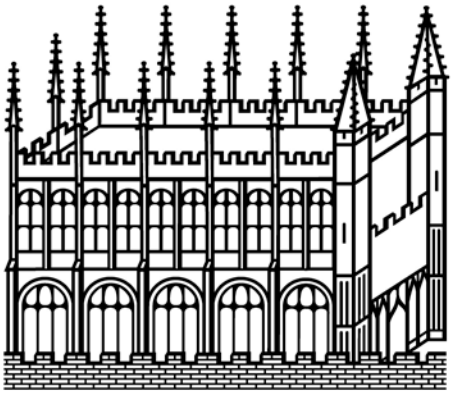

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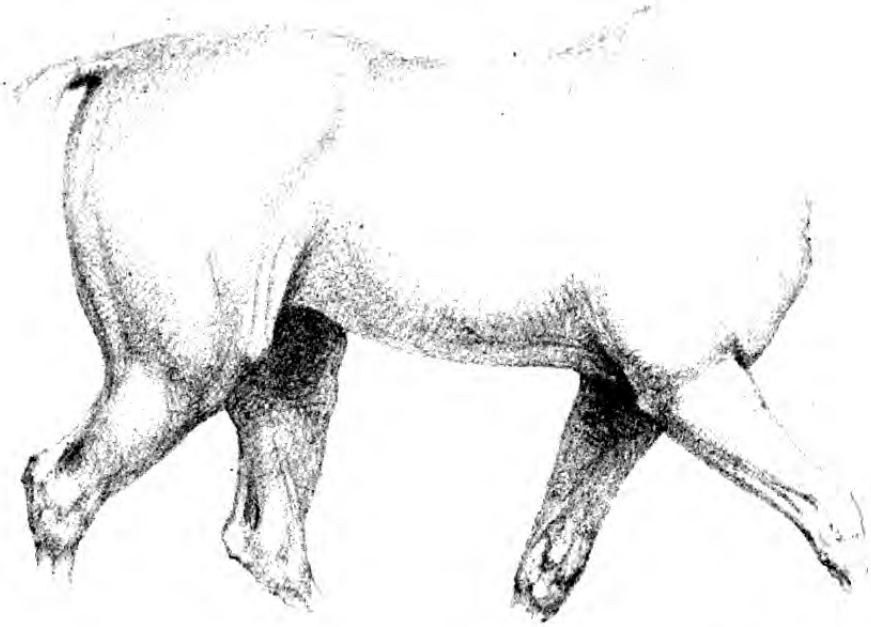

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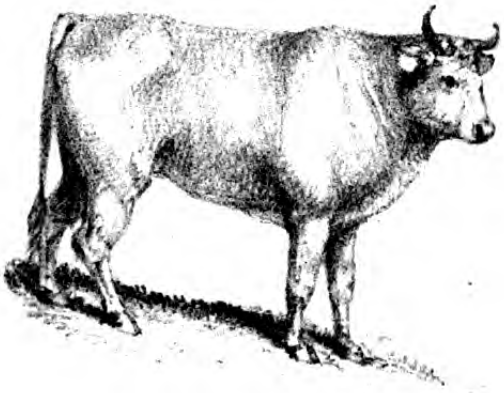

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THE SCIENCE OF DRAWING

BEING A PROGRESSIVE SERIES OF THE CHARACTERISTIC FORMS OF NATURE

PART II—ANIMALS

" Learn to sketch before you attempt to finish."
MICHEL ANGELO.

BY FRANK HOWARD.
AUTHOR OF THE " SKETCHER'S MANUAL," " COLOUR AS A MEANS OF ART," " THE SPIRIT OF SHAKESPEARE," ETC. ETC.

LONDON
WILLIAM PICKERING
1839

LONDON
C WHITTINGHAM TOOKS COURT
CHANCERY LANE

ADDRESS.

