in the book of nature is without its meaning, and even when the key to her cipher is not yet in our hands, the astonishing progress which has been made during a single generation makes it probable that we have only to wait and to labour awhile longer to be able to read the wondrous tale. Darwinism has done more in this way for the naturalist than the spectroscope has done for the astronomer, or the discovery of the cuneiform alphabet for the archæologist. As yet we are only stumbling among the elements of the new method, but already it is often possible, by exercising our reasoning faculty and our knowledge of natural laws when observing the most commonplace phenomena, to see in them a revelation of the past which was utterly beyond the reach of our fathers.

Yet it must never be forgotten that if our attempts to interpret nature's hieroglyphics are not based upon extensive and accurate knowledge, we shall run the same risk of coming to wrong conclusions as would the savage if he were not thoroughly versed in all phases of his wild surroundings. It is necessary to keep a constant check upon the innate propensity to draw inferences from whatever we see or think

we see. One finds that this habit of the human mind is curiously automatic : for constantly when we are in a "brown study," and even when we are asleep, we find that attempts are being made, although often of a vague and fatuous kind, to give reasons for what chances to be occupying the attention. The fact that this habit is universal among mankind, and that it is also innate and automatic, asserts its extreme antiquity. Probably in it we find the actual merging point of instinct and reason. Like many other mental and moral attributes which have come down to us from the remote past, it is liable to get us into grave trouble if not controlled by the most vigilant discipline. Regarded in the light of a very raw recruit, with Logic—that stern martinet of the Intelligence Department—ever at its elbow, it is still capable of rendering useful service.

The danger which besets us in accepting any plausible explanation of phenomena without subjecting it to the most searching criticism is not death or wounds, as in the case of a primitive hunter who formed a hasty and erroneous judgment, but it is one which will certainly cripple us as naturalists.

Self-contradictory as the statement may appear, what is common and obvious is often much more mysterious and wonderful than what is rare. We are so in the habit of taking circumstances in our everyday surroundings for granted, that a very great deal entirely escapes notice which offers most fruitful ground for research. Do we not constantly see, when some great invention or discovery is announced, that the thing has all the time been almost before our eyes, and that it is of the most ridiculously simple character! Within the last few years many of us learned with astonishment that air contained a new element in addition to nitrogen and oxygen. Yet for generations hundreds of able chemists have not only been breathing air but have been continually working upon it in their laboratories. And furthermore, when the facts and methods which led to the discovery of argon were announced, it seemed astonishing to every student of chemistry that since the time when Cavendish first drew attention to "residual nitrogen" not one of these experimenters has apprehended a truth which was all but naked before their eyes. Although in the year 1777 Gilbert White drew attention to the remarkable influence of earth-

worms in "boring, perforating, and loosening the soil, and in throwing up such infinite number of lumps of earth called wormcasts, which is a fine manure for grain and grass," and although he said, furthermore, "a good Monograph of Worms would afford much entertainment and information at the same time, and would open to a new and large field on Natural History," it was not until more than a century had elapsed that Darwin's work on 'The Formation of Vegetable Mould through the Action of Worms' was published. Yet all the time, in every field, abundant evidence of the influence of worms was displayed before the eyes of naturalists in the shape of hundreds of tons of earth raised to the surface in the form of wormcasts.

I make bold to say that, in like manner, most of the future discoveries of great moment to the naturalist will be made, not in the remote and minute ramifications of science such as are occupying the attention of so many of our learned investigators, but among the everyday phenomena which are open to the eyes of all. It is in this truth (for truth is scarcely too strong a word when all past experience declares and confirms the rule) that the hope of the amateur naturalist

lies. The present writer, although he has never been able to give much time to any branch of study outside his profession, has been fortunate enough to light upon several facts both in physiology and general natural history which had escaped the attention of abler students. In addition to these he has chanced upon a hundred curious hints and clues which may be regarded as "spoor" leading possibly towards the lair of more important quarry. And although probably many wild hypotheses so started will, when finally run down, prove of little material profit either to their captor or to science, yet the zest such pursuits give to the study of natural history is not only traceable to primeval methods of getting a livelihood, but still takes no contemptible place among the things which make life worth living.

CHAPTER II.

THE DOG.

MOST of our domestic animals have become modified by changed circumstances since we took them into partnership even more than we have ourselves : they have, in fact, become partakers with us of the advantages and disadvantages of our civilisation. This is especially so in the case with the dog, man's closest associate and earliest ally. Still we can trace nearly every trait in the dog which proves of use to us nowadays to a time when he lived a life of complete independence, and managed his own affairs without the aid of a human partner or director.

We must remember that although the dog is now our especial friend, with interests in the main in harmony with ours, he was not always so. The wild dog and wild man might have

been chance allies when, for instance, a fatigued quarry pursued by the pack was struck down by a flint weapon, and the greater part of the carcass left to the original hunters; or when a wounded animal escaped its human foe to be followed up and devoured by the dogs. But, as a rule, the interests of dog and man would be conflicting, as is still the case where wild dogs exist, such as the dingoes of Australia, the dholes of India, and the hyena-like wild dogs of Central and Southern Africa.

It must be borne in mind that in dealing with these primitive canine creatures, the word "dog" is used in its widest sense, and must include such animals as wolves and jackals, which undoubtedly share in the ancestry of our familiar domestic breeds.

Probably the partnership first began through small helpless whelps being brought home by the early hunters, and being afterwards cared for and brought up by the women and children. The indifference with which almost all savages regard their dogs seems to negative the idea that primitive man took the trouble to tame and train adult wild animals of this kind for his own purposes. The young dog would form one of

the family, and would unconsciously regard himself as such. The reason why he should so regard himself will be discussed later, when we come to consider the probable canine view of the relationship.

It would soon be found that his hunting instinct was of use to his captors, for while wandering abroad with them, his keen nose would detect the presence of hidden game when the eyes of his savage masters failed to perceive it; and when a wounded animal dashed away, his speed and instinct for following a trail by scent would often secure what would otherwise have been lost. The dog, in his turn, would find an easier living and a better shelter while associated with man than if he were hunting on his own account, and thus the compact would be cemented by mutual benefits.

Now let us consider why the dog should so readily fall into the position of the companion and subordinate of man. What "stock and goodwill" did he bring into the partnership besides his swiftness and powers of scenting and seizing his quarry? Let us look for a moment at his life at home as apart from his duties while hunting. In the first place, he evidently regards the dwelling

of his master as his own place of abode in which he has certain vested interests, and while he is complaisant and submissive to the regular inhabitants, he looks upon strangers of all kinds with suspicion, and regards their intrusion as an infringement of his rights, or contrary to his sense of what is lawful. Although watch-dogs have doubtless been valued for many generations, and their distinctive qualities cultivated by artificial selection, it seems clear that here we are dealing with an original instinct.

The pariah dogs of Constantinople and other Eastern cities, which are practically as untamed as their fellow-scavengers, the vultures, crows, and jackals, and which probably have only in the slightest degree ever come under direct human influence, have the same habit. Each street is the recognised dwelling-place of an irregular pack, and dogs—and in some cases even men—from other quarters are warned off or attacked if they cross the boundary.

It is said also that the wild dogs of India will drive off a tiger if he strays into the neighbourhood of their chosen habitat. Even tame wolves will, without being taught, threaten a stranger if he comes near their master's house,

but will take no notice of the coming and going of the regular inmates.

It would seem, therefore, that the watch-dog's peculiar virtue is directly traceable to the old instinct for guarding the lair of the pack. And in following this instinct, the dog indicates that it is not his custom to act single-handed. The very fact that he growls or barks at a stranger shows that a vocal intimation to his fellows of the presence of a possible enemy is part of his plan. Every one has noticed that the barking of one dog will set off others within hearing, so that on a still night an alarm at one spot will disturb a whole suburb. Although no wolves or wild dogs are known to bark in the true canine manner, it is impossible to imagine that so distinct and almost universal a habit of the domestic varieties can have been deliberately initiated by man. Several instances are recorded of Eskimo dogs, and even dingoes and wolves, learning to bark by spontaneous imitation of domestic dogs. Foxes make a noise very like barking when they challenge one another among the hills at night, and it is not difficult to provoke an answer by imitating the sound under appropriate conditions.

It seems probable, therefore, that the common ancestor of our domestic dogs and their wild relatives, which no doubt lived under somewhat different conditions from any modern wild or feral creatures of the kind, was a barking animal.

As I have already said, the very fact that the dog barks when alarmed is an indication that he is a creature of gregarious instincts, and that he is accustomed to act in concert with others. The sound is a signal to his comrades as well as a threat to the intruder. If this be not so, what can be the meaning and intention of the different tones he adopts according to the nature of the provocation, which are capable of conveying to ears afar off an idea of the measure and nearness of the danger?

Most of our domestic animals, and all which act under our orders and give us willing obedience, are gregarious in their habits when in the wild state. A little thought will show that many of the qualities for which we prize them are dependent upon this fact, and that we are the gainers by turning to our own use the stock of tribal virtues and morals which they bring with them into our service,—just in the same way as

we gain by appropriating the winter food-store of the bees, and the supply of starch and gluten laid up for future use by many plants. An animal of a troop has perforce certain social duties and obligations which, as can be shown, are necessary for his own existence as well as for the welfare of the community. He must learn to give and take, and be prepared to follow and obey the members of greater capacity and experience. It is essential that he should be of a peaceable disposition, as a general rule, among his mates, so as to preserve the harmony of the band ; since a pack of dogs—like a house—divided against itself will soon prove its unfitness, and be eliminated according to law. He must also be prepared to stand by his fellows, defend them or any of them if attacked, and warn them if danger approaches.

Seeing that most wild animals of the canine tribe prey upon quarry swifter and larger than themselves, their common welfare depends upon systematic and intelligent co-operation. A single hound following a trail by scent will frequently be at a loss, for every now and then it will over-run and miss the line ; but when several are together this will seldom happen, and the pace of the pursuit will consequently be much

greater and the chance of a meal more certain. In searching for prey it is necessary for the pack to separate, so as to range a wider area; but the instant a "find" takes place it is important that all should be informed at once, so that a united pursuit may be taken up while the scent is warm. Among all hounds and many wild dogs the signal is given by the voice; but, as will be shown later, the dog has another and very perfect method of signalling in addition to this. For the canine tail, when considered philosophically, turns out to be nothing but an animated semaphore, by means of which important news can be telegraphed to the rest of the pack in much the same way as messages are exchanged between different detachments of an army by the modern development of military signalling popularly known as "flag-wagging."

Of course in hunting all large and swift animals, a great deal can be done by strategy; and this involves a common plan of action, often of an elaborate kind, and the giving and taking of orders by the leaders and other members of the band respectively. The value of quick perception and general intelligence, as well as of a readiness to co-operate, here at once become



S. FLADE.

WILD DOGS. A STRATAGEM.

apparent, for without these qualities no such combination could be successfully carried out. Again, when the prey is within reach, it often requires the united efforts of the whole pack, acting intelligently in concert, to pull it down. If a number of wolves or wild dogs were scattered over a district, each acting for himself independently, as cats do, large animals, such as the elk or bison, would be of no use to them as articles of diet, and they might starve in the midst of plenty. But if they combine and act under the guidance of experienced leaders, they can at once utilise what would else be, in canine economy, a waste product.

As has been pointed out, this indispensable co-operation at once involves the elements of politics and morals. The obedience of the young and inexperienced to their leaders, and the observance of certain rules of conduct, are a *sine quâ non* of the success of any strategic combination.

It follows, therefore, that the young of gregarious animals of all kinds, and especially those of this type, are submissive and teachable, and have thus the very qualities we desire in creatures which are to be trained for our special use. In fact, we have here the natural basis for that

docility and readiness to obey which is such a noticeable and invaluable characteristic in dogs as we know them.

They must also be faithful to their fellows in word and deed. A hound which gives tongue when he has no quarry before him (and such canine liars are not unknown, as any huntsman will testify) may spoil a day's hunt, and send the whole pack supperless to bed. It is interesting and amusing to observe the evident contempt with which the hounds of a pack regard an untruthful member. His failing becomes perfectly well known, and, let him bay as he will, not one of his companions will rush to the spot as they do the moment they hear the slightest whimper from a trusted and experienced finder.

Loyalty to one another is also a virtue which cannot be done without. Thus we see that, however great the emulation between the individual members of the band, while the hunt is on it is kept strictly within bounds, and is subordinated to the common purpose. It is only after the game is captured and killed that contests of individuals for a share of the plunder commence. The very fact that an invitation is given to join in the pursuit as soon as the quarry is started,

instead of the finder stealing off after it on his own account, is an illustration of this; and if one of the pack is attacked by the hunted animal at bay or by an enemy, his howls and excited outcry are instantly responded to by all within hearing.

Every one has noticed the uncontrollable power of this instinct when the yells and shrieks of a canine street-brawl are heard. Dogs from all sides rush to the spot and immediately take part in the quarrel. The result generally is a confused free fight of a very irregular description, and each dog is apparently ready to bite any of the others. It will easily be seen that this confusion is owing to a disarrangement of natural politics, caused by the disturbing and arbitrary influence of human institutions. If two of the combatants happen to be comrades, they will hold together and treat all the rest as enemies. In the wild state the sound of strife would mean either a faction fight or a combat with some powerful enemy of the pack; and probably in the former case every dog within hearing would be a member of one or other of the contending parties. By adopting dogs into our families, and separating them from their fellows, we upset canine political economy in many ways;

but still the old loyal instinct to rush to the support of supposed friends in distress is so strong, that a lady's pug has been known to spring from a carriage to take part in a scrimmage between two large collies.

Among wild dogs the prosperity of the community might be fatally impaired by a lapse of this instinctive loyalty. All who have had to do with hounds know that every pack contains certain individuals whose special talents are invaluable to the rest. Generally one or two of a pack of beagles do most of the finding when driving rabbits in the furze, and in the case of a lost trail another individual will be, as a rule, the successful one in making skilful casts forward to pick up the line of scent. Another, again, will possess quicker vision and greater swiftness in running than the rest, and the instant the quarry comes into view will cease the more tedious method of following, and dash forward at full speed to seize it.

Among wild dogs pursuing large and powerful game, the need and scope for such specialists would be even greater and more important. If one of these were lost through not being well backed up in time of peril, the whole pack would

be the sufferers in a very material degree ; for it would often fail to start, or lose during pursuit, some animal which might otherwise have been captured.

The study of this communal canine morality is very interesting when considered along with Mr Herbert Spencer's theories of ethics. It is here dwelt upon, however, merely to explain on scientific principles many traits of our domestic dogs, which (as is too commonly the case with those who receive benefits) we are liable to profit by and take for granted.

The great naturalist Cuvier observed that all animals that readily enter into domestication consider man as a member of their own society, and thus fulfil their instinct of association. The probable view of the fox-terrier or the dachshund which lies upon our hearthrug, therefore, is that he is one of a pack, the other members of which are the human inhabitants of the house.

Most interesting would it be, were it possible, to get the dog's precise view of the situation. The chief bar to our doing so is owing to the difficulty of putting our human minds, even in imagination, within the restricting limits of the canine thinking apparatus. Thus we constantly

see, when anecdotes of the cleverness of dogs are told, that the narrator is quite unable, in estimating the supposed motives and mental processes, to get out of himself sufficiently to escape the inveterate tendency to anthropomorphism; and he almost invariably gives the dog credit for faculties which it is very doubtful if it possesses. When we come to consider how few persons have that power of imaginative sympathy with their own kind which enables us to see to some extent through another's mental spectacles, it is no matter for surprise that a human being should generally fail in trying to think like a dog.

Thinking, after all, is, like flying, an organic process dependent in every case on actual physical machinery; and dissimilarity of brain structure therefore absolutely precludes us from seeing eye to eye, mentally, with the lower animals.

Often when we are dealing with the relation between peculiarities of brain structure and special mental attributes, we are obliged to depend to a great degree upon conjecture, because the functions of the brain as the organ of mind are so little understood. But here it is possible to point out one of the real reasons why mental furniture in dogs and men differs so essentially. If you

examine a human brain you will find that the parts which first receive impressions from the nerves of smell are very small and rudimentary; but in the dog these *olfactory lobes* are large and full of ganglia which are connected by innumerable telegraphic fibres with the main hemispheres of the brain. Hence most of the information we gather comes in through the channels of the other senses, and our ideas of external things are but little based upon the presentation of them offered by the organs of smell. The dog, on the contrary, forms his notion of the outside world more from impressions gathered in this way than in any other. He may be said, indeed, to think through his nose.

Now we are able in some degree to understand what an influence this might have upon the whole process of thought when we observe the great difference between ideas concerning external things gathered by people who have all their senses and by those who are absolutely blind or deaf. For when the optic nerve hands in nothing whatever to the brain, all the innumerable phases of the external world which can reach us only through the eye can play no part in any of the psychic functions. And in the case of a person

born deaf the same may be said of those impressions conveyed by the auditory nerve, upon which most of us depend so much in gaining knowledge.

But this structural difference of brain, with its inevitable consequences, although it balks us in one way, comes to our aid in another. As has been said, our custom of ascribing human faculties and modes of thought is an involuntary and invariable one when we are dealing with the mental processes of other beings. Even when we speak of the supernatural the same habit is manifest, and human passions, emotions, and weaknesses are constantly ascribed to beings presumed to be infinitely more remote from us in power and knowledge than we are from the dog. Thus we see, in the not very distant past, roasted flesh and fruits were thought by men to be acceptable to deity, —doubtless because they were pleasing to the palates of the worshippers, who reasoned by analogy from the known to the unknown. This should teach us to bear in mind that there is, affecting the dog's point of view, almost undoubtedly such a thing as *cynomorphism*, and that he has his peculiar and limited ideas of

life and range of mental vision, and therefore perforce makes his artificial surroundings square with them. It has been said that a man stands to his dog in the position of a god; but when we consider that our own conceptions of deity lead us to the general idea of an enormously powerful and omniscient *man*, who loves, hates, desires, rewards, and punishes in human-like fashion, it involves no strain of imagination to conceive that from the dog's point of view his master is an elongated and abnormally cunning *dog*,—of different shape and manners certainly from the common run of dogs, yet canine in his essential nature.

The more one considers the matter, the more probable does this view become. If we, with our much wider range of mental vision, and infinitely greater imaginative grasp of remote possibilities, the result of our reading and experience, are still bound by the tether of our own brain limits to anthropomorphic criteria when endeavouring to analyse superhuman existences, still more is it likely that the dog, with his mere chink of an outlook on the small world around him, is completely hedged in by canine notions and standards when his mind

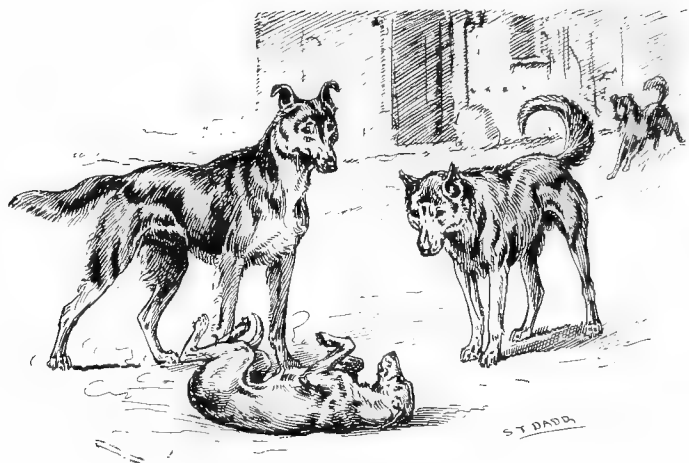
has to deal with creatures of higher and mysterious attributes.

At any rate, it will not be difficult to show that the dog's habits are generally consistent with this hypothesis. As far as mental contact is concerned, he treats his master and the human members of the household as his comrades, and behaves in many ways as if he were at home with the pack. Thus all the tribal virtues previously mentioned come into play. He guards the common lair and becomes a watch-dog, and by his barking calls his adopted brethren to his aid. He submits readily to the rules of the house, because an animal belonging to a community must be prepared to abide by certain laws which exist for the common good. He defends his master if attacked—or possibly, if not a courageous dog, gets up a vehement alarm to call others to his aid—because he has an instinctive knowledge of the importance of loyalty to a comrade, and because, as has been shown, loyalty to a leader is especially necessary. He is ready in understanding and obeying orders, owing to the fact that, when acting in concert with wild companions, it was imperative that the young and

inexperienced should comprehend and fall in with the plans of the more intelligent veterans. The same ancestral habits and tendencies render him helpful as a sporting dog, and in herding or driving sheep or cattle. This last employment is very much like a mild kind of hunting, under certain special rules and restrictions, and with the killing left out. It has been observed that the Indian dholes will patiently and slowly drive wild animals in the direction of their habitat during their breeding season before killing them, so as to have the meat close at home; and this could only be accomplished by the whole pack exercising a patient self-control, and by the leaders constantly keeping in check the fierce impulse of the younger members to rush in and kill the weary and bewildered quarry.

The peaceable disposition and readiness to submit to discipline are also tribal virtues of which we take advantage. The dog, when he slinks away with drooping tail if reprov'd, or rolls abjectly over on his back and lies, paws upwards, a picture of complete submission, is still behaving to his master as his wild forefather did to the magisterial leaders of the troop, or a victorious foe of his own species.

Jesse states that when a pariah dog of one of the Eastern cities desires to pass through a district inhabited by another pack, he skulks along in the humblest fashion with his tail depressed to the utmost, and on being challenged, rolls over, and there remains, limp and supine,



Waiting for a passport.

submissively awaiting leave to proceed. The same thing can be observed when a large and fierce dog makes a dash at a young and timid one. This expressive and unmistakable method of showing submission is calculated to disarm hostile feelings, and contributes to peace and

harmony, and therefore to the unity and prosperity of the body politic.

Although it would seem that the canine imagination from its very feebleness transforms man into a dog, yet, as we should expect, arguing from the cynomorphic hypothesis, it does not stop here. In a most interesting account of the shepherd-dogs of the Argentine, given in 'The Voyage of the Beagle,' Darwin shows that, by a careful system of training, the herdsmen have taught the dogs to regard their charges as fellows of the same pack with themselves; insomuch that a single dog, although he will flee from an enemy if alone, will, as soon as he reaches the flock to which he is attached, turn and face any odds, evidently with the notion that the helpless and frightened sheep ranged behind him are able to back him up just as if they were members of a canine regiment of which he was leader. The passage is too long for quotation, but all who are interested in the subject should refer to it.

An instance of the operation of the cynomorphic idea can be seen in the behaviour of a dog when a bone is given to him. He will generally run off with it to some quiet spot,

and is suspicious of every one who comes near him, evidently having the notion that what is to him a valuable possession is likely to be regarded as such by his human associates. Few dogs when gnawing a bone will allow even their masters to approach without showing signs of displeasure and a fear of being dispossessed of their property only consistent with the idea that the bipedal "dog" wants to gnaw the bone himself.

Every one has noticed the elaborate preliminaries which go before a canine battle. Teeth are ostentatiously displayed, the animals walk on tiptoe round one another, and erect the hair on their backs as if each wished to give the impression that he was a very large and formidable dog, and one not to be encountered with impunity. Frequently hostilities go no further than this, one animal turning and retreating with a great show of dignity, but plainly with no wish to fight.

When we come to analyse such proceedings, it will be seen that the ends of battle are often gained in a bloodless manner by this diplomatic exhibition of warlike preparations and capabilities. One primary object of a hos-

tile meeting between dogs (as well as between higher animals) is to decide a question of precedence, either general or particular. Now, if we could only settle which was the best man in any dispute by duels *à outrance*, a great deal of blood would be needlessly shed, and many valuable lives lost to the community. This introduction of moral weapons among social animals is therefore a great point gained, for injury to one is injury to all. The quick recognition of the superiority of a foe, and the perception of when submission should take the place of valour, is plainly of advantage to the individual, since a pig-headed obstinacy in resistance would frequently lead to elimination. Where in the serious business of life there is an interdependence of individuals associated for common ends, any influence which lessens the severity of civil conflicts tends to the general wellbeing. Just as commanding officers have forbidden duels between members of an army in the field, so nature has among gregarious animals, and more especially among formidable carnivores, discountenanced internecine conflicts which might weaken the general efficiency of the pack.

Few animals excel the dog in the power of expressing emotion. This power is a sure sign of an animal which is habitually in communication with its fellows for certain common ends. Although probably long association with and selection by man have accentuated this faculty, a considerable share of it was undoubtedly there from the beginning, and was of service long before the first dog was domesticated. It is easy to see how important it is for the general good that the emotions of any one member of a pack of dogs should be known to the others. If, for instance, one of the band should perceive an enemy, such as a snake or leopard, lying in ambush, his rapid retreat with depressed tail would instantly warn the others of the danger.

There are many reasons for the tail being the chief organ of expression among dogs. They have but little facial expression beyond the lifting of the lip to show the teeth and the dilation of the pupil of the eye when angry. Among the wild *Canidæ*, all of whom have stiff erect ears, emotion is shown in the head or visage even less than among domestic dogs. The jaws and contiguous parts are too much specialised for the serious business of seizing

prey to be fitted for such purposes, as they are in man. With dogs which hunt by scent the head is necessarily carried low, and is therefore not plainly visible except to those close by. But in the case of all hunting dogs, such as fox-hounds, or wolves which pack together, the tail is carried aloft, and is very free in movement. It is also frequently rendered more conspicuous by the tip being white, and this is invariably the case when the hounds are of mixed colour. When ranging the long grass of the prairie or jungle, the raised tips of the tails would often be all that an individual member would see of his fellows. There is no doubt that hounds habitually watch the tails of those in front of them when drawing a cover. If a faint drag is detected suggestive of the presence of a fox, but scarcely sufficient to be sworn to vocally, the tail of the finder is at once set in motion, and the warmer the scent the quicker does it wag. Others seeing the signal instantly join the first, and there is an assemblage of waving tails before ever the least whimper is heard. Should the drag prove a doubtful one the hounds separate again, and the waving ceases; but if it grows stronger when followed

up, the wagging becomes more and more emphatic, until one after another the hounds begin to whine and give tongue, and stream off in Indian file along the line of scent. When the pack is at full cry upon a strong scent the "sterns" cease to wave, but are carried aloft in full view.

The whole question of tail-wagging is a very interesting one. All dogs wag their tails when pleased, and the movement is generally understood by their human associates as an intimation that they are happy. But when we attempt to discover the reason why pleasure should be expressed in this way, the explanation appears at first very difficult to reach. All physical attributes of living beings are, upon the evolutionary hypothesis, traceable to some actual need, either past or present. The old and delightfully conclusive dictum that things are as they are because they are made so "in the beginning," no longer can be put forward to settle knotty problems in natural history. No doubt, in many cases—as, for instance, when we speculate on the primary origin of human laughter—the mystery seems almost unfathomable. But this present helplessness only results

from our defective knowledge of data upon which to build the bridge of deductive argument. The reason is there all the time could we but reach it ; and almost daily we are able to account for mysterious and apparently inexplicable phenomena which utterly baffled our predecessors.

Probably the manner in which domestic dogs express pleasure is owing to some interlocking of the machinery of cognate ideas. In order to understand this better it may be helpful to consider some analogous instances with regard to habits of our own species.

One of the most philosophical of modern physicians, Dr Lauder Brunton, has clearly and amusingly shown that the instinctive delight and eagerness with which a medical man traces an obscure disease step by step to its primary cause, and then enters into combat with it, is referable to the hunter's joy in pursuit, which doubtless characterised our savage ancestors when they patiently tracked their prey to its lair and slew it for glory or for sustenance.

Mr Grant Allen, I believe, first suggested that our appreciation of bright and beautiful colours, and therefore of the splendours of the flower-garden or of the sunset tints in the sky, might

be owing to the frugivorous habits of our very early progenitors, to whom the sight of red or golden ripe fruit was naturally one of acute pleasure.

Another apposite illustration is the delight we derive from all manner of contests of wits and muscles, so that nearly all our games, from whist to football, partake of the nature of strife for the mastery. A game is, of course, a systematic and recognised method of obtaining pleasure, and if we take a survey of all the most popular forms of recreation of this kind, we shall find that none of them are free from the elements of that struggle for supremacy which has been a chief factor in the evolution of the human race, especially throughout the ages of barbarism.

Now, if arboreal man took delight in discovering and devouring luscious and gorgeous fruits, and savage man in hunting for prey and in fighting his rivals or the foes of his tribe—and all these ancient habits leave an impress upon our modern ways of seeking and showing pleasure—we can see that the dog's manner of manifesting pleasurable emotions may be traceable to certain necessary accompaniments of remote wild habits of self-maintenance.

As with man, so with the dog; civilisation has made existence much more complex. The sources of pleasure of the savage man are few compared with those of the cultured and civilised, yet we find that the means of expression which we possess are but elaborations of those existing long before civilisation began. We must, therefore, look at the dog's past history and find out what were his most acute pleasures, and what the gestures accompanying them, when he was a pure and simple wild beast, if we wish to elucidate his manner of expressing pleasure now.

There can be no doubt that the chief delight of wild dogs, as with modern hounds and sporting dogs, is in the chase and its accompanying excitement and consequences. One of the most thrilling moments to the human hunter (and doubtless to the canine), and one big with that most poignant of all delights, anticipation of pleasurable excitement combined with muscular activity, is when the presence of game is first detected. As we have seen in watching the behaviour in a pack of foxhounds, this is invariably the time when tails are waved for the common good. Tail-wagging is an inevitable

concomitant of one form of pleasure, which, apparently, is chiefest among the agreeable emotions when dogs are in the wild state. Owing to some inosculation of the nervous mechanism, which at present we cannot unravel, the association of pleasure and wagging has become so inseparable that the movement of the tail now accompanies the emotion whatever may call it forth.

An explanation of a similar kind can be found for the fact that dogs depress their tails when threatened or scolded. When running away the tail would be the part nearest the pursuer, and therefore most likely to be seized. It was therefore securely tucked away between the hind-legs. The act of running away is naturally closely associated with the emotion of fear, and therefore this gesture of putting the tail between the legs becomes an invariable concomitant of retreat or submission in the presence of superior force. When a puppy taken out for an airing curves its tail downwards and scuds in circles and half-circles at fullest speed around its master, it is apparently trying to provoke its pseudo-cynic playfellow to pursue it in mock combat. It may be observed in passing that this running in

sharp curves, with frequent change of direction, is a common ruse with animals which are pursued by larger enemies. The reason of it is that the centrifugal impulse acts more powerfully on the animal of larger bulk, and so gives the smaller an advantage.

Several years ago there was a good deal of discussion of the distinctive peculiarity of the pointer and setter in the 'Field' and other papers. It was suggested that the habit of standing still as soon as game was scented, instead of springing forward at once to seize it, was an instance of the manner in which a natural instinct might be absolutely reversed by training. One of the explanations attempted at the time for this apparent anomaly was, that the immovable position of the dog was comparable to the pause which most beasts of prey make before a final spring. But we must recollect, when considering this theory, that few of the *Canidæ* pounce from an ambush suddenly upon their prey after the manner of cats. And although a terrier will stand immovable before a rat-hole for hours together, his patient, watchful attitude is very different from the rigid and strained position of the pointer or setter; which position also has nothing in it sug-

gestive of crouching preparatory to a rapid bound forwards, as is seen when a cat stalks a bird, and then gathers herself together before the final *coup*.

Not unfrequently the tail of a young setter when it sets game may be seen trembling and vibrating as if it had a disposition to wag, which was kept in check by the supreme importance of not disturbing the hare or covey. The tail also is held out in full view like a flag, whereas a rat-catcher's dog on the watch at a hole often droops its tail.

I think that there can be no doubt that the pointer and setter, in acting in their characteristic manner, are following an old instinct connected with an important piece of co-operative pack strategy, although the peculiarity has been enhanced by human training and selection, and the sportsmen with their guns have supplanted, and therefore act the part of, the dog's natural comrades in the chase.

The writer during his boyhood had charge of a small pack of beagles at a South Down home-stead, several of which were allowed to run loose at night as a guard against the foxes. Amongst these was an old dog, a part-bred Skye terrier, very sagacious, and well known in all the country

round as a sure finder when the pack were used to drive rabbits in the gorse.

Old Rattler (what a throng of memories the name calls up!) was the recognised leader of the others, and not unfrequently he would conduct them on a private hunting expedition, in which he served as sole huntsman and whip. Often on a still night his sharp yapping bark, accompanied by the clearer long-drawn music of the beagles, might be heard among the hills, as they drove a predatory fox from the farm-buildings, or strove to run down one of the tough South Down hares. It soon became evident that this pack had a certain regular system of co-operation, and, like the African wild dogs, well described by Dr S. T. Pruett in his recent book, 'The Arab and the African,' they made a practice of playing into one another's hands, or rather mouths. Old Rattler would generally trot on ahead, surveying every likely tuft of grass or ling, and exhibiting that inquisitiveness and passion for original research which is so characteristic of the terrier. On arriving at a small outlying patch of furze he would invariably proceed to the leeward side, so that as the wind drew through the covert it would convey a hint of whatever might be there concealed.

