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THEORIES AND FACTS AS ⁽¹¹⁾
TO PALÆOGENESIS IN ITS
PROBABLE INFLUENCE
ON THE COLORATION
OF ANIMALS.

BY

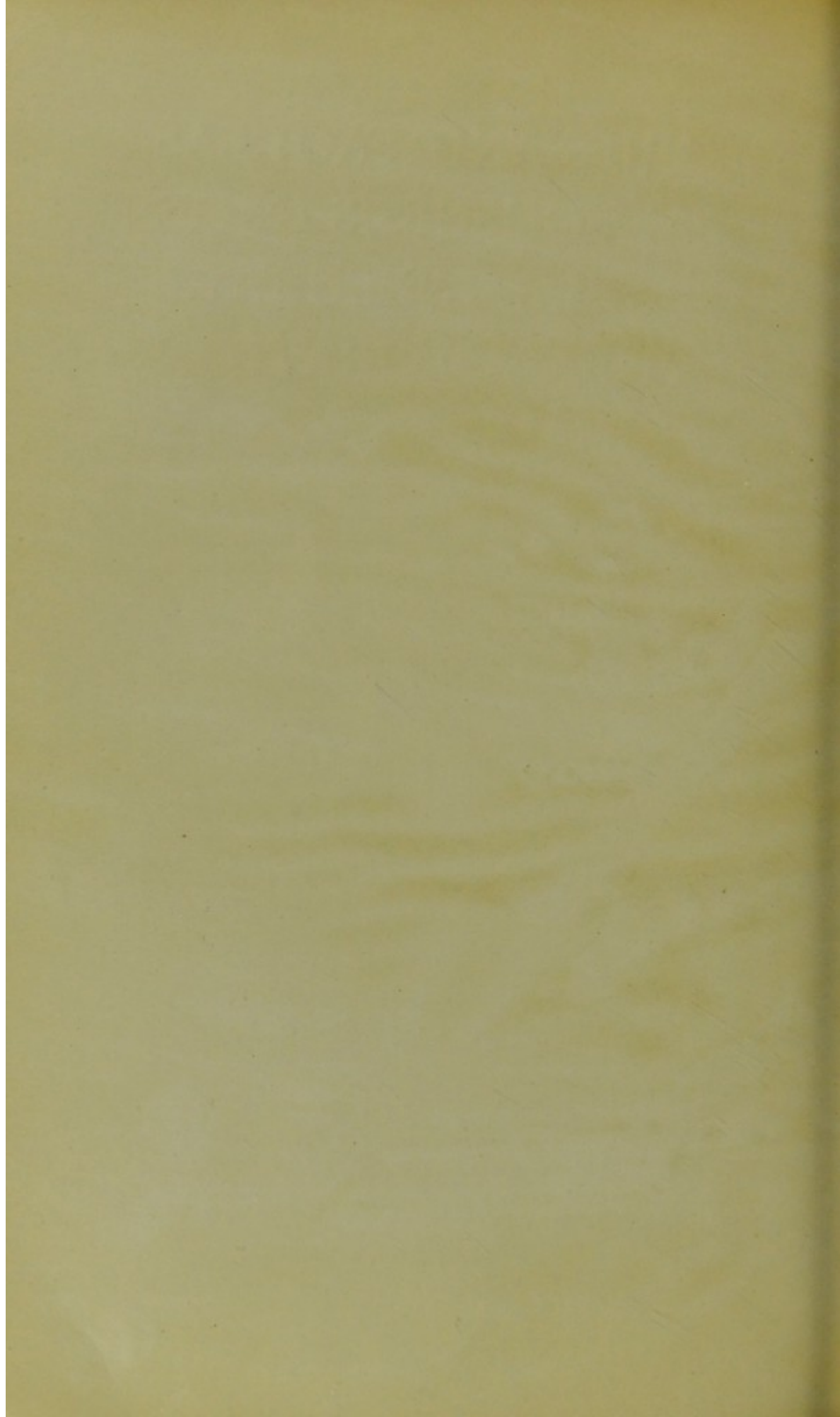
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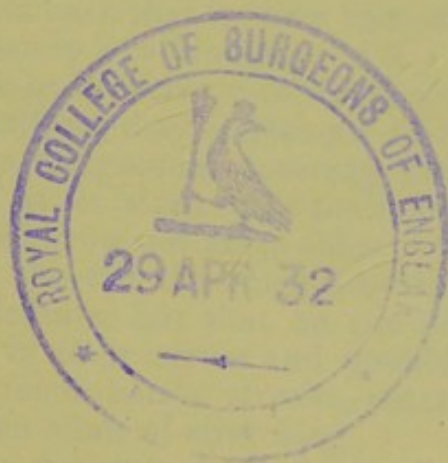


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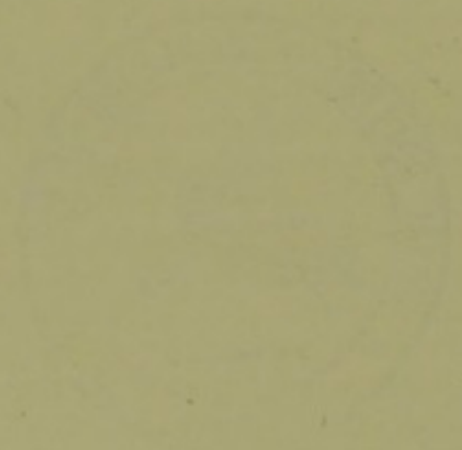
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THEORIES AND FACTS AS TO
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BY

JOHN EDGAR HUTTON
F.R.S.E.



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CHAPTER I.

GENERAL STATEMENTS AS TO PALÆOGENESIS.

PREFATORY REMARKS.

THE beginner in attempting to make observation of the patterns on the skins of animals will do well to assume that the parent type was a ringed worm. From this we may in bold conjecture pass on to the Snake, on which the rings may often become lozenges, and the tail may differ very conspicuously from the head. In the Lizard we see added two pairs of side limbs, and the lower half of the body, or perhaps a much longer portion, is clumsily narrowed to a point and constitutes a "tail." As we progress in the animal scale, the tail becomes modified and is so much narrowed at its base that it looks like an appendage to the trunk rather than merely a continuation of it. Going back to our conception of a cylindrical worm with rings of colour but without limbs and without tail, we may endeavour to realize what might occur if a distensile integument covering the whole were contracted or cut down at its sides to fit the tail or stretched out to cover the limbs which grow out at its sides. We shall easily see that in the case of the tail the rings may become smaller but may be yet more definite, but that on the limbs they may be variously disturbed in their curves and possibly broken. From their breakage may result bands, streaks, patches, spots, or mere dots. It is mainly an affair of stretching.

It may need some patience, backed by adequate imaginative faculty and some faith, but if these are given, it will probably not be impossible to interpret, plausibly, most of the various modifications in pattern which the skins of animals display. At any rate, we may feel confident that their explanation is to be sought in this direction.

It is to be understood from the outset that mere colour is of very secondary importance. It is from colour being conspicuous that it becomes of foremost use in our enquiries, but it may vary with the greatest ease without implying important change. It is the pattern and not the colour which we must regard, and the chief value of colour is to show the pattern. It must be under-

stood that the "pattern" implies much more than proneness to peculiarity in coloration. It depends upon modifications in structure which are inborn and inherited, and although capable of almost endless modifications and often suppressed as regards their manifestations are never entirely eradicated. It is to the possibility of their reappearance in remote generations or distant species that the word "palæogenesis" is useful. My chief object in the following pages is to show that there are certain recognisable tracts of skin common to all animals which have their own peculiar endowments. These latter are fundamental and receive in hereditary transmission modification only.

COLORATION—ELEMENTARY OBSERVATIONS.

Amongst the elementary facts as regards the coloration of animals we may note first that the integument is patterned in two halves, which meet above and below, and which leave longitudinal streaks at what might be called their seams of junction. It is so common as to be almost universal that there is a streak down the middle of the back, beginning at the animal's nose and extending to the tip of the tail. This *dorsal streak* may be narrow or broad, and may be almost endlessly diversified in tint, in size, and in details as to its formation, and by the interruptions to which it is liable. In many cases it is absolutely continuous from nose-tip to tail-end, but in a great number it is interrupted by transverse bars or cut up into lozenges or spots. Very often it is indistinct or wholly concealed by growth of long hair. In some animals it is prone to peculiar forms of exaggeration either in its continuity or in parts.

On the belly of the animal, from the tip of the lower jaw to the end of the tail, there is very usually a band of coloured hair which differs from the rest, but is seldom so well marked as the dorsal streak. It is usually much broader and less well defined than the latter, and very often it cannot be traced from beginning to end. In all cases both the dorsal and the abdominal streak should be looked for in young animals, or even in the fœtus, as they are often obliterated as age advances.

This *abdominal streak* becomes the "LINEA FUSCA" in the observation of human beings, and is usually merely a pigmented band from epigastrium to pubes, but by no means infrequently grows coarse hair. In many animals it is with the adjacent parts of the belly white or lighter in tint than the rest.

In connection with the dorsal and abdominal streaks there may be developed, either other longitudinal ones running parallel to them at variable intervals, or vertical streaks coursing down the animal's sides like ribs; and these bars may cross each other and may map out the skin into blocks more or less angular.

Of these latter, the angle may often be destroyed, and

roundish or oval patches, arranged in ill-marked lines, may be all that are left.

It is by special arrangements of these lines and ribs that the pattern sometimes described as "harness" (the "Harnessed Antelope"), the conditions known as "brindled," the stripes of the Tiger and Zebra, the spots of the Leopard and the blotches of the Giraffe are produced.

Amongst common, but constantly varying, peculiarities in the coloration of animals, several may be mentioned which should for convenience sake receive special names:—

The obliquely placed elliptical patch on the cheek of the Badger, which extends from near the ear, surrounds the eye, and ends at the angle of the mouth, can be traced in a great number of animals, with slight modifications as to size, obliquity, &c. It will be conveniently known as "the Badger's streak," since it is exceedingly well marked in that mammal. It has not as yet been traced in the human subject in any condition, either in health or disease.

As we proceed with special descriptions we shall be obliged to employ, in a more or less conventional sense, various other terms, such as "*Porcupine-patch*," the horses' "*white stockings*," the "*forehead flare*," the "*gridiron*" (of the zebra), and many others.

The colour pattern of the face in animals may vary exceedingly. Amongst the commonest conditions is the occurrence of a star, usually white, in the middle of the forehead. This star may be a roundish patch, or it may have prolongations from the centre, upwards and sideways, forming a cross or dagger. Its vertical portion may run *upwards* between the ears over the nape, and *downwards* to the nostrils. On the sides and across the whole forehead it is often conspicuously developed in domesticated animals, and may be best studied in the Horse. In a few very rare examples it has been recognised in the human subject, and in them appears to be often coincident with a patch on the lower lip, involving the chin. In many Horses it is large enough as to make almost the whole face white and may extend to both lips. In most instances these forehead stars or patches are white, but it must not be assumed that they are always so.

A condition which is coincident almost invariably with the white star on the forehead, or the wholly white face, is whiteness of the terminal portions of the extremities. Horses which have large white forehead-stars almost invariably have what are known as "white stockings."

What has just been referred to as "white stockings" may be regarded as an acroteric condition, and is very often not coincident with any loss of colour on other parts of the animal's body, with the exception of the tail and the face. The hoofs are always more or less involved in the whiteness.

On the feet the band of whiteness may be nothing more than

a narrowing immediately above the hoof, or it may extend up the manus and pes as high as the knee or hock, and even higher. In wild animals it probably usually involves all four limbs, and with bilateral symmetry; but in our Horses and other domesticated animals, it is sometimes not bilateral, and very often it is not symmetrically so. It is almost invariably observed that in the horse the hinder limbs show longer stockings than the fore limbs.

Animals which are striped or brindled on the body usually



Copied in order to show forehead star and white stockings on three of the feet.
Note that the far forefoot is one which shows no white.

show rings on the tail. We must regard the tail as being an attenuated prolongation of the trunk, and as carrying with it the lateral stripes, both dorsal and abdominal, which in the constricted tail meet and form circles. These rings are almost invariably connected the one with the other by a more or less obscure longitudinal band, the prolongation of the dorsal and abdominal seams.

The tail, in addition to the rings just described, often displays other peculiarities. Its tip is often tufted with long hair, and very often differs in colour from the rest. So also the body portion of the tail very usually shares in colour with that of the animal's rump. It may therefore be examined as of three portions whenever it is long, as the rump portion, a middle portion, and the end. In the two first of these it presents an

upper and a lower surface, whilst at the end both sides are alike. When the upper and lower surfaces differ, the upper surface will usually resemble the back of the animal in colour, and the under surface the belly. Very frequently the upper surface is dark, and the under white, especially in animals having short tails.* The rump portion of the tail, when distinctly marked in colour from the rest, usually grows thicker and longer fur. In some cases, especially in the Marsupials, the production of thick fur ends with this part, the rest of the tail being more or less bare and rat-like, and in some instances the line of difference is very abruptly marked.

The colour of the tip of the tail usually corresponds with that of the animal's nose.

In animals which change the colour of their fur with change of season the tip of the tail seldom undergoes any alteration; in the Ermine it is coal-black both in summer and winter.

The central idea of my speculations is that there exists an ancient type-pattern, one and the same for the skins of all animals. This does not concern colour only; indeed, colour is one of its most variable features. Colour, as I have already said, may be regarded as affording conspicuousness of peculiarity of endowment, but not in itself of much importance.

All acquired or individual peculiarities are prone to be inherited for a time, but are all controlled by the primary type. None are really new productions, but all are modifications of what has preceded them. Thus the epidermic horn of the Rhinoceros is foreshadowed in some other animals by a thick indurated patch of skin on the nose. It is an exaggeration, not an absolute novelty.

The Nails on the human hand are to be regarded as of very ancient inheritance—palæogenetic but not aboriginal. A thicker layer of tissue (*stratum lucidum*) is provided on the dorsal tip of all the digits in a vast majority of animals. It becomes modified into claw, hoof, or nail, according to the animal's needs, but is essentially the same. In some animals a claw may be found at the tip of the tail.

Although the arrangement of the skin-pattern is almost infinitely varied, and presents often peculiarities which are very difficult to explain, yet we may firmly believe that there is order in the whole. What is wanted is ingenuity and patience in tracing out and comparing different patterns. It will often be found that conditions which at first sight looked very different, on more careful inspection are obviously alike.

It is often not easy to say which part of the pattern is ground colour and which the streak or spots, but this is a mere matter of description.

* Note the white "scut" of the upturned tail of the rabbit.

In order to determine the real markings, it is desirable to see specimens of the animal both when fully grown and when old; also one of each sex at the several ages and under various seasonal states.

In the human subject, changes, which are not infrequently associated with those of disease, render obvious, for the first time, markings in the skin, which were certainly original endowments.



To show the streaks of the Zebra as modified by position.
(Copied by permission from the Zoological Society's Garden 'Catalogue.')

What I have named the "Porcupine-patch" is sacral or lumbo-sacral. It is, of course, a modification, or development, of a special part of the dorsal streak. This patch grows the "quills," whilst the rest of the back produces only modified hair.

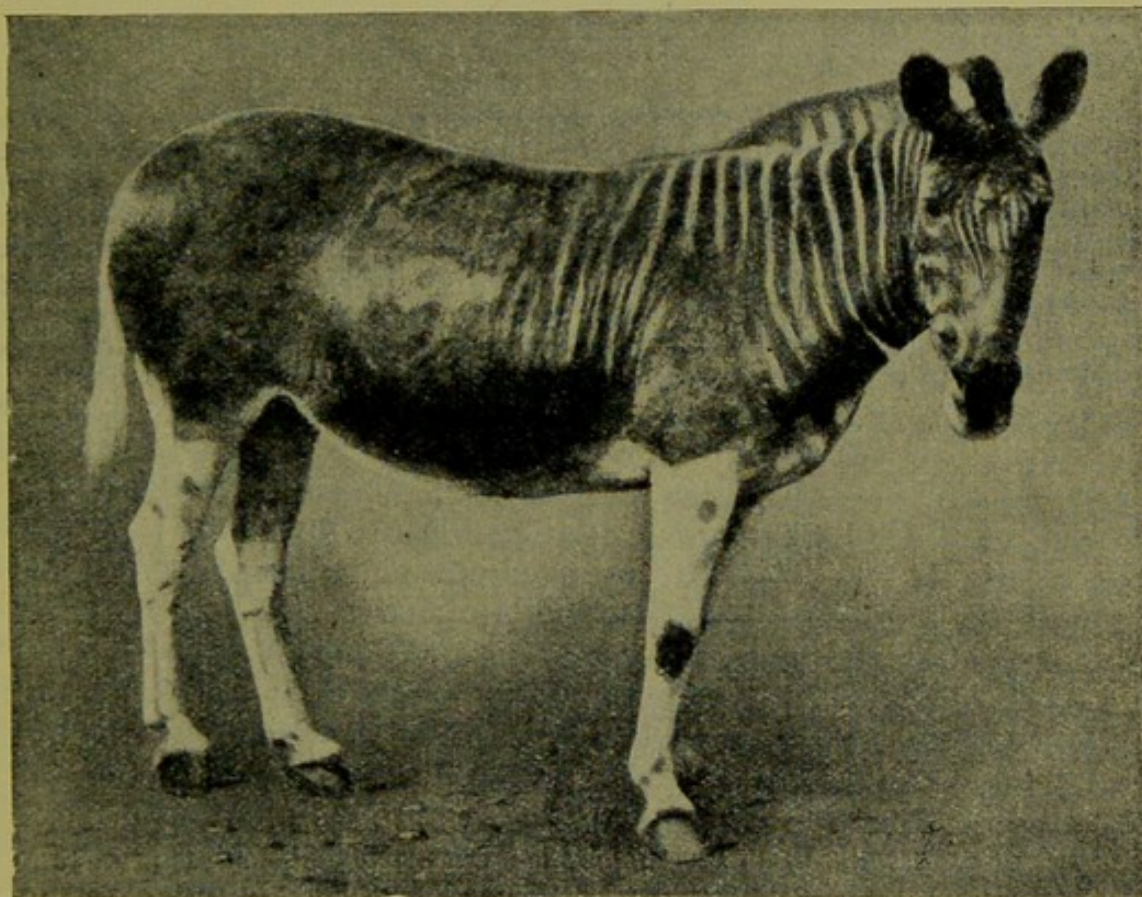
In the adult Hedgehog the whole back and sides develop spines, but in the young animal only the "*Porcupine-patch*" has spines. There are many transitional forms.