In describing the more definite forms which are the subject of this Part, a slight difficulty may appear to arise from the necessity of confining the beginner's attention to the general character of the main lines; and thence calling those straight lines which, it may be objected, even in the examples given in the plates, are not drawn with unvaried straightness. But independent of the advantage proposed by the present method of commencing Drawing with general forms, it is necessary to limit the expressions used in describing forms, to the degree of knowledge supposed to exist in the mind of the readers. The description of every minute undulation of outline, in the form of any given animal, could only be appreciated by a person thoroughly conversant with the form; and then only in the presence of the object itself,

or with the assistance of a drawing or model as large as the original. Some degree of omission must therefore, in any case, be allowed; and for beginners and learners of the form, it is requisite to omit all minute variations of outline, and to describe that as a straight line, which is so composed as to be essentially in a straight direction: and until the student has arrived at the power of generalization implied by the apparently paradoxical faculty of seeing a varied line as a straight one, he should be contented to use straight lines wherever they are directed in this little work. Even when tolerably advanced in proficiency, it will be well to continue the use of straight lines in first sketching out the forms, and to superadd the variations as the knowledge of them is acquired. It may also be remarked, that flatness and squareness of form is as essential to Character as roundness is destructive of it—as will be more fully shewn in the course of this work. Greuze, we are told, was taught to paint a globe as if it were a polyhedron of innumerable sides; and this principle has been the foundation of the style of the greatest

masters in the art of Drawing; so that the reader who should wish to emulate them, will, in the course of practice, feel the advantage of the proposed method, much more fully than it can possibly be described, and the facility it affords for acquiring a practical power of delineating objects, will be no derogation from its intrinsic utility in a higher point of view.

As the reader will observe some instances in which the lines described as straight are not strictly such, so he will also find some generalized as simple curves which are composed of several varied parts; but as the variations in the former must never be so great as to disturb the general straight character of the whole line, so the variations in the latter must be subservient to the general character of the simple curve.

CONTENTS.

CHAPTER IV.

CHARACTERISTICS OF ANIMALS.

In studying the Characteristics of Animals, the only classification available is that resulting from the natural division into Quadrupeds, Birds, and Human Beings; in each of which Classes there is a distinct general character, applicable to all the varieties of species comprised within it. In each of these divisions, there is a similarity of anatomical construction; and though the neck, legs, or back may be more or less elongated in different species, they occupy the same relative situation in all; and by pointing out the distinguishing features of some one species, as near the intermediate of the extremes of variation as can be found, a general characteristic form of each class, will be discovered.

By directing the attention of students to those parts, the variation in which gives the character of different species, and those which are almost invariable in each class or division, a means will be afforded for deciding the more minute characteristics of every species in each class, and every individual of each species.

CHAPTER I.

CHARACTERISTICS OF QUADRUPEDS.

SECTION I.

General Character of the Class.

THE HORSE is selected from this division, as most adapted to the purpose, as well as being an animal which is so constantly the object of attention to almost every person, that the character will be most easily appreciated. The body is supported in a horizontal position, equally upon four legs, of which the two in front are straight, and the two behind are bent at the joint called the hock; and when the animal is standing still, the body and legs may be contained within a square. The length of the body is equal to the height of the shoulder and back.

The neck is attached to the shoulder in a diagonal direction, and is in length as much as half the height of the shoulder. The neck gradually diminishes to the junction with the head, which also diminishes to the point

of the nose. The widest part of the head and the narrowest part of the neck should be very nearly the same width, and not more than half the length of the head. The head should be the same length as the diagonal line of the shoulder or collar.

The chest forms a right angle with the collar, in depth half the length of the diagonal; from whence the forelegs descend in nearly perpendicular lines, slightly inclining under the body, but perfectly straight, with the exception of a slight depression below the knee, and gradually tapering from the shoulder to the fetlock, where another obtuse angle is formed by the pastern joint. A line at right angles with the last gives the direction of the coronet or upper line of the hoof.

The body is nearly the same width from the shoulders to the hind quarters, the back being slightly hollowed. From whence the quarters are convex to the insertion of the tail, and from the tail to the gaskin, or upper part of the hindleg, which forms an angle with them. At the hock the leg descends in a straight line perpendicularly to the fetlock,

where it forms another angle, as in the foreleg. The front line of the gaskin is nearly parallel with that of the back of it, gradually diminishing as it descends to the hock, from whence the cannon, shank, or leg, is of equal thickness to the pastern. The hoof is formed as in the foreleg.