He would give critical sniffs, with head raised and lowered alternately, and then would either trot indifferently away or else stand rigid with quickly vibrating tail and nose pointing towards the bush. The other dogs seemed to understand instantly what was required of them, and they would quickly surround the covert. When they were in their places, and not until then, the cunning old schemer would plunge with a bound into the furze, and out would dash a hare or rabbit, often into the very jaws of one of the beagles.

By this artifice, which had never been taught them by man, the pack when hunting for themselves would doubtless often secure a meal, preceded by the delight of killing without the wearisome process of tiring out a hare.

Now it appears to me that this habit of the leader of the pack—a habit which, from its similarity to what has been observed in the case of such widely separated *Canidæ* as the dingo, wolf, and hyena-dog, is one that is traceable to very remote wild ancestors—is the basis of that peculiar talent in the pointer or setter which adds to the piquancy of a day's shooting and to the weight of the bag.

Let us endeavour to look at the part played by a pointer in the light of cynomorphic theory.

"Ponto" goes out with his pack (often a very scratch one), his comrades walking on two legs instead of four like ordinary dogs, and carrying their tails, or organs of a somewhat similar aspect, over their shoulders. The pack separate and advance in line, he being appointed to explore in the van and to search the turnips or rape for a tell-tale whiff of the scent of game. The covey is detected, but, being a co-operative and a loyal dog, he does not rush in and try to catch for himself. He therefore stands and waits for his partners to perform their share of the stratagem. All that he has to do is to show them in an unmistakable manner that there is quarry worth having in front of his nose. The pack advance, he generally taking careful note of their approach, the covey rises, the "tails" of the bipedal dogs explode, and Ponto is rewarded by holding in his mouth a palpitating mass of feathers, with perhaps the stimulating flavour of blood, and by a public intimation that the community or pack approve of his conduct and esteem him, what he dearly loves to be thought, "a good dog."

When we come to consider the very long period during which dogs have been domesticated and under the influence of deliberate selection, it is surprising to find how much in their behaviour they resemble their wild brethren. The rule seems to hold good here as elsewhere, that the outward form is much more plastic to the influence of environment than the character and mental habits which are dependent upon the nervous system. Thus, although the deerhound and the pug are so different in external appearance that it is difficult to believe that they are related, yet if we watch them we find that their mental and moral qualities are of a similar cast. The fine grey wolf in the Zoological Gardens, Regent's Park, and the performing wolves recently exhibited in London, when in a good humour, had precisely the same methods of expressing pleasure as domestic dogs, and would wag their tails and gambol about in a manner which made one doubt for the moment whether they were not in reality Scotch collies masquerading as wild beasts.

There are many other traits in our domestic dogs suggestive of their ancestral habits which cannot be dealt with on this occasion, but which

offer a most interesting field for study to every one who possesses a dog, and a taste for research in this direction.

In concluding, it may be well to notice briefly the chief points of dissimilarity between the wild and tame *Canidæ*. In the first place, there is a general difference of aspect and bearing which it is difficult to describe exactly. The wild animal has an alert independent look which the tame one has lost, chiefly owing to its long-continued habit of dependence upon man. Although, of course, all breeds of tame dogs have been at some time or other deliberately adapted by training and selection for special purposes, yet there seem to be certain characteristics which have risen spontaneously, or because the parts in which they are manifest are correlated with some others where an intentional change has been brought about. Darwin gives an instance of this in the hairless dogs, which at the same time are deficient in teeth. This question of correlation is one of the most interesting and obscure problems of natural history, and perhaps we are at present a little too ready (with our hereditary tendency to take refuge in an imposing mystery whenever our reasoning powers fail us) to ascribe to it

certain phenomena, the explanation of which, by the ordinary laws of evolution, is not clear.

Most probably the drooping ears of our domesticated hounds and hunting dogs primarily arose from the fact that the savage huntsman, disregarding shape, picked those dogs to breed from which manifested the keenest powers of scent, and that in these individuals the ears were not so much in use as in others. Again, in every litter of whelps the surly, independent, and ill-tempered brute would always be more likely to be eliminated than those which were confiding and tractable; and so, from age to age, the chief outward traits which distinguish the dog from wolves and jackals would tend to increase.

Finally, the instinct of association has, in the case of the domestic dog, become more exactly fitted to the new conditions of environment. He makes himself thoroughly at home with us because he feels that he is with his own proper pack, and not among strangers or those of an alien race. The wild animal, on the contrary, which refuses to become domesticated, still has the perception that those who would palm themselves off as his comrades are creatures of an

alien nature. He sturdily refuses to become a party to the fraud, and remains suspicious of their intentions ; and, whatever they may do to propitiate him, he keeps on the *qui vive* as against a possible enemy.

CHAPTER III.

THE HORSE.

THE horse has been the servant of man for such a long time that we are liable to forget that he once had an independent existence and managed his own affairs without our help; yet, if we examine the qualities which bring him into association with us, we shall find that man has had but little to do with their development, and nothing whatever to do with their origin. For instance, we value the horse chiefly for his speed and endurance, yet had it not been for the chief ancestor of our faithful friend the dog, the grim grey wolf of Europe and Asia with his perpetual hunger and untiring gallop, the wild horses which, in ancient times, swarmed over nearly all the great plains of the world, and from which all our modern steeds have sprung, would never



WILD HORSES PURSUED BY WOLVES.

have developed the swiftness and staying power which they undoubtedly possessed before they became captives, and which they have transmitted to their descendants.

The wolves and the wild horses were constantly at war; and, moreover, the wolf was the only predatory beast existing in ancient times which was able to pursue the horses and hunt them down on the open steppe. The speed and staying power of the horse were undoubtedly developed in the first place to enable him to escape from these gaunt persistent foes. Unintentionally the wolves acted as agents for improving the quality of the stock. The swift and the strong escaped them; the sluggish and the weak were devoured: and hence the special attributes which we value in a horse were enhanced from generation to generation. So certain does this appear to me, that I never see a wolf in a menagerie without feeling inclined to thank him for many an exhilarating gallop on horseback. If his bloodthirsty forefathers had never existed there would have been little to choose between the pace of a horse and that of a donkey.

It must be borne in mind that such influences

were at work from day to day and from year to year during immense epochs before ever the first wild horse was lassoed by prehistoric savages. Strange to say, this long and bitter feud between the Equidæ and the Canidæ seems now almost entirely forgotten. Horses seldom show an instinctive dislike to dogs; and in this respect their conduct presents a marked contrast to that of domestic cattle, which never seem able to forget the enmity of ancient days. Probably the truce which has been established between horses and dogs is chiefly owing to their close association in their common state of servitude to man. The horse is an intelligent animal, quickly adapting himself to new circumstances; and, moreover, he readily finds out who are his friends. Probably also when wild he had little to fear from a single wolf; for he has plenty of courage as well as speed, and is a skilful fighter with hoofs and teeth. Occasionally, however, the old dread and enmity crop up. I have known young horses, when surrounded by a pack of foxhounds for the first time, to become almost frantic with fear. A gentleman who lives among the Sussex Downs, and who spends much of his time on horseback, has informed me that

he has often noticed when crossing the open hills at night that his mare would suddenly start and tremble and try to make a dash for home with ears laid back and every sign of great agitation. At first he was puzzled by this, for the animal was generally quiet and tractable. At length he found that the terrifying object was usually a wandering hill-fox, which had chanced to pass near enough to be perceived either by the horse's eyes or nostrils.

Foxes, of course, are not dangerous to larger animals, but probably there is something in the wild beast about them, absent in the dog, which reminds the horses of their ancient foes. There is no doubt that, when coyotes are ridden down on the prairie and killed with a bull-whip or revolver at close quarters, the horses enter into the hunt with enthusiasm. They do their best to catch the wolves, and will strike at them with their hoofs if they get near enough. Darwin has recorded the remarkable fact that almost the only occasion upon which horses are known to scream with terror, when not suffering pain, is when they are attacked by wolves. Charles Kingsley, in one of his charming prose idylls, very graphically describes the conduct of his horse when a hunted

fox passed near. It laid back its ears, bared its teeth, and bit at the air in the direction of the fox. Kingsley accounted for the hostile demonstration on the part of his horse by the fact that it was an old hunter. Excellent naturalist though he was, I think he was wrong in his conclusion. A horse ridden after hounds seldom has a chance of seeing the object of pursuit, and probably in nine cases out of ten knows nothing about it. Certainly he could never learn enough to acquire a savage hostility to poor Reynard. Nor is there any reason why he should. The hunted fox, whether known or unknown, is to him a source of delight; for a hunter always manifests pleasurable excitement when he sees the hounds and anticipates a gallop.

I have often observed that young foals show some instinctive fear of dogs, and that they are very careful to keep on the opposite side of their dams when a dog comes into the paddock. Doubtless this is due to an inherent protective habit which was very valuable in the wild state. In looking for remnants of wild traits in domestic animals, we are far more likely to be successful if we study young creatures which have not had their innate primeval instincts adulterated with

impressions gathered from a civilised environment than if we confine our attention to adults. It will be found that all truly innate instincts, without exception, are of enormous antiquity, and that they date back to an era long antecedent to the time when man began to tame and make use of any of the lower animals. We know that the horse's wild forefathers, like the free mustangs and wild steeds of the Asian steppes, inhabited open plains and trusted chiefly to their speed in escaping from their enemies. This at once becomes evident when we examine a young foal, which in outward shape as well as in mental attributes tends to resemble the earlier types from which the modern representatives of the race have sprung. The legs of a colt are enormously developed from birth. He looks absurdly like a horse on stilts, and when four or five days old he can gallop almost as fast as ever he will in his life. He holds his head up boldly, and never tries to slink away and hide like a young calf or fawn, whose ancestors dwelt in the forest. There is a story that a thoroughbred foal of about a month old once beat a trained race-horse over a half-mile course, and thereby won his owner a handsome sum which had been wagered against him.

His dam was a mare celebrated for her speed, and she had a jockey on her back. She outstripped the rival horse, and her long-legged offspring kept level with her with ease.

If you watch how a young colt takes his nourishment, you will see that his habit tells the same story. He never takes a full meal like that gluttonous suckling the calf, which will distend its stomach with a gallon of milk at a time, but keeps constantly running to his dam, and refreshing himself with a few mouthfuls. This shows, firstly, that it is not his custom to be long absent from his dam, as are young animals which lie hidden among the thickets while their parents go to seek pasture; and, secondly, that his stomach is never so loaded with food as to hinder his running powers, which were all-important when the youngest member of the band had to keep up with the rest in their flight from wolves or other enemies. Again, a colt, when he lies down, does not curl himself up in small compass as if to escape observation after the bashful manner of a calf, but extends his long limbs conspicuously.

Another sure sign that the early horses lived on open plains is seen in the manner in which their modern descendants bear themselves when

alarmed or excited. A horse will always hold its head high; whereas a cow, if startled or suspicious, usually keeps its head rather below the level of the spine, even when it has no intention of using its horns. The reason of this difference is, that the wild horse is in the habit of watching the horizon for danger, and therefore—like the look-out man at sea—finds elevation an advantage; whereas the cow, whose ancestors were forest animals, instinctively holds her head so as to see under the interlacing boughs. Obviously also a dweller in the woods is able to make better progress when its head is kept low than when it is raised. It would be quite easy, if some new animal were brought to this country for the first time, to decide whether its natural habitat was in the forest or on open plains by observing the manner in which it habitually carried its head. The chamois, the prong-horn antelope of America, the gazelle, the guanacoës of the uplands of Patagonia, as well as the wild horses and the wild asses, habitually hold the head high; whereas the forest deer, antelopes that dwell in the bush, buffaloes, and all wild cattle, adopt a converse attitude, as if to obtain a clearer view among the tree-stems.

When we consider how exceedingly different are the present surroundings of the horse from those to which it was at first adapted by nature, it is rather difficult to understand how his legs stand the perpetual wear and tear of work in our great cities, where every step is upon a hard unyielding pavement. There is no other creature living, with the exception of the donkey or the mule, whose legs and feet could long bear the constant battering and shaking entailed by rapid locomotion over paved roads. Of course no hoofs would stand the continual abrasion caused by a granite or flinty surface unless they were protected by shoes. The horny matter of which the hoofs consist is extremely tough and grows very rapidly; but its rate of growth was calculated, in the first place, to the needs of the wild horse, which spent most of its time on sandy or grassy plains, where the hoofs would not wear away anything like so quickly as on a rasping macadamised roadway. Nature never reckoned on the ruinous expenditure in hoof material involved in modern road traffic, and, as a matter of fact, the feet of an unshod horse are soon reduced to a state of bankruptcy if in constant contact with a stony surface.

Man has got over this difficulty by fastening

iron shoes to the tough horny layer which forms the outside of the hoof. The need which existed in ancient times for power to traverse rough and stony ground has ensured sufficient toughness and substance in the hoof material to allow the smith to nail the shoes securely. But in getting over this difficulty the horse's master has rather increased than diminished the shock of contact with the hard ground, and if the ignorant farrier should cut away the elastic triangular cushion called the "frog" beneath the horse's foot (which was nature's original provision for breaking such shocks), the bones and sinews of the horse's legs soon reveal the injury caused by constant jars. Among civilised surroundings (which, as far as the horse is concerned, means interminable hard roads) the indiarubber-like "frog" if left alone would help to protect the legs from the effects of vibration. But if we look at the structure of the limbs just above the hoofs, we see another important reason why paved surfaces and such-like unfavourable conditions do not injure the legs more. The fetlock or pastern-joints of a well-bred horse are long and elastic, so that they yield a little at each step and so break the force of the concussion. The animal is, in fact,

mounted on springs. This is one reason why a thoroughbred is a pleasant animal to ride. Any one who has tried riding a cow or an ox has found the difference between the stubby jogging gait of these animals and the free elastic movement of the horse.

We find that amongst the horses of Arab and Barb descent the pastern-joints are longer and more springy than among the breeds indigenous to Eastern Europe. This is what might be expected; for the desert horse has frequently to traverse hard rocky ground, and moreover has been used during many generations for rapid travelling, whereas the progeny of the native European horses (such, for instance, as the common cart-horse and the Welsh pony) have been used to grass-covered surfaces from time immemorial, and have generally been employed in slow work on the land since they were impressed into human service.

The importance of these natural means of avoiding undue vibration to a highly organised creature like the horse can be judged by those who have ridden both a modern improved bicycle and an old-fashioned "bone-shaker." Continual jarring is always most exhausting and

injurious to the animal frame. The reason why a pneumatic-tired sulky is worth several seconds in the mile to an American trotter is not so much because it is of light draught, as because practically no vibration is conveyed along the shafts and traces to the horse's body. Ever so little vibration will weary his muscles and hamper his movements to a certain extent.

A-further proof that the horse's ancestors lived on open plains where vegetation was sparse is found in the arrangement of his teeth and in his method of grazing. Unlike the cow, the horse has chisel-like incisor teeth in both jaws. This enables him to bite very closely; in fact, a horse will thrive in a field where cattle are starving. If you watch a cow grazing you will find that she puts out her tongue and gathers the grass into a bunch, which she nips off by means of her sharp lower teeth pressing against the elastic pad in the upper jaw. The very fact that she always makes this gathering movement with her tongue when feeding shows she takes the length of the grass for granted, because she invariably acts as if there were sufficient herbage for the tongue to get together into a bunch before making an effort to bite or nip it off. Not so the

horse : he habitually behaves as if there was only a short growth of grass, or as if it were necessary to bite as near the roots as possible.

In the former case the method of grazing is adapted for a life among trees and sheltered meadows, where the grass is lank and lush from abundant moisture. In the latter the method is exactly suited for the parched and wiry herbage which grows out in the open and is exposed to drought, sun, and wind, and where only that part of each stalk or blade which is close to the ground has any great nutritive value.

I should like to discuss the question why the horse in the wild state took to a life out in the open, and what are the other effects of such a life upon his structure and habits, rather more in detail ; but this would involve too many technical points in equine anatomy and physiology for present purposes. His earliest known fossil ancestor was a splay-footed five-toed animal about the size of a collie-dog. It was by no means swift or imposing in appearance, and probably paddled about in the soft marshes which prevailed over a great part of the earth's surface during the early part of the Tertiary geological

epoch, much as the tapir wades and paddles in the South American swamps at the present day. During later periods there were huge herds of three-toed horses abounding all the world over, but, as time went on, certain evolutionary forces caused the two outer toes to disappear. At present, with the exception of a few curious reverting "freaks" occasionally exhibited in museums, all horses walk on the limb which corresponds anatomically to the human middle finger. The "ring" and "index" digits which did duty as locomotive auxiliaries in the three-toed horses have been found useless and have been suppressed, although they occasionally make themselves remembered in an unpleasant manner even in the present day when they give rise to "splints" in young horses which have been over-worked. One rule of equine evolution seems to have been, "the fewer the toes, the better the horse." It is quite certain that a single-hoofed extremity is better adapted for habitual swift locomotion over hard ground than one of the splay-footed type like those of the horse's relatives, the tapir and the rhinoceros.

At present it is by no means easy to state how the structural changes in the equine foot came

about. Did the earth gradually dry up so as to give the one-toed varieties, which preferred a firm foothold, the advantage? Or had the sedgy marshes and thicket-lined streams too many bloodthirsty inhabitants with a taste for horse-flesh, so that the early equine creatures were driven to take refuge in the open? I am inclined to think that the latter guess is the correct one. Even now most young horses resemble wild animals in being extremely suspicious of any strange sound or object, especially if they are among bushes or high grass so that they cannot obtain a clear view of their surroundings. "Shying" is most distinctly a relic of a valuable ancestral instinct. The wild horse, swift of foot and clear of vision, feared few enemies when out on the naked plains; but every bush or tuft of long grass might, and often did, contain a fierce foe lying in ambush. Many and many a time must the wild horse have saved his life by a sudden swerve and leap in the opposite direction the moment he heard the rustle of leaves or descried some strange and dimly outlined object among the underwood.

I know several horses which are not timid or

given to shying as a general rule, but which become almost mad with terror when they hear the loud rustle of reeds by a river-bank. Yet there is no danger whatever to be anticipated from this sound as far as their own experience goes. Such seizures of panic in the modern horse tell us a tale of many a tragic incident in the remote past, when the herds of wild desert steeds, parched with thirst, sought the watercourses where was "grass with reeds and rushes," and were there pounced upon by leopards or tigers, crouching in ambush on the watch for prey.

No doubt the so-called vice of "bucking" was at one time a saving virtue as far as the horse was concerned, for by this means he would often be able to shake off an enemy which had pounced upon him. The habit is rather a curious one, and seemed to be partly due to imitation; for one finds that horses in certain localities are specially addicted to it, although they do not seem to belong to any one special breed. For instance, the horses in some parts of Australia and the mustangs of Northern Mexico are notorious buck-jumpers; whereas their relatives in other parts are not nearly so given to the habit. It is worth while noting, however, that both the

Australian and the Mexican horses live a life much more like that of their free ancestors than do those in more settled countries, and hence they would be likely to redevelop attributes which are specially appropriate to the wild state. It seems pretty clear, from the wide distribution of the habit, that it is instinctive; and therefore in searching for its origin we must look for circumstances in which it was of use in the horse's daily life. However effective bucking may be in getting rid of a human burden, it can hardly be said that such a result is of sufficient benefit to the equine race to have established the habit in the first place. In fact, it is pretty obvious that the effect would be exactly the reverse of beneficial. For if the custom became so common that every would-be horseman found that he was always maltreated and thrown as soon as he got into the saddle, equestrianism would soon go out of fashion, and thus a large and prosperous section of the equine community would cease to exist. One reason for assigning the origin of bucking to a period long antecedent to the first experiments in horsemanship is its undoubtedly instinctive character. It has been remarked above that all inherent instincts are of an almost boundless

antiquity: indeed I doubt if a single instance could be brought forward where a truly congenital instinct in one of our domestic animals can be traced, either directly or indirectly, to human influence. A further indication of the natural basis of the habit of buck-jumping is the fact that young colts of all breeds go through the performance when at play; and almost any nag, when first turned loose at pasture, will lower his head and hump his back and give two or three vigorous hoists by way of showing that he is happy. Now, natural play is without exception of educative value. Nature had adopted this method of "teaching the young idea" skill in the use of its limbs and weapons both for purposes of war with our own kind and for purposes of defence against carnivorous foes. When, therefore, one sees any habitual action indulged in by young animals at play, it is safe to say that it is instinctive and extremely ancient, and, moreover, that it was at one time necessary as a preparation for the serious business of wild life. Any one who has seen an accomplished buck-jumper rid himself of his rider and his saddle, in spite of girths and crupper, will be convinced that a leopard, or any beast of a similar kind, would

have considerable difficulty in retaining his hold on the back of such an animal. And, moreover, when the head of the intended victim was down between his knees, a panther could scarcely accomplish his favourite method of killing by seizing the nose with one paw and twisting the head back so as to dislocate the neck.

Every horse which is employed on the road must learn to trot or he is of little use to his owner, yet we find that the wild prairie horses and young colts out at pasture seldom trot except for a few steps when changing from a canter to a walk. Some naturalists have even said that this pace is entirely artificial, and has been acquired since the horse became man's captive. I need not say anything of the wonderful perfection to which trotting has been brought by judicious breeding and training. But let us consider what was the natural raw material out of which the feats of "Maud S." and her competitors have been evolved.

On the smooth, springy turf cantering or galloping is the easiest pace; but on a hard, irregular track, with rocks strewn about, even the wild horse will trot, and lift his knees in the most approved style. So at least I have been told by

those who have watched the wild "brumbies" in the mountains of Australia. The reason is not difficult to see. A horse when he walks or trots puts down one front foot at a time; and when the rough and treacherous nature of the ground renders great care necessary (for a false step might mean instant death from foes or precipices), this is by far the safest method of going for an animal of his weight and bulk. He can choose his foothold better when walking or trotting than if, as when he canters or gallops, he has to find resting-places for both his front hoofs together instead of for one at a time. We find practically nowadays that for road-work trotting is the safest pace, and takes far less out of a horse than cantering. Here again we see that a provision of nature for certain special emergencies of free equine life has been taken hold of by civilised man and developed for his own ends.

When we come to discuss the useful attributes of the ox it will be shown that his value as a draught animal is directly dependent on certain peculiar habits of his wild life. This can hardly be said of the cart-horse. It is merely through a happy coincidence that we are able, without much difficulty, so to harness him as to

avail ourselves of his great muscular power for the purpose of pulling loads. The only wild trait upon which his value as a draught animal can be said to be based is the propulsive power in the thighs and loin of the wild steed which enables him to jump obstacles and to gallop up steep slopes when he is escaping from pursuing foes. Precisely the same set of muscles as are useful for such purposes are brought into action when the dray-horse bends himself to his work to haul a heavy load up-hill. The front legs of a horse act somewhat at a disadvantage when used for hauling, but still one can see that when the wild ancestor of the cart-horse was climbing some precipitous path he must have exercised the muscles of the "arm" in a manner similar to that of the draught-horse when doing his best to move a heavy load. Perhaps the most happy coincidence of all is the fact that one can fix a collar on the neck of most horses in such a way as to enable them to use all their most powerful muscles in pulling without the pressure causing any impediment or injury. Most young people who have attempted to draw some heavy load when "playing at horses" know how exceedingly difficult it is to arrange the band attached to the

traces in such a manner as neither to cause painful pressure nor to interfere with the free action of the lungs. I do not know any natural reason why the region of the shoulder and neck in the horse should have the structures so arranged as to offer facility for the wearing of a collar. In this case chance has come to the aid of man's ingenuity, or perhaps it would be more correct to say that man's ingenuity has seized upon a fortunate chance. One point as to the special fitness of a draught-horse's shape for his work is probably due to an original peculiarity of the heavier breeds which existed in the days of equine freedom. For slow draught an upright shoulder with a rather heavy "point" is considered most desirable, whereas a sloping shoulder, which does not project forwards, is found best adapted for the duties of the saddle-horse and for light-harness work requiring speed rather than strength. The aboriginal horses of Western Europe, from which our heavier modern breeds are probably descended, were built on the former plan, whereas the modern representatives of the more speedy Eastern and Southern steeds have light sloping shoulders, which, while unfitting them for heavy-harness

work, prove just what is wanted in a hunter or a race-horse.

We owe the tractable and docile temper of the horse to the fact that he is naturally gregarious in his habits ; for when many animals are associated together for common protection an accommodating temper and a readiness to obey the leaders are most necessary virtues. Selfishness and cantankerousness would soon break up the band, and then each member would have to fight the wolves or watch for the prowling *Felidæ* single-handed. A two-year-old colt readily yields his will to that of his trainer, because the young wild horse always had to "knock under" to the wild veteran which was the acknowledged leader of the mob.

Further proofs of the social habits of the horse are found in his readiness to respond when spoken to, and in his numerous methods of communicating with his fellows. Not only does he neigh, but he makes use of various less pronounced sounds, such as subdued whinnies and snorts, by means of which he makes known his wants or sentiments. A horse can readily tell from the sound made by a fellow whether he is alarmed or angry. Not long ago I was

driving a pony near London when, some distance ahead, I saw a bolting horse which had got away from its driver and was approaching at a furious gallop. The pony did not see the terrified runaway, which, fortunately, was stopped before it reached me. As I drove past the spot where some men were holding the animal, the pony, which all the time had gained no knowledge of what was going on, heard the snorting of the frightened horse and at once became so terrified as to be almost uncontrollable. The sound was to him evidently a warning signal of the most urgent kind, and for the rest of the morning he kept his head up (although not naturally a shy animal), as if on the look-out for some dangerous object. There is no surer way of judging whether an animal is naturally and habitually accustomed to associate with its fellows and to act in concert with them than by observing its readiness in expressing emotion.

One remarkable and most valuable trait in the horse is its courage. This was doubtless attributable in the first place to the habit of the wild stallion of waging fierce war with rivals or enemies. Although valour of the combative kind is not often called for in the domestic

horse—unless he is used for military purposes—and therefore has not been specially cultivated by breeders, it is probable that the natural courage of horses has been rather increased than diminished by civilisation. This is due to the selection of successful race-horses for breeding purposes. Now a horse-race is quite as much a test of pluck as of muscular power; in fact it is usually more so, for the animal which will keep up its pace as long as it has breath, will generally prevail over a better equipped rival which flags as soon as it feels severe fatigue. Owing to this fact, and the long-continued choice of winners for stud purposes, it is now an almost universal rule that “blood”-horses are highly courageous. They are certainly not so much given to shying as are “half-bred” horses—although this may possibly be due in part to another cause. Modern race-horses have an almost pure and unbroken descent from the desert-dwelling steeds of the East, whereas our heavier horses are probably derived to a great extent from the wild mobs which in prehistoric times inhabited the moister regions of Central and Western Europe. Now, if our interpretation of the origin of the habit of shying be correct, it

is evident that the horse dwelling among comparatively thickly wooded regions in Europe must have had to employ this method of escaping from ambushed foes much more frequently than did the wild Eastern steeds who made their home on the bare and open steppe.

Every one has noticed that a horse lays back his ears when he is in a bad temper. Darwin, in his work on 'The Expression of the Emotions,' says :—

When horses fight together they use their incisors for biting, and their fore-legs for striking, much more than they do their hind-legs for kicking backwards. This has been observed when stallions have broken loose and have fought together, and may likewise be inferred from the kind of wounds which they inflict on each other. Every one recognises the vicious appearance which the drawing back of the ears gives a horse. This movement is very different from that of listening to a sound behind. If an ill-tempered horse in a stall is inclined to kick backwards, his ears are retracted from habit, though he has no intention or power to bite. But when a horse throws up both hind-legs in play, as when entering an open field, or when just touched by the whip, he does not generally depress his ears, for he does not feel vicious. Guana-coes fight savagely with their teeth; and they must do so frequently, for I found the hides of several

which I shot in Patagonia deeply scored. So do camels; and both these animals when savage draw their ears closely backwards. Guanacoës, as I have noticed, when not intending to bite but merely to spit their offensive saliva from a distance on an intruder, retract their ears. Even the hippopotamus, when threatening with its widely-open enormous mouth a comrade, draws back its small ears just like a horse. Now what a contrast is presented between the foregoing animals and cattle, sheep, or goats, which never use their teeth in fighting, and never draw back their ears when enraged.¹

The great difference between the various breeds of horses has been largely brought about by human agency, but not entirely so. We find that in mountainous regions the native horses are always small and stout, with coats inclined to be shaggy. All modern ponies are descended from those herds which chose the hills for their habitat. I shall have something to say in later chapters about the effect of mountain-ranges in developing certain useful qualities of our domestic animals. Not long ago I saw some Hungarian mountain-ponies in London, and mistook them for large Shetlanders. The likeness is certainly very great, and strongly

¹ 'Expression of the Emotions,' p. 118.

suggests a common source of origin. Most interesting, therefore, is the fact that both kinds bear a remarkable resemblance, as far as general shape is concerned, to the prehistoric European wild horse, which the early men of Central France used to kill with their flint-headed arrows. We know this partly from the shape of the bones of horses found associated with early human remains; but chiefly because of the curious fact that these primitive savages were accomplished artists, and have left many masterly sketches of horses and other animals scratched on reindeer horns, mammoth tusks, and pieces of slate and stone in the caves which they used to inhabit. The horses here represented have large heads, straight short necks, round bodies, and stout legs. We know that they existed in countless herds, for at one place where the ancient horse-hunters lived there are the bones of many thousands. They were sturdy animals, although of no great size; and there is very little doubt that we have, in the Shetland and Hungarian ponies, some of their direct descendants. Most of our lighter horses owe their origin largely to Arab and Barb importations. Modern cart-horses are most probably of the

stout European aboriginal stock, but have been much improved by constant selection and good feeding. Many of them have the appearance of overgrown ponies, and their general shape is similar to that of the native European breeds which have been kept fairly pure by isolation. The mustangs of the West are now pretty thoroughly mixed; but in the first place they were the descendants of the horses which escaped from the Spanish conquerors. These, from ancient pictures, I should judge to have been a cross between the native European horse and the African barb.

One is often able to get interesting hints about the habits of animals both in the present and in the past by examining their colour: thus we shall see, when we come to discuss the domestic cat, that the markings familiar to us in the common "tabby" reveal a very curious phase in the ancient history of the animal. Certain horses, especially the breeds common in Norway and North-East Europe, have a dark stripe down the spine, and occasionally a few cross markings upon the upper part of the fore-legs. This seems to indicate that at one time the horse was a striped animal, especially as there seems a

tendency among all breeds for similar markings to make their appearance. If so, such stripes would doubtless be of protective value in the same way as are the bands upon the zebra. In a succeeding chapter we shall see how remarkably useful these may prove in saving zebras from their enemies both by day and by night. There seems a curious tendency among the wild and half-wild horses of the Western world to develop conspicuous and eccentric colours. A remarkably large proportion of the Indian ponies are "piebald," insomuch that one ingenious correspondent suggested that in the early days of Spanish rule the animals of a travelling circus may have got loose and become the ancestors of many of the mustangs! Now it seems at first sight rather remarkable that the wild members of a species should be more conspicuous than the tame ones which do not need to resort to concealment. But, as a matter of fact,—as will be seen when we come to discuss the colour of the zebra,—conspicuousness may be a decided advantage to animals living after the manner of wild horses. It would be interesting if we could ascertain whether the peculiarities of colour observable among the

prairie horses of to-day have become more marked in the three centuries that have elapsed since the Spanish conquest. At present the Barb and Andalusian breeds are not more variegated in colour than are the other horses of the Old World; and unless the adventurers who took their steeds West had a special taste for "piebald" and other eccentrically coloured steeds, it seems difficult to explain the present prevailing colours among the mustangs, except upon the supposition that the resumption of wild habits has produced some remarkable changes in this respect.

Possibly, however, an explanation of the phenomenon may be found in the fact that the early adventurers could only have brought a very few horses with them, and that of these invaluable animals the greatest care would have been taken. Hence the number which escaped and which became the ancestors of the wild mustangs would have been very small, and if one of these chanced to possess any special peculiarity it would be likely to be repeated among all its innumerable descendants.

The distinct types observable among the various strains of domestic horses doubtless

depend upon the fact that our modern breeds have been derived from several widely different sources. This seems the more likely, because certain peculiarities of disposition appear to be associated with hair of a special tint: thus a roan horse is usually placid and tractable, a sorrel is generally vicious, and a bright bay or chestnut, which shows some white markings and white in the sclerotic of the eye, is almost invariably courageous and possesses a hot impatient temper. I do not see how this double uniformity—both in colour and character—can be explained except upon the supposition that each of these distinct types represents some pure-blooded ancient race which originated such attributes of mind and body in the first instance. We know that among mankind certain types remain fixed, in spite of a free mixture of different branches of the human family. And in some cases, as, for instance, in that of the choleric red-haired man of Celtic type found wherever English is spoken, peculiarities of complexion and disposition in the individual are clearly traceable to racial idiosyncrasies.

Where animals have been domesticated for many generations, it is difficult to trace the

original cause of any peculiarity of colour, but it seems probable that the mottled markings seen on grey and "hammer-marked" horses were at one time protective.