In many animals, bristles or very coarse hairs are produced on the Porcupine-patch, and even in some human subjects there is a definite patch of coarse hair across this region.

Virchow attributed the hair-patches which he had observed

in this region to defects in the vertebræ, the so-called *spina bifida occulta*; but the "Porcupine-patch" is sometimes present in well-formed spinal columns. It is, I believe, in the human subject, sexual as well as palæogenetic. I have never seen it in women.

Amongst the Zebras the dorsal black streak is often not well marked, and in contrast with the Asses, they have almost always dark-coloured noses. It would appear that the dorsal streak is sometimes white instead of black.



To show the colour pattern in the Quagga, equatorial arrangement.
(Copied by permission from the Zoological Society's Garden 'Catalogue.')

The bars on the legs, often narrow, circular and strongly marked, are present almost to the hoofs, and on the face almost to the mouth, and are sometimes evident almost to the tip of the tail. There are usually some strong bands near to the shoulder, but no tendency to the formation of a single bar like that of the Ass's shoulder streak. A remarkable tendency to equatorial limitation is sometimes observed, especially in the Quagga. In the latter, the hind quarters are often free from bars, and the lower parts of all the limbs almost always so.

The bars in the Zebras vary very much in their width and multiplicity. When broad, they are much divided and narrow.

Almost invariably the bars are curved obliquely over the hind quarters.

Burchell's Zebra appears to be a connecting link with the Quagga.

The stripes on the fore quarters of these animals, both Zebras and Quaggas, run almost vertically on the neck and body but curve over the haunches. The tendency to curve begins at different positions on the animal's trunk, and the curves become circles as we pass down the haunch lower on the hinder extremity.

The notes which follow are not consecutive, or in any arrangement. They have been put into type hurriedly and in large part for my own convenience. The subject is a very large one, and can be adequately dealt with only after the classification of a long array of facts. As I cannot myself hope to secure time or opportunity for carrying the enquiries far, it has seemed wise to put what little I have done in such form that it may be accessible to others. In taking courage to do this, I must offer some apology to those who know more than myself, and beg to assure them that I am well aware that my attainments in Zoology and in Embryology are not extensive.

CHAPTER II.

PALÆOGENESIS IN CONNECTION WITH SYMPTOMS.

(Part of an Address delivered before the British Medical Association.)

THE first part of the following will be found to be in the main a recapitulation of what has gone before, but there are some alterations and additions. I print it as it was written for another occasion.

The sequel consists of quite detached memoranda and extracts. They are not arranged in any way, but are all cited in the index.

The topics to which I have to invite attention are in part zoological and in part concern certain half-pathological manifestations which occur in the human subject. It is obviously appropriate that I should on the present occasion deal chiefly with the latter, but as they are to be explained only by reference to the former, it is unavoidable that some preliminary statements should be introduced. I am to deal chiefly with the very varied conditions displayed by the integument of animals, including man. These changes concern colour most frequently and most conspicuously, but are by no means restricted to it. Simultaneously with colour, other modifications in the integument and its accessory structures are present, and often lead to manifestations yet more conspicuous than colour itself. All of these are of course subject to the laws of inheritance, but my contention is that there exists a fundamental and back-reaching inheritance which may overrule those forces more usually classed under that name, and bring the most varied species under its power. We understand by Atavism an inheritance from progenitors which are immediate, and although it may be remote and with the omission of one or more generations, still traceable. By *palæogenesis* it is proposed to take in an infinitely wider range of facts, and to imply inheritance quite independent of species and to some extent independent of time. It is therefore, I think, worth while to invent a new name, although in reality *palæogenesis* is only Atavism *in excelsis*.

The hypothesis which I venture to suggest as a convenient

one by which to explain the colour patterns of the skin and appendages of animals in general is the following. An archetype of the cutaneous envelope of the body common to all has been transmitted by inheritance with the most various minor modifications, all of which in turn become modified and are, when so changed, still prone to transmission by inheritance. These modifications are of the nature either of excesses, or of suppressions, but neither the one nor the other is absolutely permanent.

Although of course we cannot sustain in detail such an hypothesis, it will be convenient to assume that, at an early period of the development of animal life on our planet, the parent form of the infinite variety of beings which we now behold was a cylindrical worm, constructed in rings and without limbs. It had been formed in two halves, one on each side, which had met and joined above and below, thus constituting an upper and under line of juncture. These two halves, although designed to be exactly alike, are not absolutely so, and from the earliest period minute differences may now and then be observed. Thus all animals are prone to be, from organization, right-handed and left-handed; although the difference may be in most cases not recognisable, it is always present and is, on occasion, made evident. When the two halves are, in endowments, exactly alike, we recognise *bilateral symmetry*.

The worm-like body which we have presupposed as a primary type is covered by a wrappage which we call skin, and which must not be thought of as if it were a coating of india rubber. It is a very complex structure, and contains in itself very wonderful possibilities of growth and development. It consists of several layers, each of which has its own endowments, and it encloses in itself the germs of such structures as hair, nails, glands, and even teeth. It contains also elements which are capable of producing various colours. In the lowest forms of life, and in the earliest stages in all, the skin is closely united with the body substance which it protects, but as organization, or age, advances, it detaches its hold on the bones, muscles, &c., which are beneath it, and becomes loosed from them, and in a sense self-dependent, sharing with them only by receiving minute blood channels and filaments of nerves.

We have supposed our worm-like progenitor to be of almost indefinite length but wholly without limbs, and to show on its outside little more than a long series of rings, more or less coloured and connected both above and below by indefinite bands running lengthwise. There comes a time, however, when the animal needs limbs. These are formed by the budding out, from its sides, of structures which have been hitherto hidden. We are not concerned to do more as regards the development of these limbs than to suggest their probable effects upon the dis-

tribution of the colours already present in the skin. The limbs do not form for themselves new gloves of skin, but push before them long pouches of the body-skin with its stripes or rings or spots of colour. Although of course the skin enlarges by interstitial growth, it is at the same time also stretched. The effect of this may easily be understood. Its precise results are not infrequently definitely illustrated. (See the stripes of a Zebra.)

It is very common for conditions existing in the fœtus and still present and obvious at the time of birth to disappear during adolescence. Lambs, even if of well-bred flocks, and destined to be wholly white as regards the fleece, are almost always born speckled with brown or black. This is seen in some breeds in which the face remains through life spotted or brown.

In other cases, conditions not seen at the time of birth become conspicuous during early life, and may either disappear or persist as adult age is reached.

PALÆOGENETIC SPECULATIONS IN REFERENCE TO SYMPTOMS.

The conditions occasionally seen in the human subject in connection with which I invoke the theory of Palæogenesis are illustrated by the following:—First, unilateral streaks on the neck, trunk, and limbs. To these the term “herpetic ichthyosis,” or “unilateral ichthyosis,” and many others have been given. Perhaps the term “Biett’s Bands” (in allusion, I believe, to their first observer, and not as involving any theory of cause) is the best.

Especially we should avoid any adjective implying that they are one-sided, for they are almost always bilateral, although usually very unequal in their development on the two sides.

We may suitably recognise two forms of these bands: one in which the band is long but narrowed, and does not branch; and another in which it spreads out in a paniculate manner like Herpes zoster.

The conditions referred to are, however, rarely seen, and are well-known to but few. They are fairly well illustrated in the Clinical Museum in Chenies Street, to some extent in the New Sydenham Society’s ‘Atlas,’ and in some of our Dermatological Atlases, but are accessible to those only who search for them. I will turn to one which is more instructive because much more common. It is, in fact, so common that it attracts little or no attention. I allude to what is known as the *linea fusca*. Our gynecological forefathers knew under this name a brown line extending from the pubes to umbilicus or even to the epigastrium, and which was supposed to be characteristic of pregnancy. There is no doubt that this line assumes a deeper tint in pregnant women, and especially, perhaps, in first pregnancies. It is

an important illustration of the fact that there is generally in the pregnant state a tendency to increase of pigmentation; a sort of physiological or temporary Addisonism. Under its influences the well-known freckles, "*chloasma uterinum*," are seen on the face. Such conditions are not peculiar to women, as is well-shown in several published portraits. Nor in women are they peculiar to the pregnant state. They are evidences of excessive general pigmentation with localisation by special causes.

As regards the *linea fusca*, it is simply the ABDOMINAL STREAK common to most animals made conspicuous by pigmentation. In the male sex it is often not only pigmented but grows hair. A band of hair may be seen uniting the pubic patch with another patch very frequent on the mid-chest. On the chest the patch is often widened out, and being no longer a mere streak, clearly represents the abdominal mane of certain animals.

In the human subject the DORSAL STREAK so common and conspicuous in animals is seldom well-marked. We are told that it is evident in Japanese children in the earliest months of life, and we recognise it more or less definitely in many adult males. It is seen especially in those of dark complexions and of the Semitic family. With it goes the mane in animals, and not very infrequently a growth of hair over the lumbo-sacral region. I have been accustomed to call the growth of hair in this region "*the porcupine-patch*," since it is the part upon which the porcupine develops its quills. Many white dogs develop a patch of dark hair in this region. It is reported that in woolly sheep, removed from temperate to tropical climates, the wool may, in the course of a few generations, be to a large extent dwarfed on other parts, but is retained on this and "looks like a dirty doormat across the animal's rump." Virchow, who observed it in the human subject, attributed it to defects in the spinal column, the so-called *spina bifida occulta*, but my explanation is, I think, the more probable. It is simply the remains, palæogenetically, of the "*porcupine-patch*."

MISCELLANEOUS EXTRACTS FROM NOTE-BOOKS.

LUNATE BANDS.

The expression "lunate bands" is used by several authors as descriptive of the broken circles which are seen on the throats of many animals.

THE VIVERINÆ.

One of the *Viverinæ*, under the name of the Fossane of D'Aubenton (Madagascar), is figured, with colour, in the 'Proceedings' of the Zoological Society for 1872. Its body shows on each side four much broken streaks running its whole length. They are so much broken that in many places they might be described as spots only. On the tail, the rings are so much broken that Dr. Gray describes it as "marked with dark spots on each side of the upper surface, which are closer and give the appearance of being ringed at the end. Its throat is pale almost to whiteness, and shows no lunate bands. In some animals the soles of the feet are covered with hair. This is a definite feature in the true *Viverinæ*." (Dr. Gray.)

TAILS OF ANTELOPES.

One of the *Nanotragus* Antelopes is adjectived "*nigra cordatus*." It is a light brown animal with a white belly and broad white bands down its limbs.

Its feet are white, there is a white circle round each eye, and a white lunate band under its throat. On the upper surface and lower half of its short tail the hair is coal black, and being set between its snow white thighs, is as conspicuous as the white "banner" of the upturned tail of the rabbit.—Zoological 'Proceedings,' 1872.

SQUIRREL'S TAILS.

It has been stated on good authority (Rennie) that white-tailed Squirrels are often seen in North Hampshire. I have not found this fact mentioned by any other author, nor have I ever seen a specimen. A Squirrel figured by Dr. John Anderson,

of Calcutta (Zoological 'Transactions,' 1871), bears on this point. It has been named *quinquestriatus*, and is described as having annulations, five in number, but the coloured portrait does not exhibit them. Dr. Anderson's description is detailed, but, if I may sum up the portrait, it has in the middle line below, a central long abdominal streak of jet black, on each side of which are other streaks of white bordered at their sides by others of black, outside which and over the whole of the animal's back and limbs the colour is of a bright olive red. It has a large bushy tail, which from its root to near the tip is of light yellow.

Within an inch or two of its tip there is a broad ring of black. The very tip is yellow, not black.

The description of this animal does not coincide very closely with the coloured plate.

RINGED OR BANDED TAILS.

Tails are very often banded or ringed, a condition of which the Cat's tail is a familiar example. It not infrequently happens that the very tip of the tail differs from the rest. In a mongrel shepherd dog, now under my observation, the body is of tawny yellow, excepting the breast and belly, which are white. No pattern is to be observed on the face, but when observed closely, a few white hairs are seen in the middle of its forehead. So also at first sight it might be thought that there was no white on its tail, but when looked at carefully, there is a small white tuft at its very tip. The dog also had white feet, its fore feet having longer socks than the others.

THE PEN-TAILED TREE SHREW.

There is an animal named the Pen-Tailed Tree Shrew, one of the *Insectivora*, which gets its name from the development on the end portion of its tail of broad side fringes of hair, giving it the appearance of a pen. (See page 617, of 'Flower and Lydekker.')

BARRED TAIL IN ASSOCIATION WITH "PORCUPINE-PATCH."

The barred tail in association with the Porcupine-patch is well shown in fig. 250 at page 576 of 'Beddard's Mammalia.' The animal's name is *Rhynchocyon chrysopygus*. The root of its tail is thick and fleshy and of dark colour. This ends abruptly, a little more than half way down. Then follows an inch of white, and finally there is a short tapering black tip. The animal has a long proboscis, and much resembles a marsupial. It is, however, allied to the Moles, and of Ethiopian habitat. The lower part of its tail has stiff elastic bristles, at the free tips of which there is a swelling.

It is to be remembered that this animal is related to the hedgehog, *Insectivora*, and very distant from the Porcupine.

FORMATION OF TAILS.

In many animals having long tails, the first part of the tail is much stouter than the rest, and is limited quite abruptly. It is often of different colour and joins with the rump gradually; that is, it narrows very gradually. I have recently observed a flock of fifty young lambs. The tails of many of them exhibited this peculiarity very definitely, approximately two-thirds being, as it were, attached somewhat flail-like to the upper third, the line of junction being quite definite but not attended by any difference of colour, but being very decidedly thinner. In some of these lambs the upper portion was very decidedly wider and thicker. When they wagged their tails the lower two thirds shook as if jointed to the rest flail-like, and was definitely thinner and weaker than the rest. When the tails were cut, only about half of the thicker portion was left.

THE BANDED TAIL OF *CHIRONECTES YAPOCK*.

An illustration of a banded tail and of other interesting peculiarities in colour-pattern is given in a portrait of *Chironectes Yapock* in 'Jardine's Natural History.' The animal is a Marsupial. The first part of the tail, perhaps an inch and a half, is thick and hairy and coloured like its rump. This part ends suddenly, and the rest of the tail is rat-like, tapering and scaly, but shows no hairs; a short band near its middle is marked by two circles of white, which include a short portion which is coloured. The terminal inch of the tail shows neither hair nor colour of any kind, and is bare like that of a white rat. The animal's body is of brown tint, and shows broad markings of lighter colour down its sides. One broad dark band occupies the position of the shoulder streak in the ass. The animal's throat and belly are white.

WHITE TUFT ON THE FOREHEAD IN SHEEP.

The following fact as regards the occurrence of the white tuft on the forehead and other peculiarities in sheep occurs in 'White's History of Selborne,' Letter xvii.

Travelling on the South Downs of Hampshire, he records that "from the westward until you get to the River Adur all the flocks have horns and white smooth faces and white legs, and a hornless sheep is rarely to be seen, but as soon as you pass that river eastward, and mount Beeding Hill, all the flocks at once become hornless, or, as they call them, poll-sheep, and have, moreover, black faces with a white tuft of wool on their foreheads and speckled and spotted legs, so that you would think that the flocks of Laban were pasturing on one side of the stream, and the variegated breed of his son-in-law Jacob were cantoned along on the other. And this diversity holds good, respectively, on each side, from the valley of Bramber and Beeding, to the eastward and westward, all the whole length of the downs. If you talk

with the shepherds on this subject, they tell you that the case has been so from time immemorial."