The length of the leg from the hock to the ground should be the same with the length of the gaskin; also with that of the line formed by the hind quarter below the tail, as well as the convex upper line of the quarter. The collar line should also be of the same length, already stated to be that of the head.

As in the hindleg, so in the foreleg, the principal joint divides the limb into equal lengths.

In viewing the Horse in front, the shape of the shoulders will be bounded by a square, surmounted by a triangle,—the summit of the figure being occupied by the *withers*, the highest point of the shoulder, from whence it gradually increases in width to the shoulder-blades, which occupy the sides.

The junction of the neck is effected in a

shape resembling a leaf, of which the point is formed by the withers, and it extends two-thirds of the whole depth of the body. (Plate B, Fig. 4.)

It is necessary that the shapes of these joints should be understood; though they are not visible unless the neck be severed from the body.

The head is widest at the eyes, which are on prominences, from whence it diminishes in equal degrees to the ears and nose. The latter is the smallest as it is farthest from the eyes.

The forelegs are straight, diminishing in size as they approach the pastern, except at the knees, which are broad and flat, and widening at the hoof; are nearly perpendicular, but rather inclining inwards.

The body being nearly cylindrical, swells out in equal curves on each side of the shoulders, but commencing below the withers and ending above the lowest part of the shoulder.

The hind quarters will be best explained when viewed from behind.

The upper line should be convex, the sides

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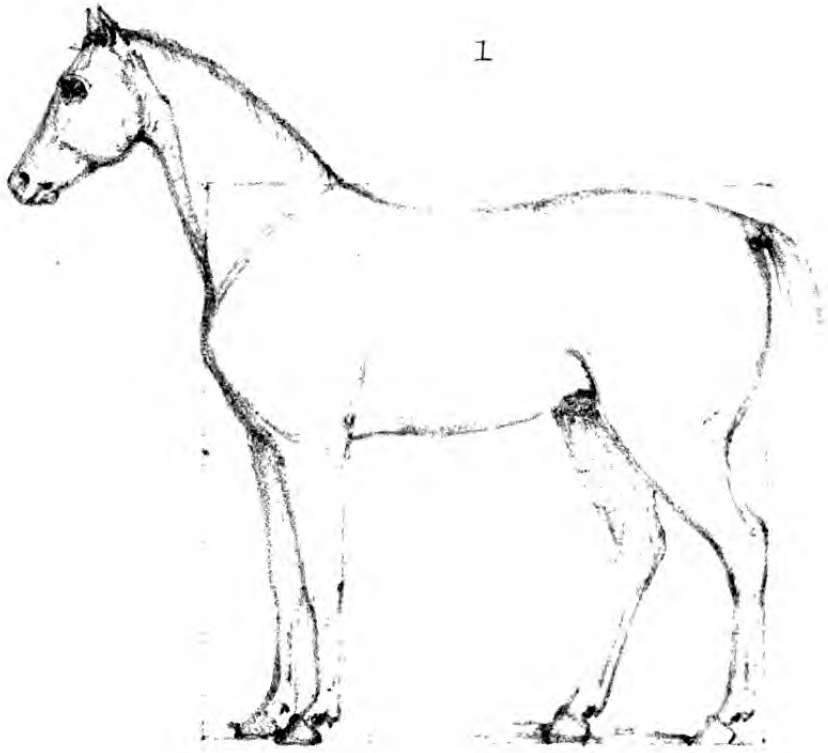

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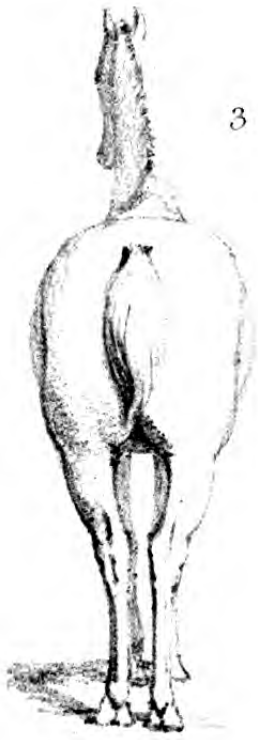


flat, and rounding into the gaskins, which incline inwards in slight curves; from whence the shanks or cannon-bones descend in perpendicular lines.