Doubtless the abundant growth of hair upon the neck of a horse served some essential purpose in wild equine economy; but it is not easy for the modern naturalist to explain its *raison d'être*. One finds a mane of some kind to be exceedingly common among quadrupeds, and the peculiarity does not depend upon mere kinship, for it is found distributed among very diverse orders. As a rule, it does not amount to more than an upright ridge of hair, such as is found upon the necks of many antelopes and all the horse's humbler relatives. If we are to accept Prejevalsky's wild horse as a true representative of the aboriginal stock from which our domestic animals have sprung, it would seem as if the mane has been considerably developed since the time when the horse was made captive; for this animal has but little more hair on its neck than has the kiang or Thibetan wild ass. It is, however, very doubtful whether either this animal or the wild tarpan of the steppes of Tartary has a clean record of independence. It is not at all unlikely

that both Prejevalsky's horse and the wild camels which inhabit the Zaisan and Dzungarian deserts are feral ; that is to say, they are descended from animals which have escaped from captivity. The Western mustangs, although they seem to have undergone some of those reversionary changes not uncommon among domestic animals which have resumed their freedom, show no sign whatever of any curtailment of the mane. In fact, Catlin and other writers who traversed Western America in the days when there were innumerable thousands of wild steeds living on the prairies, describe them as possessing extraordinarily long and thick manes reaching almost to the ground, which, when the animals were in rapid motion, enveloped the forepart of their bodies in a cloud of flying hair. Of the various suggestions which have been made as to the primary use of the mane, two, I think, deserve attention. Doubtless such a covering would be useful in shielding the delicate structures of the neck from the weather ; although, seeing that the whole spine of the animal seems equally to need protection, this seems scarcely sufficient justification for the local growth of the hair. More probably the mane of the horse, like that of the lion, was

primarily of value as a species of defensive armour. In their savage combats for the possession of the mares, stallions will invariably endeavour to seize one another by the neck with their powerful teeth, and I think there can be little doubt that the "crest," which forms one of the chief sexual differences in horses, was developed in the male to protect his cervical vertebræ from attacks of this kind. Yet, since fighting horses usually bite at the centre of the nape of the neck in their opponents, and the mane extends evenly from the forelock to the wither, it seems somewhat doubtful if its protective value in battle would be sufficient to account for its origin. Many very ancient sculptures and drawings of horses found in the East go to show that the early civilised races did not consider a long mane desirable, and therefore it is pretty certain that breeders of those days took no steps to cultivate it. Nearly all these early representations of horses show the mane to be "hogged," as if the horseman and charioteer of ancient days found the free growth of the hair to be a disadvantage when he was fighting. Although we cannot satisfactorily account for the mane on evolutionary grounds, it

seems obvious that at some time a free growth of hair on the neck was of essential value to the equine race. Hence it is quite worth while for any naturalist of a horsey turn of mind, and with a talent for investigation, to try to unravel the mystery contained in the "elf-locks" in the mane of every yearling.

The horse's tail presents no such problems as to its value and origin. There can be no doubt that the primary use of the long hairs of the tail was to sweep away noxious insects from the skin. We all know how exceedingly sensitive the horse is to the attacks of flies, and how, when his owner allows him a chance, he keeps swishing the long brush with which nature has provided him over the whole surface of his body. To a great extent this action is involuntary and automatic. Every one who has been in the habit of driving will have observed that whenever a whip touches a horse it instantly responds with a spasmodic movement of its tail, even although it may be so hopelessly tired or lazy as to require much severer coercive measures to make it quicken its pace. Now this jerk of the tail in the modern carriage-horse is an interesting piece of vestigial reflex action which bears no reference

whatever to whips or any other civilised innovations, but which probably dates back to the Eocene epoch when the *Phenacodus primævus* continually lashed his robust caudal member to and fro in defending himself against the voracious Tertiary flies.

Every one who has the welfare of the horse at heart will commend modern legislative action making it punishable to shorten the "dock" of a horse's tail. Although a docked horse may look somewhat smarter to the civilised eye than one with a tail of natural length, and is certainly less liable to the risk of getting its tail over the reins when driven, it is to the interest of the owner as well as to that of the animal that such barbarous mutilations should cease. Every horse gains in health, and therefore in value, by being turned out to pasture, under proper conditions, during the summer months. It is fairly obvious that an animal which is able to protect itself against insect enemies in the easy and effectual way which nature has provided, will get much more benefit from such an annual outing than one which cannot get rid of its swarms of worrying persecutors in spite of incessant stamping of the feet and restless movements of the whole body.

Every horse has on its legs wart-like scaly

patches of bare skin called callosities. On the front-legs they are above the knee, and on the hind-legs below the hock. They are of no present use that we can discover ; and, in spite of many guesses, no theory has ever been put forward that will satisfactorily account for their presence. In spite of the fact that no horse is without them, and although they hardly ever give rise to inconvenience, certain old writers on veterinary surgery, oddly enough, describe these callosities as manifestations of disease under the name of "mal-lenders" or "sallenders," and actually set forth several approved methods for effecting a cure ! An equally ludicrous instance of want of observation once came directly under my notice. A farm carter, who had been among horses during the whole of his life, one day made his appearance at his master's door with a very grave face, stating he had just discovered that every horse in his team had got something wrong with its legs. The farmer on going to the stable, and anxiously examining the supposed invalids, found nothing whatever except these natural callosities, which, for some reason or other, had on that day for the first time attracted the attention of the carter ! One plausible explanation which has been attempted of late is to the effect that these

patches represent the supplementary hoofs which undoubtedly, among the ancient Equidæ, used to exist on each side of, and somewhat above, the central hoof. A little knowledge of equine anatomy, however, shows this hypothesis to be untenable.

It is true that in every horse's leg one finds vestiges of the bones which used to support the extra toes, but these invariably show themselves in their proper places—that is, below the knee and hock joints. Supposing the callosity on the foreleg to be the remnant of the hoof of the first or second digit (corresponding to our thumb or index-finger), I cannot see how it could possibly have got displaced so as now to be situated considerably above the knee-joint. One of our humble relatives, the colobus monkey of Africa, has lost its thumbs as completely as the horse has, but we should be very much astonished if a vestigial thumb-nail were found embedded in the skin, not at the spot from which the thumb usually springs, but on the forearm between the wrist and the elbow.

An American gentleman who has travelled a good deal in the East informed me that the Arabs universally put forward an odd and rather ingenious theory about the origin of these

callosities, which, however, will scarcely bear scientific criticism. They say that, before birth, the fore and hind legs of a young foal are joined together at these spots; and they give as a reason for this supposed state of affairs the injury which might result to the dam if the unborn colt were free to exercise his limbs, which, as is well known, are very strong and muscular even at birth. It is scarcely necessary to say that no student of equine embryology who has studied the subject in a practical manner finds any confirmation of this oriental story.

We know that nature makes nothing in vain; and therefore these callosities on the legs of the horse either serve some useful purpose now, or else at some earlier period of his history played an important part in the economy of equine life. It is fairly certain that nowadays the horse would be just as well off without such appendages as with them, and hence they are probably historical relics of some phase of existence belonging to the remote past.

Certain circumstances of environment rendered the callosities necessary to the horse, and fixed them where we find them on his legs. Since they differ both in shape and distribution in the zebra and the ass, one may reasonably infer that

there were some material distinctions in the special outward circumstances which created the need for such things in these animals. One clue to the mystery, therefore, may be found by studying how the habits and history of wild asses and zebras differ from those of the wild horse.

Now here is a subject upon which some enterprising young naturalist may exercise his wits and his capacity for original research. If any one succeeds in solving the problem, he will certainly receive one reward for which many men of science have been content to labour; for his name will be quoted as an authority, and will pass down to future generations in every book which may be written upon the natural history of the Equidæ.¹

¹ Dr Bonavia, in his 'Studies in the Evolution of Animals,' has put forward the view that the callosities may be remnants of glandular structures secreting an odoriferous material which was useful in enabling horses to find one another after they had become scattered. One piece of evidence, however, which would have done more than anything else to prove or disprove this hypothesis he has omitted. If the callosities in a newly-born or foetal foal were found, when examined microscopically, to contain tissue similar to that of ordinary odoriferous glands, the problem would, I think, have been wellnigh solved. Until this has been done the question must still remain an open one.

CHAPTER IV.

THE DONKEY.

THE despised donkey may be said to be a more typical representative of the horse family (*Equidæ*) than the horse himself. He has far more near relatives living in a state of freedom than has his prouder fellow-servant, and also structurally more closely resembles the common ancestor of the tribe.

The four known species of zebra—the Cape or mountain zebra, Burchell's zebra, the beautiful quagga (now, alas! extinct), and the zebra of North-East Africa—as well as the three or four species of wild ass, are all the donkey's near kin.

There is very little doubt that the forefathers of our domestic donkey inhabited the mountainous tableland to the south and east of Egypt. There are still herds of wild asses to be found in

this region which closely resemble the finer specimens of our domestic breed. Ancient Egypt was almost certainly the scene of his apprenticeship as a servant of humanity. The appropriation of the valuable qualities of the ass to man's use was an achievement of the early inhabitants of the Nile Delta, and we have inherited the benefits derived from it. The Persians and the dwellers in Central Asia never succeeded in domesticating either the Syrian or the Thibetan wild ass, although ancient sculptures representing mules seem to show that it was used for breeding purposes. The hybrid obtained by a cross between an Asiatic ass and an Arab mare is usually a much more shapely and active animal than the ordinary mule.

The experience of the keepers at the Zoological Gardens, and other places where Asiatic wild asses are kept, has proved abundantly the ancient sayings as to the savage and intractable nature of these animals. In addition to this, another reason why the onager was not used by the ancients can be found in the fact that the horse was domesticated in Asia long before he was introduced into Egypt.

We have seen how many of the most valuable

qualities of the horse are attributable to the fact that he inhabited wide plains, and we have discussed the suggestion that he took to a life in the open because of carnivorous enemies which lurked in the forests and jungles of the swampy lowlands. The ass also appears to have been driven forth into the wilderness by the same agency ; but he sought safety in a different direction. He fled to the inaccessible hills ; and just as the horse became structurally adapted for life on the plains, so he became adapted for life among the mountains.

The sure-footedness of the donkey and the mule, which makes these animals so valuable for traffic upon precipitous roads, is one of the qualities developed by their ancestral home of which man has constantly made use. Lessons learned amid the heights and gorges of Abyssinia, long before the first pyramid was thought of, still yield valuable results among the passes of the Andes and Alps.

Let us see how far an examination of the donkey's other prominent characteristics bear out the conclusion as to his upland origin.

He is smaller than the horse, and the tendency is for all mountain animals to be small. We

nowhere find huge beasts, such as elephants or hippopotami, living upon the tops of ranges of hills. In the first place, they would not there find nutriment enough to supply their needs ; and, secondly, their bulk would preclude that agility of movement so indispensable to the mountaineer.

The ass is grey in colour, as are nearly all the dwellers among the rocks. As a rule, by studying the coloration of animals we can get some very valuable hints as to their habits and history. Generally speaking, animals are of such a hue as renders them least conspicuous when among their natural surroundings. There are striking exceptions to this rule ; but when such exist, we find that there are special circumstances which account for them. For instance, the zebra is very conspicuous when seen in broad daylight, and the reason is found in the fact that zebras are banded together in large herds and live on bush-covered plains. Now, a herd of animals which cannot adopt the sentry system generally guards against the approach of an enemy, not so much through each member watching for himself, as through all individuals keeping a keen watch on one another. Supposing a lion or a leopard were perceived by one zebra ; his excited movements

would at once catch the eyes of his fellows, *because he is so conspicuously marked*, and they would either join in protecting him, or flee, as the occasion required. The sharp vision of every pair of eyes in the herd is thus made to contribute to the safety of the whole community. I ought to add that Mr Francis Galton has shown the curious and interesting fact that, in the twilight, when the zebra approaches the dangerous drinking-places, his mixed colour seems to render him much less visible than if he were all of one hue.

Most mountain animals go in small bands, the members of which have to scatter over a wide area to find food, and so have to exercise great personal vigilance. To such, therefore, an inconspicuous colouring is advantageous, and in the case of an ass it is an imitation of the rocks of his ancestral domain. We do not know the colour of the three-toed horse (which, after all, was probably a donkey) which at one time roved in enormous numbers over Europe, Asia, and America, but there are some reasons for thinking that it was a striped animal somewhat similar in markings to the quagga. The chief reason for believing this is that all its descendants show a tendency to stripe-like markings. The ass is

no exception, for, as every one knows, it has a dark mark down its shoulder. Now, why should the other stripes which once existed, and which are still seen upon the zebras and occasionally upon the horse, have disappeared in the case of the donkey? or rather, why should this particular stripe which characterises him have remained after all the others have faded? According to the first principles of Darwinism—which are now fairly familiar to everybody—this peculiarity must have been at some time of vital use to its possessor or nature would not have preserved it. The only use that I can think of for the dark stripe down a donkey's shoulder is something to do with his mountain habitat; for although his grey coat might fairly assimilate with the colours of the rocks, his very bulk might reveal him to enemies, unless the even colouring was somewhat broken up. We find that nearly all animals which are protectively coloured exhibit certain lines and other markings which seem to be adapted for this end. The most notable exceptions are the white and tawny creatures whose habitat is either among the monotonous snow-fields or the sandy deserts. As a rule, nature does not present large surfaces of one colour, but almost invari-

ably mixes her tints. Hence among ordinary surroundings the evenly coloured animal is more likely to be discerned by the eyes of his foes than one which imitates nature's motley. Among the rocks dark lines indicating angles and crevices are of frequent occurrence, and it seems possible that this may have been the original use of the dark stripe down the shoulder of the ass.

The coat of the donkey is more inclined to be shaggy than that of the horse; and this also, considering the fact that he is always found wild in warm countries, suggests a habitat in elevated regions where the air is cold. Yet he shows an extraordinary power of adapting himself to different climates, and will stand fatigue under the heat of the tropics better than a horse. I was once told by a Kansas farmer that after a day's ploughing in the summer his horses would be completely exhausted; but his mules, after a roll on the ground, would scamper away to the pasture as if they had been keeping holiday all day. Although the donkey has not been used in Arctic regions, he bears cold remarkably well. Now these qualities, which greatly increase the usefulness of the animal to man, are undoubtedly

attributable to the fact that his place of origin was a mountainous region in the tropics, where he was subject to great variations of temperature. The giraffes and many of the antelopes, which come from near the same region as the wild ass, but are not highlanders, soon perish in a northern climate, as the trustees of the Zoological Gardens of London have found to their cost.

The donkey's legs have a considerable resemblance to those of the bighorn, chamois, and other climbing animals. They are stout and sinewy, and his hoofs are more pointed than those of the horse. He has no very great speed on level ground, but he can climb almost as well as a goat when he pleases. He has excellent nerves, is not given to shying or panic, and never loses his head on the most perilous track. The Syrian wild ass, the one mentioned in Scripture, is a much swifter animal; but I am here speaking of the family of our domestic variety.

The fact just mentioned—viz., that donkeys are not given to shying—rather supports the theory put forward in the previous chapter as to the probable origin of that troublesome habit in the horse. It was mentioned above that horses coming from an open country, such as the Arabs

and Barbs, are not nearly so addicted to shying as are those that live where there are bushes and trees which might harbour an enemy. Now, the donkey's forefathers lived for long ages where there was but little danger of foes lying in ambush ; hence perhaps his freedom from the habit.

The eyes of the donkey are not so prominent and quick as those of the horse, nor does he so often turn his head about to sniff the air ; but we all must acknowledge that in development of the ear he excels his proud relation. On the sandy or grassy plains, where the sound of footsteps is deadened, the eye is most valuable as a sentry, and the breeze blowing evenly across the open to the nostrils of the wild horse not only gives warning of the approach of a foe but reveals the direction from which the danger comes. But among the high rocks and gorges of a mountainous region the wind is gusty and fitful ; and there are many projecting crags round which a prowling enemy might creep unseen to within springing distance. Here the keenness of the auditory sense is much more important. The rolling of a loose stone down the slope, or the sound of approaching footsteps among the hard rocks and

shingle of the mountain-side, at once warns the sentry of the grazing herd. The long, movable ears of the ass will enable him to judge the direction from which a sound comes to a nicety, and many a time they have doubtless saved him from a violent death.

Then consider his magnificent voice! What could be better adapted for advertising his presence to his comrades on the neighbouring mountains, or for challenging his rivals from afar, when the echoes take up his defiant "hee-haw," until every cañon and crag within half a mile rings with its repetition? It sounds ridiculous enough in the streets, I admit—but so do the Highland bagpipe and the *yödel* of the Swiss mountaineer. But whatever merits the ass may have as a public speaker, it must be admitted that he does not shine in conversation. Whenever he opens his mouth, it is to utter a set oration of a strictly formal character. He has none of the small talk of his cousin the horse. If you, being his friend, go into his stable, he will greet you silently (possibly because he has no speech prepared which he deems worthy of the occasion), whereas the horse is always ready with a remark, especially if it is near feeding-time. Moreover, it may

readily be observed that when the ass is in company with his fellows, he pays but little attention to them. If two or three horses are standing together, they are perpetually turning to one another and acting in a way which is distinctly sociable; although (like some higher society animals) they do not always greet or treat their acquaintances in the kindest manner. But if you watch an assemblage of donkeys, such as may be seen any day on Blackheath and the other commons around London, the gathering is as solemn and as silent as a Quakers' meeting. All this indicates certain peculiarities in the social economy of the life of the wild ass which will be dealt with further on.

There is a cadence in the "eloquent outpouring" of the ass which always assails my pity; and had I the bent for artistic pathos of a Sterne, I would ignore for once the obligations which science imposes, and would seek to trace its origin to his first bitter taste of bondage. His pæan, or proclamation, or whatever it may be, unlike the public efforts of bipeds (whether of the Senate House, the Opera, or the barn-door), has no soaring *finale*. While still apparently in full progress, it halts, stumbles into a

groan or two, and is still. Like the fanfare of the baffled Tuscans, his

“Victorious trumpet-peal
Dies fitfully away.”

To many people the terminal gasps and grunts in this fiasco of a peroration appear a fit subject for laughter. But to my imagination they suggest that a sudden despair, prompted by the memory of his fallen state, has struck him to the heart like a leaden missile when in the full flight of his eloquence. It is as if he said to himself: “But, after all, what is the use of my old mountain war-cry! I am only a moke nowadays, and I may just as well hold my jaw. Even the Philistines make sport of it now. A day was when—— But—Well! well! I’ll go and look for a decent thistle!”

Civilisation has used the poor ass badly. Our ways are not his ways, and he not unfrequently reminds us of the fact. When he does express dissent, he shows himself an uncompromising bigot. Yet let us consider for a moment why he is “such an ass.” He has been taken from a bold and free life in the uplands, where the very air tastes of independence, and has been de-

graded to the lowest kinds of drudgery. Non-conformist as he is, he is more of a Tory than the horse. He cannot fit himself to changed circumstances. He is like the free Caribs, whom the Spaniards tried to reduce to slavery; the condition is so foreign to his nature that he cannot fall in with it without losing all the nobler traits of his old self. It crushes him. He is proverbially patient, but his patience has that in it which suggests the despondency of a slave. Yet obstinate and inert as he occasionally is, he cannot, even in his environment of bondage, be considered a fool. If he seems of dull intellect, it is chiefly because we have removed him so far out of his natural sphere. The duck and goose show a like change of character when they come under the influence of man. In the wild state, as every sportsman knows, they are among the most vigilant and cunning creatures in the world. A wild goose is proverbially wild, while a tame goose is proverbially "a goose." The fact is that their natural talents have no scope at all when they are removed from the environment in which these talents were first developed. Because such mental qualities as they possess are hidden, the casual observer jumps to the conclusion that they

are witless creatures, and makes their mental poverty a byword. But if any of us highly intelligent and educated folk were removed from our normal surroundings, to which we have adapted ourselves at considerable labour and expense, and were suddenly turned loose to get a living among the deserts of Nubia or the Siberian marshes, we should doubtless offer as fair a laughing-stock to the wild asses and the wild geese.

The obstinacy of the ass is a trait in his character which must have attracted the attention of the most careless naturalist. It is not a quality which his employer deems specially useful, rather the reverse: yet we must remember that on a long journey where food and water are scanty and the difficulties of travel are serious, the ass or the mule will, because of this unyielding temper, keep going longer than the average horse.

It seems to me likely that the great difference in character between the horse and the ass is chiefly owing to the fact that when wild the former go in large herds and the latter in small. As has been remarked above, the horse is much more of a society animal than the donkey, and this, doubtless, is the reason why his manners are

more suave. He, like all those who have to mix freely with their fellows, has acquired an accommodating disposition. In the case of men, we seldom find an obstinate, self-assertive individual among those who live in cities and mix freely in society. Such ass-like natures are much commoner in small communities, such as farm-hamlets and villages. The common view that the donkey is less intelligent than the horse is not supported by those who have studied the subject with thoroughness. Professor Romanes, in his interesting book upon 'Animal Intelligence,' tells us some remarkable stories of the sagacity of the ass. It is his unwillingness to fall in with the wishes of those who would influence him, his general conservatism, and his stubbornness in sticking to his own view, which have won him the undeserved reputation which he holds. But if we look at him in his wild state we shall find an explanation of this mental independence. In his mountain home, where pasture is scarce, only a few wild asses, as a rule, go together. Should a foe appear suddenly when they are scattered in search of the scanty herbage, each must decide on a course for himself, for it would not always be possible to follow a leader. Hence self-reli-

ance and a disposition to act independently of his fellows would be most valuable in the struggle for existence.

How do we know that the donkey's ancestors lived where pasture was scarce? Because an ass will eat a thistle; showing that his mouth has become adapted for such meagre and prickly diet as is found in desert places.

The dread of entering running water is another characteristic of the species. Darwin draws attention to this as an indication that the domestic ass first came from a region where water was scarce. He also alludes to the delight all donkeys show in rolling in the dust as an instance of inherited desert habits. I cannot see why the mere scarcity of brooks in the arid wastes of his original home should give the beast this instinctive aversion. One would think that, after a day in the parched wilderness, the cool streams would have been his delight. There evidently must have been something about the Ethiopian rivers which gave rise to well-founded emotions of fear. What could it have been? Crocodiles? We have seen how some horses become frantic with terror at the rustle of reed-beds, because it was at such spots that, for countless generations, some

of the most deadly foes of their race lay in wait for them. Indeed, far-fetched as it may appear at first sight, I am inclined to adopt the crocodile hypothesis to account for this curious and universal prejudice of the donkey.

The dogs of Egypt have the greatest horror of crocodiles, and approach the river with the utmost caution. They even, as Herodotus remarked long ago, run along the bank as they lap. Sir Samuel Baker, in his 'Rifle and Hound in Ceylon,' tells a most instructive tale of a pariah dog which refused, when hunting, to cross a narrow stream. Sir S. Baker afterwards discovered that there were alligators lurking among the reeds, and of these the dog had the most abject terror.

Crocodiles and similar reptiles were much more plentiful in the past than they are now. The rivers in all the warmer parts of the world once swarmed with them. If, as is probable, the wild asses' forefathers have inhabited a crocodile-infested country ever since the Tertiary epoch, they must have had business relations (of a very unprofitable sort for the poor jackass) with these voracious saurians for hundreds of thousands of years. It would be a matter for surprise, especially when we consider the rigidly conser-

vative principles of the donkey tribe, if such a connection had left no traces in the instinctive habits of the race.

Perhaps it may be as well to remark that any such fixed mental trait is not the result of accumulated experience. It is developed by the ordinary processes of evolution—that is to say, through natural variation and the survival of the fittest—just as is any peculiarity of the bodily frame. In spite of many expressions of opinion to the contrary which one still hears even among well-informed people, there is at present no satisfactory evidence that experience, or anything else, gained during the life of an individual organism is naturally inherited by its progeny. To take the case we are dealing with as an example—the inbred dislike to entering the water which characterises the ass tribe probably originated somewhat in the following way. Among every herd of wild asses there were always individuals which were more timid in certain directions than their fellows, just as in any assembly of human beings—every individual of which differs somewhat from his companions both in features and character—there will be some who are naturally more easily alarmed than the rest.

Now, when our primeval donkeys went to quench their thirst at a river, any incautious animals which waded in before drinking, as is the custom with horses and cattle, would be more liable to be seized by crocodiles than those which feared to wet their feet, and which started away as soon as they noticed any strange object in the water. In a comparatively short time in any country where crocodiles were plentiful the more reckless drinkers among the herd would be eliminated. This sifting-out process would go on continually; so that in the end the majority of the original members of the herd which remained would be such as had from the first manifested this instinctive aversion. And, since "like produces like," all the young asses born of such parentage would tend to inherit similar mental tendencies. Moreover, the influence which first evoked this natural trait would be constantly at work from generation to generation; for it is plain that while the environment remained the same, every young animal which took after his more reckless progenitors would tend to be eliminated just as they were.

I do not mean to imply that the controversy which has raged so fiercely of late as to the in-

heritance or non-inheritance of acquired characters is finally settled in the negative. Weismann's elaborate theory, as at present set forth, seems to me to involve much which belongs rather to the region of metaphysics than to that of physiology. We must wait until we have acquired many more solid facts upon which to base our arguments if we are to attack the Heredity Problem in the way in which Darwin attacked that of the Origin of Species. But without doubt there is a growing tendency amongst men of science to discountenance the once common doctrine that the education of one generation, whether among animals or men, has an effect upon the mental attributes of the next.

Most animals have an inbred horror of lizards and snakes, and this instinct is almost certainly a vestigial echo of the long and deadly struggle for supremacy between the warm- and cold-blooded populations which must have gone on without intermission for many thousands of generations.

There was a time when, as Tennyson says—

“A monstrous eft of old
Was lord and master of earth,”

and when the largest mammals were miserable

underlings, creeping and dodging about in the hope of escaping his lordship's terrible jaws. Does it not seem probable that the donkey's reluctance to enter the water is based upon some such natural legend, even if he has no conscious dread of the crocodile? He has never been told that the brooks of Europe and of the northern part of the United States contain no such vermin. Let some one of the rising generation of naturalists think this theory out; and when he has got at all the available facts—but not until then—let him write a monograph upon the subject. I, for one, will promise to buy it.

CHAPTER V.

DOMESTIC CATTLE.

THE study of the peculiar traits of domestic cattle should be of especial interest to us, because the genus *Bos* has undoubtedly occupied a more important place in our own ancestral history than any other species of animal. Our Aryan forefathers, who lived on the plains of Central and Eastern Europe, were cowboys almost to a man. As is the case with the Caffres and Damaras of South Africa to-day, their thoughts and conversation were chiefly about their herds. This is shown in a curious way by the study of the early development of our language. The Sanskrit word for a king meant originally a chief herdsman; the word for a parliament or assembly was derived from that for a cow-yard, and a soldier was "one who fights about cows."

It would seem as if they regarded nothing else as worth ruling over, or talking about, or fighting for. Professor Max Müller traces our word "daughter" to the ancient term for a milkmaid. In the good old times they plainly did not take any account of young ladies who were not accomplished performers in the cow-pen.

The cow and the ox were for long ages the chief standards of value. Everything, from a new coat to a new wife, was priced at so many cows. Many of our words which refer to money bear traces of this, such as "fee" and "pecuniary," which are directly derived from the Old English and Latin words for cattle. Doubtless there were currency disputes when other materials began to be used for coinage, and difficulties arose about the adjustment of relative values. "Cow - metallism" might well have been an important plank in some of the Aryan political platforms.

Our domestic cattle are descended from at least two wild varieties. One, the *Bos primigenius* or *Urus*, was a magnificent beast, as tall as a moose and with enormous horns. It probably inhabited the open, park-like country and swampy, sparsely-wooded plains. Its great

width of horn would not have been suitable for life in the dense timber. The wild white cattle still kept in Chillingham Park in Northumberland are supposed to be its direct descendants. The other, the *Bos longifrons*, was much smaller and had short horns. Its habitat was probably among the grassy glades of the forest, where it browsed with the roebuck and the fallow deer. Some naturalists consider that another wild species, the *Bos frontosus*, was also an ancestor of the modern breeds, especially of the Norse cattle.

In early times the strength of the ox was much more generally made use of than at the present day. In some parts of England, as in the Southdown district, teams of black oxen, yoked two and two, are still used on the farms, especially for ploughing and rolling. In America the draught-ox is being superseded by the quicker-stepping horse in all parts; but the first ploughs which broke the virgin soil of the United States were drawn by the cattle which the early settlers took over with them.

For hauling lumber the ox has no equal. His patient temper, and strength at a dead pull, render him far better fitted for this class of work than the more hasty and irritable horse. In France

and some other European countries he holds his own as a worker, and in the lazy East, where the heavy draught-horse has never been made use of, he is still employed to scratch the soil or to tread out the corn.

In Sussex and in parts of New England the ancient form of yoke is still used, which fits on to the nape of the necks of two bullocks. In France and Germany the yoke is commonly fastened to the horns and brow, so that the beasts draw the load with their heads; while the Spaniards make a clever compromise by connecting a neck yoke to the forehead of the ox with straps of leather.

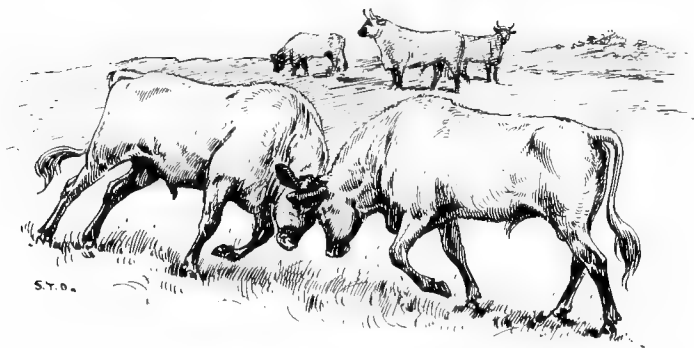
Certain humane people, both in England and America, have thought this primitive kind of harness barbarous, and have designed collars and breast-straps for oxen. I shall show that this well-meant attempt at improvement was prompted by a misunderstanding of the history and habits of the beasts which these good folk thought to relieve.

Now, what were the natural circumstances of the wild cattle which gave rise to the strength which men have found so serviceable? Partly, like the speed and endurance of the horse, it

may be attributed to the long struggle with carnivorous foes. The weakly or undersized cattle would naturally fall a prey more easily than those which were large and strong. But we shall find the chief cause in the fact that a desperate strife for the mastery was always going on between the rival bulls which desired to lord it over the rest of the herd. In these battles the strongest and most active would naturally come off victors. It was generally more a question of weight and strength than of agility, for bulls fight by charging and thrusting at one another with their horns. There is no doubt that the massive fore-end of the bull bison was developed by the habit of using himself as a projectile wherewith to batter his rivals out of the over-lordship of the herd. But the strategy of the common bull involves another method of attack. He tries to toss his opponent, and this feat, when he is dealing with a foe which weighs nearly a ton, requires considerable strength of neck.

Now it is this very strength that has been acquired for the purposes of war, which makes the ox so useful in peaceful agriculture. Men have not yet beaten their swords into ploughshares, but the ox has for many ages bowed

the muscular neck by means of which he used to overthrow and gore his enemies, to the yoke which drags the plough. The strength of the neck even in the more feeble cattle is astonishing. I have known a slim and lady-like Jersey heifer hoist a cast-iron water cistern with her horns as easily as if it had been a teacup. It would appear



How the ox learned to pull.

then, that the French or Spanish peasant's way of "hitching his critters" is right, and that the elaborate harness of the humane agriculturists is wrong.

The old-fashioned beam-yoke, resting on the nape of the neck, is a kind of compromise. It is better than the breast-straps, but not so good as the lighter yoke that fits the forehead and

base of the horns. Nature has exactly adapted the structure of the head and neck of the ox for pushing; and since a pull is only a push with a string to it, depend upon it this is the most advantageous way for a team of oxen to draw a load.

When we take milk with our tea, or butter or cheese with our bread, we are conniving at what is, when looked at in one way, a particularly heartless form of theft. Did nature, in the first place, provide the milk for our benefit? Not at all: it is the provision for the poor innocent calf, and we have filched his property from him by force or trickery. But, passing over the moral aspect of the question — which you will generally find is the most discreet method when we are discussing our dealings with the lower animals — how is it that the cow is so especially useful in yielding us an abundant supply of milk?

The answer is, Because she is naturally a forest animal, which had often to leave her baby behind and to wander far for food. Wild cattle hide their young calves in the thickets. Unlike the colt, the calf has but feeble locomotive powers, and therefore it could not ac-



WILD COW LEAVING HER CALF IN HIDING.

company the cow when she travelled to distant glades where grass was abundant. Thus the sucking calf cannot get his nutriment whenever he wants it, as the young foal can, which is never away from the mare. He has to wait for his meals until his mother returns. But this arrangement also renders it needful that the cow's udder should hold a good store of milk, which slowly collects during the hours when she is absent from her baby. Hence the large "bag," which always distinguishes a good milker; and hence, also, the important fact that a cow retains her milk until the morning and evening visits of the farmer or dairy-maid.

The habit of chewing the cud among cattle and other herbivorous animals tells a similar tale. They had no time to masticate the grass thoroughly when they were feeding, but were obliged to get in a supply of provisions as rapidly as possible, and during the hours when the wild beasts were least abroad. Having got in their store, they retired to their safe hiding-places and lay down to ruminate at leisure.