THE FRONTAL STREAK.

The frontal streak is by no means always white. In certain Antelopes, and, indeed, in many other animals, it is of dark tints. Three interesting plates illustrating it are given in the 1871 volume of 'Proceedings' of the Zoological Society, all illustrating species of *Cephalophus*. In all three the streak extends from the nose to the middle of the forehead, and is of darker tint than the rest. In two there is a parallel streak of lighter tint running up just above the eye. In one the animal is named *C. nigrifrons*, and this characteristic streak is coal black. It is narrow at its commencement close to the nostrils, but widens into a broad club just below the horns. There are, perhaps, but few animals which do not exhibit at some period of their lives a definite pattern on the front of the face, and of this pattern the feature least often omitted is the central streak here described.

TAIL OF CANIS CHAMA.

The silver-backed Jackal, *Canis chama*, has a remarkable tail. It is long and bushy and begins at the haunches quite abruptly. Although named "silver-backed," its body is almost one-coloured, its back not carrying any definite streak, but being of dark grey, almost black; becoming lighter as we pass down its sides. The dorsal streak on its tail is quite black, begins quite abruptly, and is narrow with yellow sides. About the last inch of the tail is black like that of an Ermine. The absence of black on the animal's body, and the abrupt separation of black and yellow on the tail, may be imagined to suggest that there was only black pigment enough for the tip and the narrow dorsal streak. (See plate xvii., P.Z.S., 1875.)

CHEEK-SPOTS IN TRAGELAPHUS ANGASI.

The *Tragelaphus angasi* has very definite cheek spots (3) and "spectacle frame." Also a white dorsal bar with five side ribs, a white tip to the tail, and short white patches on the front just above its hoofs. This is the male. The female shows thirteen bars of white down its sides and two cheek spots. In the female the dorsal streak is not white but coloured nearly black and growing a low mane in its whole length to the root of the tail, and onwards over the whole of the dorsal aspect of the tail. The male is of dark slate gray in parts, almost black, but the female is a light bay colour. The calf has a ringed tail, black at its root, then bay, then black, and finally white at its tip. Note the difference in the number of ribbed bands between the male and female.

SCIURUS DORSALIS.

A Squirrel (*Sciurus dorsalis*, Gray) has a broad patch of deep brown down its back from the middle of the forehead to near the root of the tail. This is abruptly bounded on the sides, and the whole of the rest of its body is snow white. Its long tail is white, but mixed with long dark hairs. A very remarkable animal; it would be very interesting to observe its young and both sexes.

MUS BLANDFORDI.

The *Mus blandfordi* has a deep brown body, including the root of its tail. The tail is almost smooth and is white, as also its legs, both fore and hind. Its long tail is of a yellowish white colour in its upper third, and dead white in its lower two-thirds, the line of junction being quite abrupt. Its under cheek and belly are quite white.

THE TIGER, SERVAL, AND CHEETAH.

In the Tiger, the ribs passing from the abdominal streak upwards are sometimes quite as large or even larger than the dorsal streaks passing downwards to meet them. The curved arrangement on the haunch is not nearly so well marked as in the *Zebra*, and does not commence until much lower down on the limb, thus more nearly resembling that of the Zebra's front limb. In the black rings on its tail the black is sometimes split, forming two in more or less close apposition. Thus the "gridiron" of the *Zebra* has much longer cross streaks.

The Serval, a link between the Leopard and Tiger Cats, shows black round spots on its limbs and trunk, and on the latter the spots are some of them elongated, and most of them are arranged more or less in longitudinal stripes passing on to the forequarters.

The Cheetah is a good example of a purely spotted animal. Its trunk, limbs, and face, are covered with small or very moderately sized spots, black, and for the most part quite round. No tendency to streaks, rings, or special arrangement can be traced, excepting on its face, ears, and tail. Its tail shows rings and a white tip, and its ears are crossed with black bands.

The Clouded Leopard has been described as "marked like a Python." Its skin with little exception is coloured, but with large patches of broad ill-defined streaks on the neck and trunk, shoulders, and thighs. On the legs the ground is much paler or even white, and shows spots arranged in rings.

PRIMATES.

The *Cercopithecus pluto* has very large bushy whiskers.

The Orang-utan is represented as comparatively destitute of hair on the top of its head. Not in an abrupt patch but much like that of aggressive senile baldness in the human subject.

The Chimpanzee has its scalp fairly well covered with hair, and a narrow, transverse forehead bar which is hairless.

THE CROCODILES.

The dorsal line in Crocodiles runs the whole length of the tail; from the nape to the rump it is widened, and consists of three parallel lines of hard tubercles. Beneath the lowest of these, and on the fore limbs, the skin is much less thickened and shows no definite tubercles.

MANES IN CAMEL, LION, AND ELEPHANT.

The Bactrian Camel develops a large lower mane below its neck, with tufts on its forehead, on the top of each hump, and around the upper parts of its lower limbs.

The mane in wild Lions is much more scanty than is usually represented. It appears to grow much more freely on those in captivity.

Some trace of dorsal mane passing downwards from the neck almost to the rump is traceable in the Elephant, Rhinoceros, and Hippopotamus. In some instances short side streaks are evident.

THE RHINOCEROS.

A certain sort of pattern can be traced in the huge plates of dense skin which cover the Rhinoceros. They are not easily traced either in the Hippopotamus or the Elephant. They consist of a shoulder plate which covers the scapula and its region. Above this is what we may call the "nuhal" or shoulder-neck plate, which covers the top of the shoulder and the nape. These two are bounded posteriorly by a line which passes from the under chest or belly over the back. Behind it is a huge saddle, the margins of which much resemble enormous saddle flaps. Behind the saddle is a much smaller one which covers the rump, and may represent the Porcupine patch, and below that, one which encases the upper part of the thigh. In the Rhinoceros there is little or no mapping out over the trunk, but a deep furrow crosses over the shoulders from side to side.

DEER, GOATS, AND SHEEP.

There are two breeds under the name of Fallow Deer in Britain. In the one "the summer coat is fawn, dappled with white; in the other the colour is dark brown at all seasons."

In Piebald Goats which show much white on the body, the legs usually wear black stockings. In a drawing before me of an Italian Goat, the "badger streak" passing from above and around the eye to the upper lip is well seen on a white face.

In the male Springbok, which has a white face, white belly, and white rump, there is a line of black, the badger's streak, which crosses from the forehead over the eye to the upper lip.

The Nubian Goat, hornless and short-haired, may be sometimes black and one-coloured, and sometimes tan and spotted. It has a very small beard placed far back under its lower jaw, and much further back a dewlap on each side. It is short-haired, usually hornless, and with drooping ears.

The Leicester breed of Sheep has short white hair over the whole of the face, and tufts of wool over the forehead. The legs have white hair, whilst the whole body and upper parts of limbs are covered with thick wool.

The Welsh breed of Sheep have white faces and white legs, their wool ending at the hocks and above the wrists.

The "fat-tailed Sheep," as depicted in the 'Living Animals of the World,' has a large under mane.

ON TAILS IN MARSUPIALS.

Some animals possessing long tails have the greater length of this appendage devoid of fur. Usually the upper part of this structure for two or three inches from the rump is thickly covered with fur, which then ends abruptly, leaving the lower few inches of its extremity as naked as that of a Rat. This condition occurs in the marsupial Chironecte, which animal has a most peculiar arrangement of colour on its back, being of a slate-grey on its body, with a streak of dark brown running down its back. From this streak there pass off, down the sides of the body, three or four broad bars of the same colour. These, unlike the stripes on a Tiger, are nearly as broad as they are long, and have obtuse round ends. The root of its tail and the adjoining parts, which grow brown hair, apparently represent one of these streaks, and make, beginning at the animal's shoulder, a fourth. The animal's belly and throat are white. The Badger triangle is very marked and of dark colour, but at the same time narrow.

It may be suggested that in this marsupial animal we recognize an early condition of the Tiger-streaked arrangement, and that we ought to give a special attention to such peculiarities in this tribe of animals.

The Dog-headed Thylacine shows conspicuous bands on the hinder two-thirds of its back. These bands begin a little behind its shoulders, where they are quite short, and scarcely leave the mid-region. They get longer and more conspicuous as we pass towards the tail, and over its haunches pass almost as low as the edge of the flank. There are a few at the root of the tail, but no bars are seen on the tail itself, which, however, has a tuft of dark hair at its tip. The animal shows no patches or streaks on its head, neck, or limbs.

It must be noted that the root of the tail very usually corresponds with the conditions of the skin behind the haunches, with which it is continuous. At a distance from one to two or three inches this changes, and the rest of the tail is often comparatively bare until we reach the tuft at its extremity.

RINGED TAILS.

The Kinkajou has a conspicuously ringed tail, but a very faintly banded body. About its eyes, in Cuvier's plate, three white patches are represented at the outer angle, and above and below. The rims of its ears are white, but there is no other white about it. Its back is a very dark brown, and its throat and belly of a light brown.

In the *Galago crassicaudata* (a Lemur) the sides of a thick fleshy tail are continuous with the buttocks, so that it is difficult to say where the tail begins; the whole tail is short—a mere stump. ('Proceedings' of the Zoological Society, 1864, p. 711.)

The Panda, in Cuvier's plate, is represented as having a red mahogany back and tail, the latter with a short black tip. The under part of its neck, its belly, and its four legs are all black; its tail is banded.

The Jerboa has a long tail, ending with a long brush, which is white at its tip and quite black on the adjacent two inches, the whole of the rest being yellowish brown like the animal's body, which latter shows an indistinct tendency to bars of darker colour.

An allied animal, the Helymas, has a shorter tail, which is better covered with hair, more especially at its root, but which does not develop any sort of brush at its end; its end, which tapers, is black. The animal's belly is white, and so also are the insides of the thighs and the fronts of the legs.

Many animals possessing long tails which are ringed have a tuft of black at the tip, while comparatively few show a white tip.

It is to be noted respecting tails that most of the animals which have long tails show circular bands, which are usually united by longitudinal lines, sometimes one only, and sometimes two.

Amongst the animals in which the tail differs in colour from the body we have the Monkey known as Deville's Midas. In this animal the whole body and the greater part of the limbs are of a reddish mahogany tint, but its tail from root to tip is black, as are its bushy whiskers, crown of head, greater part of face, and its feet and hands; its nose and lips are white. ('Proceedings' of the Zoological Society, 1871.)

The white under-tail occurs in the Hare as well as in the Rabbit, but it does not become nearly so conspicuous, because the tail is much shorter.

THE GUINEA-PIGS.

The Guinea-Pigs are remarkable for their tendency to vary in colour, and are but seldom one-coloured. They easily become albinos, and the albinism usually involves the eye as well as the skin. But certain exceptions to complete albinism are observed even in those which have red eyes; as occurs with some Rabbits, whose ears remain blackish brown when everything else is white.

In one instance under my own observation a long-haired red-eyed animal had a brown nose. The nose was deepest in tint at its end, and gradually shaded off into a smoke-brown in passing up towards the forehead. Its ears were, as usual in these albinos, of a dark, almost black tint near their tips on both sides, but the tint shaded off in passing downwards. The ears, as compared with the body of the animal, grew only short hairs, and these hairs were white. Thus, compared with the body, the ears are almost destitute of hair. The patch on the nose was not abruptly margined, as are the patches of black, white, and yellow on the piebald body, but shaded off gradually. The animal's feet grew white hair on their dorsal surfaces, but it was only short, whilst there was no hair whatever on the palms, which, as well as the digits, were flesh-coloured. Although the general features of the animal's trunk, &c., were concealed by its very long hair, the ears, hands, and feet remained comparatively free, and were conspicuous. Around both ears there were circles of tawny yellow, but from the inner angle of one of these circles upwards from the inner canthus a band of tawny yellow passed towards the lower end of the ear.

Bilateral symmetry in the arrangement of colour patches in Guinea-Pigs is seldom ever seen, and is never accurate. The animals are always piebald, and very frequently through the fact of having three colours—yellow, black, and white—they approach the condition known as "tortoiseshell." They very rarely show any arrangement in small spots, but not infrequently a small tuft of tawny hair may be noticed, and sometimes this assumes the form of streaks. There is seldom any approach to what might be called a pattern. Little or no tendency to the dorsal or abdominal streak can, as a rule, be identified, but the long middle white streak of the forehead, from the tip of nose to between the ears, is observed in most.

Two out of four animals now under observation, instead of showing the more usual conditions, are piebald grey and white, the grey being an iron-grey; one of these has the grey colour on the backs of its hands down to the ends of the digits on one foot, whilst on the other the back of the hand is snow-white. Thus it may be said of piebald Guinea-Pigs in general that their colours have a remarkable proneness to localization in large patches. They are very rarely streaked, spotted or speckled.

Three other pigs, which are simply piebald, have large patches of colour, two of them grey and white, and one of them black, yellow, and white. The patches of colour are large in size, and not placed in bilateral symmetry, although there is a tendency to rough arrangement of that kind. In all three, on the middle of the face, from the nose upwards to between the eyes, there is a long white streak. In all three the immediate neighbourhood of the eye is coloured, and in the two which are grey and white there

is a ring of lighter grey tint tending to yellowish, whilst in one this circle around the eye has an ascending branch from the inner canthus which runs upwards to the forehead—the xanthelasma patch. This upward streak occurs in only one of the animals, and is very definite.

PIEBALD.

It is more difficult to give a technical definition of *piebald* than some may imagine. We must not here use it with the vagueness which would imply only that the animal is parti-coloured. Under the term of piebald with reference to horses, dogs, cattle, &c., it must be allowed to mean that there are abrupt, map-like patches of different colour, and usually of black or red upon a ground of white. Seldom are there three colours, but they are common in the instance of cats and cattle. In piebald animals the patches of different colour are placed for the most part without order, and no pattern whatever can be traced. Often, however, perhaps even usually, some approach to bilateral symmetry may be made out, and such symmetry is often quite definite in one part of the body while it is quite lost in another. It may be sometimes shown by patches on the two sides, which correspond as to location but look very different owing to their conspicuous deviations as to size.

I do not know of any examples of wholly one-sided coloration in wild animals, whilst there are many which show equatorial limitation (as if by a girdle) with tolerable abruptness. Sometimes it is the upper half and sometimes the lower which shows conspicuous markings, and almost always the limitation, if it is abrupt, concerns streaks only.

In disease equatorial limitation is common enough in connection with injuries, or some disease of the nervous system. So, of course, is the unilateral or hemiplegic type. To the equatorial the term “para” may perhaps be applied.

THE BANGALORE CAT.

The Bangalore Cat, from an engraving which I possess, shows well-marked rings on its thighs and lower part of tail, none on the trunk, nor any on the legs. The streaks in the middle of its forehead are a little indefinite, and there are none whatever on the body of the animal. The tip of the tail is black, and five very definite rings are present above the black tip. The rest of the tail has no rings. The level of the rings is on the lower part of the tail and on the upper extremities about the same (horizontal limitation).

THE PORCUPINES.

The quills of the common Porcupine are grown almost solely on the hinder half of its back. On the front of its back, neck, and top of head there is a mane of long hairs, but they do not develop

into quills. The quills are banded with black and white, a condition which these long hairs rarely show.

In the Brush-tailed Porcupines, the tail, like the mane, consists of long hairs, and is described as a "paint-brush," "épié à queue en pinceau." The whole of the back is covered with flattened spines of about equal length.

In the Canadian Porcupine (*Erethizon dorsatus*) the whole of the back from the snout to the root of the tail is of paler colour than the sides. The quills or spines are stout and of variable length, ranging from one to four inches.

In another Porcupine, *Hystrix* (*Synetheres*) *prehensilis*, on the hinder portion of the back where the Common Porcupine would grow quills freely, a patch of white hair with short quills is developed, the rest of the animal being of dark brown. This is a good instance of the transmission in allied species of local peculiarities in the skin and its appendages which yet do not attain to identity. In this animal there is no trace in Cuvier's drawing of the "Badger triangle."

DR. CHASTER ON ALBINISM IN SNAILS.

Dr. G. W. Chaster, in his Presidential Address on "Species and Variation" to the Conchological Society on Oct. 20th, 1906, observed that "Albinism is a condition dependent upon an innate inability of the animal to produce pigment. In conchology it must be borne in mind that the lack of colour in the shell is no more evidence of albinism than is the white skin of an European. In the true albino the normal colouring of the animal is absent, even the eyes being colourless. Several years ago I discovered a large colony of *Acme lineata* near Penmaen pool, in Merionethshire, all the individuals of which were true albinos, none of the animals showing any trace of colour except in the liver, the colour of which belongs to a different class from that of a pigment, inasmuch as it has not been produced for the sake of its colour, but is dependent on and associated with the functions of a gland."—('Journal of Conch.,' xii. p. 29.)