The inner line of the gaskin is nearly parallel with the outer, and the thighs are brought close together with abrupt curves.

The inner line of the shank is parallel with the outer, and the hoof widens to the ground.

The cylindrical form of the body is seen on each side and underneath the quarters.

That the tail is inserted below the highest point of the back will be evident from the profile line of the quarter.

When all these parts are put together, we shall have for the profile, or side view of the Horse, this, Plate B, Fig. 1. For the front view, this, Fig. 2. And the back, this, Fig. 3. For the purpose of studying the general character of quadrupeds, these are sufficient; and for the purpose of representing them it will be best for the student to make himself acquainted with the motions and balance of the animal, without attempting more detail, until this is done with facility.

Section II.

Motion of Quadrupeds.

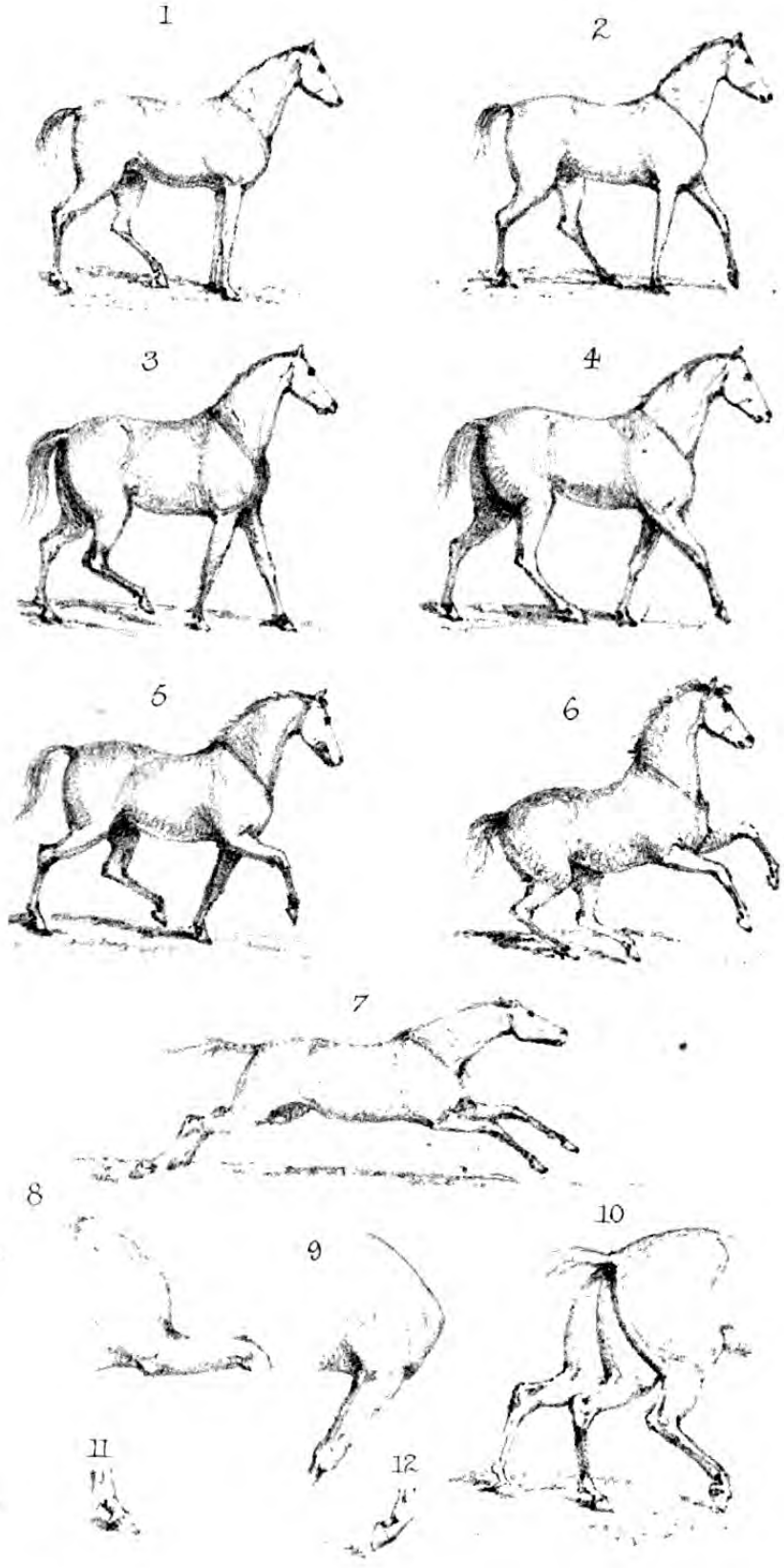
The motions of the limbs of animals of this class are chiefly directly forward, or directly backward; the power of lateral motion being very limited.