It is easy to see that cattle are at home in a moist and wooded country. The feral cattle of

Texas and Australia never from choice stray far from the woods. Out on the Western ranches there are, of course, few trees, and the beasts thrive fairly well ; but, for all that, the conditions of their life are artificial, and are not such as they would select if free to choose their own dwelling-place. All cattle love to stand knee-deep in water and under the shadow of trees. Their heads are carried low, even when they are startled, so that they can see under the spreading branches of the forest. Compare the habitual position of the head of a cow with that of the heads of the horse, pronghorn, or guanaco, which live in the open and have to watch the horizon for the approach of enemies.

The split hoofs of cattle are wonderfully adapted for progress over soft ground. In galloping through bogs or deep mud an ox or a buffalo will easily distance a swift horse. Their toes spread wide, and so they do not sink in so far as the solid-hoofed animal. What is even more important, the open cleft between the toes allows the air to enter the hole in the mud as the foot is withdrawn ; whereas a horse's hoof sticks like a "sucker," owing to the partial vacuum below it, and can only be

dragged out by a great muscular effort. Mounted hunters have been overtaken and killed by buffaloes—African and Indian—owing to this fact.

The tough material of which the horns of cattle are composed has been applied by man to an almost endless number of purposes. Horns are of course the chief weapons of the ox tribe, and all feral and half-wild cattle are provided with them. Probably those most liberally endowed in this respect in the present day are the Bechuana cattle of South Africa. I have seen a pair of horns belonging to an animal of this breed which measured between thirteen and fourteen feet from tip to tip round the curves! Probably such a monstrous development as this is due to the eccentric taste of the Bechuana stock-raisers. No species of domestic cattle belonging to civilised people has had its horns specially cultivated; in fact the reverse has generally been the case. Civilisation has but few uses for the horns of the ox while they are on its head, although it is so ready to turn them to account after his death. A number of breeds of polled or hornless cattle have been developed independently of one another, in various parts of the world. These

have not been the result, as some people imagine, of the ancient barbarous practice of "de-horning" cattle, because it is almost certain that the changes produced in the individual by such mutilations are not inherited. Probably in every instance in which such a breed has been developed man has made use of a "chance variation" in this direction. It seems very improbable that any of the ancestral types of cattle were hornless. Among the many ancient skulls which have been unearthed in all parts of Europe one finds no trace of a polled breed. Indeed the wild cattle, living as they did a life of continual warfare both civil and against numerous fierce carnivorous enemies, could scarcely have existed without this natural means of defence.

There are reasons for thinking that the horns were developed, in the first place, not so much to enable the wild bulls to be victors in their civil contests, as to enable the wild cows to protect their calves from wolves and other enemies. It has puzzled some people that, although the bull is a much more warlike animal than the cow, the horns of the latter, both in shape, length, and direction, are far

more effective as weapons than are his. Probably the cow's long curved horns represent the primitive type, while the blunt and conical weapons of the modern bull represent a special modification.

This leads us to one of those interesting general questions concerning what may be called the moral aspect of animal life which Darwinism has done so much to reveal and to unravel. One finds it to be a rule that, where natural weapons are used in civil contests, they are scarcely ever of a lethal character; and even where they are chiefly for defence against bloodthirsty foes, they are seldom of such a form as inevitably to produce death. One can, of course, see that where animals live in communities in the manner of the Bovidæ, it is decidedly against the public interest for duels to the death to occur between the rival champions of a herd. Supposing, for instance, that the bull was armed with the fearful bayonets of the gemsbok, and was still in the habit of charging impetuously at his competitors for the chieftainship, it would often happen that the herd would be deprived of its two most promising leaders and protectors; for neither beast

could escape from such a contest without dangerous wounds. In bovine society, although the practice of duelling has not been so rigidly discountenanced as among our civilised selves, private contests have been reduced to a comparatively harmless form, similar to that now prevailing among French journalists and German students—where, by the way, one sees the same conservative law at work which has been unconsciously operating for many centuries in the wider realm of nature.

Again, in all probability an adult bull would not stand in much danger from any of the ordinary foes which threaten wild cattle. We find, wherever horned stock have run wild, whether in the Ladrone Islands, in America, or in Australia, the bull constitutes himself without difficulty as the supreme lord of his district. None ventures to attack him in the open except the hunter with his deadly fire-arms. Hence the wild bull would have but little need of the means to repel the attacks of the Carnivora. One finds that wolves make a special aim at capturing the young and helpless members of a herd. Hence in the great majority of cases when their onslaught had to

be met, it would have been by a cow which was defending her calf. The bulls whose weapons had been shortened and blunted for political reasons were not losers by the change, while the body politic was so much the gainer, because it seldom lost a valuable member through private duelling.

It would be a slight both to the genus *Bos* and to the British people to refrain from alluding to the noble attributes of beef. Doubtless, in the first place, the table qualities of the bullock depended simply upon chance, since one can hardly imagine that—if we ignore festive reunions with the *Carnivora*—it could make much difference to an animal *per se* whether he were pleasant to eat or not. But it is probably more than a happy coincidence that this crowning virtue of the ox (which, as is often the case with virtues, is more discussed after the death of its possessor than during his lifetime) should meet with such an avid response in modern Aryan palates. We must here rather reverse the order which we have hitherto followed in discussing the evolutionary connection between certain qualities in the lower animals and the needs of civilised man. For in this instance it is man who has adapted himself to one

of the wild traits of the bovine race, and who has been profoundly influenced by it. Why should man, who has an almost exclusive vegetarian ancestry, take such an instinctive delight in the savour of roasted flesh? This is a question which our present knowledge of the history of human instincts will not allow us to answer. But I think, without straining our evidence unduly, we can form a shrewd conjecture as to why many cow-keeping and beef-eating nations have come to the front; and we shall also find that this suggestion, if accepted, throws a somewhat new light on certain questions which have attracted the attention of the most learned writers on ancient history.

In spite of a profound conviction which has been religiously adhered to in England for many years—viz., that much of our working and fighting power depends upon a liberal consumption of roast-beef—I am inclined to think that the latter-day use of this article of diet has but little to do with national vigour. Such physical and moral prowess as we may possess, if analysed in the light of what we know concerning the early migrations of our race (alluded to at the commencement of this chapter), seems more due to

the vices of living beeves than to the virtues of dead ones.

Given a Northern tribe with a taste (however acquired) for keeping and eating cattle, it seems to me that the following chain of causes and consequences might ensue. The keeping of horned stock in a barren and unfenced country involves the employment of herdsmen. The cattle, being active and half wild, could only be controlled by men on horseback. Hence in ancient days the tending of unruly mobs of cattle always involved the keeping of swift and serviceable horses. Now we find that the most daring horsemen in the world are found in the United States and Mexico, on the Southern pampas, in the Australian bush, or amid the steppes of Tartary, among the stockmen who follow such half-wild herds. Such an employment develops hardihood, boldness, resourcefulness, and determination, as well as skill in horsemanship; for all these qualities are called for in directing and mastering the fierce and active beasts which the men have in charge. Moreover, in a sparsely settled district the cowboy is almost always called upon to settle disputes as to pasture rights and ownership in the rough-and-ready fashion customary among frontier or

barbarous peoples. He has to protect his herds not only from wild beasts but from robbers. Occasionally also—doubtless only under extreme stress of circumstances—it seems right or expedient for him to do a little raiding on his neighbour's domains. It follows that every tribe which kept cattle, and which had to roam far afield to find pasturage, had a most formidable force of light cavalry always at its disposal. A regiment of Western cowboys or Australian stock-riders mounted upon their fast and wiry horses would, even in the present day, be tough customers for the finest troops to tackle. And when we remember that, before the days of fire-arms, cavalry was practically invincible when opposed to men on foot, it will be seen that a nomadic cattle-keeping race would soon become supreme over those which were purely pastoral or agricultural. Not only so, but by their constant conflicts with the horsemen of similar half-predatory tribes they would become practised in the use of weapons, and in many phases of the complex art of war. History shows over and over again that it is this perpetual strife between fierce clans of kindred blood which gives rise to the qualities which lead to national supremacy.

To such causes as these—resting, as we have seen, on a bovine basis—may be traced nearly all those redoubtable characteristics of the Goths and the Huns which enabled them to overcome the trained legions of Rome.

Gibbon and Hodgkin may say what they like as to the causes of the fall of the Roman empire : I venture to maintain that in this one particular the natural historian can give a hint even to such authorities on matters historical. It was the restive ox which developed the cowboy, and it was the cowboy of old who broke the power of Rome.

In this sense also it may perhaps be said that the vigour of the Anglo-Saxon race is based on a beef regimen ; although, through the later centuries, it has doubtless been enhanced by change of air and a liberal use of salt water.

Before we turn from this carnal aspect of the Bovidæ, perhaps it may not be out of place to endeavour to track to their sources the vaunted merits of ox-tail soup. Needless to say the ox did not grow his extremity for this special, and sapid, end—as is rumoured to have been the case with the benevolent kangaroo. Primarily the glutinous character of the ox's tail which so fits it for

soup-making is owing to the fact that the bones composing it are light, porous, and gelatinous, and are surrounded by numerous muscles and tendons so as to enable the animal to swing the organ freely from side to side. Wild cattle inhabit damp and wooded regions, which during the summer are swarming with bloodthirsty flies; and the tail of the ox is, and ever has been, its main protection against these maddening pests. If you watch cattle in a pasture-field you will find that the long tassel at the end of the tail is perpetually and automatically sweeping the surface of the body to drive away noxious insects. The Americans have drawn a most telling comparison between a man in a state of frantic exasperation and a "stumped-tail bull in fly-time." Had it not been for the need of continual protection against small enemies of this kind, the caudal member among cattle would not have become what the modern disciples of Alexis Soyer find it. When next you enjoy a basin of ox-tail soup—thank the flies!

One function of the tail of the ox is that of a signalling apparatus when there is some special danger threatening him or the herd. The hoisting of this natural semaphore is a sign of anger

as well as one of fear, although probably, as in the lifting of the bristles on the back of the dog, it is chiefly shown when both emotions are excited. In this country the signal is most commonly displayed when there are gadflies buzzing near the herd. Under such circumstances an ox will erect its tail in the most extraordinary manner, and at the same time seems to be seized with an unreasoning paroxysm of fear. I have known teams of oxen which were quietly plodding along the newly turned furrows suddenly hoist their tails and dash away across country, dragging the plough after them until it either was broken to pieces or the yoke-chains gave way.

To those who know how to interpret nature's hieroglyphics this habit of the ox tells a curious story. Its terror is purely instinctive—that is to say, the emotion does not depend upon previous unpleasant experience with gadflies, but is inherent in the animal, and forms part of the mental stock-in-trade which it received from its wild progenitors. Whenever one finds a habit or instinct so strongly marked as this, it is a sure record of some decisive phase of the struggle for existence, just as the monuments at Waterloo

and Bunker's Hill are records of great turning-points in history. Nowadays the gadfly is but a casual and puny foe. Even if it be successful in planting its eggs in the skin of a cow, the result does not in the least imperil the beast's existence. In modern times the gadfly merely causes some fear and a little discomfort to an animal, and some loss of money and temper to its owner when he finds that the hide has been perforated, and is therefore held cheap by the tanner. But there must have been occasions when the war between gadflies and cattle was a much more serious affair. So strongly marked a protective instinct can only have been produced at a time when the very existence of the species was threatened by parasites of this order.

The peculiarities of temper of the ox, to which some allusion was made when we were speaking of his usefulness in hauling lumber, may to some extent be explained by the kind of life which he led before man interfered with his liberty. He is undoubtedly a sociable animal, and it is owing to this fact, as I shall explain further on, that he is, when young, fairly easy to teach and to control. Oxen have a peculiar kind of stolid courage which has been many times made use

of in India. It is said that a team of oxen will draw a siege-gun into action more steadily than will any other animal; and it is customary where elephants were used to haul these ponderous weapons, to have a bullock-team attached to each gun, so that it can be sent forward when the elephants refuse to face the noise and danger of the battle-field. Cattle are not liable to sudden panics, nor, except under certain special circumstances, such as those discussed in the preceding paragraphs, does a herd "stampede" owing to some trifling cause, as a mob of horses or a flock of sheep will. Under anything like favourable conditions the life of the wild Bovidæ was a fairly placid one. Being so powerful, and armed with such effective weapons, they did not need to be continually on the watch, like deer and other feebler creatures. Indeed this calmness of temper which has so often been noted in them was generally conducive to their safety. While the herd of wild cattle stood firm not even a tiger dared to attack them, and if a single animal were away from its companions, it would generally find it the safest policy when enemies were near to remain quiet in the hiding-place which it selected before it lay

down to ruminate. When roused or thoroughly frightened, however, there is no animal more unreasonable and more difficult to calm than an ox.

Those who have much to do with working oxen, and who watch the behaviour of a number of such animals in the stall or the pasture, find that there is quite a complex system of etiquette among them, which is undoubtedly traceable to the social laws which used to prevail in the free herds. For instance, there is an order of precedence in some ways as exact and as rigidly adhered to as that at a German court. It is customary when feeding working bullocks in winter to fasten them by chains which encircle their necks and are attached to stanchions in the wall of the hovel. These are so arranged that each beast can reach his own lump of food (consisting generally of cut chaff with a little meal and root-pulp) or the portion of his neighbour on his right. The length of the chain will not allow him to reach the food of his neighbour on his left. Now, in order to ensure that each beast should get the food which is meant for his consumption and no more, the oxen have to be so arranged that

every beast is "master" of the one on his left; otherwise pilfering and discord would occur at every meal. It often takes the oxmen a long time in discovering the particular rank and precedence of any new beasts which have been added to the teams; but after watching their behaviour when loose in the yard, and thus ascertaining which bullocks give way to the new-comers and which lord it over them, they are at length apportioned their places in the line. Curiously enough, an ox's precedence does not depend upon his strength or bulk, nor upon his courage—as we recognise it—nor upon his steadfastness of character—as revealed in his work. One frequently finds some huge muscular beast occupying quite an inferior position; and an animal which shows fearlessness and resentment when interfered with by men will humbly "take the lowest room" and allow all the rest to drive him. Again, the "boss ox," although usually one of the huge elder brethren of the team, may have nothing either in his bodily or mental qualities which, to our perceptions, fits him for the post. But it is evident from the unanimity with which he and each of his inferiors

are granted their respective positions (often after a somewhat hot debate), that the animals readily recognise whatever moral or other qualities tell in settling bovine precedence. Occasionally one finds, when trying to study the social and political institutions among oxen—as I have often done during my boyhood when ensconced in a snug bay of the straw-stack overlooking the ox-yard—that matters are somewhat more complicated than they at first appear. Thus A may be the “boss-ox,” B the second, C the third, D the fourth, and so on; that is to say, each of these animals is able to take precedence of the one next below him. But if you remove some of the series you will find sometimes that, although B was master of C, and therefore “so much the more” ought to be master of E or F, this is not always the case. For the practical purposes of the oxmen, however, the order of natural rank, whatever it may depend upon, proves useful in settling the place of the animal in the team and in the stall, and in preventing contests between these powerful long-horned brutes.

Mr Francis Galton, speaking of the differ-

ence which he found in the characters of the oxen which he used for riding and for drawing his waggons when he was in South Africa, says: "Not one ox out of forty will make a 'ride-ox,' for only those are fit to break in that show far less gregariousness of disposition than oxen ordinarily do. The beasts that walk first and lead the herd are the only oxen that can be ridden with any comfort or success; the others 'jib and crowd together and fight with their horns when you try to urge them on, and the whole caravan comes to a stand-still." Other African travellers dwell upon the difficulty in finding oxen of sufficient independence of character to take the front place in the long teams. Doubtless among wild cattle animals which show this disposition to act on their own initiative would be the natural leaders of a herd.

There is one peculiar habit, not unknown among other domestic animals, but which has attracted special attention in the case of cattle. If an individual in a herd happens to be sick or wounded, the others, instead of showing sympathy, attack it, and either drive it away into solitude or gore it to death. The whole

proceeding offers such a contrast to the civilised human method of dealing with a distressed fellow-creature, and seems so wantonly cruel, that in most people it provokes surprise and highly unfavourable comments.

Now let us look at the matter in the cold light of science, and strive not to mix up human sentiments with bovine codes of morals. In the first place, we may lay it down as an axiom that the habit has in some way proved conducive to the welfare of cattle; otherwise it would never have become established. The problem is, I think, a fairly simple one. A bullock, like a man, has two sets of obligations to observe: first, his duty to himself; and secondly, his duty to his neighbours. There is the same painful friction in both instances when the interests of self and society are not identical. A like balance has to be maintained between individualism and socialism in nature as in our artificial human communities.

Now, when a wild creature of the ox tribe is sick or wounded, it is found that the dangerous beasts of prey, which are always prowling on the outskirts of the herd, are quick in ascertaining the fact, and are drawn together by the prospects

of a feast. When previous experience has anything to do with the action of the mob in expelling their afflicted brother, one can conjecture that they might, in their stupid beefy way, argue the matter out somewhat as follows: "This fellow seems to be a source of attraction to our enemies; look how those beasts of wolves are swarming about him! We had no idea that there were so many of the brutes skulking about in the woods! Perhaps he has wickedly collected them on purpose; or, since they have suddenly appeared out of nowhere, it may be that the rascal *makes them*—who knows? At any rate, he and his new friends are a nuisance and a danger—so here goes to knock him out of the herd!"

Probably, however, the action is generally the result of inherent impulse, and is not founded upon any acquired knowledge of the danger to be feared from the presence of a sick companion. We know that cattle are liable to infectious diseases of many kinds; and, prompted by a blind instinct, they have probably in the past been able on many occasions to preserve their communities from the spread of contagion by driving those first affected away into the

wilderness. It would be as difficult to guess how such an instinct first arose as it is to guess the origin of life upon the earth. The only certainty about the matter is, that the intelligence of the beasts themselves had little or nothing to do with it. Plainly any herd which adopted such a custom would be better off in the long-run than one which did not; because the beasts composing it would be less exposed to dangerous diseases, and would also, probably, be less harried by wolves and other enemies.

It is proverbial that anything of a bright red colour tends to excite the anger of a bull. This seems to result from the instinctive aversion to blood which is observable among all the cattle tribe, since the smell of blood has very much the same exciting effect. I think that we have here nothing more than a variation of the protective instinct which we have been discussing. A wounded and bleeding animal is obviously a source of weakness and danger to the wild herd, for he would attract the Carnivora even more than one which was sick. Probably, mixed up with this instinct, is some muddle-headed notion that an enemy has caused the flow of blood (or the appearance of it), and hence a more

vehemently hostile feeling is provoked by a wound, or by anything which might be mistaken for blood, than by the appearance of an animal which is merely suffering from illness. Indeed in the latter case horned stock will often do no more than boycott the invalid and persistently avoid his society.

Mr W. H. Hudson, whose opinions are well worth listening to, because they are always founded upon careful personal observation, thinks that the action of cattle in rushing upon and goring one of their number which is wounded or otherwise in trouble, is a misdirected attempt to rescue it from an imaginary foe. Mr Hudson gives various good reasons for coming to this conclusion in his delightful book, 'The Naturalist in La Plata.' Probably, however, the instincts of the animals which make brutal blunders of this kind are quite as much mixed as are their ideas.

How are we to explain the fact that farmers find it necessary to make away with bulls when they are four or five years old, because they then become so pugnacious and unmanageable? I learned from the keepers at Chillingham that each mob of wild cattle is under the command

of a single powerful bull, and that he keeps all the others in absolute subjection. When a stronger than he arises, and indeed whenever a younger one comes to maturity, there is a terrific battle; and if the original lord of the harem is worsted he retires into sour solitude. The cows and all the young bulls yield ready obedience to the chief; and this inbred disposition to submit to established authority is taken advantage of by the stockman, who, among domestic cattle, may be regarded as the deposed King Bull's vicegerent. But when bulls get their full growth and strength, their wild instinct impels them to commence a determined tussle for the mastery.

In the freedom of the forest this was laudable ambition, and might lead to the chieftainship of the herd: but in the farmyard it is regarded as viciousness; so the usurping human "boss," whose supremacy is thus disputed, settles the controversy in a summary way, and sends for the butcher.

CHAPTER VI.

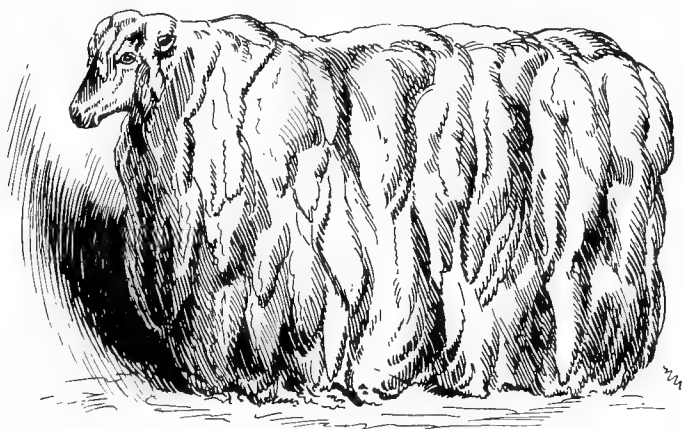
THE SHEEP.

WITH the exception of certain breeds of dogs, the sheep has undergone more modifications at the hands of man than any other animal. All the rest of our domestic animals have proved their capacity to reassume the habits of their wild ancestors, but no once tamed sheep has taken to a life of independence. This is at first sight surprising, because many kinds, such as the Scottish mountain sheep, and those upon the highlands of Chili and Patagonia, manage to live and thrive with very little aid from their masters. Yet it is found that even a hardy pampas sheep cannot hold its own when that aid is wanting. If man were to become extinct in South America, or indeed in any part of the world, the domestic sheep would not survive him half-a-dozen years.

There are three chief reasons for this, and all of them are of peculiar interest. In the first place, a sheep is, as a rule, a timid and defenceless animal, and at the same time is neither swift nor cunning. It falls an easy prey to the meanest of the wolf tribe. A single coyote or a fox-terrier dog could destroy a flock of a thousand in a few days. Secondly, it is found that the young lambs and their mothers require especial care and nursing, and if they do not get it during lambing-time the flock-owner will lose them by the hundred. It is a common thing in the South Downs for the shepherd not to leave his flock day or night during the whole lambing season. Lastly, very few modern sheep shed their wool naturally in the way that the horse and other animals shed their thick winter coats.

There was exhibited at the first great International Exhibition in 1851 a seven-year-old Southdown ewe which had never been shorn. Its enormous burden of wool hung to the ground, and it would have been about as capable of getting about as a man covered with a dozen thick overcoats. It is quite plain that such a creature could not get its living in the open fields unless it were regularly shorn. Now, if we seek

for an answer to the question,—Where did the sheep get its wool from? we shall find an explanation also of the other two characteristics which now prevent it from holding its own in the wild state.

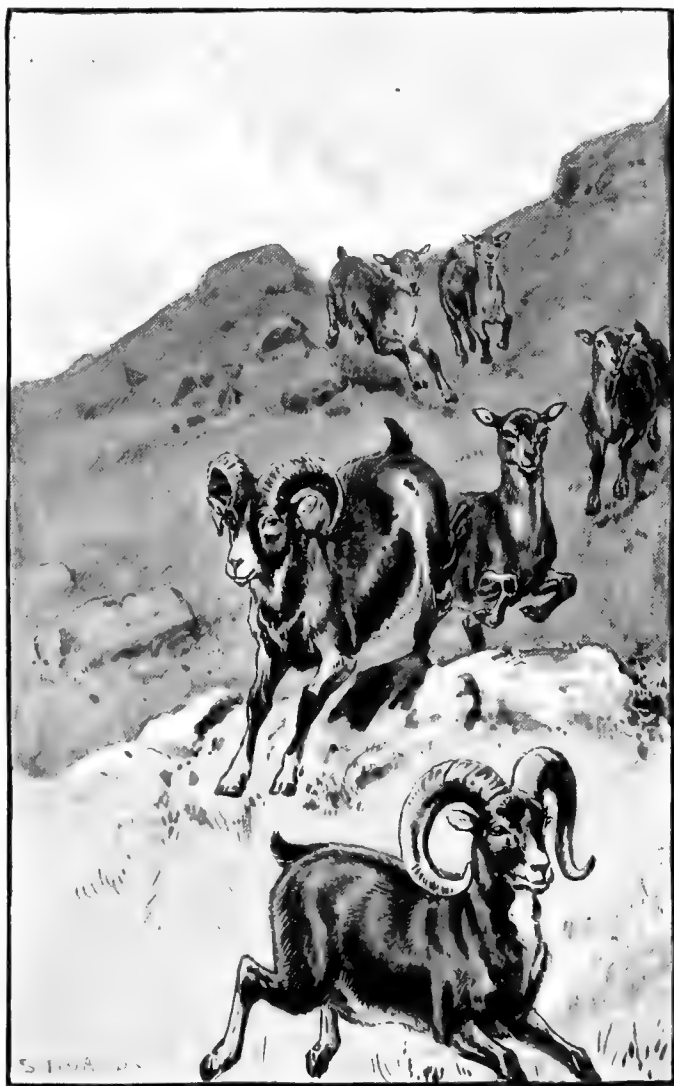


Seven years' old unshorn ewe.

The wool was of course developed primarily to protect the sheep from cold. But from what cold? The cold of winter? That can scarcely be, since the wool shows a tendency in all our domestic sheep to persist and continue growing all the year round. The cold of arctic climates? That also must be excluded, since no sheep, either tame or wild, thrives in the extreme North.

On the contrary, in Australia and many other warm countries the flocks flourish abundantly. Certain naturalists say that the so-called musk ox is really a sheep ; but it is plain that, if so, that curious beast is a very distant relative of the familiar varieties. Neither the musk ox nor any other arctic animal would long survive a removal to a sub-tropical region.

If we study the various kinds of wild sheep all the world over, we at once find an answer to the question as to the origin of the wool. Without exception they are dwellers upon high mountains. Some live almost among perpetual snow. The bighorn inhabits the Rockies, the moufflon the mountains of Corsica and Sardinia, the Barbary sheep the high regions of Morocco and other parts of Northern Africa, while the gigantic *Ovis poli*, the argali, and the burrhel are at home amid the towering ranges of Siberia and Thibet. On the grassy slopes and terraces they find sustenance, and among the giddy precipices above they take refuge when danger threatens them. They took to the hills in the first place, like the wild asses, because the fierce Carnivora of the lowlands were too many for them. Their cousins, the antelopes and deer, were swift enough to hold



WILD SHEEP AT HOME.

their own in the woods and on the plains; but the only chance of survival which was open to the more sluggish *Ovidæ* was to take to the mountains. Many a human refugee, hunted by a human beast of prey, has had to do the same. Having once chosen this habitat, it was necessary that their instincts and structure should become adapted for the life of a mountaineer; and, throughout long ages, by the survival of those individuals best fitted to this kind of existence, and by the elimination or sifting out of the unfit, they have developed into what they are now.

As a protection against the cold of high altitudes, they grew a thick woolly covering beneath their coarse thatch of hair. The need of mounting steep slopes with rapidity, and of propelling their heavy bodies by leaps among the rocks and crevasses of their place of refuge, caused the muscles of the hinder quarters to become peculiarly stout and fleshy. To the former fact we owe our woollen clothing, and to the latter the massive and succulent "legs of mutton" which so often appear on our tables. As has been said above, and as is proved by the unfortunate animal shown in our illustration, the wool continues to grow in most

of our modern domestic varieties in spite of summer heat. It is known, however, that, like the bison, the reindeer, and the musk ox, most wild sheep get rid of some of their wool in the hottest weather. Traces of this habit are still to be found even in the Merino and Southdown breeds. The Southdown flockmasters are very particular in choosing the season for shearing. They say that at a certain time—which conforms with the almanac to a remarkable degree—the fleece “lifts,” or “is up.” By this they mean that, close to the skin, there is some tendency to a separation between the old wool and the new. This, as far as I can make out, is not absolutely a separation of fibre, for the staple can generally be traced unbroken right down to the pelt. But there certainly appears a division between the wool and the skin, which seems to be caused by the fibres of newest growth erecting themselves and lifting the matted fleece slightly. When this occurs the shears run easily; and the labour of shearing is considerably greater if it is undertaken before the change takes place.

It is most instructive to observe the date of the “lifting” of the wool in the Southdown

region. Within certain limits it depends partly upon the elevation of the various farms and the amount of exposure to which the flocks are subjected, and partly upon feeding. One large flock with which I am well acquainted (that at Saddlescombe, near the Devil's Dyke) is always shorn, if possible, on midsummer day, because at that time, and scarcely a day earlier, the wool is "up." Now why should this feeble attempt at shedding the coat occur in the South of England at midsummer? By that time all the other farm animals have long cast their extra winter covering; and, as a rule, the heat in May and June is very considerable. I think we must go for our explanation far away from the smooth grassy Downs to the rugged alpine heights of Central and Southern Europe. There we find that midsummer marks approximately the time when the mountain pastures are open, and when the herdsmen drive their cattle from the valleys to their high feeding-grounds. The alpine summer comes suddenly, and the sun, as every one who has climbed the Swiss mountains knows, soon attains a power which renders heavy clothing unbearable. We have thus, in our domestic

sheep, a curious page from the meteorological records of the Southern Highlands ages and ages ago.

I have said that the date of the lifting of the wool is dependent to some extent on feeding. It is an occasional experience of the careless shepherd to have his flock escape from control in the spring and ravage the standing crops. Such a *contretemps* means not only damage to the growing corn or hay, but also injury, both immediate and long continued, to the flock. A sudden change of diet from the frugal fare on the hill-turf and in the "dead-fold" to that of the lush cereals and grass of cultivated lands is not unfrequently fatal to the animals. But, even if they escape digestive perils, further results are liable to occur, which show themselves in the fleece. The wool not only "lifts," but actually peels off in great flakes, leaving the animal in rags and half-naked, and, of course, destroying the hopes of the flock-master. Now it seems to me to be very likely that this may point out to us one of nature's agencies for fixing the time when the wild mountain sheep get rid of their winter clothing. When the midsummer heat melts

the upper snows, and thus at the same time both irrigates and forces the mountain herbage, the moufflon and his relations would greedily avail themselves of the rich new pasture. This change of diet, through some physiological association of causes, has an effect upon the system generally, and especially upon the integument, which occasions a shedding of the wool. Let me say, however, that this view is merely put forward as a suggestion.

It was probably the fleece which first brought the sheep into captivity, and it is the fleece that is mainly instrumental in keeping him as a servant and dependent. It now grows so abundantly that he needs to be freed by the shears once a-year, or the burden of it would overcome him. Imagine being obliged to wear two suits of winter clothing in July!

But both the fleece and the meat, as we now find them, have, of course, been greatly altered by human agency. Those sheep have constantly been chosen by breeders which fattened readily or which had the finest and most abundant wool. The coarse outer covering of hair disappeared; although, as might be expected, it occasionally shows itself. In the West Indian

Islands even imported Southdown sheep become completely changed in appearance, for the wool is hidden by long brown hair. Each different breed of sheep, as the Cotswold, the Leicester, and the Merino, has wool of a different character. This is chiefly due to artificial selection. The sheep-breeders of Saxony, by picking out those animals which had the softest fleeces, soon produced a greatly improved supply of wool. They used the microscope to ascertain which animals had wool of the finest fibre, and rejected all which did not come up to a certain standard.

Most of the other weak points of the sheep come from the facts that he has been by nature adapted for one special kind of life, and that we have now removed him from it. The conditions to which every atom of him had become exactly adjusted are changed, and it is hardly likely that he will be at home at all points under the new circumstances. For this reason the tame sheep, like the ass, appears a stupid animal. At critical times, such as when the young lambs are born, the unaccustomed surroundings may be fatal. It is this "specialisation," as the naturalists call it, which accounts for the extinction

of many creatures which used to be abundant. They become exactly fitted to one particular way of life, and unfitted for any other. If circumstances change, or if they are compelled to migrate, they die.

Generally such a race comes to an end through the parents being unable to rear their tender young, which naturally feel the stress of an unfavourable new environment more than the adults. This is what would happen to the domestic sheep if the shepherds were not to take such assiduous care of them in the lambing season.

Now let us see what other relics of wild life can be found in the sheep. It is always, as I have said in a previous chapter, worth while to examine immature animals, if we wish to find out the habits of their early ancestors. Young lambs have enormously developed legs, and are capable of keeping up with the flock when only a few hours old. This at once suggests that they had to run with their parents when wild sheep moved from place to place, and were not hidden in secluded spots by their dams. They have a curious habit of following anything large and light-coloured which moves quickly away

from them. A new-born lamb will rush after a newspaper or any other large and light-coloured object blown along by the wind, or, as Mr Hudson says in 'The Naturalist in La Plata,' they will persistently gallop after a horseman on the pampas. It is the old and most necessary instinct of following the flock when it was fleeing from an enemy, but the instinct is at fault in civilised regions. Mr Hudson, when speaking of the habits of sheep in La Plata, alludes to what he considers to be defective instinct in lambs due to long domestication. I will quote the passage in full, because I think another interpretation may be attempted :—

I have frequently observed newly-born lambs on the pampas, and have never failed to be surprised at the extreme imbecility they display in their actions, although this may be due partly to inherited degeneracy caused by domestication. This imbecile condition continues for two, sometimes for three days, during which time the lamb apparently acts purely from instincts, which are far from perfect ; but after that, experience and its dam teach it a better way. When born, its first impulse is to struggle up on to its feet ; its second, to suck—but here it does not discriminate like the newly-hatched bird that picks up its proper food, for it does not know what to suck. It will take into its mouth whatever comes near, in most cases a tuft of wool on its

dam's neck ; and at this it will continue sucking for an indefinite time. It is highly probable that the strong-smelling secretion of the sheep's udder attracts the lamb at length to that part ; and without something of the kind to guide it, in many cases it would actually starve without finding the teats. I have often seen lambs many hours after birth still confining their attention to the most accessible locks of wool on the neck or fore-legs of the dams, and believe that in such cases the long time it took them to find the source of nourishment arose from a defective sense of smell.