HORIZONTAL STREAKS.

Some animals have bars of colour extending not, like the tiger, downwards in curved streaks, but horizontally from one end of the trunk to the other. Of this, the *Paca*, or *Cælognys subniger*, is a good example. In this animal streaks extend from in front of its shoulders to the root of its tail. The uppermost streak is broken into white dots. Next to it comes a very imperfect streak, and below that an unbroken band. Next to this is a band somewhat broken at its front end, and below that two others. Thus we trace six bands more or less definitely. There is no marked Badger triangle.

The Viscache (*Lagostomos trichodactylus*) is for the most part one-coloured, but with a dark tuft to its tail, and with black bands extending from its nostrils backwards over its cheeks. There is no definite Badger patch.

ONE-COLOURED.

The Common Chinchilla is almost wholly one-coloured, a slate-grey.

TIGER-STREAKED BRINDLING.

Cuvier figures the Common Hare as having Tiger-like streaks down the sides of its shoulders and chest. Is this correct?

NECK AND SHOULDER.

The Pteromys (North American), of grey and brown general tint, shows a tendency to become streaked and banded on its neck and shoulder.

TORTOISESHELL PIEBALDS.

The term "tortoiseshell" may be understood to designate a condition in which the patches of colour are abruptly margined but quite irregular in shape, the colours almost invariably being black, white, and yellow. Tortoiseshell condition becomes piebald in the Horse. There is generally some approach to bilateral symmetry, but it is seldom or never complete.

THE RHINOCEROS'S RINGED TAIL.

The Sumatran Rhinoceros has a coloured representation in the Zoological Society's 'Transactions,' 1872, which is of interest as representing the tail as ringed. There are short bristle-like hairs over most of the back and a long but ill-marked dorsal streak. These also cover its otherwise naked tail. Its armour-plates do not show anything distinctive. Its horns are low and limpet-like.

THE DOG AND WOLF.

Cuvier figures a Wild Dog of the Cape which is streaked and patched with white, an irregular piebald, and has a bushy tip to its tail, which is white with a band of black immediately above it. The arrangement of the patches is not with bilateral symmetry, so far as the figure can be judged.

Cuvier figures a Red Wolf (*Canis jubatus*) which has dark, almost black, feet and legs, and a black mane.

According to Cuvier's plate, the Common Wolf sometimes carries on its brown body a long oblong saddle-cloth which is almost black. This black cloth extends to the root of the tail, and the whole of the latter is of a darker tint than the body.

The Fox, as everybody knows, has a white tip to its tail, in front of which the bushy fur is darker than in other parts. It has also a white throat and white chaps.

THE CHEEK PATCHES (NILGHAU).

The Nilghau, as shown in the Knowsley Collection, has white patches on its cheeks very well marked. It has also patches under its throat and on its ears, also between the hoof and the fetlock. In the latter place in association with black patches, and the same also on its ears. It has some streaks of black running down the fore limbs. The condition of its feet showing alternating bands of black and white over the fetlocks is very peculiar.

In the *Bubale acronotus* or *Bontybock damalis* two young animals are shown which differ a good deal from the adult, not showing the long black streaks running down the fronts of the fore limbs which are conspicuous in the adult, whilst one of them has markings on the face which are not present in the adult.

THE PORCUPINE.

The *Cephalophus punctulatus* has a broad white patch over the Porcupine region, being of a dark grey elsewhere, and not otherwise punctate.

THE CHEEK SPOTS.

The cheek patch is shown in several of the Antelopes in Slater and Thomas's work. The Decula, the Harness Antelope, and others have it. In the latter it is represented in a young fawn, and similar groups of spots are seen over the haunch. The manner in which the spots may be produced by the breaking up of a narrow band is very well illustrated.

THE ORYX.

The *Oryx Beisa*, young female, an adult, is figured in Zool. 'Transactions,' 1881, p. 626.

THE CHEEK MARKINGS.

The Raton has a banded body and tail of grey-brown with a white face, upon the cheeks of which, surrounding the eye, a deep brown band like that in the Badger is present, but passing lower down and not including the ear.

Many animals have a rim surrounding the eyes of fur darker coloured than the rest of the face, but in many others this part is whiter than the rest.

FACE MARKING ON LAMBS.

During the spring of 1910 I had an opportunity of observing from their birth a flock of seventy Southdown Lambs as they were dropped in succession. The parents were well bred; their

mothers much alike, and the father one and the same. All had the buff-brown face peculiar to the Southdown, and the brown legs, but they varied a little as to depth of tint. The Lambs showed marked differences one from another. These were clearly noticeable on their faces, and were best seen about the end of the first week, from which time they became gradually less distinct.

The cheek patches of white were visible as three distinct ones in many, but in not a few were merged in a single one. Crescentic patches curving round the inner canthus were defined in many, but in many these patches, those of *Xanthelasma*, were extended into a somewhat indefinite circle surrounding the eye. In a few, rather obscure white bars crossed the root of the nose.

THE LEMURS.

A Madagascar Lemur, which has been named *Prosimia rufipes*, has been described and figured by Dr. Gray in the Zoological 'Proceedings,' 1872. It shows the whole body and limbs in two specimens, a male and female, of a reddish brown tint everywhere brindled with black. The under throat is white, but with streaks. The tails, fairly bushy, show no rings.

Other Lemurs, figured in the same journal under the name *Cheirogaleus typicus*, show very similar coloration. In all a broad circle of deeper colour surrounds the eye, and gives the animal the appearance of wearing clumsy spectacles.

The Red Lemur figured by Cuvier has a red body and limbs, but a black tail, face, hands, and feet. Its feet show a remarkable crescentic band of white crossing the dorsum just below the knuckles. (*Lemur ruba*, Cuvier.)

A Monkey figured by Cuvier shows the whole of its back of a brown tint with stripes, while its fore quarters, shoulders, and neck are blue-black, as well as its hinder extremities. (*Midas ursulus*.)

LEMURS AND FACE MARKINGS.

Several Lemurs show a vertical band of white from the upper part of the forehead to the nose, leaving the cheeks with the parts surrounding the eyes of a dark tint.

LEMURS OFTEN BRINDLED.

The Lemurs are very frequently characterized by brindled bodies, and tails not showing abruptly margined streaks or spots. The under surface, both of throat and belly, is usually of paler tint, or possibly white, and this frequently includes the chin and cheeks up to the ears.

RATS AND MICE.

The Rat tribe shows for the most part greyish or brownish colours of the face, back, and limbs, with tails almost bare and not tufted. In all the belly is white, and in many the feet are bare.

The Lemming is patched on its back and sides with large areas of black, as is the top of its head, the rest being of a yellow-brown. One patch of black descends on to its shoulder; the tip of its short tail is white.

The Lerot or Loir (*Myoxus nitela*) is very definitely coloured. The Badger triangle is quite black, and, extending backwards, includes the base of the ear and adjacent parts of the neck. It has abroad horsecloth which covers the whole of its back and root of tail, and is of a grey-brown tint. With the exception of its root the tail on its upper surface is black, while its tip is snowy white, as is its belly.

Why is the belly in almost all animals white? Protective coloration cannot be suggested. It may be supposed that in most cases white or absence of pigment is the primary condition, and that all pigmented states are additions.

GUINEA-PIGS.

The *Cavia capivara* is an animal of uniform deep grey colour, with slate-grey extremities, ears, and nose.

Guinea-Pigs appear to be especially liable in domestication to vary their colours. Most of them may probably be described as piebald, with its associated condition of tortoiseshell, but they easily become white, black, or albino. The parent type of the Guinea-Pig is supposed by Cuvier to be l'Arpérée, but this is doubtful. This animal is of uniform brown tint, with the exception of white rings round the eyes and round the ears.

HAMSTER.

The Otomys of the Cape is much like a Rat.

The Hamster is of yellowish brown tint, which is darkest on its back, belly, and throat. On the sides of its shoulders and face there are abrupt mapped patches of white. The Badger patch is of irregular form, and covers the whole of the eye, but not the adjacent part of the neck. It is of interest in connection with the *Leucoderma colli*. The lower part of the throat, including the fronts of the shoulders, is black. The tip of the tail is white.

MOLE-RATS (RODENTS).

The Mole-Rats (*Spalax*) are remarkable for the closure of the skin of the eyelids over the eye, and for an irregular patch of white or light colour, extending forwards over the cheek.

The *Bathyergus* or Strand-Mole much resembles the *Spalax* in these peculiarities.

The Geomys ("pouched Rats") or *Mus versarius*, North America, shows the side of its neck and front of shoulder banded with black, whilst the rest of its body and limbs are of nearly uniform brown. Compare with *Leucoderma colli*.

SERVAL AND LYNX.

The Serval (*Felis Serval*) shows mixed streaks and spots. Its tail is conspicuously ringed, and so are its lower extremities. The whole of the shoulder region and neck are spotted. Its throat and the inner sides of its limbs have a white ground, but with some black streaks and spots.

The Lynx has a reddish body, with a white belly and white throat. It is spotted over with black blotches, which are most numerous and most conspicuous on its shoulders and lower part of neck and on its hips. Its tail is short and not bushy, but an inch or more at its end is black. The tips of its ears are black, and the arrangement of the Badger triangle on its face is somewhat exceptional, a feature which is also conspicuous in the *Felis jagua rondi*.

The Gueppard (Cuvier, *Felis guttata*) is, as its name implies, spotted. It is covered almost all over with small black spots, which show in the figure no special arrangement. Its tail is ringed with thick black hairs for an inch or more at its end. The animal has a white throat, and its hands and feet show no spots, although its legs are spotted low down.

THE MONKEYS.

The *Ateles (melanochirus or variegatus)* has, like many other Monkeys, naked and black face, feet, and hands. The terminal two-thirds of its tail is comparatively destitute of hair, and also black. A peculiarity in its face is that there is a whitish patch in the middle of its forehead resembling that in what I have described as "piebald" human subjects.

This animal should be examined in some other portrait if possible, but I do not know where it is figured. There is some appearance of another white patch on each side of the forehead.

An allied animal is described under the name of *Pithesia leucocephala*, on which is described a narrow black line which parts the middle of its yellow forehead. In the figure given, however, as I have stated, there are narrow white patches on a white forehead (Zoological Society's 'Transactions,' 1871.)

A snow-white American Monkey (*A. mico*) is figured in Zool. Soc. Trans. 1868, p. 256. Its face, hands, and feet are free from hair and of flesh tint, but its whole head and forehead, as low as the eyebrows, are well covered with an even and thick coat of silky, pure white hair, which extends downward between ear and cheeks as low whiskers. Its long and tapering tail is thinly covered with short rigid hairs very different from those of its trunk.

BIETT'S BANDS.

A Zanzibar Monkey (*Colobus Kirkii*) has a red-brown back, with broad streaks of black from shoulder to hand on upper

limbs and also outer aspect on thighs. Its chest, belly, and upper part of face (a rim) are white. Wide streaks of white pass down the inner aspects of limbs, like very broad Biett's bands. They end at the wrists and ankles, whilst both feet and hands are black. The crown of the head, the rump, and the whole of a long tapering tail are red-brown. A white patch is represented on the nose. (See plate, Zoological Society's 'Transactions,' 1868, p. 180.) The face appears hairless and almost black.

In the *Ateles vellerosus* there are very broad white streaks (Biett's bands) down the inner sides of the arms, whilst the backs of these extremities are of dark brown, almost black, and the hands are slaty black. The white band on the inner arm ends abruptly at the front of the wrist. There is a similar yet broader band of white on the inner side of the thigh, which again ends abruptly, just above the inner malleolus. This portrait might be copied to illustrate Biett's bands.

THE NOSE AND TAIL IN MONKEYS.

The *Ateles cucullatus* is a long-limbed, spider-like Monkey, whose skin presents scarcely any trace of pattern, but is of an olive-brown tint. Its hair is deficient in the middle of the back and along the upper surface of its tail, but hangs in mane-like fringes from its neck and sides of trunk and along the under surface of its tail. The terminal third or half of its tail appears to be almost destitute of hair and flesh-coloured. Its feet and hands are also destitute of hair, and of inky black tint. Its face is bare and is almost covered by the long mane which hangs from its scalp and neck.

An American Monkey (*Pithecia albinaria*) is uniformly of dark tint approaching black, but has a pear-shaped patch of carmine red, the base of which includes the whole end of the nose. It narrows into a stalk which passes between the eyes to base of forehead. At the very end of nose, in the middle of the patch of carmine, is a small white patch from which its name has been given. (Zoological Society 'Transactions,' 1881, p. 256.)

SEASONAL CHANGES.

The following two specimens are preserved with others in my Haslemere Museum:—

An Ermine, in early winter coat, was bought for me at Sir Archibald Macdonald's sale at Woolmer Lodge. The animal is mounted alone without accessories, with its mouth open and back curved. It is wholly white (with a faint yellowish tinge) in all parts except the following:—The back of its head and the back of its neck passing on to its shoulders are still brown. A brown ring passes under its eye, whilst the lower parts of its cheeks are white. Over on the root of the nose and extending up between its eyes the brown is mottled with white. A noteworthy feature

is the presence of a brown patch, ill-defined, on its rump, just over the root of its tail. The purest white occurs about the lower part of the face and upper part of throat. The arrangement of the dark colour in narrow bands surrounding the eyes reminds one of the permanent colour of these parts in the Badger.

A Stoat in full Ermine dress, mounted in a case with two young silver-grey Rabbits, illustrates the persistence of a narrow brown ring surrounding the eyes, whilst the rest of the animal's face down to the tip of the nose is white. In this specimen no brown is seen on the rump. The general colour is a dead white, with a very slight tinge of yellow.

The change of coat in the Common Mole is shown in a figure in the 'Living Animals of the World,' but it is somewhat indistinct and difficult of interpretation.

A great many animals have the under surface of much lighter colour than the back, but in a few, as in the Badger, this is reversed. It is obvious that a darker-coloured back in an inhabitant of the temperate regions is an advantage if the animal desires to be warmed by limited sunshine.

It is therefore prejudicial when there is cold and no sun, but if sun be present it is helpful, although the air may be very cold. In tropical climates it is always oppressive if the animal be exposed to the sun.

White tends to prevent the escape of warmth from the animal, and at the same time hinders the reception of warmth from the surrounding air. Thus it may be thought to be of use in cold and sunless conditions by preventing the escape of animal heat, and again useful, when the exposure to heat is too great, in preventing its absorption. Black, on the contrary, economizes what heat is present in the surroundings and may be absorbed, whilst it also favours the escape of warmth from the animal's body.

THE SLOTH-BEAR.

The Sloth-Bear (a Bear and no relation to the Sloth) is remarkable for the development of its under-throat markings. It has a broad collar of white, a little above the top of the sternum, which branches upwards and outwards. Above this, similar in form but merely narrow streaks, are two other bands which are connected in their apices by a longitudinal one. The broad, lower collar occurs both in the Himalayan Bear and the Malayan, in which animals, however, the narrow streak is not shown. What is known as the "parti-coloured Bear," one of the many peculiar animals found in Tibet, has very exceptional markings. Its general colour is white, but with black ears and black rings round its eyes. Over its shoulders there is a black band like that of the ass, but broader. This band is narrowest on the spine, and increasing in width downwards is continuous with the lower part of the shoulder and the rest of the lower extremity, these latter

parts being black. The adjective *melanoleucus* has been applied to this animal on account of the strong contrast between the black and the white parts. Mr. Lydeker well remarks that it is difficult to assign any explanation for this remarkable contrast of colour. It is not a piebald animal, having neither spots nor patches and being bilaterally symmetrical.

THE BEAR AND LUNATE PATCHES.

Ursus nasutus, a black Bear from South America, has a pale brown nose and chin, with an indistinct pale band passing from chin to mid chest, where there is a small isolated and conspicuous white crescent. ('Transactions,' Zoological Society, 1868.)

The White Bear is wholly white, without any blotches of colour anywhere. Its whiteness, however, is of a yellowish tint, and sometimes so much shaded with brown that the whalers speak of the animal as the "brownie." The eye is in no way protected by colour. In some Brown bears the snout and lower part of the face, including the eye, are white.

THE COMMON HARE.

In the common Hare the Badger triangle is incomplete, and consists of a patch on the side of the back head, a ring round the eye, and a patch on the side of the nose, all of which are white.

THE SQUIRREL.

The English Squirrel, the common European Squirrel (*Sciurus vulgaris*), is represented in winter peltage as slate grey, with the exception of its hands, feet, ears, and tail. The tail which is bushy has a black tip, and shows, obscurely, bands of black and buff, whilst the root of the tail, like the haunches, is slate grey.

THE SKUNK.

The Skunk (*Mephitis putorius* of Cuvier) has the front half of its back white, and the hinder half black, with side tufts of white. Its bushy tail is black, with the exception of the tip which is white. Its face is black, with a conspicuous central star on its forehead.