The hinder limbs always commence progressive motion as in the first position of the walk. (Plate C, Fig. 1.) The forefoot of the same side advances next. (Fig. 2.) Then the hind foot of the opposite side (Fig. 3.); and lastly, the forefoot on that side, and so on. (Fig. 4.)

In the trot, the hinder leg of one side and the foreleg of the other are raised together. (Fig. 5.)

In the canter, or gallop, both forelegs and one hindleg are raised together. (Fig. 6.)

But when rapidly moving, the two forelegs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and the two hindlegs appear to advance together; still the hind and foreleg of one side should be slightly in advance of the other. (Fig. 7.)

The variations in form occasioned by these motions are very trifling. On the projection of the foreleg, the point of the shoulder is raised and becomes a more obtuse angle, from the advance of the lower joint or elbow; (Fig. 8.) and when the body is projected by the second motion of the walk, or trot, the point of the shoulder drops, retreats, and resumes its original form, a right angle. (Fig. 9.)

In the advance, the arm or upper part of the foreleg should not be raised higher than to form a right angle with the humerus or bone of the shoulder; and when retired should range in a line with it.

The knee cap, when the leg is bent, always retains its flat form.

In the quarter, the line below the tail should always be parallel with the shank or cannon bone. (Fig. 10.)

The direction of the pastern continues the

same until the hoof is lifted off the ground, when it makes an angle in the opposite direction (Figs. 11 and 12.): the variations in form are too minute to be noticed till the student is further advanced.

Some animals have a peculiar mode of progression; but the variations from the common walk, trot, or gallop (though the latter is frequently converted into a series of leaps), are so few and so striking as to be instantly discovered and easily remembered.

CHAPTER II.

CHARACTERISTICS OF QUADRUPEDS.

Details.

It may be useful before entering into the details of the characteristic features of animals, to point out the distinctions between the great divisions, Quadrupeds, Birds, and Human Beings, in a feature common to all, and which has not met with the attention which it deserves, probably from the circumstance of the varieties in it not being sufficiently evident to strike general observers. It is the eye In the pictures of Rubens, Snyders, Giulio Romano, Raffaelle, and almost all the most celebrated painters in the middle ages, and in too many of the present day, the horses and lions have eyes like human beings. Horace Vernet, in his Mameluke charging, has given a horse the eye of a bird.

The human eye is a long eye, placed in a cavity, and at right angles with the nose, having a circular coloured iris, and a large quantity of white. (Plate D, Fig. 1.)

The eyes of all quadrupeds are much rounder, and placed on prominences, and at acute angles with the nose; but few of them have any white, the coloured iris occupying all the open space between the eyelids. (Fig. 2.) None of the feline tribe shew any white, nor is the eye moveable to any great extent; it is nearly circular, but with long corners, as they are commonly termed. (Fig. 3.)

The eyes of birds are perfectly round, without white, and the corners barely visible. (Fig. 4.)

The Horse has been selected as being one of the most *symmetrical* of quadrupeds. The variations from this symmetry will give the most distinctive characteristics of the other species.

It has been stated, that in all quadrupeds there is a similarity of anatomical construction, and that the relative situation of the head, trunk, and limbs, is the same in all. Likewise in all quadrupeds the trunk may be divided into three parts, viz. the forehand, the body, and the hindquarter, usually abbreviated into the quarter. And these parts

are of the same general shape in all, though differing in proportion, both in themselves and in relation to each other.

The form of the forehand is always more or less nearly approaching that of a right angled triangle; the right angle of which is the projecting point of the shoulder.