Now there is one important physiological law which has of late come into prominence, which has a marked bearing upon the question Mr Hudson raises. This is the law that nervous phenomena, such as instincts, reflexes, and the like, are much more fixed and permanent in the animal economy than are details of structure in the skin, muscles, or skeleton. When we find that all our domestic animals, with the one exception of the sheep, are capable of resuming their original independence without difficulty, in spite of thousands of years of domestication during which the many complex and delicate instincts necessary for wild life lay dormant, one is very reluctant to accept the theory as to a natural instinct having been perverted or abolished by domestication. It is

much more probable, *primâ facie*, that the change which has rendered any inbred habit inoperative has taken place, not in the instinct itself, but in some detail in the bodily structure or in the external environment. In the example given by Mr Hudson this seems clearly to be the case, for we must remember that in the wild state the sheep has no tufts of wool hanging about its flanks or belly, and that therefore the udder, with its inviting teats, is the first thing that presents itself to the investigating muzzle of the lamb. Civilisation has shortened the ewe's legs, and in this way also has interfered with nature's adjustment between dam and offspring, and has made the source of nutriment more difficult to discover. But here the fault clearly does not lie with the lamb, which probably acts in precisely the same manner as did the lambs hundreds of thousands of years ago. In the same way the habit of following a horseman or a large bunch of pampas grass blown by the wind, to which Mr Hudson and other writers allude, may be explained by changed environment rather than by the development of a new and pernicious instinct. Doubtless on the tops of the Corsican or Thibetan mountains pampas grass and horsemen were as rare

as newspapers ; and certainly such objects were never common enough to be taken account of in the formation of habits of self-preservation.

However white the fleeces of their elders may be, young lambs are usually of a brownish or dirty-grey colour (as indeed are all wild sheep), so as to harmonise with the rocks of their ancestral home. When at play they always seek the steepest parts of the field, and, if there is a rock or a log lying about, they will skip on to it and butt at one another, as if playing "King of the Castle." If mountain or moorland sheep on a hillside are attacked by a dog, they will always, from choice, run diagonally up-hill. Should a flock of Southdowns take alarm and break out from the fold at night, the shepherd knows that the place to find them is the highest ground in the neighbourhood.

If a dog enters a field where there are ewes and lambs, he is watched in the most suspicious manner, and at once attacked if he comes too near. Many a valiant puppy, who thought that sheep were poor spiritless things, has received treatment which astonished him when he strolled into the sheep-pasture in the lambing season. Now dogs are rarely dangerous to domestic

sheep. The determined hostility shown to them at such times is a relic of the old, wild instinct, when the horned flock on the mountain-side defended their young against jackals, dholes, and wolves. An angry ewe will stamp her foot when a dog comes within sight. This is probably a relic of an ancient method of signalling the approach of a foe. But it is also a menace; for many animals akin to the sheep use their sharp hoofs with terrible effect. Deer will destroy snakes by jumping on them and ripping them to ribbons with outward strokes of their hoofs. Nearly all antelopes use this method of attack, and incautious hunters have been killed by the hoofs of the nylghau, the great Himalaya antelope.

A wild sheep in his native country is no trifling antagonist. The horns of the *Ovis poli* and argali are enormous, and must be seen to be appreciated. Sir Joseph Hooker, the great botanist, says that in Thibet foxes have been known to make kennels in the hollow horns of the argali! This sounds rather a "tall" statement, and I confess I should much like to find one of these hermit-crab-like foxes at home!

Some Indian tame sheep allied to the wild

breeds are desperate fellows to fight, and are exhibited by native potentates matched against bulls and other animals. Phil Robinson tells a story of a ram that was sent to the Calcutta Zoological Gardens, and, since he was of no value as a curiosity, the keeper thought that he would make a tit-bit for a venerable tiger. The sheep, however, being of a pugnacious disposition, "went for" the tiger as soon as he was put into the cage. The traveller goes on to tell that, after a sharp tussle, the sheep killed the tiger! Whether he ate him afterwards is not related, but one would not be surprised at anything in such a sheep as that!

The immense number of varieties of sheep, and the widely different characters they present, prove to us that the species has been domesticated for a very long time. If the dog was the first animal tamed by man, and the goat was the second, the sheep was almost certainly the third.

Naturalists are not agreed as to which of the wild species our modern sheep are descended from. I think it is probable that they owe their origin to several kinds, including the moufflon, the burrhel, and the argali. These, oddly

enough, have short tails, like nearly all dwellers on high hills. The chief purpose of the tail among herbivorous animals is to drive away flies, and on the windy heights these are not troublesome. Yet domestic sheep are born with long tails; and in spite of the long-established practice of farmers and shepherds of cutting the tails short, they still persevere in growing them. Here are two problems for the rising generation of naturalists, who, of course, are incalculably smarter and more intelligent than the old fogies who have written on such subjects hitherto! Why does the modern sheep grow a tail? and why does a lamb wriggle his tail at meal-times?

A curious story has been told of wild sheep in the Rocky Mountains, and in other parts of the world, which has never, I believe, been verified by any competent naturalist, yet which, in spite of its incredible character, one is obliged to consider with some respect. It rests on the testimony of a good many independent although uncultured observers, and is to the effect that, when wild sheep are driven to the edge of a precipice, and find escape impossible, they will spring over and alight *on their horns*, falling considerable distances without the least injury.

Now there appears to me to be one piece of evidence of an anatomical character which gives a certain amount of countenance to this strange tale. Consider for a moment the force of the impact when two heavy rams, rushing at full speed from thirty or forty feet apart, crash their heads together. It not unfrequently happens that the recoil is so great that both animals are flung over backwards. The structure of the sheep's head, whether he belongs to one of the horned varieties or not, is extraordinarily adapted for bearing a tremendous blow from the front, and the vertebræ of the neck are so immensely strong that they receive the shock without the least injury. Now a sheep might fall from a considerable height and alight on his head without the force of the impact being greater than that which a ram experiences when engaged in a desperate combat. It would certainly be safer for a sheep to fall in this way than on its comparatively frail legs, especially if it possessed large and spiral horns, the resilience of which would break the shock somewhat before it reached the skull and the spine.

The strange indifference shown by rams to a blow on the head was demonstrated in an amus-

ing manner in the case of a farmer of my acquaintance. This gentleman possessed a large ram of a very pugnacious disposition. Every one who entered the field where the sheep grazed was assaulted by him; and he was seldom content until he had laid his victims flat upon the ground. To cure him of this inconvenient habit his master adopted the following stratagem. Entering the field unperceived by the ram, he took his stand against the trunk of a stout oak-tree which stood near the centre of the pasture. The instant that the sheep perceived the intruder on his domain he came trotting towards him, and, as he drew near, lowered his head and made the usual blind, headlong charge. The farmer waited until the animal was about six feet off and then stepped suddenly aside, with the result that the ram's head banged against the rigid trunk of the tree with a force which, although it did not shake the latter, hurled him backwards on his haunches. Although somewhat astonished to find that he had such an unexpectedly "hard master," the sheep's wits were not sufficiently alert to enable him to grasp the situation; while his fighting instinct impelled him to renew the charge on the instant. The same thing happened

again, but the sheep, though equally "taken aback," was not yet daunted. Several times he renewed the onset, until it at last began to dawn upon him that something must be wrong, and he



A hard master.

trotted off with a shake of the ears, as if feeling puzzled and out of humour with himself at his unaccountable failure to knock the man down.

There is another wild habit of sheep which can be observed wherever a drove is moving along a

narrow or crowded road. If one gives a leap, all the others following it on reaching the same spot follow its example, although there may be no obstacle whatever for them to jump over. The whole proceeding looks extremely silly in the street; but supposing the flock to be on its native mountains, one can easily see the value of such a habit. Wild sheep always appoint sentinels and leaders, and follow them in the most implicit manner. Whether the animals are grazing or are on the move, these sentinels or leaders act as the eyes of the flock. When all dash off together among broken ground, or are crowding along some perilous ledge on the mountain-side, it would be quite useless for those in the middle of the band to endeavour to see obstacles at their feet. Hence each keeps an eye upon the leader, or upon those immediately in front, and follows their example. If the leader thinks a three-foot jump is necessary to clear some dangerous spot, every sheep in the procession will take a three-foot jump; if he jumps higher, they will jump higher, and so on. They carry out this imitated action with a most extraordinary precision, even when it has to be transmitted through a long chain of different individuals.

CHAPTER VII.

THE GOAT.

ALTHOUGH the goat and the sheep are commonly classed together, and not unfrequently run in company, there is a great difference between them in habits and disposition. In the first place, the goat immediately regains the faculties which enable it to thrive as a wild animal wherever it escapes from human control. One finds goats which have run wild almost all the world over where there are mountains. The goat is historically a climber among the rocks, whereas the ancestor of the sheep, unless alarmed by a foe, fed on the grassy slopes of the hillsides. Wild goats to this day prefer to live among precipices and broken crags, and to browse upon the leaves of the scattered shrubs which find lodgment in the clefts and crannies. The goat

is a more sure-footed animal than the sheep, and, moreover, adopts different methods of progression when among its native haunts; for where sheep prefer to jump, goats usually prefer to clamber. One can see by merely observing the outline of a goat that it is not so well adapted for jumping, and is better adapted for climbing, than a sheep. It is altogether more alert in its movements, and evidently bestows more thought on the process of locomotion. Its hinder quarters have not the swelling muscles which propel the wild sheep from rock to rock, but are rather lean and light. Hence the wide distinction (at times overlooked in Wales) between a leg of goat and a leg of mutton. The great difference shown between the two animals in character is probably owing to the fact that, where the wild goats feed, it is necessary for the herd to become scattered and for each individual to find its own way. Hence, doubtless, the remarkable independence of the goat. Like his fellow-mountaineer, the ass, he has unshakable nerves, and will keep his presence of mind even when exposed to sudden and unaccustomed danger. How great a contrast is he in this respect to the sheep, which is always

liable to sudden seizures of panic, and which, when frightened, invariably loses its head! This independence and *sang-froid* of the goat have proved of service to its masters on many occasions. It used to be the custom in almost all stables containing a number of valuable horses to keep a goat, which was allowed the free run of the building. The reason given was that, in the case of fire, when terrified horses will sometimes refuse to leave the stables, and are therefore in great danger of perishing, such a goat will lead the way with the most perfect calmness, and, encouraged by this example, the bewildered horses will follow it, and so escape destruction. I do not know personally of any instance where this has taken place, but the commonness of the custom asserts that it has probably been justified by experience. There seems to be something about a goat's imperturbable character which inspires confidence and respect in other animals. I have known instances of butchers who have kept goats in order to entice victims into their slaughter-yards. Usually as soon as an ox smells the taint of blood he becomes suspicious and refuses to go farther, but if preceded by a goat he will

follow quietly to the place of execution. In like manner, specially trained goats are constantly used on the ships which bring sheep from abroad. At the unloading-places in the Thames these decoy-goats become very clever at their business. They will proceed to each part of the ship where sheep are penned, and lead forth the huddled and frightened passengers with very little guidance from their masters ; and they will proceed in this way in the most methodical manner until the whole ship is cleared.

Not only does the goat show more initiative and greater independence than the sheep, but he also displays more versatility. This indicates that, when free, he must have lived a kind of life involving frequent changes of habit, and must have been prepared to meet a great range of emergencies. Mr Romanes, in his book on 'Animal Intelligence,' quotes two "cases of an intelligent manœuvre performed by goats" which illustrate the expedients to which these animals occasionally have to resort :—

On both occasions two goats met on a ridge of rock with a precipice on each side, and too narrow to admit of their passing one another. One of these cases occurred

on the ramparts of Plymouth Citadel, and was witnessed by many persons; the other took place at Ardenglass, in Ireland. In both these instances the animals looked at each other for some time, as if they were considering their situation, and deliberating what was best to be done in the emergency. In each case one of the goats then knelt down with great caution, and crouched as close as it could lie, when the other walked over its back. This manœuvre on the part of goats has also been recorded by other writers, and it is not so incredible as it may at first sight appear, if we remember that in their wild state these animals must not unfrequently find themselves in this predicament.

Intellectually as well as physically the goat is less specialised for mountain life than the sheep, and hence he finds it easier to adapt himself to the environment of the farm. That he is quick at learning anything new—when he can be induced to give his mind to it—has been shown by the achievements of a most interesting troop of performing goats which has been exhibited several times in London. Another peculiarity of the goat tribe which shows that they are less specialised than the sheep is the way in which certain varieties tend to resemble kindred animals which are not goats. Thus there has been a long controversy as to whether the “Rocky

Mountain goat " is really a goat or an antelope ; while some of the wild goats of Northern India seem to be akin to the sheep tribe, since they have, on all four feet, certain digital pits or glands, which were at one time supposed to characterise the genus *Ovis*.

Another point about the goat which we find very useful, and which can be accounted for by ancestral habits, is the liberal supply of milk which it gives. Primarily this is owing to the fact that, long before goat's milk was used by man, two or three kids had often to be provided for at the same time ; but to some extent the special utility of the goat as a milch animal is due to the same wild habit as that which gave rise to the peculiar usefulness of the cow. The udder of the ewe is small when compared with that of a nanny-goat, and contains but little milk at any one time. In this the ewe resembles the mare, and the cause is the same in both instances. When in the wild state, both these animals are in the habit of keeping their young ones with them from the first, whereas the cow and the goat put their tender offspring in hiding when they go to search for food, and only suckle them twice or thrice daily. The extreme liveliness,

intelligence, and the early developed climbing powers of young kids seem to indicate that they were soon released from their nurseries in the clefts of the rocks, and were allowed to accompany their dams. Certainly when compared with a young calf a kid is a prodigy of intellect.

Almost every movement of a kid proves the mountain origin of its race. Its powers of climbing are extraordinary, and must be witnessed to be believed. I have seen them clamber on slippery roofs and up the almost perpendicular face of a quarry to places which seemed impossible to reach without the aid of a ladder or the clinging power of claws or fingers. I remember once seeing a pair of kids running races up and down the shafts of a disused farm roller which were tilted up at an angle of about 45° . On the extreme ends of the shafts, high in the air, the little creatures would stand, one on each, and turn about as on a pivot, with the tips of all four hooflets close enough together to rest on a penny-piece.

Such feats on the part of the goat are far more artistic exhibitions of skill in climbing than anything that can be done by a cat or a monkey; for he does everything by calculating his distance

with absolute exactitude, and by an infinitely delicate power of adjusting his weight so as to



Kids climbing shafts of roller.

maintain his balance. What gives such finish to the performance is his sublime confidence in him-

self, and the extraordinary precision with which every movement is executed. His judgment is so perfect that he scarcely ever makes a mistake. Necessity has been his grim schoolmaster ; for it is of course easy to see that, when leaping from ledge to ledge along the face of a precipice, the least error in calculating either his distance or the amount of muscular force to be exercised would instantly prove fatal.

This is a branch of the study of natural history which has a peculiar fascination for me, and which, the more I think of it, fills me with admiration and amazement. What a mathematician the goat would make if he could only tell us the process by means of which he performs his feats ! A Senior Wrangler or a Smith's prizeman would be nowhere beside him. Let me endeavour, very briefly, to point out the nature of certain problems which he is in the habit of solving with absolute accuracy at a moment's notice. Supposing a goat, following a new path, has to take a leap so as to alight on a pinnacle or narrow crag overhanging some abyss. First of all, he must estimate the distance to be traversed, and having got it—whether by trigonometry or by some *cap-*

ricious method of his own — he has next to compute, to the fraction of an ounce how much propulsive force is required to project his body (the exact weight of which has to be taken into account) precisely that distance and not a quarter of an inch farther. Moreover, he must take into calculation whether the spot he wishes to reach is above or below his starting-point; and plainly his brain, when it sends forth motor impulses to the numerous muscles involved, must beforehand reckon out and apportion to each its share in the task. At the same moment he must also estimate the exact proportionate amount of muscular force which will be required in each of his limbs to stop and balance his body on his new and precarious foothold.

Of course one need scarcely say that the whole process goes on without reaching the consciousness of the goat, or anything that could, even by courtesy, be called his mind. But, nevertheless, it is obvious that, in some way or other, the calculation is made, and is completed in a time and with an unerring accuracy which completely puts to shame the mathematical triumphs of the human intellect.

One term habitually—and alliteratively—applied to the goat appears, when we regard his feats as a mountaineer, to be singularly inappropriate. People speak of him as “giddy”; and as long as the word is applied exclusively to his morals (which, judged by our standard, I admit to be something worse than negative), I have not a word to say against it. But if any one ventures to impute physical giddiness to a goat, he lays himself open to a charge of false and malicious libel—false, because it must be obvious to everybody who has seen goats perched aloft in their native haunts, that they can never experience any such feeling; and malicious, because, the goat being above all things one whose distinct calling it is to climb in perilous places, the charge is one involving professional incapacity.

In spite of the goat's splendid qualities as a mountaineer, and the toughness and vigour which he evidently possesses, man has made little or no use of him as a beast of burden. Doubtless his small size largely accounts for this; and he has been, in almost every country where he could have been of use, cut out by the superior muscular capabilities of the donkey and the mule.

It is easy to see that, had we been unable to make use of larger and more robust animals, the goat might have come to our aid in this particular kind of service, just as did the llama among the ancient Peruvians. Moreover, I see no reason why, under the influence of domestication and proper selection, his size and strength should not have been doubled or trebled. We find, however, in investigating the growth of civilisation among primitive races, that as soon as their affairs are complex enough to require pack-animals, they find it profitable to disregard the claims of the goat and to take into their service some more robust creature, such as the yak, the donkey, or the mule. There are several reasons for thinking that the goat was one of the first animals domesticated by man. We find, from the numerous records of prehistoric races yielded by the mud on the shores of the Swiss lakes, that the bones of goats are associated with human remains belonging to a period long anterior to that of the advent of the domestic sheep in Central Europe.

Probably in nearly all cases where savages have habitually tamed wild animals the custom has arisen somewhat in the following way. The

hunter, having killed the dam and captured the little ones, carried the latter home, very likely as playthings for his children. If the little orphans were pretty and playful, they would be cherished by the "squaws" and "papooses," and would become, as it were, members of the family circle. Now young kids have very engaging manners, and are to this day universal favourites with children; hence they would be very likely to be kept and brought up in some such manner. Goats, again, require very little looking after; they can get a living almost anywhere, and will remain in the vicinity of their owners without much herding. Hence they would suit the indolent disposition of savages far better than would animals which require constant attention. Many of the African races seem to show little or no faculty for keeping domestic animals, but one finds that most of them have a few tame goats about their villages.

Another reason why it seems likely that goats have been domesticated for a very long time is the great number of varieties now found in captivity which are undoubtedly the result of artificial selection. Some of these have certain remarkable peculiarities which could only be pro-

duced by many generations of careful breeding. Thus the ears of one kind are so enormously developed as to be 19 inches in length and $4\frac{3}{4}$ inches in breadth. Others have an extra pair of horns; and it is stated by one French writer that in Nubia they have actually developed a breed which has no goat-like odour. It seems likely that the milking qualities of the goat would be appreciated by primitive people, who would be quite unable to turn the wool of the sheep to practical account; and since sheep, when removed from their mountain home, require very much more care than goats, I should be inclined to give the latter the prior place in the history of domestication.

Attention has been drawn to the love of thistles displayed by donkeys, and to the hint it gives us of their desert origin. The goat has some peculiarities of taste of an equally extraordinary character, which may be explained by an examination of the kind of vegetation which thrives in his ancestral habitat. A goat will cheerfully munch up strong cavendish tobacco, cigar-ends, wormwood, red chillies, or almost any vegetable substance the pungency or nauseousness of which deters other animals. Now we

find that among the Southern rocks nearly every herb and shrub has a markedly bitter or aromatic character, partly induced, doubtless, by the abundant sunshine, and partly as a defence from the depredations of animal life. That the goat is indifferent to some of the most deterrent flavours is probably due to the fact that for many generations he has been obliged to exist upon highly-spiced pabulum of this kind.

One peculiarity about the goat I only venture to mention (not that he is reticent on the subject himself), because it illustrates by what diverse means nature attains like ends. Now among animals and plants, as well as in the commercial world, the business of life cannot be done without advertisement. The wild ass uses his sonorous voice in proclaiming his presence to all whom it may concern within the radius of half a mile. Now the goat has a comparatively feeble voice, and yet he also has occasion to make himself known to any friends or rivals who may be in his neighbourhood. He does it silently — but in this instance silence is wholly unconnected with modesty. He so arranges matters as to make it abundantly evident to the nostrils of every

living thing within an area quite equal to that dominated by the voice of the ass, that he is at home.

Professor Lloyd Morgan, in one of his delightful books about animals, indulges in what Louis Stevenson might term a "romantic evasion" when he speaks of the "natural pat-chouli" of the billy-goat. Whether the use of this somewhat strained euphemism be due to respect for a national emblem of the Welsh, or whether the learned and gentle Professor desires to lessen the inevitable shock to our feelings which must ensue from his further assertion that that most worthy and respectable female, the nanny-goat, takes a gross pleasure in the effluvium, I cannot say. Professor Lloyd Morgan's statements are worthy of all respect; but, if I have any choice in the matter, I would much rather believe that feminine taste, however capricious, could never sink to such an abysmal depravity. Needless to say, this wild trait in the goat is not one which man has studiously cultivated. There may have been circumstances under which it took its place among the virtues — where, in fact, it contributed to that "odour of sanctity" demanded by

hircine moral ideals. But we will avoid the risk of mental overstrain by not striving to explain or imagine how such could ever have been the case.

The goat is an excellent example of what seems to be a general law—namely, that when mountain animals are tamed and are removed from their natural habitat, they tend to diminish in size. Oddly enough, the converse holds good with many creatures coming from more fertile and favourable situations: thus no wild horses ever reach the size of the modern hunter; while the huge dray-horse, so commonly seen in our streets, would appear a stupendous monster if put side by side with his ancient European ancestors. Both the sheep and the ass also exemplify the above law; for, in spite of their having received the advantages of human protection and of a more regular and abundant dietary than they ever enjoyed in the wild state, they are, as a general rule, markedly inferior in size and robustness to their wild surviving relatives, to whom ease and plenty are all but unknown. These facts seem to show that the average size of the animals of any species (of course we are not here speaking of

individuals) is not directly dependent upon ease and an abundant food-supply, or the reverse. Size, after all, is only one of the many conditions which go to make up conformity with environment. If animals find it profitable, whether for purposes of war or for the sake of gaining sustenance, to be large, they will tend to increase in bulk from generation to generation. If, on the other hand, they find it easier to maintain the struggle for existence when they are small, each generation will lessen them. Moreover (and this is more to the point in the question as to why mountain animals tend to degenerate when they are domesticated), if the pressure of circumstances which is forcing them to be large or to be small be removed, they seem to revert to some ancient standard of bulk which was probably maintained without material alteration throughout an immense epoch before the later circumstances which influenced their size came into operation. And this traditional average standard may be said to be (in so far as that often misused phrase is allowable) the "natural size" of the animals.

One inference which arises from this suggested explanation is that mountain animals are de-

rived from an ancestry inferior to most of the modern species still living in a state of freedom; and that the degeneration which apparently sets in as soon as such creatures are removed from their mountain homes represents a reversion to a more primitive lowland type. Although in drawing such inferences one is obliged to depend to a certain extent upon guess-work, there are various grounds for adopting this view. Every natural mountaineer, as I explained in a previous chapter, first sought refuge among inaccessible heights because it was persecuted by the Carnivora in its original dwelling-place. We still find many herbivorous animals living where beasts of prey are most plentiful; but they are usually either extremely swift and vigilant like the antelopes, or well armed and powerful like the buffalo. Naturally the fugitives which sought safety among barren and storm-swept mountains would be those unable to hold their own elsewhere. Thus it seems probable that the weakest and least swift of the ancient Herbivora fled to the hills and became adapted for a highland life. If so, such robustness as they now possess is strictly of mountain origin, and hence when they are

removed to lower levels where the surroundings somewhat resemble those of their pre-mountainous days, they miss the physical stimulus of a life at high altitudes and tend to become both smaller and weaker. We must not, however, while engaged in speculations of this kind, lose sight of the fact that there have been few attempts on the part of the breeders to increase the size of any of the above-named animals.

The goat, being a mountain animal, is well protected against the cold, and we find that in some varieties there is a most abundant fleece of soft, silk-like wool. But the wool of the goat differs materially from that of the sheep, and the reason is not difficult to explain. Goats, from their habit of browsing among shrubs, need to be able to force their way through thickets without injury either to their coats or to their skin; whereas the sheep, living on the open hill-side, is enveloped in a covering which is merely calculated for warmth, and is not fitted to stand much wear and tear. Hence we find that the wool of the goat does not "felt" and become tangled together in a mass like that of the sheep. Microscopically the fibres are much smoother and more compact, and lack the saw-like edges

of true wool. In fact, the silky fleece of the Angora goat reminds one of the soft locks which grow on the head and beneath the coarser hair of the Skye terrier, whose aptitude for work among gorse and brambles is proverbial. Man finds that this special adaptation of the goat's natural covering to bear friction among rocks and thorns is an extremely useful one when he uses the wool for his own purposes. Some of the very toughest woven fabrics we have (such as that now largely used for umbrellas) are made of goat's hair. For long ages the Cashmere goat has been shorn to make the beautiful materials woven by natives of that country. The history of the introduction of mohair (which is a wool of the Angora goat) is one of the well-known romances of the history of commerce. It is now used in enormous quantities in the manufacture of soft wear-resisting fabrics. Not only is the hair of the goat more fitted for standing wear and tear than that of the sheep, but one also finds that its skin is tougher, and therefore more useful to man. When properly prepared it can be rendered exceedingly soft without its strength being in any way diminished. Hence its great value for the

manufacture of gloves, and for other purposes where such qualities are necessary. Doubtless the reason why a pair of kid gloves wears well nowadays is because, thousands of years ago, the forefathers of the original owner of the material had to have skins which would stand continual contact with the rough and thorny vegetation prevalent in regions where wild goats make their homes.

A comparison of the horns of the sheep with those of the goat also reveals to us the difference of habit which has so affected the fleece in the two animals. The spiral horns of the sheep are exceedingly ill adapted for passing through thickets, because it is obvious that they would constantly become entangled and hinder the progress of the animal. Among some very ancient records of human affairs we find an example of this—for did not Abraham find “a ram caught in a thicket by the horns” when he was about to sacrifice Isaac? The very fact that a sheep usually is unable to disentangle himself if hung up in the bushes proves that the position is an unaccustomed one; although it does seem rather odd that fighting rams, whose horns have become hooked together, and who, one would think, would

be well used to such an accident, seldom have the sense to make the half turn of their corkscrew-like weapons which would suffice to set both prisoners of war at liberty. Instances have been known of sheep having perished, head to head, because they had not sufficient wit—or possibly too much obstinacy—to detach themselves from one another.

Now the horns of the goat are never curled so as to make it dangerous for him to pass through tangled briers or closely set underwood. He has merely to lift his nose and his horns lie back on each side of his spine or curve down his shoulders and serve as a protection for his body when he is forcing his way among the thorny scrub of the hillside.

It has been frequently asserted by hunters that the ibex and other wild goats, when hard pressed, will throw themselves over precipices and alight on their horns. Mr Hutton (quoted by Professor Lloyd Morgan) says that he has seen captive wild goats use their horns for this purpose. There is not the peculiar anatomical reason for accepting such a story which we find in the skull and cervical vertebræ of the sheep. Goats do not fight by hurling themselves against one another, head to

head, as is the custom with rams. Their comparatively light weight and their greater activity induce them to adopt a different method of attack. A goat when face to face with an adversary will usually rear on its hind-legs and strike a downward blow with the rasp-like front edges of his horns. This doubtless explains the peculiar corrugations upon the horns of the ibex. Such a habit does not necessitate that immense strength in the sinews and bones of the head and neck which is possessed by the fighting ram. Still, since the front of the wild goat's horns are plainly constructed by nature to give and receive severe blows, it is quite possible that they may be sufficiently strong and elastic to receive the weight of the animal when it falls from a moderate height.

As regards the future of the goat one can now speak rather more cheerfully than would have been possible before the hidden excellences of his fleece were discovered. Until comparatively lately the general tendency has been for the goat to act merely as a kind of temporary makeshift among domestic animals; for we find that advancing civilisation has almost always replaced him by others whose serviceable qualities have proved

better adapted to human needs. In fact, his fate has been that of the "jack-of-all-trades" who is "master of none" all the world over. But there are some regions of the earth where his star is decidedly in the ascendant, and where it is not likely to decline for a very long period. On the exposed and parched tablelands of South Africa, where at one time antelopes innumerable found sustenance, goats, probably because of their kinship to the antelope family, thrive better than do any other imported animals. The thorny shrubs and brown shrivelled herbage of the Karroo, which seem to the European traveller to be of the most unpromising character as fodder, afford the goat abundant nourishment.

Not long ago, it may be remembered, a well-known South African statesman went on a mysterious visit to the Sultan of Turkey. As this gentleman is popularly supposed to be always engaged in some deep and dreadful plot, sundry disquieting rumours got afloat as to the purport of his mission. At last some keen-witted journalist wormed out the awful secret. It was this: His Highness the Padi-shah happened to possess some particularly fine Angora goats, and the gentleman in question

was desirous of "doing a deal" with him, so as to improve the quality of Cape mohair. When the supposed Machiavellian intrigue was declared to be merely a pastoral incident of the mildest and most commonplace kind, some wise folk refused to believe that Mr Cecil Rhodes and Dr Jameson would travel all the way to Constantinople merely for the sake of buying a few billy-goats. But the future will probably show that this patriarchal piece of traffic has done more for the permanent wealth of South Africa than "all the gold of the Rand."

CHAPTER VIII.

THE FIG.

THE pig and the sheep may be classed apart from other domestic animals in one particular: man makes but little use of them during their lifetime. With the exception of the tribute of wool which he exacts from the sheep—and occasionally the contribution of bristles which he wrests with oriental brutality from the reluctant boar—he chiefly benefits by appointing himself their sole heir and executor, and then arranging for their seasonable demise.

Beyond this unfortunate fellowship, the sheep and the pig have but little in common either in habits or history. The more we examine them the more evident it becomes that they have been developed among utterly different surroundings. Yet in each case the special characteristics which

render the animals valuable to us were of essential service in preserving them from extinction during long epochs before the commencement of their captivity.

We now chiefly regard a live hog as so much perambulating bacon. His other qualities, both moral and physical, are almost totally eclipsed, as far as we are concerned, by ideas about the number of pounds of pork which we hope—and intend—to inherit from him. Yet, as I hope to show, the pig is by no means the gross and unintelligent beast he is supposed to be by many people who have to do with him. There are certain points in his character which it is difficult to describe or appraise without using terms which we generally consider appropriate to the highest human virtues.

But since we always put the pig's carcass before his soul, and, when considering the carcass, think chiefly about the amount of grease which it contains, let us first inquire whence he gets his most praiseworthy aptitude for laying on fat. Of course it is plain that no wild animal could long exist in the condition of the prize hogs which we see exhibited in agricultural shows. Long-continued and assiduous care has been

exercised by men in enhancing this one quality in the domestic breeds both in America and Europe, and to an even greater extent in the far East. Indeed we are indebted to the ingenious Chinaman for the delicate flavour of our pork in nearly as great a degree as for our tea and China teacups. If any of my readers require an authoritative account of how, why, and when the Chinese began to cook pork, I must refer them to Charles Lamb's "Dissertation on Roast Pig." This still holds the field, in spite of "recent advances in science and literature," as undoubtedly the most masterly monograph on the subject which has ever been penned. At any rate, I have never heard that the statement there put forward as to the origin of "crackling" has ever been seriously controverted.

The wild boar of Europe is an uncouth and scraggy giant when compared with our domestic swine. He would need a vast deal of civilising before his gaunt and sinewy frame could be cushioned over with the thickness and quality of adipose tissue which is deemed orthodox in his kinsman whose mission it is to die for humanity. Very many years ago breeders found that the European pigs were much improved by being

crossed with the Chinese. These are of a different race altogether, and are not found wild anywhere at the present day. The careful Mongolians have kept and improved them for untold centuries, and this doubtless accounts for their superiority from the farmer's point of view. Nearly all our breeds of domestic swine—such as the Sussex, the Berkshire, and the white Yorkshire varieties—show distinct signs—both outward and inward—of Celestial descent. Until comparatively lately the Irish pig—whether from a sense of patriotism or under coercion I cannot say—maintained his national independence. He was a creature in shape somewhat resembling a tailless and scaleless crocodile which had been pinched sideways and mounted on stilts. His snout was of enormous length, his back was convex from end to end, not with a soft, blubber-like layer of fat, but with corrugated bony prominences arranged like the stones of an arch. He was probably—like his masters—the direct descendant of certain pristine monarchs of the soil who owed neither blood nor allegiance to any foreign nation (whether Saxon or Chinese) to the east of St George's Channel. His modern representatives have, however, conformed to the

current fashion, and are now but little different from the other civilised pigs throughout Europe and America.