THE RATEL.

The Ratel is very conspicuously coloured. It carries a saddle-cloth of snowy white from the top of its forehead almost to the root of its tail. This cloth is abruptly margined and ends in a line drawn along the middle of its side. The lower half of its body is brown almost to blackness.

THE TELAGON.

The Telagon (*Midas telagon* of Cuvier), like the Ratel, has a white back, but its white saddle-cloth is narrow and does not pass more than a quarter down its side. It has a short and white

tail, whilst the Ratel has a longer one, white only at its root and tufted with black at the end.

THE XANTHELASMA PATCH.

The animal sketched for me by Mr. Burgess to show the xanthelasma patches around the eyes is named the Eye-browed Brocket (*Coassus superciliaris*). In one, the white patch is over the inner canthus only, and in the other it occurs both above and below both canthi.

THE CIVET.

The Civet and the Jenet are figured with Leopard-like coats and banded tails. The spots on the trunk do not extend on to the extremities, which from shoulder and hip, downwards, are of dark tint. The tail in both is ringed with black.

THE CAT.

The common Cat usually has a black tip to its bushy tail, rings on the rest of the tail, and stripes arranged in patterns over its whole body.

THE HYÆNA.

Of the Hyænas, one, the *Hyæna crocata*, is spotted, and its spots extend on its limbs as low as the hand and foot. The hands and feet themselves are of a uniform dark tint. The tail appears to be black with white patches. The Protale de Lalande (*Proteles lalandi*) a Hyæna-looking animal, has a few broad, conspicuous streaks down its sides, but no spots. A few smaller streaks, very conspicuous, cross the fronts of its fore legs above the carpus. Its tail is somewhat bushy, obscurely ringed, and has a black tip.

THE PERUVIAN TAPIR (*Tapirus Peruvianus*).

The portrait of this animal in Zoological 'Proceedings' for 1872 shows an olive brown skin streaked and spotted with white. Five streaks are fairly regular along its back and sides, and extend to the root of its short tail. They are broken in many places into spots. These spots on its extremities are arranged in rings and pass down as low as the hoofs.

THE MARMOSETTE WITH FOREHEAD PATCH.

Geoffrey's Marmosette (*A. midas*, from Colon) is figured in Plate 38 of the Zoological Society's 'Proceedings' with a coloured portrait.

Its coloration is remarkably like the Lemur's in the brindled pattern of its back and its black face. Its tail in the lower two-thirds shows only short and scanty hair, and its hands and feet are pale and hairless. Its most noteworthy feature is a conspicuous patch of snow-white hair on the crown of its head,

having its apex on the root of the nose, and corresponding with a broad arrow on the Horse's face.

THE ANT-EATER.

A Tamandas Ant-eater, from the vicinity of Santa Marta, is the subject of a good illustration in Plate 43, p. 516, of the Zoological Society's 'Transactions,' 1871. Its peculiarities are a *white* dorsal streak which runs to the root of the tail, and which is continued over the root of the tail for a third of its length. The distal two-thirds of the tail are comparatively hairless, and it is tapered at the tip and of dark colour. The animal wears a black saddle, with flaps passing down to the abdomen, and with broadish bands passing over the top of the shoulder to meet under the top of the sternum. Its hind and four quarters are white, including feet and hands, as are also its neck and face. The nose, like the lower two-thirds of the tail, is slaty black.

As an example of a dorsal saddle of deep colour, quite distinct from the haunch and shoulder, this is a very remarkable illustration, and is worth copying.

THE NYCTIPITHECUS.

Nyctipithecus rufipes.—This animal is of a grey colour over the whole of its body, but of a yellowish brown on the extremities. On the hands this tint begins at the wrists, and on the legs at the keel. There is a light brown streak on the whole of its belly, and, beginning at the tail a little below its root, it extends over its whole length, being very dark on its upper surface. The tail is long and bushy towards its extremity. Dark circles surround its eyes and the end of its nose, as well as its ears. The contrast between its body and its extremities is very striking. (See Zoological Society's 'Proceedings,' 1872.)

THE ELAND IN KNOWSLEY COLLECTION.

The portraits given in the Knowsley series as the *Orias Derbianus*, an Eland, show a number of narrow white ribs—fourteen or fifteen—which cross the trunk and the haunches, running downwards from a black dorsal line. On the front of the shoulders there is a broad white line, which meets its fellow on the middle of the chest. The tail is peculiar, being almost bare in its length, but at its tip divided into two side tufts. A line of white runs from the armpit to the false hoof—a Bielt's band. A little above the wrist, crossing this band, is an isolated black patch which does not become a ring. A narrow rim of black extends from the false hoof to the true hoof, which latter it surrounds. There is a patch covered with stout hair over the withers, which might be held to correspond with the scar-patch on the Sloth.

Mr. Burgess has copied for me, from Plate 34 of the Knowsley collection, portraits of the adult and young animal of the *Moschus*,

which is remarkable for showing lines of white spots arranged in figures on the sides of trunk and the haunches. Two parallel lines cross the back a little above the haunches. The white bars on the throat are very strongly developed, more especially in the young animal. The abdominal band begins at the lower lip and ends at the tip of the tail. From the side of this, at the throat, broadish bands extend downwards and outwards, of which three or four may be somewhat indefinitely defined.

THE ANTELOPES.

The Nilghau.—This animal shows the side spots very well, both in the adult and in the calf. It also shows streaks running vertically down the limbs, some of them black. There are broad bars of white in front of the hocks, and rings of white separated by rings of black just above the hoofs. Mr. Burgess's portrait is not quite accurate. In the calf, streaks of black on the fore limbs are especially marked.

In many Antelopes that are almost one-coloured the face shows a longitudinal black streak from the nose to the roots of the horns. This streak varies in width at different parts, but is normally widest between the eyes.

THE ZEBRA AND QUAGGA.

Prof. William Ridgway, in the 'Proceedings' of the Zoological Society for 1909, has carefully compared the specimens in various museums known as "Quaggas," of which animal there are several local varieties. All differ in greater or less degree from the Zebra in losing the stripes on the hind quarters and on all four lower extremities. The stripes persist on the face, neck, and shoulders, becoming less and less distinct as we pass backwards from the mid trunk. The belly and lowest parts of limbs are always white, and in some instances the white of the belly extends half-way up the side, leaving only a long saddle-cloth over the animal's back.

Some observers have recognized many species of the Zebra and Quagga, and there is no doubt that these animals are liable to considerable variations. Mere varieties are not, however, to be admitted as species. Of the Zebra, three are now accepted: the Mountain Zebra, Grey's Zebra, and Burchell's Zebra. The last mentioned comes nearest to Quagga. (I possess a Quagga's skin but, unfortunately, do not know its history.)

THE SHOULDER STREAK OF THE ASS.

The Knowsley Collection contains some good portraits of hybrids. Several of them show streaks down the shoulders like those of the Ass, excepting that there is more than one. On the hind quarters in some there are indefinite streaks and even spots, and nothing approaching to the regularity of the

Zebra. Burchell's Zebra, according to these plates, had no bars on the lower extremities, which were white like those of the Quagga. None of the Zebras, Asses, or Hybrids, with one exception, have white noses, and there is no instance of a white star on the forehead. An ill-defined brownish streak passes down the middle of the forehead in almost all.

BACK OF EAR.

There is a conspicuous white spot on back of Jaguar's ears.

NOTT'S PHOTOGRAPHS.

Nott in his beautiful photographs gives one of the Tapir, which appears to show ill-margined patches of white on the back of its neck and shoulders, also a white nose and patches of white above its feet; possibly some white spots down the length of its back.

Piebald Elephants.—One of Nott's photographs shows an Elephant with ill-defined, large patches of light-coloured skin on its face, lower extremities, side, and haunches.

Nott's photograph of a two-horned Rhinoceros in the Zoo shows four blotches of white in a group over the shoulder, and another group over the haunch. It may be, however, that the shadows are defective, for the two horns appear to be light-coloured.

THE FOREHEAD AND EXTREMITIES.

The topping or top-knot is a term applicable to a tuft of hair or feathers produced on the top of the animal's head, and when developed in any remarkable degree is generally due to selection in breeding. Toppings are often seen in horses, sheep, and oxen. The hair is almost always of the same colour on the tip of the tail and the end of the nose.

As a rule, the skin of the eyelids is thin and hairless, and very often of a dark colour.

Not many animals show anything very definite in the shape of eyebrows.

The palms of the hands and soles of the feet are in many animals of a dark colour, and not infrequently leather-like, resembling black kid, and quite hairless. The backs of the digits may grow hair down to the roots of the nails, but very frequently the whole, both of the manus and pes, both above and below is quite destitute of hair.

THE ANTELOPES.

The Bubal (Hartebeest) is remarkable for a long horse face and very high forehead, almost a hump-back, no obvious streak

down the back, but a very remarkable tail. On the lower third of the tail, on the dorsal surface only, is a long tuft of coarse black hair, whilst the under surface of the tail is quite bare, and so also is the extreme tip. It is incorrectly described as "tail black on the terminal tuft only," for there is no terminal tuft, strictly speaking, but a dorsal growth of hair on the terminal third. The tail should be copied for an illustration. The animal is of uniform colour, pale rufous or fawn, entirely without darker patches on forehead, chin, or limbs. We have no note as to the coloration of the calf.

These peculiarities do not apply strictly to the representations given in the Knowsley Collection, in which a calf is represented with a dorsal streak of black over the withers.

The Bubal is a form of the Hartebeest. In Swayne's Hartebeest exactly the same condition of tail is represented, that is, the growth of black hair is on the dorsal surface of the tip only; but in this animal the fore legs have white stockings above the knees, whilst the upper part of the leg is black.

In Hunter's Antelope, allied to the Hartebeest, the under surface of the tail grows hair plentifully, which is white. The dorsal surface has a narrow streak of black, but is erroneously described in the text as being wholly white. This animal has a narrow line of white between its eyes, crossing its forehead. It has no white stockings, but a bar of white, ill-defined, crosses from its chest downwards to the white under surface of the tail. In Lichtenstein's Hartebeest there is the same condition of tail, a black crest, coarse hair on the lower half, no white underneath.

In the Cape Hartebeest the coloration is very peculiar: coal-black patches on the fronts of the shoulders pass down in a narrow bar to the foot, and others down the forehead with the white bar between the eyes. On the back of the ham, as low as the hock, a coal-black patch extends upwards to a snow-white patch over the rump, and on the whole length of the tail a dorsal bar is quite black, whilst the under surface is white, but without long hairs. Although the portraits of the different species of Hartebeest vary among themselves very definitely, and in some respects have suffered from inexactitude on the part of the artist, it is clear that they all have a peculiar feature in the growth on the dorsal surface of the tail of a black crest. It is sometimes a very narrow one, and is obscured by abundant growth on the under surface of white; but more usually the white is absent, and the crest, well developed, is only observable. It is the same on the face; in several species a broad black streak passes from forehead to nose, whilst in others this part is white. One species is named *Bubalis albifrons*.

THE DORSAL STREAK IN JAPANESE CHILDREN.

It is reported (Dr. Grimm) that pale blue patches are observable in the dorsal aspect of Japanese children.

Dr. Grimm states that "these pale blue patches resembling faded tattoo marks are most frequently observed in the sacral region. They make their first appearance during the fourth month of intra-uterine life, and disappear between the fifth and tenth year; very seldom do they persist longer." The pigment is contained in the *pars reticularis*. The *pars papillaris* and the appendages, hairs, &c., are relatively free from pigment.

We may remember that the Ainos, the aborigines of Japan, are a hairy race. The present "Japanese" have received a large infusion of Ainos blood.

SEASONAL COLORATION.

It is expressly stated in the 'Royal Natural History' that none of the Martens or Polecats have a winter coat markedly different in colour from that which they wear in summer.

The principal animals which change to white in winter are the Arctic Fox, Hudson's Bay Lemming, American Hare, Ermine (or Stoat), and some Weasels.

The change of colour is more rapid in some animals than it is in others. Sir John Ross found the change to take place in a week in a Lemming.

According to Mr. Welch's observations on *Lepus americanus*, the change in the summer coat takes place without the hair being shed; there is a new growth of white hair which is thicker than the summer coat, and the coloured hairs change their colour and become blanched. The blanching commences at the tip, and does not always involve the entire shaft. The entire change takes three months, beginning early in October.

It is thought that change of temperature produces the change in the hair. Sir John Ross's experiment upon a Lemming seems to prove this. But not all Polar animals become white at the approach of winter.

It is also thought that the change has been brought about by natural selection, the white coat being useful for concealment. This view is supported by the fact that the Sable, Musk-Ox, and the Raven retain their summer colouring in winter. On the other hand, it is stated that both White and Blue Foxes are met with in the winter, and Professor Semper has pointed out that if the change of coloration in Arctic animals is due to natural selection, then the intermediate stages must be useless, for a piebald creature would be just as conspicuous as a black one.

Beddard writes: "It is difficult to avoid the conclusion that the depigmentation of the hair is directly due to cold, or dryness, or whatever the true *environmental* cause may be."

Animals which inhabit more temperate climates have a winter and a summer dress, *e.g.*, the Manchurian Deer has a summer dress of yellowish brown with white spots, while the winter dress

is much darker, and the white spots are barely visible, excepting on the back just above the shoulders.

In many birds there is a more or less marked difference in the summer and winter plumage.

The Grey Phalarope is brown in summer, but grey and white in winter. The Snow Bunting is remarkable in that it is whiter in summer than in winter.

WAISTBAND LIMITATIONS (EQUATORIAL).

There is a peculiar arrangement in certain animals, in which the front half of the body presents remarkable differences from the hinder half, the line of division passing in a ring round the middle of the trunk. This is well seen in the Viscacha of La Plata. Here the head and shoulders are ringed with white, whilst the hinder half of the body in the figures before me show no markings at all.

The words "hemiplegia" and "paraplegia" are used in reference to paralysis, to indicate limitation of the paralysis to a lateral failure or a transverse one, respectively, but I do not know of equivalent expressions which would denote distribution of colour. "Equatorial" is perhaps the best.

THE FEET IN MARSUPIALS.

Several of the Australian marsupials have naked feet, pale flesh-coloured but not hairy. The Wombat, however, is uniformly of dark smoky tint, nearest to black, on its face and feet. The Koala is of a darkish brown, except its throat and belly, which are white. Its face shows an exceptional condition of the Badger ellipse. In most of the Kangaroos the hands and feet are represented as black, and in some the haunches are of a paler tint than the rest of the body.

THE DORSAL STREAK.

Of the Squirrels the *Tamias striatus* shows very interesting coloration. A narrow black band runs along the mid-spine, and below this, at a distance of perhaps one and a half inches, there is a narrow white band on each side, bordered with black. Below this white streak the sides of the body, the shoulders, and the haunches are of a yellow-brown tint, and this tint includes the root of the tail, the rest of the tail being of slate-grey, like the animal's back and the top of its head. The Badger triangle is buff-coloured, surrounding the eye and passing down to the nostril. The belly is wholly white.

THE MARSUPIALS.

For the study of types of coloration the marsupials are of great interest, as showing some of the more primitive forms in mammals,

and next to them come the Lemurs. The latter present especially strange patterns.

A SPOTTED DASYURE.

Amongst marsupials, the *Dasyurus mauvei*, figured by Cuvier, a mouse-like animal with a tapering and pointed tail, has the whole of its back and upper parts of sides spotted over with perfectly round spots of white. They are of considerable size, but nowhere coalesce. It is in strong contrast with the *Perameles nasutus*, which has its back covered with bars of black, and a tuft at the end of its tail. The Dasyures remind one of the *Leucoderma colli*, and the face, feet, and legs are of pale colour, but without any spots.

THE EYE CIRCLE.

Amongst separate regions we must put that of the circle around the eye. In many cases it is merely a rim. It may vary in colour, and although usually darker than what surrounds it, may often be lighter, and very infrequently white.

In some these circles almost touch over the bridge of the nose, as in many Baboons, making the animal look as if he were wearing clumsy round spectacles.

COLOUR IN HORSES.

I am told that *chestnut* horses are often "delicate," but my informant could not specify any special disease.

Chestnuts also often have long white stockings.

Black horses are said to have softer hair than others, and to be more liable to saddle-sores.

Bay horses but rarely have long white stockings.

SINISTRAL HORSES (LEFT-FOOTED).

Some horses canter on the wrong side or with the wrong foot. Are they left-handed (sinistral)? The frontal star should be noted, whether symmetrical or not; also whether white stockings are present and placed as usual.

Is the mode of stepping hereditary? Is it marked in any other step than that of cantering?

AN ALBINO SNAIL.

It is recorded that Mr. L. E. Adams exhibited before the Conchological Society, on September 19th, 1896, at the annual meeting held at the Manchester Museum, Owens College, "a remarkable form of *Helix aspersa*. The animal was a true albino, white with pink eyes, shell unusually dark, from Northampton."