In most animals it assumes the proportion of Fig. 5, in Plate D: in the Giraffe it becomes elongated, as in Fig. 6.

It will be more distinctly impressed on the mind, by pointing out the cause of this form being assumed. The bladebone joining the humerus, makes the angle, and the muscles attached thereto, make the base. In most quadrupeds the spine rises in a diagonal direction above this form; and the sternum or breast bone, takes a horizontal direction below it. (Fig. 5.)

The body of the Horse in form is a near approach to a cylinder or truncated cone: the back being slightly hollowed, and the belly slightly curved in almost parallel lines. This is the general form of the body in most animals of this class, and is governed by the

spine and ribs placed as in Fig. 7.: the lower line being described by the muscles of the abdomen; in which the principal variation takes place by their being more or less closely drawn up to the ribs.

The spine is more or less hollowed even in different individuals of the same species: and in the Giraffe has a diagonal instead of a horizontal *direction:* (Fig. 8.) but the principal variation in the *form* of the body in different quadrupeds depends upon the fleshy parts, the muscles of the abdomen being more or less closely drawn up to the ribs. In the Greyhound will be found one extreme of the scale: and in the Kangaroo the opposite extreme. (Figs. 9 and 10.)

There are instances, as in the cases of the Elephant and the Camel, in which the upper line, instead of being concave, is convex. (Figs. 11 and 12.) But these are the exceptions to the rule, which will be immediately and strikingly apparent upon the most cursory observation.

The quarter is bounded by two convex and one concave line placed angularly, and form-

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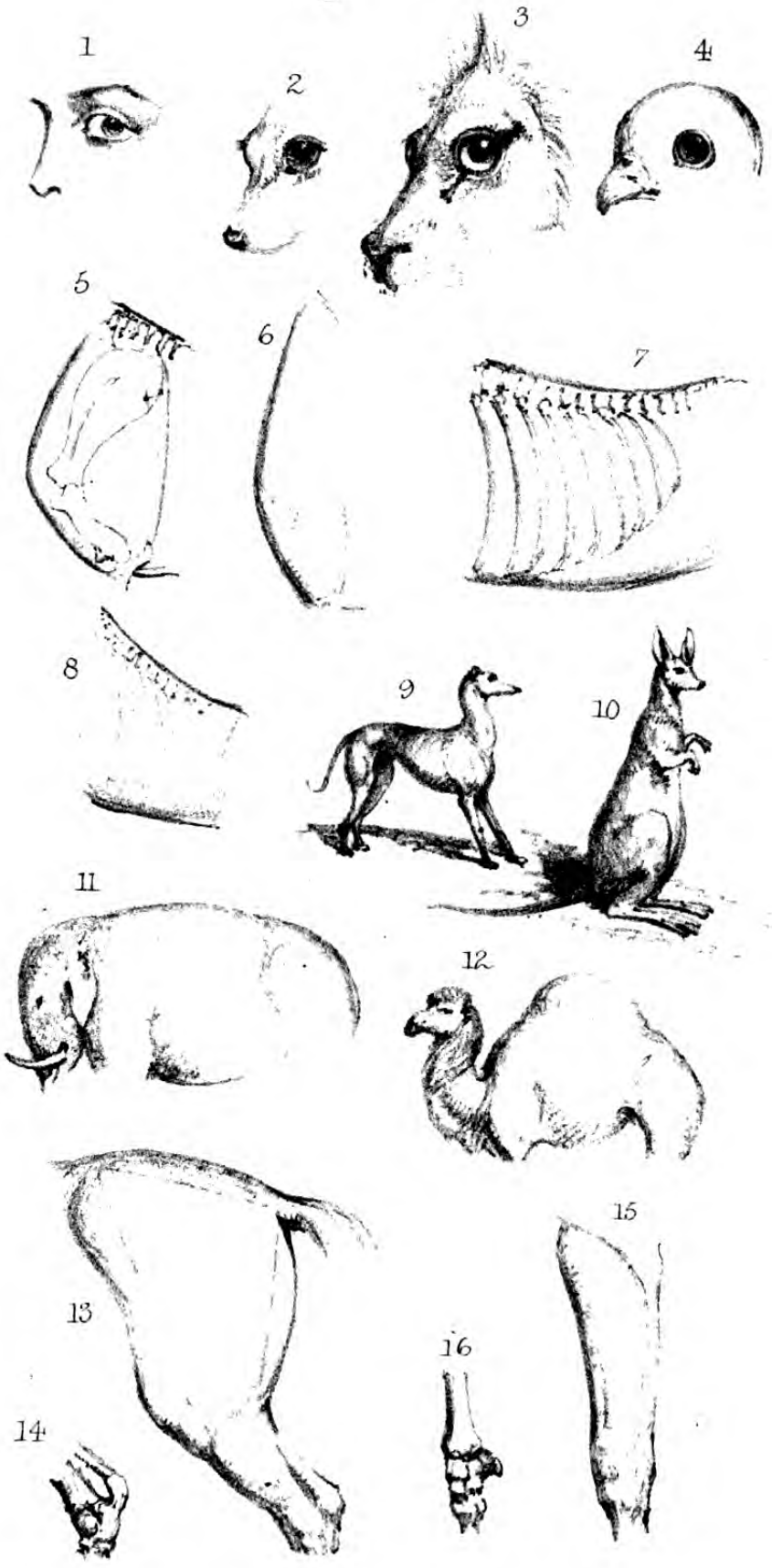