In my childhood I remember learning some verses in which an aboriginal Irish pig—described as “very lean and tall, with long hind-legs”—was represented as making a speech (of an unusually ungallant character for any being hailing from that polite country) to a Chinese sow who inhabited an adjoining sty. It ran somewhat as follows :—

“If you and I were bacon, ma’am, the difference between
An Irish and a Chinese pig would scarcely then be seen.”

Now, apart from the moral at the end (for I have an impression that there was an excellent moral), this didactic effort can scarcely be commended. A closer adherence to Baconian methods would have convicted the poet—out of his own mouth—of his error. Both to the eye and to the palate the difference is very considerable.

Although the table qualities of our domestic swine are to a great extent due to the care of the early gourmands of the East, their disposition to lay on an enormous amount of fat in a short space of time dates back to an age far beyond

the beginning of Chinese civilisation. This rapid acquisition of adipose tissue was a most necessary habit in the case of the pig's wild ancestors in any but the most favoured climates; for in all probability the hog which did not get fat in the autumn would perish during a hard winter.

To the casual observer there is not much in common between fat pork and honey, although analysts tell us that they are chemically very similar. Yet in both cases they were in the first place stores of heat-giving material laid up for winter use by their respective owners, which man, the Arch-plunderer, has appropriated for his own purposes. There is this difference, however, that whereas the bees accumulate their savings in a joint-stock bank, the pig carries his about with him.

Throughout the spring and summer in Northern and Central Europe the wild hog, by diligently grubbing for roots and whatever else he could find, managed to make a bare living. If his present habits are a true record of his past history, he must have had a hard struggle even through these softer seasons. His passionate addiction to "rooting," which is so inveterate

that it can only be prevented, even in a well-fed hog, by piercing his nose with an iron ring, and the fierce eagerness with which he devours the coarsest food put before him, show that strenuous and unfailing attention to the main business of life (which with him, as with all of us, is to avoid extinction) was forced upon him by circumstances.

When the autumn came and the acorns and beech-mast fell he revelled in plenty. Moreover, at this season many of his enemies, such as the bears, were feasting on the ripe berries and nuts, so that he was left in comparative peace. The result was that in the few weeks between the fall of the mast and the first severe weather he filled out amazingly. Then came the winter, during which he had to face the cold and find what food he could beneath the snow or on the surface of the hard frozen ground. Towards the end of the cold season commenced the most trying time of all: the ground was still hard with frost, so that even a hog's indomitable snout, with the pig-headed resolution behind it to "root or die," could not unearth anything of value. By this time, also, every nut or acorn in the forest had been picked up by the thousands of hungry searchers. The pig was no longer fat; his in-

ward store had wellnigh been consumed. It was always an anxious question with him whether he would "save his bacon" until the breaking of the frost. We know that in every hard winter when the cold lasts a few days or weeks longer than usual, thousands of birds and other wild creatures perish. Nature so nicely computes her annual estimates that there is seldom any surplus even in an average season. It is during winters and droughts of unusual severity that the eliminative force of adverse circumstances (of which Darwin makes so much) makes itself most apparent.

You will thus see that the hog which had amassed within his own private bank a shilling's worth of adipose savings more than his fellows, would in an exceptionally protracted and inclement winter be one of the few to survive. He would naturally transmit his talents to his progeny; and thus it comes about that in the present day no animal so handsomely responds to liberal feeding as the domestic pig.

Many other beasts which lived under somewhat similar conditions share with the hog this faculty for accumulating a store of fat during the autumn, or whenever food is specially abundant,

but in no other case has it been taken advantage of by man to such an extent.

I am not aware whether any wild hogs are in the habit of laying up a store of food outside their own skins. One often notices a pig carrying a potato or some such morsel in his mouth for a considerable time, but I have never known one to attempt to conceal food after the manner of dogs, squirrels, rooks, and many other creatures which have to provide against periodical scarcity. One faculty of the pig of which man makes use occasionally is a further proof of the stress to which he was subjected in times of famine. He has an extraordinary power of scenting certain roots and fungi which are concealed beneath the ground, and the truffle-hunters of Perigord have frequently employed pigs to aid them in their search for these delicacies. That his olfactory sense is by no means contemptible has also been shown by his success, under proper training, in imitating the useful habits of the pointer and other dogs.

Many animals have an extraordinary and inexplicable faculty for discovering hidden stores of food, which reminds us of the mysterious

gift ascribed to some persons of finding water or metals in places where they are quite concealed from the ordinary senses. Squirrels will without the least difficulty find stores of nuts and acorns buried far from any tree or other perceptible landmark, even when the ground is covered by a recent layer of snow; and still more wonderful stories are told of rats, termites, and other creatures. Apparently, however, the hog, although, with the exception of ourselves, perhaps the most versatile and resourceful mammal in existence, does not possess any mental faculties of this mysterious order.

There are two other bodily peculiarities of the pig which we find of especial value—viz., his tough skin and bristly coat. We will now briefly discuss the natural origin of these.

We have seen that the horse, the ass, the sheep, and the goat found it necessary to retire from low and marshy regions where cover was abundant, and which swarmed with voracious foes. Not so the wild hog: he stayed and faced the danger. If you observe the shape of a lean pig, you see at once that he has been built for forcing his way through dense cane-brakes and jungles. He is shaped

something like a submarine boat or a White-head torpedo. His nose is the thin end of a wedge (or rather a cone) for forcing apart the close-set stems of his native thickets. His hide, especially about the shoulders and back, is extraordinarily tough. The bristly covering of the wild hog is a perfect protection against the thorns, which, however pointed and curved, slide along among the stiff elastic hairs without impediment and without reaching the skin at all. Hence he will plunge at head-long speed through dense masses of bramble and brier where no other animal of his size and weight can follow. If any of us were to pursue the same track we should get our clothes, and afterwards our skins, torn to shreds. He merely gets his hair thoroughly combed, and rather likes it than otherwise.

Another attribute traceable to the needs of wild life among swine of which the farmer avails himself, is the proverbial greediness to which I have incidentally alluded. Now, we do not, when using our civilised ethical standards, regard gluttony as a virtue. But supposing a man were so situated that it was his one supreme duty to devour all the food he could get, it

would be decidedly immoral for him to abstain from doing so. As we have seen, there were frequent occasions when the wild pig which wished to survive during a time of scarcity was bound by every law of nature to "gather gear with every wile" that his porcine intellect could suggest. Survival was to him the great aim of existence; and to neglect any means which might contribute to preserving his precious life would have been therefore grossly sinful, according to piggish canons.

Many of the pristine bestial virtues which we have been discussing have an unhappy way of changing into vices when their possessors become subject to man. Instances of these are seen in the shying and bucking of the horse, and in the pugnacity of the adolescent bull. But in this particular case the corrupting influence of civilisation is not seen. If any distortion of primitive porcine morals has taken place, it seems to have been cancelled by a lucky turn of circumstances. When farmers are anxious that their hogs should fatten rapidly they are careful to put several together in a sty. Now the gross appetites and inordinate desires of his wild and wanton past become

means of grace. For is it not the one chief aim—and end—of the pig's changed life to provide fat pork for the enjoyment of others? When a pig is alone in a sty he will often take his meals in an indifferent and leisurely manner, and as often as not, if abundantly supplied with "wash," he will leave some of it in the trough until it becomes sour and uneatable. But when several are domiciled together, the beautiful influence of competition, which we so often admire in human affairs, comes to the aid of the farmer. The instant that the pail is emptied into the hog-trough there is an eager rush to the spot—each pig thrusting its fellows aside and plunging its snout deep into the fluid in order to get as much property as possible into the only strong-room he knows of where his goods are in peace. So determined is every pig not to let his fellows have an undue share, that they all will continue diligently sucking up the fattening "wash" until not a drop is left.

Travellers tell us that in certain parts of Africa, where an indispensable portion of a young lady's dowry is physiologically of the same nature as the personal wealth of the hog, it is the custom

among match-making mothers anxious to get their daughters "off" to put a huge bowl of milk before a damsel, and at the same time to apply a switch sharply and continuously to her back with the view of stimulating her appetite. Only when the milk is all swallowed and is fairly on its way to enhancing the *débutante's* charms (according to Ethiopian ideals) the *vis a tergo* ceases to operate. Comparing the two methods of obtaining a like result employed by the British agriculturist and the African mother respectively, I think it will be acknowledged that the artifice employed by the former is more worthy of the human intellect. Its economical soundness alone justifies his claim to a higher civilisation.

The true wild swine, and the feral hogs which have escaped from captivity in various parts of the world, go about in herds for mutual protection; and when one is attacked the others are generally ready to stand by him and defend him. This affords an explanation of the original use of the shrill voice of the pig, and of his readiness to exercise it whenever he is in trouble. In fact, whenever you hear a pig squealing, you hear a testimony to the intrepid deeds of



WILD SWINE RESCUING A COMRADE.

J. J. JADE

his race in the past, as eloquent and emphatic as a Fourth of July oration. In the wild state it was his appeal for help, to which he knew his brethren, one and all, would respond with splendid loyalty and courage. Many a hunter has had to climb a tree to save his life after wounding one of a herd of peccaries. Now the hog would not expend his breath in ear-splitting squeaks unless he felt pretty sure of getting some benefit from so doing. His squealing, therefore, amounts to a lively expression of faith in the noble moral qualities of his brethren. It conveys precisely the same sentiment as do the words of a stump orator when he says: "Gentlemen, I well know your constancy and your courage! You have proved many times in the past that you are worthy of all trust when the party is in danger! I confidently look to you, therefore, to stand by me in the present tremendous crisis."

The continual grunting of the pig is also of interest, as revealing something of the conditions of life of his wild ancestors. A herd of swine searching for food in the long grass of the jungle or among the brackens of a European forest would soon lose sight of one another,

and would be in danger of becoming separated and destroyed piecemeal by pork-eating foes. But the grunts of each would still advertise his presence to his hidden neighbours; and so the individual members of the herd would never lose touch with the main body. Then there are grunts and grunts. If one of my readers will imitate the ingenious Mr Garner, and take a phonograph to the nearest pigsty, he might get material to make up a book on the language and grammar of the hog. However thick the jungle, the wild pig could, by taking note of the pitch and emphasis of the grunts to right and left of him, tell pretty much what his hidden colleagues were thinking about.

There is another peculiarity of the Suidæ, or pig tribe, which is of great importance to the farmer, and which at the same time tells a tragic tale of the circumstances of the early forefathers of our domestic hogs. They are very prolific, and produce from half-a-dozen to twenty at a birth; whereas the other animals which we have discussed produce, as a rule, only one or two.

Now, in a state of freedom the number of individuals of an established species remains fairly constant from year to year. If they

doubled every year, the world would soon be overpopulated. Supposing they increased ten-fold and could find sustenance, it would not take many generations to pack the whole surface of the earth with hogs as closely as a Chicago pork-factory-yard before a grand kill. There must, therefore, be a corresponding destruction of life to make up for the annual increase, or, more properly speaking, the normal rate of increase becomes adjusted to the amount of annual waste.

But what a state of affairs this reveals! Out of every family of from a dozen to twenty only one or two were left alive by the following spring. Truly, the pig paid dearly for his pig-headedness in sticking to the forest and the swamp! The wolf, the bear, the lynx, and the panther were the chief factors in this fearful process of subtraction. You may take it as a general law that when a beast is a member of a large family born at the same time as himself, his prospects of long life are not good. A life assurance society would not take him at any price—except in the annuity department—nor would a company which grants compensation for accidents.

The natural term of life of the pig is longer than that of the sheep, and the frightful mortality implied by the above facts is therefore due to violence in nearly every case. If he is not made a meal of by a prowling enemy, he will probably be killed in battle; for most wild boars will cheerfully attack anything, from a kitten to a locomotive.

Even this reckless valour of the pig has been made use of by man in the districts which once swarmed with rattlesnakes; and, curiously enough, directly the grunting warrior appears, the snake seems to know that he has met his match. I should not wonder if some very remote and gallant ancestors of the hog bore the brunt of that deadly war between the reptilian and the warm-blooded inhabitants of the earth to which I have several times alluded.

If so, we owe him a debt of gratitude greater than we imagine. What if, after all, "the gentleman that pays the rint" were the real St Patrick who cleared Ireland of snakes?

CHAPTER IX.

THE CAT.

ALTHOUGH cats live in closer association with mankind than do any other domestic animals, they have been less influenced by us, both as regards their bodies and their mental habits, than any of the creatures which we have been discussing. All the rest have become man's slaves or servants, although in some cases they may be said to attain to a more equal and honourable relationship. But the cat can scarcely be classed as a servant, since it seldom yields to restraint or acts under orders ; and, moreover, its co-operative relations with mankind are of a very loose and limited character. Even if we regard the cat as a partner, we must acknowledge that it takes a very free-and-easy view of the bond. It comes and goes when it chooses, transacts its share of the

business of the firm (in the rat and mouse department) strictly in its own way, selects its mates with an utter disregard of the views of its human colleagues, and habitually keeps outrageous hours. We, many of us, put up with a great deal from our servants and co-workers, but what employer or member of a firm would tolerate from his associates in business brawls and riotous orgies on his roof at two o'clock in the morning?

In fact, if we were to seek for any parallel relationship existing between human beings, we should find it rather in the case of two independent people who occasionally find it convenient to share premises or to transact business in company, than where there is a definite tie, such as exists between partners or between employer or employed.

We may expect, therefore, to find remaining in the cat a great many attributes which were developed, not to meet any present needs, but to enable it to encounter the emergencies of a wild life in the forest before it joined its fortunes with those of man.

All the cat's habits show it to be by nature a solitary animal. Even in early life, when family ties necessarily bring out the instinct of

association, this is apparent. If you compare the play of puppies with that of kittens, you will find in the one case that companionship of some kind is an essential, for if a puppy has no playmate of his own species he will always try to make one of the nearest biped; whereas a cork or a bit of string is all that is necessary to satisfy the requirements of the kitten. The way in which the cat takes its food is a sure sign that, in its natural state, it is not in the habit of associating with greedy companions. When given something to eat, it first carefully smells the morsel, then takes it in a deliberate and gingerly way, and sits down to finish it at leisure. There is none of that inclination to snatch hastily at any food held before it which we observe even in well-trained dogs; nor does a cat seem in any hurry to stow its goods in the one place where thieving rivals cannot interfere with them. Indeed no greater contrast in natural table manners can be observed anywhere than when we turn from the kennel or the pigsty and watch the dainty way in which a cat takes its meals. That a cat allows people to approach it while it is feeding without showing jealousy, proves that it does not attribute to human beings like tastes with its own. A dog

which is engaged with a bone grows if his master draws near, and the probable reason is that, having accepted his human friends as members of his pack, it seems to him probable that his master would like to steal the bone and gnaw it himself. Cats, indeed, appear to regard human beings who may be domiciled with them rather as part of the furniture than as comrades. We are probably, to the feline mind, merely so many items of environment which might affect a cat's safety or comfort. I do not say that some muddle-headed ideas of comradeship may not occasionally arise; but from the action of cats generally, this, or something like it, seems to be the prevailing view. We must remember that the cat has acquired no new instincts since it left its den in the wilds and came into our houses, and that all its present innate habits were primarily adjusted to the conditions of a free life in the forest. Possibly, therefore, where the dog transfers his loyalty and *esprit de corps* from the pack to his new associates, the cat, having no such social traditions or preconceptions, merely transfers instinctive notions about trees, wind, and weather. While I was considering the probable view held by cats about human beings, it was suggested by one ingenious

friend that they may look upon man as a kind of locomotive tree, pleasant to rub against, the lower limbs of which afford a comfortable seat, and from whose upper branches occasionally drop tit-bits of mutton and other luscious fruits! We may laugh at this hypothesis, but certainly in many ways the cat's behaviour gives colour to it. If the ancients found no difficulty in imagining that beings bearing human shape habitually changed places with trees, why should not the cat transfer its pristine instinctive notions concerning trees to men? It would be but one instance of the extremely common habit of arguing by analogy from the known to the unknown. Certainly the wild cat was a solitary roamer, securing its prey, as a rule, without any aid from its kind. In a sense the trees were its chief friends, for it found a comfortable home in the hollow trunks, and a safe refuge from its foes among the branches.

How can we tell that the cat's ancient dwelling-place was in the forest? Firstly, because every kitten takes to climbing trees almost as readily as a young duck takes to water; and, secondly, because almost all cats are striped or mottled after a fashion almost invariably adopted by denizens of

the woods. This system of coloration has the advantage of rendering animals inconspicuous when living among trees, where the light, shining through the leaves above, generally falls in spots and streaks upon the evenly coloured bark and upon the ground below. Furthermore, nearly all the wild cats, which show a marked family resemblance to our tame varieties, seem to prefer a life in the woods.

Since the cat habitually preys upon animals smaller and weaker than itself, it seldom needs to resort to co-operation. Moreover, mice and small birds could not be hunted profitably except in the true feline style. A mouse is generally close to a hole or some other place of refuge, and a bird will be safe upon the wing within a second of the time when it perceives an enemy. Hence the best way of capturing such creatures is by lying in ambush, or by adopting the method known among backwoodsmen as "still-hunting." Not only has the cat no need for comrades when following its usual prey, but it has the best of reasons for preferring room to company. When your game (and your dinner) is a mouse or a sparrow, the fewer partners you have to share it with you the better. If the dog's hunting

motto is "The more the merrier," the cat's is "The fewer the better fare."

It is often remarked that cats are more attached to places than to persons, whereas a dog will always prefer to accompany his human friends, and will make himself at home with them anywhere. Here again we see remnants of certain ancient habits. Wild cats usually choose some fixed spot as their permanent headquarters, and devote their attention to the game in the immediate neighbourhood. Hence when the cat takes part in our civilisation, the house where it lives and is fed is regarded in the same light as was the den it used to select for itself among the gnarled roots of some forest tree. Wild animals of the dog tribe, — such as wolves, jackals, and dholes, — on the contrary, range a great extent of country, and, except when breeding, make their lair wherever night finds them. Darwin pointed out that whenever a dog lies down he curls himself around several times as if he were trampling and twisting long grass into a comfortable nest. Each member of the pack regards himself as at home as long as he is with his fellows. Of course when a swift creature, such as a deer or an

antelope, is run down, the chase would often end many miles away from the starting-point, and the weary and gorged pack would lie down to sleep in the nearest place where a tolerable bed could be found.

There is little doubt that the cat first came into association with man in the same way as did many other of our domestic animals—viz., through primitive hunters carrying helpless young ones to their wigwams as playthings for their children. No savage in his senses would have brought home a full-grown wolf or wild cat with an idea of taming it. Probably, as in the case of the kid, it was the natural playfulness and prettiness of the little creatures which first made them welcome inmates in the primitive household.

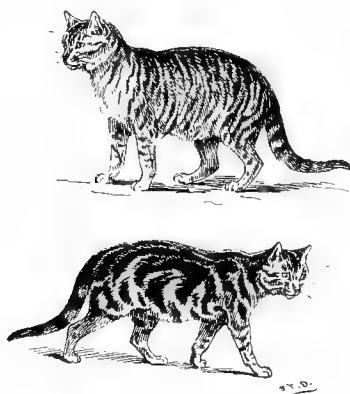
The young wild cat would grow up regarding the habitation of the savage as its home. Guided by its natural instincts or urged by hunger (for we know that our early forefathers were often in want), it would soon become expert in catching small birds and animals, and would assume the independent *rôle* which its race has maintained ever since. From what we know of feline habits nowadays, it seems probable that when a primi-

tive family which had adopted wild kittens migrated to fresh hunting-grounds, such half-tamed animals, if old enough to shift for themselves, would generally remain behind and resume a life of freedom. Of course when man took to agricultural pursuits, and had to live in a fixed dwelling and to store his produce in stacks or granaries, his partnership with the cat became much more stable and profitable.

It is found in all parts of the world that domestic cats mix freely with native wild ones. Thus in the north of Scotland, even to this day, an unusually large number bear the markings of the indigenous wild cat, and in India and elsewhere the crosses with aboriginal varieties have been so frequent as materially to alter the shape and appearance of nearly all the domestic cats.

Most naturalists hold that our tame cats are descended from several distinct wild species, and certainly the readiness with which they interbreed with wild ones of many kinds supports this view. Dr Gray states that "the normal colour" of our domestic animal "seems to be that of the tabby cat, grey with black dorsal streaks and sub-concentric bands on the sides and thighs; some-

times all black from melanism." Curiously enough, Dr St George Mivart, in his monograph on 'The Cat,' draws no distinction between the two completely different types which are both popularly known as "tabby." For, in addition to the true tabby spoken of by Darwin and Gray,



Grey and tabby cats.

one frequently sees cats marked in a manner very similar to the European wild cat—namely, with a dark band along the spine and a number of small and narrow stripes or streaks branching from it at right angles so as to mark the animal somewhat after the fashion of a tiger, but usually leaving so much of the neutral ground tint visible that at a little distance the cat seems to be of

uniform grey colour. For the sake of clearness I shall speak of this type as "grey" and not "tabby." When we consider how little control man exercises over the domestic cat, and how freely these animals intermix, one would expect that in the course of many generations they would have become fairly uniform in appearance. That they have not done so is due to the mysterious law as to the preservation of type which so often aids us in detecting ancestral traits among mixed-bred nations and animals. In spite of a very free mingling of all the aboriginal strains, one finds that certain distinct types remain fairly constant, and I think that within certain limits we may presume that these truly represent different wild ancestors. I cannot help thinking that the original progenitor of the domestic tabby (which, as we have seen, is the most common and representative type now existing in captivity) was a distinct natural variety which no longer exists as a wild animal. Not only are the markings of the true tabby very different from those of the Caffre cat (*Felis caffee*), which some naturalists confidently assert to be the chief ancestor of our familiar tame species, but it also differs essentially both in

colour and shape from the European wild cat. The black-and-grey pattern of the tabby cat is so constant and so characteristic that it is impossible to think that this type is merely a chance variety which has arisen since its forefathers came under the influence of man. Moreover, there are some exceedingly curious points about the system of stripes upon true tabbies to which I shall allude presently. If the interpretation which I shall venture to suggest be correct, the special traits alluded to are distinctly referable to certain peculiar needs of wild life. Before discussing this point, however, I may remark that there are several types of tame cats which have peculiarities suggesting a distinct wild ancestry, although no species may be now extant in a state of freedom to which we can refer them. Thus the tailless Manx cat with its long hind-legs, which both give to the animal its characteristic rabbit-like attitude and its great leaping power, is probably a representative of some ancient wild species. The peculiarities exhibited by tortoise-shell and sandy cats seem to indicate that they also may have sprung from a separate race. One frequently finds that the male and female of a species differ materially in

appearance. Usually this difference indicates some diversity of habit in the two sexes, and is owing either to the special need of protection of the weaker vessel—as in the case of sober-coloured hen-birds which need to be concealed when nesting—or to the profitableness of conspicuous colours to one sex only for advertising and other purposes. Among the living wild representatives of the cat tribe any marked difference between the sexes is rare, but still, as in the case of the lion and lioness,—and possibly also in that of the male and female jaguarondi,—it occasionally exists. Now it is a well-known fact that a tortoise-shell cat is almost invariably a female, and that if a tortoise-shell be mated with a sandy-coloured “tom” all the female kittens are tortoise-shell and all the male sandy. Moreover, it is, I believe, rare to find a true sandy cat which is not a male; and some writers have put forward the view that the tortoise-shell is the true mate of the sandy cat, and *vice versâ*. If this be so, it is strong evidence that at one time there lived a breed of wild cats which had these colours, and which, owing to some peculiar circumstances of environment, found it profitable to have the protective mark-

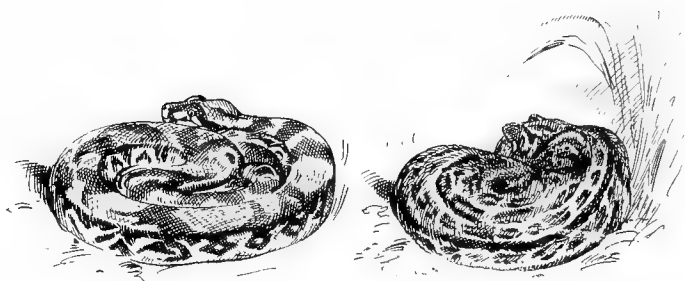
ings different in the two sexes. We can only guess at what these circumstances may have been, for at present no wild members of the cat tribe exist which exhibit like peculiarities. Possibly, however, the ancestors of the domestic tortoise-shell and her sandy spouse were creatures living in some desert region where such colours would be advantageous for concealment; and if the male roamed abroad among the sand while the female lived chiefly in the scrub or amid the rocks surrounding their den, their respective markings would each prove useful.

Although the wild progenitors of our modern cats seem to have acquired their general system of coloration in order to harmonise with their surroundings, there are, as I have already hinted, some further and very curious questions raised by a closer study of the arrangement of the markings upon certain familiar types. For, taken in conjunction with certain other traits which will be discussed later, it seems possible that we have in the peculiar pattern of the dark bands upon a true tabby a remarkable instance of that "protective mimicry" which is so common among insects and other lowly organised crea-

tures, but which is supposed to be almost unknown among mammals.

My attention was first turned to this subject by noticing that when a very fine tabby which I possess was curled up asleep, the dark bands arranged themselves in concentric circles, or rather in a closely set spiral, strongly suggesting the appearance of a coiled serpent; and the resemblance was further increased by a dark oval blotch in the centre of the coil where the head of the snake should be. When the cat got up, the snake-like aspect disappeared; the coils became the well-known curved bands running along the sides and down the thighs of the animal, and the dark spot which had formed the "snake's head" was shown upon the flank. After first noticing this peculiarity, I made it a habit for some time carefully to observe the markings upon tabby cats of this type, and I found that, although these differed somewhat on different animals, in all cases they showed the same tendency to fall into concentric curves with a dark oval blotch in the centre whenever the usual sleeping attitude was assumed. More extended observation brought to light certain kindred facts which it is difficult

to believe are mere coincidences, although in some cases their protective significance is by no means clear. Thus the ocelots and kindred cats of Central and South America have parallel curved bands running the length of the body, which also appear to become merged into an



Boa and ocelot.

apparent spiral when these animals are curled up. These lines are not black, as in the case of our tabbies, nor is the general arrangement of the markings the same in the two classes of animals. They consist of chains of blotches somewhat lighter in the centre than at the outside, and these linear mottlings, strange to relate, are almost exactly similar in size, shape, and colour to the markings upon the backs of certain of the most formidable serpents of the

countries inhabited by ocelots, such as the rattlesnakes and the pythons. Now, one does not generally think of a wild cat as a creature requiring special protection from enemies, more especially if it is as robust and formidable as are most of the ocelot tribe. But we must remember that such protective resemblances—if in reality they exist—are of very ancient date; and that in the early days of mammalian life on the earth the warm-blooded quadrupeds were an exceedingly feeble folk when compared with contemporary birds and reptiles. It is therefore quite possible that many of the characteristic markings upon creatures living to-day—which are often so difficult to explain—are mere vestiges of a state of affairs which existed in very ancient times, and which demanded special means of protection.

Did these phenomena stand alone, one would perhaps be scarcely justified in regarding them as more than suggestive coincidences. But if we inquire further we find that they by no means stand alone; and, moreover, that wild cats even in the present day are exposed to dangers from which such peculiarities might tend to preserve them.

Several writers have drawn attention to the markedly viperine look of the head of an enraged cat, when, with ears pressed flat, with eyes glassy and glaring, and with exposed fangs, it faces an enemy. Miss C. Hopley, in her well-known work on Snakes (p. 375), draws the same comparison from the opposite standpoint, and alludes to one circumstance which I have not found noted elsewhere: "When a viperine snake yawns extensively, as it so often does, you may sometimes perceive the fangs partially erected or entirely so, or the vibratile motion in them observed by Fayrer. When the snake is angry, this vibratile action is much like that of a cat gnashing its teeth."

Moreover, when so situated a cat invariably renders its tail as conspicuous as possible, and switches it with a peculiar sinuous movement from side to side. This habit is also remarkably snake-like, for it has been remarked that nearly all snakes when angry and about to strike will jerk their tails to and fro. "Excitement," says Miss Hopley, "displays itself in the tail of a snake as much as in the tail of a dog."

Now when one of the more formidable enemies of the cat tribe finds itself confronted by

a creature bearing this aspect, one can easily imagine that it would be somewhat disconcerted by the horrid suggestion that, unawares, it had come face to face with a venomous serpent. For not only does the cat's head and expression seem to mimic an angry snake, but at the other end of its foreshortened body is seen the quick to-and-fro movement of its barred and sinuous tail, which further contributes to the deception. Moreover, a cat appeals still further to the instinctive terror which all warm-blooded creatures have of snakes by uttering sounds almost exactly similar to those emitted by many of the most venomous species when enraged. Miss Hopley states that "the rattlesnake, cerastes, and little echis emit short spitting sounds when about to strike." It is worth while noting that both serpents and cats make use of two quite distinct sibilant threats. Snakes, as well as certain other reptiles, in addition to the spitting sound noted by Miss Hopley, give vent to a harsh and somewhat prolonged hiss, which is not like our sharp hiss of disapproval, made with the tongue held almost against the closed incisor teeth, but is somewhat deeper and more guttural, such as is produced when

the back of the tongue is pressed against the soft palate during expiration through the mouth. This last is almost exactly the sound which many animals of the cat tribe emit when they wish to intimidate a suspected enemy. The other and much more explosive hiss uttered by cats and snakes — popularly known as “spitting” — is of the nature of an ultimatum. It signifies in both orders of creatures a much greater degree of anger than the prolonged sound, and may be considered to be a menace which, if disregarded, may be immediately followed up by an attack with the fangs.

Before bringing forward certain other facts, gathered from a wider area, as to the use of these sibilant snake-like sounds — which give additional support to the “mimicry” hypothesis — let us take note of some of the special dangers which threaten wild cats nowadays, and see if they will give any hints as to how a serpent-like aspect might possibly afford protection.

St John, in his ‘Wild Sports and Natural History of the Scottish Highlands,’ states that in his day the British wild cat became almost extinct in some districts, owing to its being

persistently preyed upon by the golden eagles; and he narrates that a tame eagle in his possession attacked and killed several domestic cats. Speaking of the Highland wild cat, he says: "The strength and ferocity of the wild cat when hemmed in or hard pressed is perfectly astonishing. The body when skinned presents quite a mass of sinews and cartilage. . . . I never saw an animal fight so desperately, or one which was so difficult to kill. If the tame cat has nine lives, the wild cat has a dozen." Yet, in spite of its most formidable powers of resistance, he found that an eagle was able to destroy a full-grown wild cat without the least trouble or danger by pouncing upon it and driving its talons through its ribs and flanks into its vital organs, and at the same time bewildering the wretched animal by beating it with its wings and tearing it with its beak.

The same author states that wild cats and martens form the favourite food of the golden eagle. I met, quite unexpectedly, with a partial confirmation of this statement when visiting the animals kept at the Crystal Palace a short time ago. The keeper was showing me some

animals in his private sanctum when I happened to notice several cat-skins hung up on a beam overhead. Being just then rather full of my "protective" idea, I drew his attention to the characteristic markings on the skins of the tabbies, and asked him whether he had ever observed them or thought about their significance, at the same time narrating St John's account of golden eagles attacking wild cats. I observed from his expression while I was speaking that he had something interesting to tell me, and when I had finished he remarked: "Perhaps it would interest you to know, sir, that those are the skins of cats which I have got from time to time as tit-bits for my eagles when they were out of sorts and would not take their regular food. They are fonder of cat's flesh than of anything else, and if an eagle refuses to eat a cat it shows it is very ill indeed."

Here, at any rate, is a suggestion as to how a sleeping cat might gain an advantage by imitating a coiled serpent. Many eagles not only refrain from preying on snakes, but always seem to fear and avoid them. One finds also that certain birds which are akin either in structure or habits

to the eagle family, but which make a practice of killing and devouring serpents, have developed special structural peculiarities to enable them to carry on the war without any great risk of death from snake-bite. Compare the secretary bird of South Africa and the long-legged *çariama* of South America with the imperial or golden eagles, and the special structural adaptations which the habit of preying on snakes have rendered necessary at once become apparent. A cat lying asleep on some exposed ledge of rock or upon the broad limb of a forest tree would be in a peculiarly defenceless position if swooped upon from above by an eagle; whereas if it seemed to be a creature of the dreaded ophidian order (and it is chiefly when seen from above that a curled-up tabby looks most like a coiled snake), it might frequently escape an attack.