A WHITE FOX.

A white Fox, killed in Somerset in 1886, was "nearly all white, the only fox-colour being the back part of the ears, a patch on

the top of the back just behind the shoulders, and a large streak on the upper part of the brush. The eyes were of the normal colour."—'Zoologist,' 1886.

THE ASS AND ITS CROSS.

The kid-leather patch in some foreign Asses is placed high up on the fore leg, almost close to the chest.

Asses show only indistinct markings on the forehead, and none which approach at all closely to the stars on the forehead of the Horse. Nor do they wear white stockings. But on their legs the tints gradually shade off to a lighter tint to the hoof. Their tails may show bands of strong hair on one side only, but more usually rounded.

THE CHESTNUTS IN THE ZEBRA.

Burchell's Zebra, like the Ass, and unlike the Horse, has its chestnuts only on the fore legs. They are higher up than those of the Horse, more of the kid-leather type, but neither so high up nor so soft as those of the English Horse.

THE QUAGGA AND ZEBRA.

In the Quagga the hind-quarters usually escape stripes, and all four legs are also free from them, the tint becoming paler and paler as the hoof is approached.

In Burchell's Zebra the legs but rarely show stripes, nor do the hinder parts of the hind-quarters.

In several representatives of the Ass tribe there is little or no trace of the shoulder cross-band, although the back streak may be broad and very conspicuous, and, running from forehead to tip of tail, it is seldom attended by any appearance of ribbing down the sides.

THE ANTELOPES.

The coloration of the neck and face of the Derbian Eland (*Orias Derbianus*) is a remarkable example of a collar round the neck. This collar is white, and passes from the middle of the mane to the centre of the chest. In front of it the neck is jet-black from the shoulders to a level with the ears, whilst the entire face up to the front of the ears appears to be bare of hair. The narrow bands of white which pass almost vertically down its sides are fifteen or sixteen in number from its rump to its withers. Its neck, from its white shoulder-collar to its pale face, looks as if it were wearing a thick black astrachan collar.

The *Tragelaphus* family of Antelopes includes the Nilgai, the Harness Antelope, the Kudu, the Eland, and many others, and presents many modifications of coloration, but all on the same

plan. In the Harness Antelope there are longitudinal and vertical stripes, which not infrequently break up into spots. Under the throat and crossing the upper parts of the limbs there are many broad streaks of abruptly differentiated colour, light or dark. The presence of longitudinal streaks running down the limbs is frequent. The illustration given by Slater and Thomas of the Demlar Antelope well shows these points, and amongst its congeners there are those which show most instructive variations which serve as connecting-links, and which demonstrate the manner in which the very peculiar markings have been developed.

The Nilgai Antelope (*Boselaphus tragocamellus*) has the peculiarity of a throat tuft of black hair beneath a broad band of white. It has a conspicuous black bar, narrow, growing strong hair, passing the whole length of its back and the upper surface of its tail. The under surface of the latter is, like its belly, snow-white. Its adult colour is bluish-black and not conspicuously either streaked or spotted, but some small white spots occur on its cheeks and in its ears.

The Gemsbock (*Oryx gazella*) has somewhat exceptional coloration. It has four long white stockings, but with narrow bars down the fronts of the lowest parts of these limbs. Its neck, shoulders, barrel, and haunches are, with exceptions to be named, of uniform grey colour, without either streaks or patches. Its face, including its nose and ears, is with certain streaks snow-white, but a narrow badger line crosses from below the base of the horn under the eye to the throat below the muzzle. With this exception the whole cheek region is snow-white. Between cheek and lower throat there is a bar of black from below the ear to the throat part of the belly streak. The latter is narrow, conspicuously black, and grows a black tuft in mid-throat, like that of the Nilgai. Its black belly streak bifurcates under the chest, and its divisions join by a narrow band with broad black patches around its thighs. On the top of its rump there is a large black patch, which extends from the middle line, with a point over its upper third, till it almost meets the black patch which, by another sharp point, slopes upwards from that already mentioned as encircling the thigh. Its tail is black, at any rate on its upper surface.

The Sable Antelope (*Hippotragus niger*) presents very marked differences in its youth. A young animal is depicted in the "Book of Antelopes" with its mother. It is of a yellow buff colour, and shows black only along its dorsal line and the tip of its tail. The dorsal streak grows a narrow band of stiff hair, which in the adult animal is developed into a definite mane over the shoulders and neck. The badger ellipse of darker-coloured skin surrounding the eye is quite definite in both.

The Gambian Shore Antelope (*Hippotragus equinus gambianus*)

shows conditions of coloration very similar to those of *niger*, but has, in addition, tufts of black at the extremity of its ears and a throat rough, as well as a mane. Both these cognate animals show narrow black streaks down their limbs very comparable to those of the papillary ichthyosis in bands. These streaks run down the fronts of the fore limbs, and are obscurely marked on both sides of the hinder limbs between the hock and the carpus. They are especially well-marked in the young calf.

In the Roan Antelope (not Gambian) the limitations of white and black on the face are very conspicuous, and look as if the animal wore a mask. It is to be noted that the nose is pure white, whilst the dorsal ridge of the tail and its tip are quite black. It also shows the lengthwise streaks on its limbs.

Another of the *Hippotragus* family, the Blue Buck, shows the streaks on its limbs more conspicuously, since the contrast of colour is more marked.

In near alliance with the *Hippotragus* we have the Addax, which has earned the appellation of *nasomaculatus*, and which presents very marked peculiarities of coloration. It is not piebald, but the boundaries of the parts which are snow-white and those which are brown are very abrupt. The latter include the neck, shoulders, and body as far as the haunches. The belly is white, as well as the fore limbs from the elbows downwards. Although the extremities are snow-white, they, like those of its relatives, show the narrow streaks of brown which pass from the hocks downwards.

In the portrait given by Slater and Thomas, the tail on both its aspects appears to be snow-white, and the tip almost wholly so. The transverse bar of white which crosses its forehead is interrupted by a very narrow band, which joins its coloured brown nose with a strongly marked black crest above it.

The Oryx, or Tufted Beisa, is a closely allied animal, and shows very interesting similar conditions. The area of brown is much larger than in the Addax, and includes the whole haunch and the whole tail, the latter being quite black. The face shows the vertical line of black connecting the forehead tuft with the nasal patch very definitely, although exceedingly narrow. This animal has its under throat line of black, which bifurcates along the belly. It has bracelets of jet-black above its wrists (fore-knees), below which it wears long white stockings.

THE BANDED DEER (*Cephalophus doriae*).

The Banded Duiker is, as its name implies, a conspicuous example of coloured bands. They occur only on the hinder half of the body, none being seen on the fore shoulders or neck.

There are no streaks on the limbs of this animal, but above

its hoofs there are short stockings, perhaps three inches long, which are jet black.

DAMALIS CAPENSIS.

The *Damalis capensis* (*Strepsiceros*) is a good example of vertical streaks on the barrel and buttocks without any on the fore-quarters.

It has, however, on its face the eye-to-eye spectacle-band of white which curves strongly downwards instead of being transverse. Above this band and between the ears, placed on a patch of darker skin, there is an arrangement of white streaks resembling those on the piebald negro.

In the *Damalis* the lower extremities are of a very pale brown, the hoofs are black, and a black line extends from the true to the false hoof across the back of the terminal joints. This is of great interest with reference to some of my portraits showing "Bielt's bands."

THE EQUATORIAL ARRANGEMENT.

The *Kobus illipsi-peregrinus* has a drooping mane which surrounds its whole neck from the back of its ears to its shoulders. It has a greyish body and limbs to the level of its knees and hocks, below which all the limbs are of a rich brown.

The *Bubalis lunata* in Dr. Smith's portrait has a light-brown ground colour, but with a streak of black on the forehead. It has other streaks down the outside of its shoulders like those in the ass's cross, and others on a corresponding level from the flanks to the hocks. Below these latter the legs are dark brown. The markings on the forehead are of much interest in contrast with the star so common in the horse and other animals. A broad band, almost black, extends from between the horns down to the nose. This band is broadest between the eyes, and in the middle of this broad part displays a white star, not abruptly margined. Above this star is an isthmus of black, and there occurs, almost on a level with the horns, another blotch of white, thus reminding one of the star seen in some portraits of piebald human beings, and seen in the "spectacle-frames" of many animals.

THE PANGOLIN.

In the Pangolin the whole skin, with the exception of the lower part of the face, is covered with scales like those of a fire cone, and all of much the same colour. Between these scales a small number of hairs are produced, but they do not come into view. The lower half of the face just including the eye is covered with grey hairs. On the back to the tip of the tail the central scales are arranged in lines. The animal has no teeth, and protects itself after the manner of the hedgehog.

COLOURED TUFT BEHIND THE EAR.

In many animals, as for example in the *Macroscelides*, there is a patch of hair behind the ear which differs in colour from the rest. In these mouse-like animals it passes as an orange streak from above the ear over the side of the forehead to the angle of the eye.

THE BEATRIX ANTELOPE.

The Beatrix Antelope is an animal with a snow-white body and brown limbs. Its face and head would be snow-white, were it not for the presence of deep-brown patches in mid-forehead over middle of nose and on the cheeks. The small brown patch between its horns extends downwards by an almost thread-like isthmus to form the upper end of the nose-patch.

Its four limbs take on the brown colour very abruptly at about the same level in all four, that is, midway between the hock and the flank. Lower down on all the limbs there are short snow-white stockings. The end of the tail appears to be dark brown, but all the rest is white.

COLOUR-CHANGE IN A TIGER-CAT.

"A few years ago a young Gibbon Ape, kept in the Zoological Society's Gardens, changed the colour of its coat from drab to black; this change being apparently a permanent one, and not merely seasonal. An analogous change has just been observed in an African Tiger-Cat recently living in the menagerie, the colour-change in this instance being from bright red to dusky grey. Unfortunately the creature died soon after its metamorphosis, so that it could not be determined whether the change was seasonal, like the exchange of the red summer dress of the Roebuck for the olive garb of winter. It is, however, probable that the dusky coat would have been permanently retained. Such unexpected changes are very annoying, in one sense, to the naturalist, who may readily regard the red and the black phase as representing two distinct animals" (from "Knowledge").

DOMESTICATED CATS.

"According to a paper recently read before the Zoological Society by Mr. R. I. Pocock, two distinct types of so-called Tabby Cats are recognisable. In the one the patten consists of narrow vertical stripes; and in the other of longitudinal or obliquely longitudinal stripes which, on the sides of the body, tend to assume a spiral or sub-circular arrangement characteristic of the blotched tabby. One or other of these types is to be found in Cats of almost all breeds, whether Persian, short-haired, or Manx; and there appear to be no intermediate stages between them. Cats of the striped type are no doubt descended from the European and North African wild Cats; but the origin of Cats exhibiting the blotched pattern appears to be unknown. As it was to a Cat of the latter kind that Linnæus gave the name *Felis catus*, the author urges that this title is not available for the European wild Cat, which he would call *Felis sylvestris*" (from "Knowledge").

SPOTTED LIONS AND PUMAS.

"Lions from East Africa retain more or less distinct traces of the spots of their childhood even when full grown; and it is quite evident that both Lions

and Pumas are descended from fully spotted ancestors. By an examination of the form and arrangement of the spotting in the cubs of the two species, Mr. R. I. Pocock has been endeavouring to ascertain the nature of the markings of their respective forbears. In the case of Lion cubs, the author shows that the pattern of the markings is intermediate in character between the stripes of the Tiger and the rosette-like spots of the Leopard, although inclining perhaps more to the former type. Another distinctly Tiger-like feature in the Lion cub is the presence of a white patch over the eye, which disappears in the adult. As regards the stripes of the Tiger, these certainly seem to be derived from the rosettes of the Leopard; the double striping frequently seen being a remnant of the rosettes. If these conclusions are correct, it is clear that Lions, Tigers, and Leopards (and, it may be added, Jaguars) form a closely allied group.

"Puma cubs, on the other hand, present a pattern quite unlike that seen in any of the foregoing, and thus indicate the marked distinctness of *Felis concolor* from the Lion and Tiger group. Pumas may accordingly be regarded as large, uniformly-coloured derivatives of one of the groups of smaller, and probably American, Cats" (from "Knowledge").

THE HAUNCH REGION.

The hinder extremity is joined to the trunk by what is known as the haunch. In front of the haunch is the barrel, and above it the back. The haunch is separated from the barrel by a fold (the flank) which marks it off very definitely. The bars of colour cross the haunch transversely, and are thus at right angles more or less with those on the barrel, which latter are vertical ribs. They correspond with the horizontal bars on the back, from which probably they are derived. Lower down on the leg the transverse bars of the haunch become mere rings or half rings. These rings can be traced as low as the feet and even to its hoofs. (See the Zebra.) Thus the skin of the lower extremities is an extension almost wholly from the back and but little from the belly (abdomen). The flank only is supplied by the latter.

The posterior parts of the two haunches are the buttocks, and together they constitute the rump. The tail is a prolongation from the back, and is continuous with the spine of the back at the sides and the buttocks on each side. In short-tailed animals, the rabbit for instance, the under parts of the root of the tail are known as the "seat." Along the middle of the back of our common Tabby, over its hinder part, are three parallel, strongly marked bars which run towards the root of the tail and are sometimes continued upon it.

ON DISTRIBUTION OF HAIR.

The Gorilla seems to offer the best example of profuse growth of hair on body and limbs amongst the Apes. It resembles some examples of excessive growth of hair in the human subject, but differs from Hebra's portraits, &c., in that the front face, including upper lip, front of chin, and forehead, remain quite bare.

The hair grows especially thick and long on the upper extremities, from the shoulders to the lower third of the forearm. A big patch over the deltoids might be named "the epaulettes." The hands remain quite free.

SPINY FURS.

The Syrian and African genus *Acomys* has very spiny fur, so much so that "when it has its spines erected it is almost indistinguishable at the first glance from a diminutive Hedgehog."—(See illustration in "Beddard," p. 473.)

HAIR TURNING WHITE.

[378]—"Perhaps the following facts may be of sufficient interest to warrant their insertion in 'Knowledge.' James Trafford, a coachsmith in the employment of Francis Mulliner, coachbuilder, of London and Liverpool, about two-and-a-half years ago burned himself accidentally at the root of the middle finger of his right hand. The injury was caused by a bit of red-hot iron flying into his hand. He was obliged to cease work at once, and continued to be incapable for about three months, during which time I watched the consequences of his accident as they made their appearance. He poulticed his hand, and in about a week the swelling broke, upon which matter began to exude. In a week after the breaking of the wound, and while the matter was exuding, his hair began to turn white upon the right side of his head, and a fortnight subsequently he presented the picture of a man with the hair, moustache, and beard, on the right side of his head, snow-white, and on the left side jet-black. The process continued, the matter was still exuding. Five weeks after his accident, every hair on his head and face was perfectly white. At this time he was only about forty-two years old. Ten weeks after his accident he was so bald that not a single hair was to be found on his head. A week later his hand healed, and the matter ceased to run. Another week and his hair re-appeared, and grew so fast that in about a month his head and face were again covered with hair. Six months after his accident his head and face presented their usual appearance—jet-black hair, moustache, and beard. I obtained his consent to send this account to another journal, but omitted doing so. It has, therefore, never before been published" (H. Smith in "Knowledge," April 7, 1882).

FOREARM PATCH IN HARPALEMUR.

"A curious feature confined to the sub-family Lemurinae was first discovered by myself in *Harpalemur griseus*. On the forearm (see fig. 258) is an area of hardened skin which is raised into spine-like processes. Fully developed, this organ is characteristic of the male, the area being marked off on the female, but without the spiny outgrowths. On removing the skin a gland about the size and shape of an almond is brought into view. In other Lemurs there is no modified, but a small tuft of particularly long hairs, which are also present in *Harpalemur*, and a small gland beneath the skin. The gland of *Harpalemur* may be comparable with a tract of hardened skin in *Lemurcatta*, which projects to a large extent, and has been spoken of as a 'climbing organ'" (from Beddard's "Mammalia," p. 536; fig. on p. 537).

BEDDARD ON GLAND PATCHES AND CALLOSITIES.

"The gentle Lemur (*Harpalemur*) has a peculiar gland upon the arm about the size of an almond, which in the male underlies a patch of spiny outgrowths.

In *Lemur varius* is a hard patch of black skin, which may be the remnants of such a gland. It is thought that the callosities on the legs of Horses and Asses are remnants of glands" (see notes on "Glands of the Skin," Beddard's "Mammalia," p. 12).

ASSES.

The presence of the shoulder strap, which in our domestic Ass in England we suppose to be characteristic, is by no means common, though some trace of it is to be found in several allied species. It is conspicuous in the African Wild Ass, as figured in the 'Royal Natural History'; commencing at the withers it runs down the shoulders over the scapula as a narrow, well-defined jet-black streak, and is lost before it reaches the breast. It is attended by bars or circles round the legs. The usual dorsal streak is narrow and runs the whole length of the tail.