ing a shape approaching part of a right-angled triangle. It is more closely connected with the hindleg than the forehand is with the foreleg. The two curves in front and behind join the curves which describe the gaskin, and thus descend in nearly parallel serpentine lines to the hock, which is of triangular form, governed by the heads of the two principal bones, with the tendon called the tendo Achillis, attached to the projecting os calcis, or bone of the heel. (Figs. 13 and 14.)

The forelegs diminish gradually to the knee, which is a flat oblong form, governed by two ranges of small bones slightly projecting, and to which the sinews of the arm are attached. (Figs. 15 and 16.)

The forehand and the hindquarter are joined to the trunk by loose flaps of skin.

These may be assumed as the general form of the body and upper parts of the limbs in all Quadrupeds. (Frontispiece, Fig. 1.) They may vary, they do vary in proportionate length and width, but the essential characteristics of the form are the same.

The peculiar characteristics of the different

species of Quadrupeds, will be found to depend upon the relative *proportions* of the trunk and limbs, in themselves and to each other; and in the variations which exist in the *forms* of the extremities.

In the tribes that have hoofs, there is little variation in the relative proportions of the trunk and limbs, from the type of the class; the difference principally consisting in the intrinsic proportions of the parts themselves. The Deer tribes are of more slender make, and carry a shorter neck more erect. (Frontispiece, Fig. 4.) The Ox tribes have generally heavier forms, and carry the neck horizontally. (Fig. 2.)

In Quadrupeds that have paws, the legs are shorter in comparison with the length of the body, in the parts below the knees and hocks. The neck is shorter, but generally carried in the same direction with that of the horse. (Fig. 5.)

The variations in the forms of the extremities will be considered separately.

Section I.

The Head.

The great difference in the heads of the various tribes of Quadrupeds will be found in the form of the nose, and in the proportion it bears to the cranium, which varies in width and depth, but not much in shape. In some few examples, as the Hog and Rat tribes, the head is widest at the ears, and from thence diminishes to the end of the nose. (Plate E, Figs. 1 and 2.) In others, of the carnivorous tribes, the cranium is the same width at the ears and eyes. (Fig. 3.) But in general the form of the head is nearly a lozenge, with one end more or less extended, according to the length of the nose, which governs the characteristics of many different tribes. (Figs. 4, 5, 6, 7, and 8.