I admit that there are many objections and difficulties standing in the way of this theory, although most of them tend to diminish when we examine the evidence in the light of evolutionary law. Some of the animals of the cat tribe bearing band-like markings which give the appearance of a coil when the animal is asleep, are so large and powerful as to be totally indifferent to the

attacks of any bird of prey. And, moreover, one finds that the hissing and spitting sounds to which we have alluded are uttered by jaguars and tigers as well as by the smaller Felidæ. Yet evidence apparently so adverse to my suggestion that we have in the markings of many cats a curious instance of protective mimicry, loses much of its negative force when we remember that without doubt the traits we are dealing with are all of vast antiquity, and probably date back to a time when the ancestors of all cats were small and feeble creatures living in a world which swarmed with huge reptiles and formidable birds. We know that it does not take any very long time—in the geological sense—to increase or diminish the normal bulk of an animal a hundred-fold, and we know also that physiological phenomena, such as some of the above, are often exceedingly stable under changed environment. A minor objection to the theory is the fact that the European wild cat, although apparently standing in need of protection from eagles, is not marked in the serpentine way, but is simply streaked and mottled so as to present a general resemblance to its usual surroundings. All such matters are settled by nature's protection department much as actuaries

determine the premiums to be paid by insurers of different ages and callings—viz., upon averages drawn from a vast number of cases. Animals cannot be protected against *all* adverse risks, and if the balance of chances in the case of one species shows in favour of a *general* protective coloration (similar to that of the wild cat) and against a *special* protective coloration (such as that of the tabby), the former will be adopted. But such an actuarial pronouncement is merely of general application, and must not be taken by any single cat as a certificate of immunity from risks requiring a special premium. The common wild cat, although exposed to occasional attacks from eagles, has nevertheless found it most profitable in the long-run to wear a kind of general-utility uniform of mixed grey, which enables it to steal unseen upon its quarry and to hide itself without much difficulty when among its normal surroundings. But the original tabby—if our argument holds good—found it worth while (possibly because it was first developed in regions much infested by large birds of prey) to sacrifice a few of the business advantages arising from an inconspicuous coat for the sake of avoiding one special danger which threatened it with extinction.

What appears to my mind to be by far the strongest evidence we possess that protective mimicry is resorted to by certain of the Felidæ, in almost as marked a degree as among insects and other lowly organised creatures, is the habit of hissing and spitting at an enemy shown by the blind, newly-born kittens of almost all varieties of cats. Now, whenever one finds an identical instinctive habit displaying itself in every newly-born individual among a number of distinct but related species, one may be sure that it is of very great antiquity; for it must have been established before the separation between the several species took place. Hence the explosive kitten helps to explain away the difficulties raised by its gigantic relatives, such as the jaguar and the tiger, who, while still uttering sounds suggestive of reptiles, obviously stand in no need of protection. For, as was remarked above, the earliest cat-like animals were undoubtedly much more defenceless creatures than the great majority of those now existing; and, moreover, at the time when they and their instincts were first evolved, formidable reptiles and birds were probably much more important factors of environment than they have ever been since. Still the kitten, if its testimony

were unsupported (and perhaps more especially because we are presuming that every hiss it utters is a lie), might be disbelieved when it appears as a witness in support of mammalian mimicry. Fortunately we are able to call an immense amount of the most unimpeachable corroborative evidence; and, moreover, our additional deponents not only belong to a proverbially unsophisticated and unbiassed class, but are wholly unrelated to the cat family and are summoned from the most diverse quarters.

It has been remarked that the wild cats commonly make their homes in hollow trees and other dark retreats where their broods are fairly safe from molestation. Now if we examine into the habits of other creatures which breed in similar places, we find that their tender offspring have one common and very remarkable trait. Nearly every young bird or mammal whose nursery is in a comparatively shallow hole, whether in the trunk of a tree or elsewhere, utters a sharp hissing noise whenever an apparent enemy approaches. Owls, bats, titmice, woodpeckers, phalangers, dasyures, hornbills, opossums, and even certain monkeys, all unite with the kitten in employing this

method of intimidation. A mere glance at this very incomplete list proves at once that neither blood-relationship nor geographical propinquity can account for the common possession of the habit. Indeed the only thing which most of these sibilant youngsters have in common seems to be the character of the nurseries in which their parents deposit them. So widespread a defensive method can only have arisen from a common need of protection from one kind of danger. Now we know that many beasts of prey are keen searchers for nests, and make a habit of exploring any hole likely to contain tender and defenceless morsels which may be won without much exertion or risk. When a family of young kittens or owlets is left by its natural protectors, it is in a position of most imminent peril if the nose or eye of a prowling foe should chance to detect its hiding-place. I do not know of anything which more emphasises the greatness of the danger which often threatens dwellers in hollow trees than the habit common to hornbills in various parts of the world of walling up the hole in which the female bird is sitting, so that only a small

opening remains through which her mate feeds her. This is purely a defensive measure, and has nothing to do with any jealous tyranny on the part of the cock or any moral shortcomings in the hen, as some people have supposed. Now a hornbill is by no means one of the most helpless of birds, and the hen sitting upon her nest and presenting her formidable beak at any meddling intruder should scarcely need any further protection. I do not know what particular enemy the brooding hornbill most fears, but it is evident from the elaborate precaution taken that the risk she guards against is by no means a trifling one.

Now, one finds that among almost all warm-blooded animals a dread of snakes is an inherent instinct. You may take what order of the animal kingdom you please, and it would be easy to show that many representatives have an innate and intense horror of anything which has the appearance of a serpent. This fact is so generally known and admitted, that it is scarcely necessary to insist upon it. Even when animals are in the habit of attacking and killing snakes, the presence of such an enemy arouses feelings of intense excitement in which anger and

fear seem to be mingled. In creatures such as the mongoose, hog, and certain deer and birds which make a custom of killing snakes, the feeling of aversion does not lead to flight, but from the frenzied manner of their attack it is obviously present. Usually their behaviour shows much more emotional disturbance when they are doing battle with snakes than when they are pitted against any other form of enemy.

When we consider the innumerable and marvellous shifts to which nature resorts in providing safety for her feebler children, it would be a matter for surprise if she failed to make use of so pronounced and widely distributed an influence as this inbred horror of the serpent. I think there can be but little doubt that the otherwise inexplicable and useless hissing of defenceless young creatures, such as those mentioned, has been evolved in order to take advantage of this instinct.

It may be objected that a hungry carnivore which had discovered the presence of some helpless creatures in a hole would be able to assure himself of their true nature without much difficulty, and would therefore not be deterred if,

when he inserted his head or "privy paw" to drag them forth, they greeted him with a chorus of hisses. But any one who has watched a fox or any similar beast of prey when he was prowling abroad in search of food must have noted the extreme caution with which he approaches any object which offers him the prospect of a meal. The proverbial—and I think much overrated—cunning of the fox or the wolverene is often nothing more than an almost incredible degree of suspicion and timorousness when such an animal is brought in contact with anything which puzzles him or appeals to his fears. It is well known that such animals will rather starve than meddle with any object which has the appearance of being a trap. A familiar stratagem adopted by hunters in North America to protect a carcass from the wolves takes advantage of this peculiarity of disposition. After killing a deer or any other animal too large to be carried home, the hunter will often inflate the bladder and hang it over the carcass, so that it swings to and fro in the wind. This plan is said never to fail in keeping even famished coyotes or timber-wolves from meddling with the meat. I cannot see that there can

be anything in the round swinging object which can appeal to any definite idea of danger, whether acquired or instinctive, in a wolf. Bladders have never been destructive agents either in his own experience or that of his ancestors, nor, as far as I am aware, is there any trap or other detrimental object, either natural or manufactured, which in any way resembles one. It is simply the inherent and inveterate caution of the animal which makes him bear the pangs of an empty belly rather than face this mysterious apparition.

Now I think there should be but little difficulty in recognising the protective value of the mock-ophidian hiss when uttered by a creature concealed within some dark hole such as is often made use of by snakes. That the danger lurking within is occasionally a very real one was demonstrated in a most unpleasantly conclusive manner in the case of a near relative of mine, who when a boy assumed—boy-like—the *rôle* of an amateur beast of prey, and groped in a hole which he thought likely to contain a nest of young wild rabbits. I do not know whether he received any warning hint, but a viper which was occupying the hole

struck its fangs into his hand and caused him a somewhat severe illness. Supposing that our prowling carnivore is met with a hissing sound when he seeks to investigate the contents of some arboreal nursery, even although his sense of smell may tell him that the hole con-



"Is it a snake?"

tains a litter of kittens, he will undoubtedly think twice before he disregards that blood-curdling threat. How is he to know — supposing him for the moment to be much less stupid than he usually is — that a poisonous serpent has not recently invaded the hole for

the sake of its contents, and is still in possession ready to defend its spoil against another robber? If a wolf, fox, glutton, marten, or other animal is generally ready to face starvation rather than meddle with anything that appears to him in the least like a baited trap, still more would such a beast avoid the risk of thrusting his nose or his paw into a cavity from which there issues the awful menace of an explosive hiss. For, in addition to the habitual diffidence and cautiousness of the beast, there is its ingrained terror of the serpent fighting in favour of the innocents *lying* within the hole.

Whatever doubt we may have as to the protective meaning of the concentric bands upon the sleeping ocelot or tabby, or of the attitude, movement, and utterances which characterise a cat at bay, there can, I think, be no two opinions as to the cause of origin, and as to the protective value, of the hiss when uttered by helpless young creatures such as those we have been discussing.

And if the latter part of the case be admitted, I do not see where the sceptic is to draw the line and say, "*This* may be true

protective mimicry, but *this* must be accounted for on other grounds." Even the main objection, and the one which I myself at first felt to stand absolutely in the way of the protective hypothesis—viz., that such formidable animals as jaguar display in common with the weaker cats many of the special habits and peculiarities upon which the argument is built—does not seem an insuperable difficulty when we take a wide view of our ground and consider the facts in the light of what we know concerning the general laws of evolution and the history of the development of diverse modern species from common ancestral types.

The habit of purring when pleased is universal among all the cat tribe, and we may therefore conclude that it also is of enormous antiquity. I have no opinion to offer as to the origin of the habit or as to its usefulness either in the wild or tame state. The sound seems to be caused by a rapid and continuous vibration of the vocal cords in the larynx, and is maintained with little variation when the air is passing both outwards and inwards. It is almost always produced with the mouth closed, and seems to proceed not only from

the nostrils, but from the general surface of the body. The other day while a kitten was purring on my knee I took my phonendoscope (which is a modern form of stethoscope somewhat on the microphone principle) and carefully investigated the origin and character of the sound. I found that the purring was so fully conveyed through the creature's lungs to the chest wall that its ribs vibrated almost like the woodwork of a violin. Heard in this way, the purring of a cat has a most curiously exact resemblance to the sound made by a powerful dynamo, and as I stroked the cat's fur the crackling of electric sparks—also magnified by the phonendoscope—added to the deception. Needless to say, I do not advance this as another remarkable case of protective mimicry! Tempting as such a hypothesis as to the origin of the purr may appear to a baffled evolutionist, it must be admitted that dynamos scarcely played a sufficient part in early mammalian development to have become exemplars for future generations of mimics.

A cat's scrupulous cleanliness is certainly one of the chief traits which render the animal a welcome inmate of our houses. The force of the

toilet-making passion in the cat was exhibited in an amusing way a short time ago by the kitten mentioned above. It was diligently cleaning itself in characteristic feline fashion when a boy rather roughly tilted the chair on which it was sitting, so that it fell off on to the ground. Not for one moment did the little animal cease from licking its toes and rubbing them over its ears and face; in fact it was so completely absorbed in the pursuit of cleanliness that it did not appear to notice the sudden tumble on to the floor.

Now we may get a hint as to the importance of this habit of the cat by investigating the surroundings of many woodland creatures. In this soap-and-water epoch we can have no idea as to the part played by dirt and vermin of all kinds in settling the destinies of our forefathers and their humbler contemporaries. Many wild animals are so persecuted by ticks, forest leeches, and many minute enemies of like bloodthirsty habits, that they languish and die unless they can get help in freeing their skins from such pests. The cat, being a solitary animal, could not rely upon the kind offices of friends, as do our neighbourly kinsmen the apes. It therefore was obliged to devote un-

ceasing and vigilant attention to its fur and skin in order to prevent the lodgment of detrimental parasites; and the habit remains, although, thanks to human protection and sanitation, the domestic cat can now do its daily rounds without gathering many persecutors of this order.

I must confess ignorance as to the history of, and the part played by, the vocal capabilities of the cat in the economy of feline life. Why a solitary animal which does not engage in faction fights which render a rallying cry necessary, expends so much breath in squalls and howls when face to face with a foe, and why its love ditties should be of such a hideous and blood-curdling character, I must leave for some future naturalist to determine.

CHAPTER X.

THE POULTRY-YARD.

IT is possible that certain of our domestic birds, unlike their mammalian fellow-servants, first came under the influence of man of their own freewill. Many wild birds deliberately choose the neighbourhood of human dwellings when they are breeding, for the sake of protection against the raids of egg-stealing enemies. Thus we find that wood-pigeons—generally throughout the rest of the year exceedingly shy and suspicious birds—will make their nests in suburban parks and other places where people are constantly going and coming. The missel-thrush seems especially fond of trees situated close to houses when it is choosing a nursery, and doubtless the same preference also explains why in country gardens one usually finds so many more

birds' nests of various kinds than in any equal area far away from human habitations. In fact, many birds seem to adopt man as a natural partner. Business relationships of such a kind between creatures belonging to totally different orders are not uncommon ; and many instances could be given of birds which find it profitable to establish a partnership with some quadruped. The rhinoceros and buffalo birds of Africa afford typical examples ; as also does the more familiar starling, which often may be seen riding on the backs of domestic sheep. Some of these associations are of a very odd and complex character, as when the prairie-owls share the same premises with marmots and rattlesnakes. One interesting example of a partnership between birds of different species which I think has not been alluded to by any naturalist is that of the redshank and the lapwing. The herdsmen of the Essex marshes are well aware of this compact, and if they find a redshank's nest they invariably search about with the expectation of finding the eggs of a plover within a few yards' distance. In this case the mutual benefit derived from association is pretty clear. The redshank is an exceedingly vigilant bird, but has little power of

self-defence. It gives early warning of the approach of any foe to the lapwing, and the latter either beats off the enemy from the common nesting-ground or entices him away by pretending to be wounded.

Some associations are of the slightest and most temporary kind, as when a swallow skims to and fro for a few hundred yards in front of a rider for the sake of the insects disturbed or attracted by the horse; while others are so binding that a dissolution would bring ruin to both parties. It seems not at all unlikely that the ancestors of our domestic pigeons, which built their nests on the ledges and crevices of the rocks, found the dwelling of some prehistoric troglodyte a very efficient protection against the raids of hawks and crows. Yet although pigeons and certain other birds may have become partially domesticated in this manner, it seems hardly likely that savages—who are generally keenly on the look out for something to eat—would, either from sentiment or any other motive, have allowed such birds as the duck or the common fowl to nest in their neighbourhood without molestation. Most probably such birds as these were tamed in the same way as were

many domestic mammals,—that is, they were captured when young and helpless and brought up in the dwellings of their owners. Many savages, such as the Indians of Northern Brazil, often tame young parrots and other birds, and allow them to roam about freely among their dwellings.

In the common fowl certain instincts proper to the wild state seem to have become curiously altered by association with man. Thus, although it is plain that the custom of cackling after laying is a habit not acquired during captivity, since its deeply rooted and universal character shows it to be extremely ancient, its primary utility is altogether lost. We now take the spasmodic outcry of a hen as a kindly intimation that it is worth while to visit the fowl-house. But what could a wild hen possibly gain by proclaiming to a hostile and hungry world the fact that she had laid an egg? Nature seems to have provided so carefully for the concealment of nests and young that this habit of the domestic fowl, which apparently operates in exactly the opposite direction, seems very strange and anomalous.

Were we unable to get information about the natural history of birds of this order which are

living in a state of freedom, it would be very difficult to explain the origin of this habit. Not only are there still many of the original wild stock (*Gallus bankiva*) from which our domestic fowls have sprung living in the Indian jungles, but in many parts of the world feral or half-wild birds may be found which have enjoyed almost complete freedom for many generations. Mr Hudson, in his 'Naturalist in La Plata,' discusses this cackling question with his usual ability, and states that in the "creolla" fowls, which live a semi-independent life in South America, the habit displays itself in such a manner as to prove of undoubted value. He says:—

Each family occupies its own feeding-ground, where it would pass a greater portion of each day. The hen would nest at a considerable distance from the feeding-ground, sometimes as far as 400 or 500 yards away. After laying an egg she would quit the nest, not walking from it as other fowls do, but flying, the flight extending to a distance of from 15 to about 50 yards; after which, still keeping silence, she would run or walk, until, arrived at the feeding-ground, she would begin to cackle. At once the cock, if within hearing, would utter a responsive cackle, whereupon she would run to him and cackle no more. Frequently the cackling call-note would not be uttered more than two or three

times, sometimes only once, and in a much lower tone than in fowls of other breeds.

If we may assume that these fowls, in their long semi-independent existence in La Plata, have reverted to the original instincts of the wild *Gallus bankiva*, we can see here how advantageous the cackling instinct must be in enabling the hen in dense tropical jungles to rejoin the flock after laying an egg. If there are egg-eating animals in the jungle intelligent enough to discover the meaning of such a short, subdued cackling call, they would still be unable to find the nest by going back on the bird's scent, since she flies from the nest in the first place; and the wild bird probably flies farther than the creolla hen of La Plata. The clamorous cackling of our fowls would appear, then, to be nothing more than a perversion of a very useful instinct.

From the fact that these half-wild birds only cackle when they have travelled some distance after laying we see that this seemingly foolish habit of the barndoor fowl may originally have served the same purpose as does the well-known strategy of the partridge or lapwing in luring enemies away from the nest.

But how has the habit become so altered since the bird has been domesticated? Probably deliberate selection may have had something to do with it; for naturally every owner of a hen wants to obtain its eggs without much

trouble, and supposing one bird always laid her eggs so that they were easily found while another managed to conceal them, those of the first would doubtless be chosen for breeding purposes, and the chicks hatched therefrom would tend to inherit their mother's cackling idiosyncrasies. Another reason why a change has taken place is because domestic birds live a life almost totally devoid of fear. Although man has preyed upon them and defrauded them in the most systematic manner for thousands of generations, the poor blockheads have never found him out, and still allow him to pose as their friend. He may go into the henhouse and steal the eggs, and there is scarcely a croak of protest, whereas if a fox or a ferret were to make its appearance there would be a great hubbub. If the wild hen has an impulse to cackle when she moves from her nest, she restrains it because of the fear of enemies which always possesses wild creatures, until she is at a safe distance from her treasury. But the domestic hen, having nothing to fear, requires no such self-control, and can shriek as soon and as loud as her hysterical impulse dictates.

It is strange how the security enjoyed by

many domestic birds has completely changed their character. This is a subject which I shall discuss more fully later on. There is little alertness or cunning apparent about the ordinary barndoor fowl, yet its wild cousin of the jungle is said to be one of the most astute and wary birds in existence. We shall see just the same change in ducks and other domestic birds when we come to deal with them.

Civilisation has not interfered so much with the matrimonial arrangements of the fowl as it has done in the case of most domestic creatures. Both in the wild state and after he has entered civilisation the rooster is a confirmed polygamist. A little knowledge of natural history enables one to declare this fact after merely looking at his plumage. Nature clothes her Turks and Mormons with a distinctive and conspicuous dress, so that their matrimonial propensities can generally be inferred at a glance. Wherever you find a male bird who displays more gay and conspicuous clothing than the females of his species, you may be sure that he has (or would like to have) a plurality of wives. Even as low down in the animal scale as this it is not difficult to recognise some of the social and

moral advantages of monogamy. Matrimony among the polygamous birds seems to be based chiefly upon meretricious display and the exercise of brute force. Birds which mate permanently are scarcely ever sexually decorated, nor are they in the habit of indulging in brawls as part of the process of courtship. Evidently, from the Quaker-like dress and disposition which many of them display, it is their custom to settle such affairs upon quite another basis ; and I think one may say, without being accused of conferring imaginary qualities upon them, that they are actuated to some extent by an appreciation of the higher moral attributes. In a less degree the same is true of the birds which are content with a single mate, although they may regularly avail themselves of nature's autumnal divorce laws to try a new connubial venture. It must be admitted that chanticleer, with his gay coat and gallant bearing, makes much more of a figure in the world than the sober-coated monogamous quail, and his ostentatious politeness to the members of his harem is more impressive to the superficial observer than the commonplace domestic virtues of the partridge.

It is pretty obvious that the pugnacity of the cock was developed in the first place for the sake of enabling him to acquire and to keep guard over his wives. High as is his courage, and formidable as are his weapons, they could have been of little avail against eagles, tiger-cats, and jackals. What is the natural history of the splendid valour of the game-cock? As a rule, a combat between two such birds, armed only with their natural weapons, lasts a long time. Of course when the brutal folk who take a delight in cock-fighting fasten steel blades to the legs of the birds, fighting-cocks soon cut one another to pieces; but it is not an unfamiliar sight in a farmyard to see a couple of roosters fighting until both are completely exhausted, and renewing the struggle from day to day until one acknowledges himself to be vanquished. Under such circumstances it is quite plain that the bird which had sufficient pluck and determination to keep on fighting in spite of innumerable wounds and intense exhaustion would be more likely to win his battle and his hens than one which, after receiving severe punishment, began to debate within himself as to whether the game was worth the

candle. In spite of the intensely combative disposition of male fowls, under natural circumstances the fighting instinct is kept within economic bounds. That is to say, nature never allows it to become so developed as to be injurious to the race.

Darwin has shown that the constant selection of victorious fighting-cocks for breeding purposes may so intensify this trait as to render it very detrimental. He says:—

Game fowls are notorious for their pugnacity: young cocks crow and clap their little wings and fight obstinately, even while under their mother's care. "I have often had," says one author, "whole broods scarcely feathered stone-blind from fighting, and rival couples moping in corners and renewing their battles on obtaining the first ray of light." The weapons and pugnacity of all male gallinaceous birds evidently serve the purpose of gaining possession of the females; so that the tendency of our game chickens to fight at an extremely early age is not only useless but injurious, and they suffer much from their wounds. The training for battle during an early age may be natural to the wild *Gallus bankiva*; but as man during many generations has gone on selecting the most ostensibly pugnacious cocks, it is more probable that their pugnacity has been unnaturally increased and unnaturally transferred to the young male chickens.

We see here that, as in the cackling of the hen, and in many other psychic traits which we have been discussing, changed conditions may transform what was originally a virtue into a vice.

Doubtless the continual clucking of the brooding hen serves the same general purpose as the grunting of the pig. When a brood is abroad among the grass searching for food, the chicks would be in great danger of wandering and losing their mother if it were not for this incessant intimation of her whereabouts. Concerning the purpose originally served by the crowing of the cock I am somewhat in doubt. Doubtless it is a splendid piece of advertisement, and, like the trumpet-blast of the days of chivalry, is a most telling way of proclaiming a victory or of challenging all and sundry to single combat. But when we analyse any natural trait in animals, we must remember that nature is absolutely utilitarian. She does not spend a farthing upon advertisement unless she clears a profit by so doing. Neither does she indulge in any "freaks" or superfluities, in spite of numerous expressions of opinion to the contrary. We know that, in some way or

other, the expenditure of energy represented by every "cock-a-doodle-doo" means a gain to fowldom; but I confess I cannot see just where the profit comes in. Doubtless this is merely owing to a defective knowledge of gallinaceous economy. Certainly, regarded as an advertiser, chanticleer is admirable. Not only has his voice a splendid carry, but he is careful to choose a time when all nature is silent, and when all who are likely to be influenced by his announcement are just rousing from sleep and have minds receptive and as yet unoccupied with the details of daily business. Perhaps it will be best to refrain from saying more in praise of his methods lest one should provoke some human competitor in the vile art to shatter the blessed stillness of the dawn with clamorous proclamations concerning pills or soap.

The squalling of a hen when it is captured would seem to indicate that in the wild state it was the custom of the birds of a flock to defend one another against enemies. That an outcry made under such circumstances was often originally an effective appeal for help was shown when we discussed the habits of the dogs and

pigs. Doubtless some of the enemies of gallinaceous birds could be driven off or intimidated by a combined attack, although, as has been remarked above, the weapons of the jungle-cock would not prove of much use against such a foe as a wild cat or a jackal. St John states that the fowls in a farmyard made a combined attack upon a hawk which had destroyed a number of chicks. The unlucky robber had been caught in a trap and disabled so that its beak and claws could do no damage, and the indignant hens soon pecked it to death. A hen will often defend her brood with the most reckless bravery, and always resorts to the stratagem of ruffling out her feathers so as to give herself a formidable appearance.

The vehement, hysterical cackling, flapping of wings, and general excitement shown by a fowl which is frightened, is doubtless the remains of an artifice exceedingly common among wild birds which live chiefly upon the ground. It can hardly be said that the bewildering noise thus made is sufficient to intimidate a formidable enemy, and yet it is by no means difficult to show how useful such a habit may be as a means of protection. Every one who has flushed

a covey of partridges close to his feet knows how disconcerting is the sudden clatter and whirl of wings. The sportsman armed with a gun, unless a novice, has usually time to recover from the shock to his nerves before the birds have got out of range; but we must remember that a cat or a fox has to pull itself together and make its spring before its intended victim has flown a couple of yards. We know how we are "put off" when attempting any athletic feat requiring judgment and skill if we are suddenly startled at a critical moment. The rule on the golf-links which orders absolute silence when a player is "driving from the tee" shows how important it is that the elaborate combinations of the nerves and muscles involved in such an action should not be disturbed. Now without doubt the spring of a wild beast on its prey often requires quite as complex nervous and muscular processes as a stroke at golf. Imagine, in the latter case, the effect of a sudden clamour of a covey of partridges, or of half-a-dozen panic-stricken hens, close to the player who was "addressing the ball"! Without a doubt the habit of making sudden startling noises has a considerable protective value among

birds of this class, in that it often disconcerts a prowling enemy at the moment when the hidden flock has to reveal its whereabouts by taking wing.

As soon as it gets dusk the barndoor fowl betakes itself to its roosting-place; and this shows that nocturnal habits are not in accordance with the traditions of the family. The eyes of the domestic fowl show no indication that they have ever been adapted for seeing in the dusk. Nearly all birds of this kind depend upon sight in finding or selecting food, and therefore the day's business is over with them as soon as the light begins to fail. Moreover, it is when the sun goes down that most of the enemies which they dread begin to steal abroad, and they are obviously far safer when perched aloft on some secure branch or pole than they would be if they slept upon the ground. The custom of going up to roost immediately the light fails is very strongly marked in turkeys. A story is current that George IV., when Prince Regent, won a wager by backing a flock of geese against a flock of turkeys in a three-mile race. The conditions were that the birds should start in the cool of the evening, and that they should follow a road well shaded by trees. Of course

the long-legged and active birds soon got far ahead of their waddling competitors; but when they had completed about half the distance it began to get dark, whereupon the whole flock of turkeys fluttered up into the trees over the road and refused to come down. In fact, the more frightened they became at the shouts and threats of the men who were driving them, the more closely they stuck to their perches. Meanwhile the geese, who were bound by no such arboreal or crepuscular traditions, plodded steadily on and were declared winners.

One curious habit of geese and of ducks seems to show that the mimicry of snakes is by no means confined to the *Felidæ*. It seems very probable that the hiss of the goose, when it desires to show hostility, is founded upon the hiss of the serpent. Many ducks also, when nesting, will thrust out their necks and hiss when an intruder approaches, and a Muscovy drake is almost as ready to adopt this method of intimidation as a gander. It is found that nearly all long-necked birds which nest among reeds and bushes show a similar habit. The South American ostrich, when sitting on its nest on the open plains, has a curious resemblance

to a weather-beaten shrub, or bunch of pampas-grass; and, if the bird is disturbed, from this apparent covert there darts, with sinuous movement and an ominous hiss, something that looks enough like a snake to make most horses and other animals start away in terror. In reality this fearful object is nothing but the head and neck of the brooding rhea. One can easily understand that among thick grass or reeds, where only the head and neck of a nesting duck are visible, the forward dart and hiss might often be sufficient to deter a cautious enemy from making an attack.

It should be easier for us to trace wild traits in the duck than in the barndoor fowl, because the ancestors of the former were mostly natives of our own part of the world. Many of our tame varieties still bear a close resemblance to the wild ducks with which many sportsmen and naturalists are familiar. It seems not unlikely that the amphibious domestic birds have been domesticated for a longer time than those of the gallinaceous order. Most tame ducks are still able to make shift both in getting food and in guarding against enemies with very little aid from their owners.

Probably most aquatic birds primarily took to the water as a measure of self-preservation. We all know how very early young ducks find their way to the nearest pond, and how fearlessly they launch themselves upon it. Few who are familiar with country life have not sympathised with the anxiety of some clucking foster-mother, who, when taking her brood of ducklings out for the first time, has found them all apparently bent upon self-destruction. Now why do young ducks take to the water so early? Because they are extremely helpless little creatures, without either the swiftness in running or the skill in hiding possessed by chicks and other fluffy birdlings of similar habits. Moreover, reed-beds and shrubs along the banks of a river or lake afford lurking-places for many enemies capable of destroying a whole brood in a few seconds. But as soon as the duckling is afloat, he is comparatively safe. Even a hawk swooping from the upper air would usually find him gone by the time it reached the surface of the water; for most young aquatic birds have an instinctive knowledge of diving. One danger certainly threatens the duckling when swimming, for sometimes a hungry pike seizes his little paddles from below

and drags him under. Still, on the whole, there can be no doubt that, like the average sailor, he is much safer afloat than ashore. Ducklings usually get a living very much more easily on the water than on the land. Their beaks are not so adapted for picking up unconsidered trifles as are those of chicks, nor are their feet fitted for exploring the ground for worms, seeds, and insects. Much has been said of the remarkable skill evinced by the newly hatched chick in snapping up crumbs without any preliminary training. But the nascent duckling evinces an even more wonderful instinctive skill in using its beak; for as soon as ever it commences to swim it is able to catch the midges and gnats which dart to and fro near the surface of the water. For the first month or so of their lives wild ducklings are almost as purely insectivorous as the swallow or flycatcher. Towards the close of the day their little crops are distended with a mass of insects which must be much of the same consistence as the "midge dough" which Livingstone describes as being baked and eaten by natives living on the insect-infested shores of Tanganyika.

A young wild duck is distinctly a more alert

and independent little creature than a tame duckling. Such differences between the newly-born members of a species are at first rather difficult to account for if we adopt Weismann's doctrine of the non-inheritance of acquired characters. I am inclined to think that the difference is not so much a matter of heredity as it at first sight appears. Many newly-born animals can be shown to be extraordinarily impressionable to outside influence almost from the first moment of independent existence. One might compare the vacant brains of such creatures, instantly absorbing impressions from the outside world, to an empty sponge plunged in a basin of water. The apparent lethargy of the infantile mind is deceptive. How quickly impressions are received during the first hour of life, and how profound is their influence upon the character, is seen in the case of the young calf. Most of our domestic cattle, if their calves are born out in an open pasture, will obey the ancient instinct which led the wild cow at once to hide her feeble offspring in the bushes. Now, if a calf be once hidden in this way, it becomes practically a wild animal with an instinctive terror of man; whereas if it has been born under

cover, and has been assisted in its first moments by the stockman, it is as tame as its parents. Dr H. S. Williams,¹ when speaking of the plasticity of the infantile mind, says :—

Young wild ducks, when they first come out of the shell, have no fear whatever of a human intruder, but will nestle contentedly in his hands ; but after a few hours of maternal tutorage they become so timid and shy that it is almost impossible to capture them, and if taken they show extreme terror of the being that a few hours before did not alarm them. Birds that pass their early childhood in a nest do not develop quite so rapidly, but undergo the same transition. The young crow, if taken from the nest during the first week or ten days of its life, becomes the most confiding and amusing of pets, seeming to regard men as beings of its own kind. If a few days later another nestling is taken, this one also will become domesticated, but it will never be tame and confiding as the first ; it will have something of the suspicious nature of the wild crow. Yet another week or ten days later and the remaining nestlings are able to fly about with their parents and have become altogether irreclaimable. No amount of training will ever suffice to tame them.