In the portrait of the Nubian Wild Ass, given by Lydekker, the shoulder streak appears to begin on the withers, but is not more than two or three inches long, and does not cross the shoulder. This animal has no bars on the legs, excepting perhaps one on the fetlock. Its four extremities, as well as its belly, nose, and throat, are all white.

The Kiang has snow-white legs, belly, throat, and buttocks, and has no trace of brindling. It carries a broad saddle-cloth of black, from the front corner of which there passes a broad, ill-defined bar of black, which no doubt represents the narrow streak seen in the common Ass, and which runs to the same level over the shoulder joint. In the Kobdo Onager the saddle-cloth of the Kiang is present, but is less darkly marked. Bars of white run parallel with the dorsal streak from the withers to the buttocks, which show a much larger area of white than in the Kiang. This animal shows no brindling, but it would be of much interest to observe the state in the young foal. In this animal—the Onager—a blotchy, ill-defined patch of colour descends over the shoulder.

Beddard's representation of the Nubian Wild Ass, probably the progenitor of the British Ass, shows a definite but rather short shoulder streak and some indistinct parallel bars on the neck in front of it. Thus we may assume, allowing for discrepancies of illustration, that all the Ass tribe have a bar crossing downwards from the withers, which bar, however, varies very much as to width and distinctness of outline, and is most conspicuous in the Nubian or African.

Without exception all Asses appear to have white noses, and in many the white nose is abruptly limited by an "equatorial" circular band.

THE SKUNKS.

Most of the Skunks are black or blackish, but variable. The white-backed Skunk presents such differences; it is allowed to constitute a separate genus, of which it is the solitary example. This is a native of Brazil (*Conepatus Mapariti*).

It is not literally "white-backed," but has a continuous black band from shoulders almost to end of bushy tail. Has it the Ass's shoulder bands? On the sides of the dorsal band are broad bands of white extending downwards to sides of belly from cheeks to tail. When its tail is, as is usual, thrown upon its back, it then exposes a continuous white surface. Its cheeks and nose are black, the lateral halves of which do not join in the middle parts, but leave a narrow lozenge of white ("Royal Nat. Hist." vol. ii. p. 76).

Make a group of the Badgers, Skunks, Polecats; compare with Cape Polecat.

In the Koodoo Antelopes (both the large and small) the back and sides are crossed by vertical bands of white. These are not found on the neck or fore-quarters. In most of this tribe there are broad white bands crossing under the throat (one or two). In some allies the legs (which in Koodoo are light grey and not spotted) have broad bands of black and white somewhat irregularly placed.

NOTES FROM 'THE ROYAL NATURAL HISTORY.'

Dr. Hartmann remarks that: "The skin of the Chimpanzee is frequently of a light yet muddy flesh colour, which sometimes verges upon brown. Spots varying in size and depth of colour, sometimes isolated, sometimes in groups, and of a blackish-brown, sooty, or bluish-black tint, are found on different parts of the body of many individuals, especially on the face, neck, belly, arms and hands, thighs and shanks, and more rarely on the back" (vol. i. p. 25).

Concerning the White-handed Gibbon (*Hylobates lar*) it is stated that its colour is subject to much variation, but it may be always known by the pale colour of the hands and feet, and the complete ring of more or less nearly white hairs round the black naked face. Sometimes the back is lighter in colour than the under parts of the body, a peculiarity not often seen in mammals (vol. i. p. 62).

In the Common Tenrec (*Centetes ecaudatus*) the body is covered with flexible spines, bristles, and hairs. In the young the spines are arranged in longitudinal lines down the back; in adults they form only a kind of collar round the upper side of the neck. In an allied genus (*Hemicentetes*), the Streaked Tenrecs, the longitudinal rows of spines are retained throughout life.

The Common Tenrec is the most nearly related to the marsupials of all living mammals (vol. i. p. 341).

Mrs. Martin, writing of the Meercat (*Suricata tetradactyla*) says: "A curious kind of seam, starting from the middle of his chin and running underneath him along the whole length of his body, gives him somewhat the appearance of a stuffed

animal which has not been very carefully sewn up" (vol. i. p. 478).

The Ratels or Honey-Badgers (genus *Mellivora*) show in a remarkable manner a peculiarity frequently seen in the Weasel family, viz. having the under parts dark and the upper parts lighter. "The whole of the muzzle, together with the under parts of the head, body, and tail, and the entire limbs, are black; while the upper portion of the head, body, and fore half of the tail are whitish-grey" (vol. ii. p. 81).

Concerning the colour of cattle introduced into America, Australia, New Zealand, &c., and which have since run wild, forming vast herds, it is stated that "Those found in Texas and on the Argentine pampas have become of a nearly uniform dark brownish red colour; while in the Ladrones or Mariana Islands, in the Pacific Ocean, all the wild cattle are white with black ears." The cattle in the Falkland Islands are white, with the feet, ears, or the entire head black; in some parts of the islands they are brown or mouse-coloured. The New Zealand wild cattle are white spotted with brown.

The Brindled Gnu is striped on *fore* quarters only. It is maned and has long hair on the face.

In the Reindeer and some others there is white band around the hoofs, both the true and false, in some amounting to a low white sock.

THE ANTHROPOIDS, MONKEYS, &c.

At first sight it would seem improbable that the Anthropoids and Monkeys would afford the most frequent examples of close approach in the arrangement and colour of the hairy parts of the skin with those of the human subject, for it is of interest to note that many animals apparently much more remote from mankind often exhibit very definite resemblances.

Thus the hair and beard of the goat resembles in its isolation and its position that of many men and of only a very few Monkeys. The beards of Monkeys more usually take the form of a ruff around the throat and upper part of neck.

A noteworthy feature of general resemblance between the human subject and the Monkey tribe is to be observed in the growth of hair on the hands. In both it is almost universally absent on the palm of the hand and sole of the foot, and in both there is a comparative absence on the backs of these regions.

This may rank in some sense as an esoteric peculiarity. In a great many men there is some production of hair on the back of the hand and often on the back of the first and second digits, and in certain Monkeys the back of the hand is hairy. When it is found so, it is usually in association with other peculiarities; thus in Monkeys the hand and foot when quite

bare, although usually of a flesh tint, are not always so, but may be bluish or even black.

Many Monkeys, as regards hair and colour, look as if they were wearing gloves, the colour of the hands from wrists to finger ends being quite different from that of the forearm.

THE DOMESTIC TABBY CAT.

A Cat's back has the central streak, and on each side of it still more strongly marked parallel streaks. An obscurely marked cross streak (that of the Ass) crosses the shoulders just behind the borders of the shoulder blades.

A leash of bars, usually firm but often split into five or even more, crosses the broad head, and runs between the ears towards the nose. The outermost bar of this leash passes to the outer angle of the eye. From this bar, a little above the eye, a short bar passes off to join the bar next to it.

The Cat's shoulder bars run downwards and forwards into its armpits. Do those of the Ass take that course?

The usual coloration of the members of the Cat tribe takes the form of dark spots or stripes on a lighter ground; the ground-colour generally varying from shades of grey through tawny to yellowish or orange. The spots may be either simple, or in the form of rings or rosettes enclosing an area of darker tint than the general ground-colour of the fur. From these ringed spots there is a gradual transition, as is well displayed in the marbled Tiger-Cat, to stripes, which are generally more or less vertical, and assume the most regular development in the Tiger. In a few species, however, such as the Lion and the Puma, the entire coloration is tawny; but even then traces of spots may often be detected in certain lights, while the young are invariably spotted. From this it may be inferred that the uniform tawny coloration of such species is an acquired character—probably originally adapted to the desert-haunting habits of the species in which it occurs—and that all the Cats were primitively either spotted or striped. A black colour among the wild members of the family is of comparatively rare occurrence, but it is met with among the Leopards, and in certain other species ("Roy. Nat. Hist." vol. i. p. 356).

BEDDARD ON COLOURS OF CAT TRIBE AND STRIPES AND SPOTS.

The coloration of these creatures is very varied: spots of black, or bordered with black upon a more or less tawny ground-colour, is the prevailing pattern. Stripes are also met with, as in the Tiger, but these are usually cross stripes, while in the related Vivenidæ there are many examples of longitudinal stripes. Finally, many Cats, as for instance the Puma and the Syra, are self-coloured—have, that is to say, a uniform tint. Just as the unstriped Horse sometimes shows traces of the former existence of stripes, so the self-coloured Cats are occasionally spotted when young; this is markedly so in the case of the Puma; while the Lion is spotted as a cub, and in the adult—particularly in the Lioness—there are distinct indications of these spots. It is evident, therefore, that there are grounds for regarding the spotted condition to be antecedent, at least in some cases, to a uniform colour. There are divers explanations of these hues and of these changes. It is held by many that the coloration has a relation to the habits of the creature: the spotted Cats, it is pointed out, are largely arboreal; this is eminently so with the Jaguar at any

rate; and in an arboreal creature the spots, it is said, give the impression of flecks of sunlight broken up by foliage. On the other hand, the self-coloured Cats of a sandy or earthen hue assimilate in tint with a sandy or stony soil. The stripes on the Tiger, it is thought, approximate to the tall parallel stems of grasses and other plants in the dense cover in which it lives. In favour of these views is undoubtedly the fact that in other mammals, and other animals belonging to quite different groups, the same four plans of coloration are met with. Spots and cross stripes are found in the Marsupials; the young Tapir is spotted, whilst the adult is self-coloured, and so forth. This last fact, however, serves to illustrate another view which is being put forward in explanation of these characteristic markings of the Felidæ. Limer has come to the conclusion that there is, and has been, a regular series of steps in the evolution of these markings. The primitive condition was, he thinks, a longitudinally striped one; stripes then broke up into spots, and the spots rearranged themselves as transverse stripes; the self-coloured Puma and Lion are a final stage in this gradual evolution. In support of this is the fact that spots precede self-coloration in the individual growth of these animals. The exact sequence of these markings is, however, contradicted by Dr. Haacke's observations upon a certain Australian fish which is cross striped when young and longitudinally striped when adult, a precise reversal of what ought to occur on Limer's view (from Beddard's "Mammalia," p. 392).

NOTES ON SPECIAL SPECIES OF ANIMALS.

In the Hedgehog the spine-covered saddle-cloth, which wraps the whole of the animal from the root of its tail to the vertex of its head, ends at his ears. His face is bordered with a narrow snow white ring or rim which includes his upper eyelids, passes just in front of his ears, and crossing his forehead makes a setting for his face, which is black.

His short tail shows but few hairs and these are coarse and short, and his feet and whole extremities are grey and but scantily covered. His belly is white.

It is a noteworthy fact that, although the young of the Pig tribe are conspicuously streaked by longitudinal bands of black, which are entirely lost before adult age, these bars are not shown in young animals of the Hippopotamus, Rhinoceros, or Elephant. All these animals have skins almost absolutely bare of hair and of a dull earthy tint without any markings whatever.

The young of the Orias (*Roselaphus orias*) shows no pattern on the body, neither streaks nor spots, and is of a fawn tint, with a narrow dorsal streak of black which develops into a black tuft at the end of its tail. It has a white belly, and its cheek in a line drawn from the ears across the eye to its nostrils is white.

In some more or less closely allied animals, and notably perhaps in the Okapi, the entire face is white.

THE XANTHELASMA CRESCENTS.

In many animals there are circles round the eyes of a paler colour or white, and in some of these the circle is deficient near the canthi exactly where the *xanthelasma* patches occur. The

foreheads of most of the Antelope tribe are marked by a long, broad band of colour from the roots of the horns almost to the tip of the nose. Very often this band is divided by indistinct bands of colour or of white, and it is very often limited laterally by bars of white running from just above the eye to the side of the nostril. It is frequently divided transversely by one or more bands of white, and when this is the case, it is common to see a very narrow isthmus of colour exactly in the middle line connecting the patch above with that below.

In many cases the transverse bar does not run straight, but curves like that of a spectacle frame over the nose. In others it makes a much steeper curve.

In *Coassus superciliaris* (confined to South America), as shown in the Knowsley portrait, there are crescents of white curving round the inner canthus of the eye exactly like those seen in *xanthelasma*.

The animal has no white patches on other parts of the surface, excepting somewhat indefinite ones under the ears, and possibly inside the ears. But the whole of its under surface is nearly white.

In an allied animal, the Eye-browed Brocket, there is not only the crescent round the inner canthus, but also a similar one round the outer one. These very nearly constitute a circle such as we sometimes see in *xanthelasma*.

LEATHER PATCHES ON LEGS.

In the Black-tailed American Deer curious scar-like patches are represented on the inner sides of the hocks, and lower down on the mid-leg smaller ones. These conditions are repeated on two animals on the same plate. The patches are long, oval, nearly white, with an oval, ill-defined centre of darker colour.

FRONTAL TUFTS.

One of the most remarkable examples of frontal tuft or "topping" occurs in the Duikerbok, *Cephalophus coronatus*. It stands between or just a little in front of the ears, is six or eight inches high, and as abruptly margined as a soldier's cockade. The Knowsley portraits give no suggestion of horns, and the dorsal mane is only sparingly covered with hair. The tip of the tail is not a large one, and the animal shows no superfluous hair on any other part. It has black fetlocks and a black nose.

PIGMENTED BORDERS TO WHITE PATCHES.

It has long been a puzzle to dermatological observers that in the condition known as "leucoderma" the immediate borders of the patches are more deeply tinted than the rest of the skin, as

if the pigment had been driven from the parts which had become white, and had accumulated at their margins. This, however, is easily explained on the palæogenetic hypothesis, for it is precisely the condition prevalent in the lower animals. See the portraits of the Wapiti in the Knowsley Collection. (Wapiti, *Cervus strongilocerus*.)

FAWN DIFFERING FROM ADULT.

In the Barbary Deer the spots on the sides, which are arranged in horizontal lines and very definite in the fawn, are scarcely visible in the adult. In the Wapiti Deer almost the only traces of white are the tail and the rump. These are snow-white, abruptly margined with a dark rim.

THE MUSK DEER.

The Musk Deers are very peculiarly coloured. In some of them a horizontal band of white crosses the whole body from the tip of the lower jaw over the shoulder, &c., to the root of the tail. Above this bar on the back there are ribs of white dots four or five in number, which are represented below the line by as many single spots. Under the throat are broad transverse bands of white parallel with the longer one, and there is a single white spot on the cheek of the male animal. The face shows no marking at all either in the young or the adult animals. In the young of the Indian Musk the throat markings are very similar to those described, and are more definite in the young than the adult.

THE LLAMA AND VICUNA.

The Llama-Vicuna and the Llama-Guanaca are both of them depicted in the Knowsley Collection, and in one of the latter the front half of the body is clothed with hair very much longer than that of the rest.

Certain drawings which depict the Llama with one equatorial half of its body covered with long wool and the other without any are very possibly instances in which the wool has either been shed or cut.

One of the Knowsley portraits represents a dam and calf somewhat similarly coloured black and white, and of the piebald type. Both have black and white faces in abrupt patches, looking exactly like *leucoderma*. In the calf the entire neck, fronts of shoulders, and all the four extremities are snow-white, whilst in the mother (presumably) only the lower thirds of the legs—that is, below the knees—are white. In both animals, as far as the portraits show, the conditions are bilaterally symmetrical. It must be remembered that these animals had been for long domesticated.

In ten other examples represented in these plates animals young and old are represented as one-coloured, and none of them show any spots or streaks. In one of these, however, a white animal is represented wearing a black saddle on the mid-back, and apparently tufted over the rest of the surface with brown. In most of them the face is indefinitely marked with brown, but some appear to be black and almost bare.

THE CAMEL TRIBE.

Camels and their New World relatives, the Llamas, are all for the most part without any conspicuous pattern markings on their skins. We know them but in the domesticated state. In this condition, true Camels vary but little from a uniform brown or grey tint. This colour is also common in the Llama family, but it is said that when recently shorn they are distinctly spotted, showing a marked tendency to variation in the direction of Piebalds and wholly whites or blacks (not albinos). They are often patched or spotted, but seldom any approach to stripes. The faces, however, are usually marked indistinctly, according to ordinary types. Both Camels and Llamas frequently develop long hair about the neck and limbs in the form of under manes or ruffs or crests and toppings. In the Llama, the neck ruff spreads out over the shoulders and is often snow-white. The possibility of equatorial allotment of colour is sometimes strikingly illustrated. Thus the front half of the body with neck and head may be white, and the hinder half black, the line of demarcation encircling the animal as a waist band or girdle. In these cases the lower parts of the legs are spotted with black, but are not brindled.* The Journal from which I quote (No. viii.) gives an illustration of a Vicuna which is obscurely banded on its shoulders and lower neck, and which also has its feet patched symmetrically in black and white, while there are white patches under the eyes.

The Badger ellipse is always present, but is sometimes reduced to a mere streak. The dorsal streak is usually narrow, but often grows a mane, whilst the abdominal streak is much more strongly marked, and extends from under the chin down the throat, until it bifurcates between the fore limbs and passes as two black streaks enclosing white to the inner side of the flanks.

Many of the representative animals wear broad black bracelets, below which the limbs are white. Many also have black tufts to their ears, and many have narrow coloured streaks extending down their limbs.

* See a coloured print in the 'Colonial Journal' No. viii. See my portfolio "Camels."

ANTELOPES.

The group of Antelopes which includes the Hippotragus, the Oryx, and the Addax, is of very great interest as regards the coloration, especially of the face. It is excellently illustrated in Slater and Thomas's magnificent work. Amongst the features which may be mentioned are the transverse bar across the forehead, and its vertical isthmus between the tuft and the nose patch. This connecting band is always present, but is often not wider than a cedar pencil.

THE ADDAX SUGGESTIVE OF LATERAL HALVES.

The three portraits of the Addax in the Moseley Collection show the spectacle-frame arrangement on the forehead, in one of which the vertical isthmus is seen, whilst in two others it has disappeared.

The calf is of a light fawn colour excepting its face, whilst the adults have neck and body of black but the rump snow-white.

CALF DIFFERING FROM ADULT.

The Corigum or Senegal Antelope (*Bubalis senegalensis*). In the Moseley Collection the calf is represented of uniform light brown without any markings, and with only a small black tuft at the tip of its tail. Its mother has a broad coal-black streak from its ears to the tip of its nose, with slight appearance of bifurcation between the horns, but no other markings. It has a dark, ill-defined patch on its cheek, and large coal-black patches on the front of the shoulders and over the hams. It has a black tuft to its tail.

HARNESSED ANTELOPE.

The Harnessed Antelope is made almost grotesque in the Moseley portrait by its strong colouring. It has white patches on its lower jaw and cheeks and neck, and broad ribs, three to eight in number, together with spots over the haunches and fore shoulders.

HARNESSED PATTERNS.—THE KUDU.

The Kudus are many of them well harnessed, and display from thirteen to fifteen streaks from the withers backwards. They display also broad throat-bands, a white throat-streak, one, two, or four isolated spots on the cheeks, and a white bar across the lower forehead from eye to eye. Some of them have yellow stockings, but with narrow white bars just above the hoofs.

The Greater Kudu shows larger lateral ribs, but fewer of them. It has a large transverse spectacle bar, connected above and below between forehead and nose by a very narrow isthmus. It has light yellow stockings, and both longitudinal streaks from flank to hoof with a half bracelet.

THE ELAND.

There are certain features in the Eland which more than usually well illustrate the division of the animal into two lateral halves. Along the back, from the forehead to the tip of the tail, the dorsal band develops into a low mane, and at the end of the tail this dark-coloured band divides into two lateral halves of long hair making a bifid tuft. A narrow band of dark hair extends on the whole length of the under surface from the throat backward.

This bar is more evident in the young than in the adult, but in both is accompanied by a somewhat pendulous fold along the whole of the neck, which in its middle develops a central tuft. There is also a tuft on the head midway between the ears, especially well seen in the young animal.

At all ages the animal shows a dark patch, the half of a bracelet crossing the back of the fore limb a little above the knee, and in all a black patch crosses the back of the foot from the false to the true hoof. All these features are well seen in three animals in the Moseley portrait.

NILGHAU AND FAWN.

The Nilghau is shown in the Moseley collection with a calf. In both animals a single broad neck-band occurs just under the throat, and in both two broad patches of white are seen on the cheeks. In both there is a low mane down the whole of the dorsal streak, and in the adult there is a tuft of long hair in the middle of the neck a little below the throat. In both animals the tips of the ears are white, and there are white patches just above the hoofs. The adult animal has low horns, and is possibly a male. In both the under surface is white, both as regards the belly and tail, but the latter has a tuft of black. The calf exhibits long streaks of black running down the fronts of its legs.

ON DEVIATIONS FROM BILATERAL SYMMETRY.

Although I am assured by a very good embryologist that there is no reason why the limbs on one side should almost constantly differ from those on the other, yet so it is, and the exceptions are far more numerous than the rule. The startling exceptions are still more infrequent. I cannot but think they are infinitely more exceptional. In domestic animals or in human beings, which may be regarded as half domestic as far as breeding is concerned, it is well worth while, therefore, to note the exceptions particularly. It may be noted also that the face differs in its two sides much less frequently, as compared with the upper one. I have scarcely ever seen a dog with an unsymmetrical face, other than a definite piebald. These latter are sometimes attended on what are called

wall eyes. I have attempted to estimate the occurrence of white legs or white feet in horses on rather a large scale, and although I have no statistics, and believe it to be quite impossible to avoid fallacies, I feel certain I have formed correct impressions. To begin with, many horses have black feet and black hoofs. Next to them, I think, come in frequency those who have two white hoofs, and next, those who have three. If only one hoof is white, it is more often the left than the right alone. Sometimes it is only part of a hoof, but the hoof always goes with the foot. Three white feet are not uncommon, but it is decidedly exceptional to see two white hoofs on the same side—and if that is seen, the other two being black, it will generally be noticed that the horse does not go nimbly. This, of course, is not because the feet are defective, but because the non-symmetry of the feet probably implies some non-symmetry in the brain. It is decidedly common, I believe, comparatively, to find only a single black foot, and as a rule, if there be but one white one, that white one will be a left. These rules would appear to imply that there is some little defect in the left foot which prevents its taking pigment easily. Allowance must always be made for the length of the white stockings, for very long ones, that is above the knees, implicate more than one foot. I do not think that anything can be estimated from the number or length of the white stockings if they are still symmetrical. It is bilateral symmetry and not the number or size of special parts of the limbs which may be to some extent trusted. If there is definite and characteristic defect of one side of the surface, it implies the possibility that there may be defect on both sides, and that one special part of the skin may be involved. It would be going for the present too far into detail to attempt to estimate the prevalence of mixed tints, the various kinds of roan, &c., but I can scarcely doubt that other minor peculiarities, as well as the colour of the skin and tint of the hair, are also to be observed if careful search be made.

Of still greater interest than the appearance of white feet in horses are the forehead patches and noses—but few amongst English horses are born without what is called the “star” or forehead patch. This patch almost invariably occurs in the middle of the forehead, midway between the eyes, but it sometimes advances much further on one side than the other, and it very frequently advances lower down on one side of the nose than the other—not infrequently so as to invade the upper lip or even the lower one. Thus it frequently is shaped like a dagger, with flanges more or less wide. The central star on a horse’s forehead is not very often omitted altogether. Not infrequently it expands in the middle. If the horse has definite white feet, it is almost certain that it will have a white star on its forehead. On one occasion I challenged some ladies to find a single white

hair on my horse, although I was aware that it had two white feet. One of them after a little search discovered two or three quite white hairs which I could not doubt. Great care must be taken to avoid definite negatives. The prejudice to white-stockinged horses has, I believe, pretty much subsided. They are figured of large size in not a few of our prize cart horses and in some of imported Arab stock. I have no doubt they may become hereditary at any time in a few generations. I doubt whether there is any proof of their being so in a wild state.

It is not a little curious to reflect that the zebra and the horse, which are nearly related animals, are so remarkably and characteristically different in colour pattern. The zebra so far as I know, changes but very little either towards the horse or ass. In the quagga it has lost the greater part of its stripes, and they are almost restricted to its fore quarters. In the ass there is for the most part only one horizontal and one vertical bar, a long cross, and in different species of asses it is sometimes very much reduced in size and only occasionally that it is well pronounced. What special bar in the pattern the cross of the common ass represents it is difficult to say. It may be almost assumed that it is some one of the vertical bars (of the scapula) which has persisted and of which there is no representative in any other species of quadruped. There are many other species in almost all classes of animals which have conspicuous vertical bars, but few of them with such a definite pattern as the zebra. What is called the "gridiron" of the zebra crosses at right angles over the animal's rump across the vertebral column, and in doing this constitutes a gridiron.

THE SO-CALLED "PORCUPINE PATCH."

I have already tried to show it is probable that there exists on the back, immediately over the sacrum and its lower part, a tract of skin which is endowed with a facility to produce coarse hair, bristles, or quills. This rises to its greatest height in the porcupine, and in that fretful animal produces its renowned quills. In the hedgehog it spreads over almost the whole back and produces his spines. The latter is an extreme case, but a great many animals have a decided tendency to grow quills on that part. Especially do they do so in youth. It is even said that in Japanese children, Ainos, there is for a short period during early life a growth of pigmented hair on that part. It is also said that in tropical climates the wool in imported sheep will fall or become thin and leave the animal after a time, as described by a lady, wearing a dirty doormat over its rump. In not a few Europeans there is some tendency to grow the hair on the back.

I do not know how soon an entire change of habits would

induce a porcupine or a hedgehog to shed his quills. Not a few other animals retain some pigmentation of the part from which in long distant generations the quills have grown. The face of a black and white dog takes the division of colours resembling that of the black horse, but in the reverse direction. In him it begins at the nose, whereas in the horse it begins at the tail. The dog may be quite white from the tip or nearly the tip of its tail to its nose end, and begins on white just above the nape of its neck. From the nape it never ends by a square ending but by a tapering tip. Its tip may slant forwards over the top of the middle of its head. This tapering part is formed by the meeting of two halves which surround a portion of the white skin. This may be seen in a great number of dogs, and following it the rest of the body may be wholly white or the skin may be spotted with small jet black spots. The symmetry is generally pretty nearly complete, and the tan *xanthelasma* patch over the eyes and two over the cheek, and perhaps a white nose, will be all that remains.

The Canadian Porcupine, like the hedgehog, has quills over the whole of its forehead, back, and tail, but they are not nearly such fine quills as in the European one. It has a moderately long tail. The Brazilian Tree Porcupine resembles it, but has a yet longer and slenderer tail. The porcupine is allied to the guinea-pig. The quills themselves are banded in three, four, or more bands.

HARDWICK'S STOAT.

Mustela Hardwickii an animal of exceptional colour and somewhat peculiar arrangement, is from India, and probably known under some other name. It has the top of its head, from its nose over the whole lower limb as high as the elbow in front, of a dark brown colour. Its long bushy tail is also a dark brown, nearly black. Probably a better specimen or better delineation of this is obtainable. (See Zoological Society, vol. iv., plate viii.) The limitation to its neck coloration is very abrupt. It is an animal very like a ferret. The back parts of all four limbs are brown almost to blackness.

MALAY BADGER.

The Malay Badger has a broad white streak down the whole of its back which ends at one end of its tail, and the other where it is somewhat wider on its forehead. It does not show its characteristic streak, since both sides of its face are white. The true badger has a white nose as well as a broad white bar down its forehead. The typical badger streak usually has a long ellipse of black, of which the thicker end rests on the ear and the lower near the nostril, having included the eye.

THE THREE DIVISIONS OF THE TAIL.

Phascologale pencillata.—This animal in Jardine's plate has a slate grey body on its upper surface, and this is prolonged over the first part of its tail. About an inch further from its rump it is much narrower and bare, and after continuing not much more than an inch, it is prolonged quite bare for a couple of inches. It is a marsupial. The lower two-thirds of the tail is a good bush and much bigger than the rest.

Phalangista ursina, see Jardine's plate. This animal has one colour on its back, and wearing a ring from nose almost to a third of its length of the under surface of its tail. These parts are of a pale yellow, but not for more than two-thirds of its tail. It has naked feet.

Chironectes Yapock.—This animal presents a remarkable measuring of the length into three portions, perhaps even indistinctly into four. There is a thick stump to the tail of perhaps about two inches long which tapers rapidly and is covered with grey hair. Next to it by an abrupt margin comes a bare portion coloured like the body and possibly in several indistinct rings. After progressing perhaps six inches, this is succeeded by another colourless portion at the tip. The badger patch may be studied in this mammal, but it does not at all closely coincide with its usual appearance.

WATER OPOSSUM.

The Water Opossum has a banded back, and on its face a broad spectacle frame of white dividing, except a narrow isthmus, the whole of its forehead. It should be sketched side by side with some of the deer tribe.

PALÆOGENESIS IN REFERENCE TO PATHOLOGY.

All forms of Ichthyosis have for their base inborn defect of structure, and are usually palæogenetic in origin, and the terms which have been applied comparing them to the appearances in various animals, such as "Serpentine," "Porcupine," and other expressions, are perhaps not quite so entirely fanciful as they have been thought.

The patches which occur in *xanthelasma* of the eyelids, although they are not present at birth and are not always persistent, have probably their peculiar location in connection with peculiarity of organization. The tendency to peculiarity of structure in the particular parts affected is revealed in the normal arrangement of colour in some animals.

Leucoderma colli is perhaps one of the conditions which may be the most readily accepted as of palæogenetic origin.

It was the first which drew my attention to the topic. In

it the occurrence of diffuse pigmentation appears to reveal the fact that the skin of the neck and trunk, although in health showing no spots or mottling, is really dappled with white.

The diffuse melanosis of the mouth occasionally seen, and which has been observed occurring congenitally in two sisters, is another good example of the same tendency. The mouth changes in "Addison's disease," and in what is sometimes called "black tongue," and is often a racial peculiarity, must be placed in the same category.

Palæogenetic influences in all probability take a considerable share in the definite localization of many maladies.

In the condition to which the term "sycosis keloid of the nape" is given, we may suppose that it is the survival of structures which constitute the mane in animals which supply the site. These conditions occur only in the male sex and in adults, and occupy the base of the neck and nape, sometimes extending on to the scalp, and in a scattered manner down the back and shoulders. The indolent pustules which give rise to the keloid condition are probably developed in what remains of the pilo-sebaceous system of these regions. A remarkable tendency is often displayed to gather the hairs of the parts into tufts, like those of a scrubbing-brush, the condition sometimes seen, I believe, in the horse's mane, several hairs making their exit at the same orifice.



A piebald sheep, showing a broad white band on the face in association with white legs and black stockings. To be compared with Buffon's portrait of piebald child with star on forehead and black gloves and stockings (Copied by permission).

The accompanying illustration of a four-horned South African piebald ram is copied by permission from the guide to the domesticated animals exhibited in the British Museum of Natural History. It might be mistaken for a goat or a hybrid, but the appearance which might suggest a beard under its chin is really a misplaced horn bent down on the other side. The patches of colour on the animal's back are abruptly margined. There is accurate bilateral symmetry as regards its feet, all four being black, whilst the legs in their lower parts are quite white. This is in keeping with the forehead which down to the nostrils shows a broad central band of white.

The portrait does not enable us to determine bilateral symmetry as regards the other side of the animal, but its occurrence on the extremity would suggest a probability of it. It may be compared instructively with the next illustration.



Face-pattern on a negress with acroteric distribution of colour in a piebald skin. (From Buffon.)

This portrait from one originally published by Buffon and since copied by several authors, illustrates a very definite tendency to bilateral symmetry in a young negress. It will be seen, in the first place, that the feet and hands on the two sides are exactly alike; they are all four black, with very abrupt limitation of the colour. The shoulders, again, are symmetrically coloured, and a little careful observation will easily disclose the fact that there is a partial symmetry with great deviations as to size of patches on the whole of the body. On the forehead there is a lobed patch of white which may be compared with the white star or "flare" so often seen on the forehead of horses. There is also a patch involving the lower lip and the corresponding part of the chin; this arrangement may also be frequently seen in horses, and is again seen in the portraits which follow.



Face-pattern in three negresses (sisters) with acroteric distribution of colour, probably of piebald skin. (With permission, from a photograph given by Professor Niesser.)

These three portraits which are copied from a photograph given me by Professor Niesser, of Breslau, represent individuals which some years ago were publicly exhibited both in England and on the Continent. Although they were all exhibited as negresses, the central figure may be reasonably suspected to have represented a male. They exhibit as regards the face remarkable similarity of arrangement. It must be understood that the hair is artificially arranged so as to show apparent elevation.

The white patch on the forehead is in the form of a Greek cross. Its vertical bar shows extension on the nose in two instances, in which also it occurs on the chin. The arrangement of the hair probably makes it appear larger than it really was.

It was unfortunate that the subjects of the portraits show nothing but the face and hands; with the exception of one, no part of the bust is exposed. The arms, however, of the central figure are piebald in large blotches, and from them it may be assumed that such was the condition in all these cases, and on the surface generally. In piebalds in all animals, the face almost invariably exhibits the most definite peculiarities. These portraits have been reproduced, and the curious history of the preservation of the originals which are now, thanks to Sir Erasmus Wilson, preserved in the Museum of the Royal College of Surgeons, has been given in much detail by the present able Curator, Dr. Arthur Keith. Full particulars, together with good portraits, will be found in the excellent monograph on albinism, recently published by Karl Pearson and Edward Nettleship.

I do not agree with those authors, however, in thinking that the term "partial albino" is altogether a happy one. The term "localized albinism" would, I think, be preferable.

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