Doubtless the confidence and the lethargic habits of the domestic mother-duck would in

¹ "Can the Criminal be Reclaimed?" 'North American Review,' August 1896.

like manner impress the ducklings born in captivity, and they would not therefore during the first few days of life acquire the alertness of mind and movement shown by the young wild duck. This alone is hardly sufficient to account for the difference—which is, to a certain extent, structural and constitutional. We must, however, remember that the vitality of nearly all tame creatures is somewhat lower than that of their wild relatives; and hence some of the comparative helplessness evinced by the tame duckling may be due to this cause; more especially since, as is so obvious in many animals, and in civilised man himself, the weakness due to artificial surroundings shows itself in a very marked degree in the production and raising of offspring. Doubtless the protection given to the domestic duck has for many generations prevented the sifting out of those young ones which did not, in wits or physical development, come up to the standard which, under nature's cruel competitive system, qualified for survival. Obviously among wild creatures which produce more than a dozen young in the course of a season the natural process of elimination must be exceedingly active. Under

ordinary circumstances the number of wild ducks remains pretty constant from year to year. This means that out of every family of fourteen (taking twelve to the average brood) as a rule only two survive to breed in the following spring. Now we know that when wild animals are closely observed they are found to differ from one another as much in mental and physical characters as do human beings. Hence among each brood of wild ducklings there would always be dullards or weaklings which would fall a prey to watchful enemies or else perish from disease or accident. We find that in most cases where a large number of young are produced every year, infantile mortality accounts for by far the greater part of the annual waste. Now, among tame birds the young are carefully nursed and are never purposely destroyed, because they are of no value until they have obtained their growth. Moreover, instead of being selected for breeding purposes on account of their alertness or activity, they are chosen on a principle which often ensures the possession of exactly opposite qualities. What civilised man wants is a duck of a placid and greedy disposition which will

not give much trouble to catch, and which promises to acquire a considerable bulk in a short time. Not only does the farmer care absolutely nothing for quickness of wit in his ducks, but he regards activity on the wing and a disposition to roam far from the home-stead as most undesirable qualities. When I was a boy the common ducks found in many Sussex farmyards belonged to a small black variety which in habits showed near kinship to the wild duck. Now, however, one finds that these active, self-reliant birds have been supplanted on nearly all farms by tubby, lymphatic imbeciles known as Aylesburys. Each generation born in captivity tends to show a greater proportion of the more stupid or unwieldy young birds which, under natural conditions, would be instantly weeded out. Owing to the above facts, I do not think that, in accounting for the differences between young tame ducks and wild ones, we need suppose that confidence in man, or any other peculiarities acquired by the birds during their lifetime, are directly transmitted.

This confidence in man, as was stated in an earlier part of the chapter, has had a re-

markable influence on the characters of many of our domestic birds. What greater contrast can be imagined than that between the wild goose, which the ablest sportsman finds so difficult to outwit, and the cackling, waddling fools of the farmyard whose name has become a byword? Doubtless in some degree this apparent stupidity, like that evinced by the donkey and the sheep, is due to the creatures being compelled to live among surroundings totally different from those for which nature first adapted them, so that their natural intelligence, which sufficed for all the emergencies of their wild life, has no chance of displaying itself. But the lethargic disposition of such birds as those we are discussing chiefly illustrates how ready nature is to dispense with superfluities. We know how, when plants or animals become parasitic, they quickly lose faculties and organs which are no longer necessary.

I confess I feel some little difficulty in explaining this readiness on the part of many birds and animals to trust entirely in human protection. For we must remember that domestication means the introduction of something which is almost absolutely new to the

experience of every adult creature from the very beginning of life upon the earth. For thousands, and probably for millions of generations, the ancestors of these birds have had to shift for themselves, and have known no security except through their own activity and vigilance from the time they were under their parents' care. However carefully we may survey the realm of nature, we find that ease and safety are practically never secured outside man's tyrannous protectorate. Life is a perpetual struggle. Hunger and thirst are never far off, and, in the case of most animals, scarcely a day passes without its danger of a violent death. The state of things which Kingsley imagines in 'The Water Babies' finds no counterpart in the real world; and he would have had considerable difficulty in explaining the economy of "Mother Carey's Peace Pool" if any inquisitive young reader had asked him what the seals and the polar bear lived upon! The laws of nature provide for no retirement from the worries of business other than that final compulsory retirement to which all of us are subject.

One reason why many animals readily show confidence in man may be because he is not one

of their traditional enemies ; although this would only be true if we traced the origin of their instincts back to an extremely remote period. One finds that among many animals certain inherent antipathies exist, some of which are undoubtedly traceable to legends of infinite antiquity. Thus the horror that most warm-blooded creatures have of snakes and other reptiles is probably traceable to the time when the only mammals existing were the humble little marsupials whose remains we find in the Stonesfield slate and Oxford clay. During the Cretaceous period the whole world was swarming with voracious reptiles from the size of a house to the size of a sparrow ; and undoubtedly the feeble mammals must have needed all the extra quickness of movement and wit which their four-chambered hearts and higher nervous organisation gave them in escaping such terrible foes. In the long-run the mammals proved victorious ; but throughout an immense epoch the strife must have been of the most fierce and deadly character. To such causes we may fairly attribute that innate antipathy which we feel to reptiles and all cold and crawling things. The hostility existing between cats and dogs is shown to be innate

by the behaviour of blind kittens when they smell one of their hereditary enemies; and in like manner, as has been shown in a previous chapter, sheep, when they have lambs, display a strong animosity to all dogs; although it is probable that, as long as man has kept flocks and herds, these animals have played the part of protectors. Most of our domestic animals, if taken to countries where lions or other large or formidable beasts of prey are found, evince an instinctive fear of such enemies before they can gain any actual knowledge of their dangerous nature; and this is undoubtedly attributable to an innate traditional aversion.

But man, if Darwin is right in his conclusions, is able to enter into association with most of the creatures whose company he finds desirable without being hampered by any traditional feuds dating back to the Eocene epoch. At a time when the early *Canidæ* and *Felidæ* were leading a cat-and-dog life, and when the primeval wolves continually harassed the as yet untamed flocks, he led a peaceful frugivorous existence in his native forests. His arboreal habits enabled him to live a higher life aloof from and superior to earthly strife and turmoil, and made it easy for

him to avoid the far-reaching consequences of a primordial vendetta. Although possibly before he took to *terra firma* he was not wholly clear of all bloodguiltiness, if in his habits he at all resembled the gibbons and chimpanzees—which are not averse to animal food when it comes in their way—he never made a custom of preying upon his weaker fellow-creatures. Hence neither his appearance nor his natural odour arouses in animals which are unacquainted with his later habits instinctive feelings of hatred or fear as do the appearance and odour of many carnivores and reptiles. The young kitten does not explode when it smells him, nor does the anxious ewe stamp and lower her head when he approaches her precious lamb. No doubt his clean vegetarian record during the time when most instincts were in process of manufacture has been of great assistance to him in acting the part of peacemaker or arbiter among the heterogeneous and hostile elements gathered together in the farmyard.

The authority which man so readily establishes over the lower animals seems largely attributable to a curious readiness to acknowledge superior mental gifts which we find very

widely distributed in nature. It is often remarked that many animals are shrewd judges of character; and we all recognise how quickly very young children perceive and take advantage of intellectual or moral weakness in those about them. Probably to a great extent this readiness of animals to accept man as their superior is due to their perception of the confidence which he feels in himself when dealing with creatures of inferior brain power. All who have had much to do with horses know how quickly a rebellious colt recognises the authority of a courageous rider, and how readily also he takes advantage of nervousness or inexperience. Man, confident in his superior wits and weapons, encounters animals much stronger and more formidable than himself with a comparatively calm mind and a steadfast eye. Throughout the whole mammalian world there is a remarkable uniformity in the machinery of emotion. This facilitates sympathy, and establishes, to a certain extent, a common language between creatures which are very widely separated in nature, habits, and mental development. It seems probable that man's moral and mental superiority is chiefly recognised through

his confident bearing, because almost all animals, however stupid, are able to judge the difference between the outward signs of courage and those of fear. And courage, we must recollect, is, in nature's utilitarian *régime*, almost invariably the mark of superior physical qualities. If this were not so, courage would prove a destructive rather than a preservative agent, for it would constantly lead its possessors into strife where there was no chance of victory, and into other dangers involving death or injuries for which there was no compensation. Possibly the confidence shown by domestic animals in human protection is partly based upon the awe which they themselves have of the human species, and is not altogether owing directly to the economic and automatic law which dispenses with every unnecessary attribute. This is a subject which is well worthy the attention of any naturalist who has a bent for comparative psychology. Certainly, when we take into account the extraordinarily stable and permanent character of most instincts and like nervous phenomena, it does seem strange that a few generations of domestication should so completely alter the mental habits of many of our familiar birds.

CONCLUSION.

IT will be seen in the preceding chapters that I have chiefly devoted attention to those well-known characteristics in the lower animals which bring them into association with man. Thus the sagacity and the social virtues of the dog, the speed and endurance of the horse, the milk-giving qualities of the cow and the goat, and the capacity of the sheep and the pig to provide us with wool and pork, have been severally discussed, and attempts have been made to trace them to their origin in nature. In the same way I have selected for analysis a few of the most obvious characteristics of the cat, and of various domestic birds. This choice of the commoner and more well-known traits of domestic animals rather than those which are exceptional or "wonderful" has been made purposely, and for several definite reasons.

In the first place, it was my hope that the inferences to be drawn from such everyday facts would show how remarkably Darwinism illuminates and vivifies matters which are regarded by many people as dull, commonplace, and trivial. To the evolutionist nothing is common or unclean, because every fact about a living creature has its bearing upon those mysterious laws of life which all philosophers have striven to unravel. Secondly, it has been my wish to emphasise one most important truth put forward in the introductory chapter—viz., that to the modern student of natural history common and obvious things are more valuable, and often far more fraught with interest and mystery, than things generally deemed wonderful and rare. Next, by pointing out how much may be learned from familiar traits in a few farmyard animals, I have sought to show, indirectly, what a vast field for research has been opened up to the modern naturalist by the new doctrine; and lastly, I have tried to demonstrate in a practical manner—although, I fear, very imperfectly—the way in which the methods and materials now placed within our reach may often be utilised in reconstructing the vanished past.

Any one who has seen the changes which have

taken place in some of our great museums devoted to natural history—such as that of the Royal College of Surgeons, London—during the last generation, will have noticed that a number of specimens which used to be in the foreground are now either discarded as mere lumber or are given much less prominent positions. Our forefathers seem to have had pretty much the same idea in getting together scientific collections as has the enterprising showman who caters for that section of the public which revels in “rarities” and “freaks.” Even the records of that most solemn and weighty body, the Royal Society, show that the learned Fellows were at one time almost as fond of what is called in Western England a “gape show” as are the modern patrons of a “dime museum.” Interspersed with accounts of the researches of Leeuwenhoek and of Isaac Newton are papers relating some wondrous tale—often upon the most shadowy authority—which nowadays would hardly find a place in an odd corner of a newspaper. Thus in the year 1700 a learned Fellow read an account of various giants which he had “heard of,” some of which were 11 or 12 feet high; and about the same time a specimen was shown of a “monstrous animal”

(very like a whale) which had been cast out of a human stomach ; while second - hand stories of sleeping girls, fasting men, and "infant phenomena" of various kinds were recorded with the utmost gravity. In fact the early volumes of the 'Transactions' of the Royal Society strongly remind one of the illustrated accounts of abnormal potatoes and other "remarkable phenomena" which occasionally appear in our cheap popular magazines.

Of old, when pious students dwelt with admiration on the wonderful works of the Creator, one finds that reference is almost always made either to something very vast or very small, or else to some strange and unusual phenomenon such as a comet or a volcanic eruption. Things of a more familiar type seem to have been taken for granted, and to have inspired but little curiosity.

One reason why the old order (and lack of order) has changed and given place to new is because our knowledge of nature has become more and more systematised. We now think a great deal more of establishing and illustrating natural laws than in drawing attention to apparent breaches of law. It is only by treating each phenomenon, whether small or great, in relation

to others (rather than as a wonder standing by itself), that anything deserving the name of science becomes possible. When a great number of items are linked together by natural relationship the human mind is able to obtain a general mastery over them, but when you have a mass of data chaotic and unclassified, it is impossible even for the most powerful intellect to acquire anything like a comprehensive knowledge. In the latter state of affairs it is inevitable that attention should be chiefly directed to such things as are boldly advertised by some striking quality—which, after all, may have no bearing upon their intrinsic value—just as in a human assembly one first notices persons of unusual dress or aspect who often turn out to be mere nobodies.

According to the invariable rule, both our sense of ignorance and our curiosity have increased *pari passu* with our knowledge. We are no longer content to take common things for granted, but are impelled to keep probing the foundations upon which our predecessors built with a confident assurance that they “knew all about them.” A good illustration of this is seen in the change of attitude of scientific inquirers with regard to the question of the origin of life. Nowadays

nothing would so startle the world as an announcement that in an absolutely sterilised and hermetically closed tube some exceedingly low living organism had appeared spontaneously. But we find that two hundred years ago learned men accepted almost as a matter of course the doctrine that many highly organised worms and insects were bred spontaneously out of dirt. As soon as students began to give attention to the everyday phenomena round about them, it was found that the world, instead of containing seven wonders, contained seventy times seven ; and as knowledge has increased these have multiplied into innumerable myriads.

Although the comparison may appear rather a fanciful one, it may be said that the same change has come over natural phenomena (regarded from the philosophic standpoint) as has come over civilised society. Science is a great leveller. It has pulled down mighty wonders from their seats and has exalted facts of low degree. The old oligarchy of marvels which was once supreme in the realm of natural history, and whose claim to prominence rested upon self-assertion or unstable tradition, and was not broadly based on law, has gone the way of many aristocracies whose tenure

was of a like nature. In its place in our museums are groups of commoners in orderly array, each shelf a Parliament upholding and upheld by law. All phenomena are now born free and equal, and we judge of their merit according to their ability to fill places which need filling, or to conduce to public order, or to add to the capital of the commonwealth. Yet, as in other republics, there is not that dead level of equality which democratic theorists seem to strive after, for every now and then some fact (often of obscure birth) leaps into prominence as great as that of any of the deposed marvels who lorded it of old. Let a fact establish a law or reconcile two opposing theories, and it is hailed with acclamations of which a Cæsar might be proud. Within the last few years we have seen the triumphal march of Argon, the "X rays," and many other minor celebrities. By-and-by, when their work is done and their services to law have been sufficiently recognised, they will drop back into the ranks again and become once more mere items in the republic of Nature. Just as any new-born American citizen may become President, so the humblest fact may become for a time the most prominent figure in the scientific world. Hence—and with this we

will conclude our simile—there has been a general levelling up as well as a levelling down. No single item in the great commonwealth of science can ever again be despised or ignored as under the old *régime*.

Although, as was pointed out in the introductory chapter, the stimulus given of late to the study of natural history has greatly increased the number of workers in this branch of science, it has widened the field in a still more striking manner. There need be no fear that, like the British coal-fields, the supply of unworked material is in danger of becoming exhausted. Regions which offer the most tempting prospect to the investigator are continually coming within our view. Each fresh discovery, instead of fixing a limit to our researches, is a Pisgah height from which new lands “flowing with milk and honey” can be discerned.

In the preceding pages many examples have been given of the way in which Darwinism opens the door to the naturalist. It would have been no more possible for our forefathers to have read the meaning of many of the wild traits of domestic animals than it would have been for them to have studied the chemistry of the stars.

In spite of the fact that the discussion has been kept within the range of students whose knowledge is elementary, there has been no difficulty in finding abundant material without going outside the walls of the farmyard.

I wish to lay special stress upon the help that Darwinism gives us in breaking new ground, because nothing so damps the enthusiasm of a beginner as the thought that everything which he can do has been done before. One finds that among young students there seems to be a fixed tendency to overrate the achievements of their predecessors, and to consider that little remains to be discovered. Equally mistaken is the notion which one finds commonly prevalent among beginners, that we must wander far in any region of knowledge before we come to virgin soil. The wilderness of the unknown comes right up to our doors (had we but eyes to see it), and we need not take many steps in any direction before entering upon untrodden ground.

But in order to become a pioneer of science the student must be prepared to leave beaten tracks and most of the facilities for travel (such as books, lectures, &c.) which have helped him hitherto, and to launch forth alone into regions

which are often as difficult to penetrate as a tropical thicket. Needless to say, he should avail himself of all organised methods of progress within his reach until he comes to the frontier. Beyond that point his books will be of little use to him in pushing ahead, although these and many other "resources of civilisation" are necessary in enabling him accurately to survey and to report upon any new discoveries.

When the naturalist wishes to read the records of the past in the world round about him, there are certain conditions which must be scrupulously observed. In the first place, a fairly comprehensive knowledge of vital phenomena, including comparative anatomy, is essential, otherwise he may fall into many ludicrous errors.

Thus an old traveller told me that he was firmly convinced that some blood relationship existed between the penguins of the Straits of Magellan and the Chola Indians of Peru, because these foolish-looking birds, standing in rows upon the shore and dangling their flipper-like wings, forcibly reminded him of a number of gaping uncouth savages whom he had seen undergoing military drill during a revolution in Quito! This gentleman, it is true, made no

pretence to scientific knowledge. Yet one finds scattered up and down among the abundant literature of Darwinism not a few mistakes which are almost as ludicrous, most of which also result from a defective acquaintance with elementary facts and laws.

It is necessary that every hypothesis, however plausible, should be subjected to the severest scrutiny at home before it is turned loose to bear the brunt of the world's criticism. Every fact also which arrests the attention of the naturalist—such, for instance, as the snake-like peculiarities of cats, which were discussed in the previous chapter—needs to be put through a very stringent testing process before its value can be gauged. The only way to do this successfully is to compare it with kindred facts wherever they exist, and plainly this cannot be done without a fair acquaintance with other branches of natural history.

But knowledge is by no means all that is required in order to form a just estimate of the value of any such piece of evidence. There must be a complete impartiality of mind. Doubtless it is on the whole a good thing that we feel a kind of parental regard for notions which

we deem to be of our own begetting, for it makes us take pains in following them up and collecting sustenance for them in the shape of additional facts. But this parental solicitude, unless kept within lawful bounds, is liable to spoil our theories even more completely than too much indulgence spoils our children.

It is necessary for the parent of a hypothesis to be sternly impartial when it is beset by hostile criticism. He must to a great extent imitate the conduct ascribed to Edward III. of Cressy, and let his offspring "win its spurs" by its own merit. I admit (and I speak from experience) that it is very painful to one's feelings to have a favourite theory which one has nurtured from its youth up turn out badly, and prove unworthy of further support, when it has to face adverse evidence. Let me say in parenthesis here, that to the student of science facts are the best critics. Pretty nearly anything may be proved by argument, and most theories so established are as easily disproved by the same means. But when a matter is established by facts it may be considered that it has come to stay. Moreover, if an inanimate fact tells against one of our pet notions, we are not so ready to become fierce

partisans as when the offspring of our minds (or imaginations) is assailed by a human critic. It is, I think, the experience of most students that the farther they go in scientific pursuits the easier they find it to be impartial. Beginners perhaps need to be cautioned against minimising adverse evidence and making the most of that which is favourable as regards the point of view which they wish to establish. Let it be understood that I am not here speaking of attempts to mislead others, but of that tendency to self-deception which besets all enthusiasts. The earnest student of science soon finds out how little satisfaction there is in fathering doctrines that are not sound from the feet upwards, and by-and-by he becomes as merciless as a Brutus as soon as anything is proved against his pet views. It is needless to waste words in condemnation of stupid people who squeeze their "facts" to fit their theories.

One of the chief reasons why Darwin attained his supreme position as a naturalist was because he was absolutely unbiassed in dealing with facts and hypotheses. So imbued was he with the love of truth that those who knew him best declare that he would have cheerfully abandoned

his whole theory as to the Origin of Species if, towards the close of his life, he had come across evidence that showed that it was not well founded.

In concluding, I will endeavour once more to illustrate the methods which I am recommending to young naturalists by making use of them in order to solve a riddle which has doubtless occurred to many of my readers.

Why are many creatures which have every reason for avoiding notice often marked so conspicuously as to be visible to every eye?

This problem had been occupying my thoughts a good deal several years ago, when I chanced to take a walk through Greenwich Park. The dappled fallow-deer were grazing among the chestnut-trees or lying down upon the soft grass. I sat down on a seat to watch them, determined if possible to learn something fresh from them before I moved from the spot. One could not help noticing how remarkably their mottled skins, angular outlines, and branching horns fitted them for concealment in the glades of a forest. Even here, where the surroundings were to a large extent artificial, every now and then the eye would suddenly chance upon a deer resting

among the checkered shadows which was so inconspicuous that it had previously escaped notice. Suddenly a dog came bounding through the trees, and in an instant all the deer which had been lying down leaped to their feet, and after a moment's hesitation the whole herd cantered away to another part of the park. As they fled every animal was rendered exceedingly conspicuous by its white tail, which flapped up and down at every bound.

Now why should these timid creatures at the very moment that they are avoiding an enemy thus render themselves the most prominent objects in the landscape? That the white tail is not chance eccentricity of coloration, like the white markings about certain domestic animals, is evident for three reasons. Firstly, deer have never been sufficiently domesticated to be bred artificially, like tame cattle, fowls, or pigeons, and therefore their present coloration must be attributed to natural causes. Secondly, the white "flag" displayed by certain deer is not a peculiarity of one or two animals in a herd, but is universally present among all members of a species; therefore it can only be accounted for upon the ground that it has proved of value in the struggle

for existence. And, thirdly, the fact that other creatures having habits somewhat akin to those of deer, but which belong to totally different orders, have the same peculiarity, shows not only that the white tail serves a distinct purpose in the economy of certain of the *cervidæ*, but that some "widely felt want" has been met in this way.

Every one who has wandered in the fields at sunset must have noticed the white fluffy tails of wild rabbits, and how extremely conspicuous these are when the animals are scampering to some place of refuge from a spot where they have been disturbed.

Now it is pretty obvious that every deer or rabbit which advertises itself to its enemies in this manner must incur greater danger than if it remained concealed. This, of course, has been specially the case since man became the chief enemy of all edible mammals, and grew skilful in the use of missile weapons. Many a rabbit and many a buck has been betrayed to death by his conspicuous tail when a hunter with a gun has been prowling near. Perhaps, however, it is not fair to mention guns as evolutionary forces, since almost all the natural characteristics

of animals with which we are familiar were developed long ages before Roger Bacon or his Chinese predecessors taught men the lethal power of "villanous saltpetre." Nay, more, I am inclined to assert that even such primitive missiles as the arrow, the spear, and the sling-stone are all too new to be classed among nature's moulding forces. Still, if we ignore these new-fangled agents of destruction, we yet find plenty of ancient date which might be called down by the flaunting of a white tail. Doubtless if keen-sighted wild dogs started several of a herd of antelopes at the same instant, they would generally follow after the one which rendered itself most conspicuous, so that if one animal of the herd had a white stern and the others had not, it would incur much greater danger than its fellows. Again, birds of prey, which depend entirely upon sight, would naturally direct their course towards the creature which could be most easily followed by the eye, and an eagle dashing suddenly among a number of rabbits would be much more likely to pounce upon one showing a considerable surface of white than upon one which was almost exactly the same colour as its surroundings. Here, then, is apparently a remarkable conflict

between a general law—viz., that all clearly-defined and widely-distributed attributes have justified their existence by preserving the race from extinction—and the actual and obvious fact that every defenceless beast showing a white tail to its foes is thereby rendered less likely to survive than its neighbours which are not so advertised.

If we carefully observe the conduct of some of these white-tailed animals we shall get a hint as to the utility of their peculiar attribute. For this purpose the common wild rabbit is more useful to us than the deer, because we have no difficulty in finding him in every part of the country.

If we walk along a hedge-side on a summer evening just as it is getting dark, we find that a wild rabbit when grazing is a very inconspicuous animal, but the moment when it takes alarm and canters away its white tail betrays its whereabouts. Even when it is very dark (it is never pitch dark under the open sky) there is no difficulty whatever in seeing a moving blotch of white against the dark grass or foliage. Now let us find some suitable ambush close to a bank or a hedge frequented by rabbits. For this purpose

there is nothing better than a seat on the branch of a tree some ten feet or so above the ground, for wild creatures scarcely ever look up, and the tell-tale scent of a human trespasser perched aloft in this manner does not easily reach the nostrils of creatures which are close to the ground. As it gets dusk rabbits begin to emerge from the covert. Some commence grazing almost immediately, others canter slowly some distance out from their place of refuge before settling down to sup. As the darkness thickens their little brown bodies become almost invisible, for when they are on the feed they keep their white tell-tale tails pressed close to the ground. They have been cropping the sweet grass with quiet diligence for half-an-hour or so, and a few of the more venturesome have wandered fifty yards from their stronghold when some terrifying object—possibly a prowling fox—is observed by one of the front-rankers, and he comes scampering back towards the hedge. Although it is now quite impossible to see the outline of a rabbit, the bobbing tail of the fugitive is visible enough. And, moreover, one can tell by the rapidity of its oscillations how fast its owner is going. This enables all the other rabbits of the community not only to learn

the fact that danger is present but to measure its imminence; and they all take the hint without delay and scamper towards the bushes, suddenly revealing many moving specks of white where the observer had not suspected the presence of a living creature.

When an opportunity offers for watching wild fallow deer we find very much the same order of events when one of their number takes the alarm and bounds away waving his white flag. The others at once take warning—although probably they have not learned anything concerning the approaching danger by means of their own senses—and follow their comrade without a moment's hesitation.

It seems plain, then, that the conspicuous white tails of timid creatures such as rabbits and deer play the part of danger signals to the rest of the community. But as soon as we reach this explanation we find ourselves face to face with a further problem. Can it be possible that the white tail of the rabbit or the deer is an emblem of altruism? For it would appear that each beast, by possessing and displaying a conspicuous tail, exposes itself to its enemies for the good of its fellows.

This is such a pleasing notion that it is really a pity to upset it. Tennyson speaks of the rabbit's "innocent face," and if one could add to this an altruistic tail it would imply qualities entitling him to a very high place among the "good" animals which are often held up as an example for frail humanity.

Unfortunately for his moral reputation, the rabbit's claims to altruism are negated by a further examination of the facts. Yet the alternative conclusion which is forced upon us is almost as remarkable. For it seems that the white tail of the rabbit bears an almost exact comparison with such highly civilised and prosaic things as rates and taxes. Apart from any special evidence, his pose as an instance of altruism is completely upset by the absolute utilitarianism which pervades all nature. "Nothing for nothing" is the invariable law.

Certainly our rabbit or deer confers a benefit on his fellows at some expense to himself. But we know—because of the universal character of the above law, if for no other reason—that he gets back from the community every bit as much as he gives.

Now let us see how this works out. All

beasts displaying the traits under discussion are natural socialists. Concerning one apparent exception—the hare—I shall have something to say further on. Now rabbits and deer have not brains enough to organise themselves into co-operative societies or to start political institutions for the public good, after the custom of civilised human beings. Mother Nature therefore undertakes the business for them; and although in the case of the lower animals the process is quite independent of anything approaching intelligence, the result is curiously the same in both instances.

Wherever creatures live in communities they do so for mutual protection. Sometimes they may adopt warlike measures and form themselves into armies; at other times they find safety by combining their wits instead of their weapons. When their only means of safety is flight, they will in some way utilise the combination so as to aid one another in this method of avoiding destruction.

Now if all the deer of a herd and all the rabbits of a warren warn their associates by displaying white tails when they flee from an enemy, it is plain that each member of the

community receives benefit from the custom. Thus supposing the life of a rabbit is threatened twenty times a-year (a very modest estimate) through his rendering himself specially visible, he receives more than twenty warnings from the caudal danger-signals of his fellow-citizens of the presence of dangerous foes which might otherwise kill him. The result, as I have said, is very much like what one finds in civilised human communities. We pay out of our means of livelihood so much a-year to the Government (which represents the community) in rates and taxes. When one comes to examine the part which money really plays in the economy of life, one finds that it must be placed amongst the means of subsistence; for it is merely a kind of substitute for such necessities as food, raiment, and covering. If such things are taken from those of us who have only a bare competence (and it must be remembered that this is all we are *naturally* entitled to, for Nature does not give any of her children any surplus income as a general rule), our chances of life are thereby to some extent lessened. Thus, broadly speaking, money stands to us in the same relation as any other influence which tends

to preserve us from extinction, and we are therefore—from the purely selfish or individualist point of view—apparently so much the nearer extinction when we give our cheques to the tax-gatherer and lessen our bank balance by several pounds or dollars.

In reality we are of course purchasing from the Government very much more effective protection for life or property than we could obtain by the individual expenditure of the amount which we pay in taxes. The money provides us with the services of police and soldiers to defend us against robbers and invaders, and some of it is usually spent in safeguarding our health and in aiding us in getting a livelihood. Hence we get back from the community in the long-run a good deal more than the money which we had to yield up in the way of taxes.

Now let us return to our rabbits and deer. Being creatures which live in communities, they have certain obligations towards their fellow-citizens. In some way or other each has to contribute something to the commonwealth. Silver and gold they have none, so they cannot pay taxes as we do. Property they have none, so they cannot pay in kind as do the

bees and ants. Being totally without aptitude for war, they cannot discharge their liabilities to the state by serving as soldiers, as do the wild hogs and other robust creatures which are banded together for self-defence. Thinking power they have practically none, so they cannot even contribute to the common welfare by giving good advice during a political crisis, or by helping to outwit public enemies. But every one of them is born with a conspicuous white tail, and this it loyally dedicates to the service of the public.

Plainly, a rabbit living alone and possessing an ostentatious tail would be at a great disadvantage. It would pay its taxes and receive nothing in exchange. Now the hare affords us a most interesting example of how gregarious customs become modified when a solitary life is adopted. In many ways the hare betrays the fact that it is descended from socialist forefathers which not only lived in communities but which burrowed in the ground and transacted all the business of life without straying far from their places of refuge. Its white tail is therefore a historic relic of the time when there was little to choose between a hare and a rabbit.

Nowadays the hare finds nothing is to be gained by rendering itself conspicuous, and in this way paying a tax which was originally imposed for the sake of the welfare of a community. It therefore keeps the white part of the tail carefully tucked out of sight when disturbed by an enemy while feeding or lying in its "seat." This action on the part of the hare surely should inspire us with respect for the integrity and public spirit of our friend the rabbit; for it would seem as if in his case the payment of the tax were to some extent optional. Certain animals of the deer kind have white markings on the body around the tail, which serve the same general purpose as the peculiarity we are discussing, and which could not possibly be concealed. But where the upper part of the tail itself is of a dark colour and the lower part only is white, it is obvious that a bolting rabbit desirous of "defrauding the public revenue" might easily do so if he chose by always holding his tail down, hare-fashion, between his hind legs.

Whether his apparent virtue as a citizen—for I have never known a rabbit to shirk his obligations in this fashion—be due to a tender conscience or merely to some detail of caudal

anatomy which prevents him from lowering his tail when running, I cannot say.

Probably a rabbit would not get sufficient profit from his habit of displaying his tail to compensate him for the danger thereby incurred unless he were domiciled with a considerable number of his fellows. The presence of only two or three comrades would not be sufficient to recoup him, for it takes many warnings to balance the increased liability to attack which he incurs by rendering himself conspicuous.

Yet while it is fairly obvious that wherever there are a large number of rabbits assembled in a warren each individual receives greater benefit from this protective measure than where the community is small, there is some danger of such a commonwealth becoming unwieldy. Supposing a square mile of country were covered by rabbits of one clan, and every time one of these saw danger and bobbed his white flag all scuttled into their holes, it is plain that none of them would get far enough afield to obtain food, and the system would prove detrimental.

Here is a problem which any one with a genius for statistics and for calculating chances might

perhaps work out without much difficulty, supposing he also were a fairly competent naturalist.

What is the size of a rabbit community which is most profitable to the individual? Nature, who is, as I have several times remarked, a great actuary and statistician, does these calculations continually, and her answer is set down wherever a rabbit community can be found which exists under anything like natural conditions. Of course each community would be subject to special circumstances according to the nature of the surrounding country, so that an abstract calculation would, after all, have but an academic value.

If the question were asked, How did white tails first become fashionable among rabbits and forest deer? I do not suppose that any naturalist of this generation would be ready with an answer. The actual origin of phenomena like the above is especially puzzling to the evolutionist, and many such problems must remain unsolved until our knowledge of natural history is considerably greater than it is at present.

One point, however, is fairly evident, and that is, that we must regard the *herd* or the *community* rather than the *individual* as the chief unit with

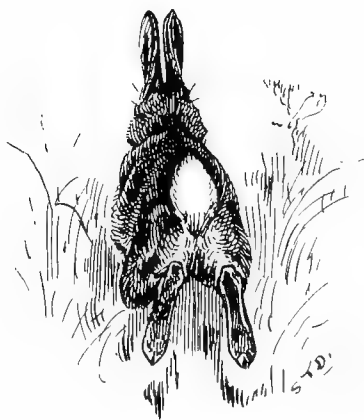
which we have to deal when analysing the traits of many gregarious animals. We must, in fact, regard individuals very much as the physiologist regards the various component organs of the body. Among social animals, including the human race, it was not so much the question which beast or which man would in the long run prove the fittest to survive, as *which herd of beasts* or *which tribe of men*.

The struggle for existence in nature, as in the commercial world, takes place between those who get a livelihood in a similar manner, and in both instances amalgamations and joint-stock companies are formed which, while not doing away with competition, render it a matter of strife between corporations rather than of strife between individuals.

The relations of the individual to his community, whether among men or among beasts, is always a matter of great philosophic interest. Almost every question of internal politics among all peoples from the very commencement of civilisation has arisen owing to the perpetual need of adjustment between public and private "rights."

We are beginning to understand that in hundreds of instances among the lower animals nature

had long ago traversed the very ground which civilised human communities are now entering upon for the first time in the history of our race. Possibly by studying such examples of natural social and political relationships as those which we have been briefly discussing, our statesmen and moralists might obtain some help in their attempts to solve some of the burning questions which are so sorely troubling them at the present day.



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