The Ears, though differing in length and

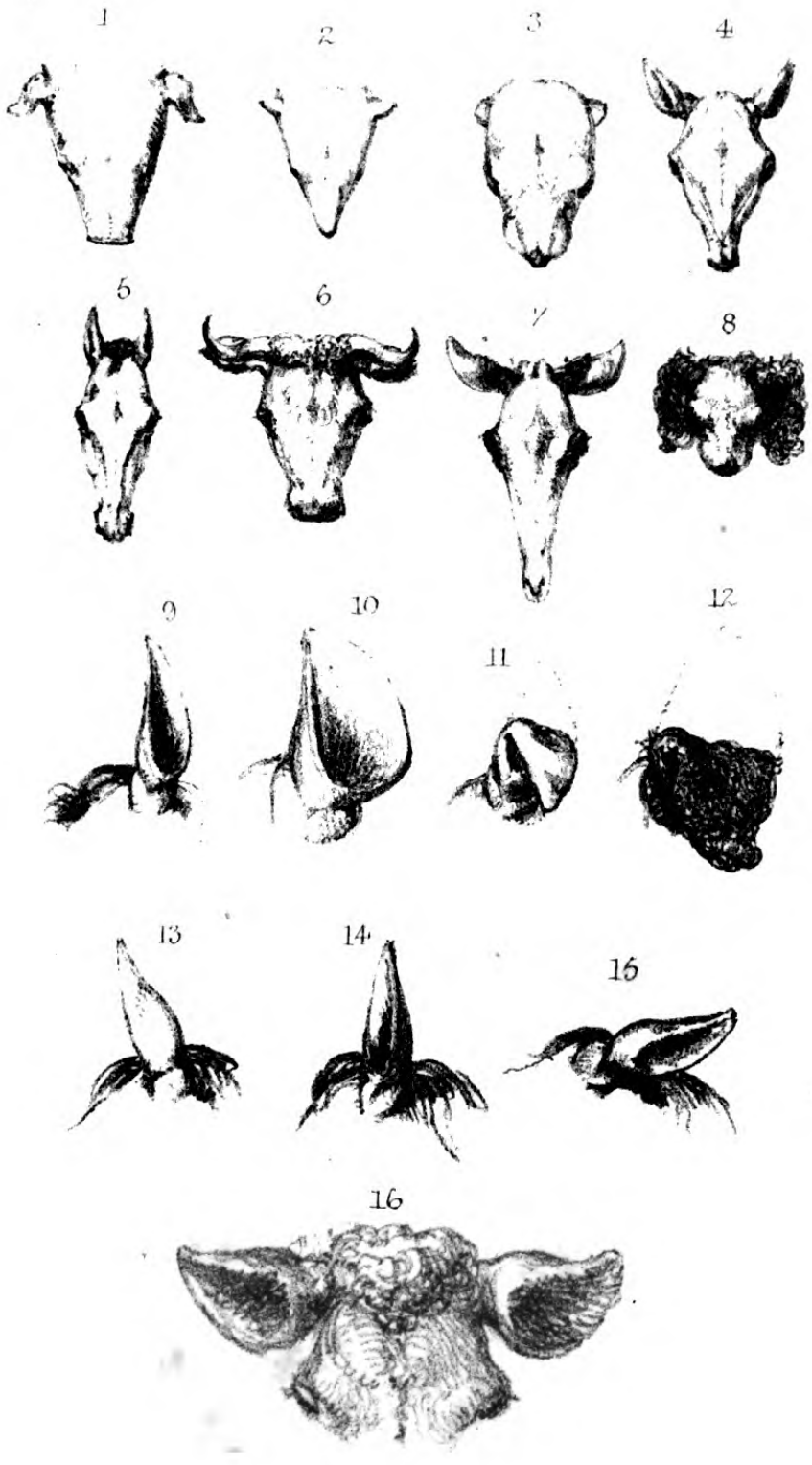
width and mode of carriage, are essentially of the same form in most Quadrupeds. There is a sort of cup attached to the head, out of which the ear appears to grow. The front of the ear is straight, and the back curved. The orifice is of a lanceolate shape. (Figs. 9 and 10.)

The point of the ear is frequently pendant, as in the Greyhound, Spaniel, &c.; but in these the form is only partially concealed. (Figs. 11 and 12.)

The ears of the Horse tribe are very moveable, but generally erect. (Figs. 13, 14, and 15.) In the Ox and Deer tribes they project laterally (Fig. 16.); but this is a difference of position easily noted: the form remains essentially the same, and the variations will be immediately discovered, when once the Characteristic is impressed on the mind.

The end of the nose assumes several very distinct forms.

One variety which is to be found in the Horse tribe and a few other species, is nearly square; the nostrils, which are developed externally, and capable of great distension, are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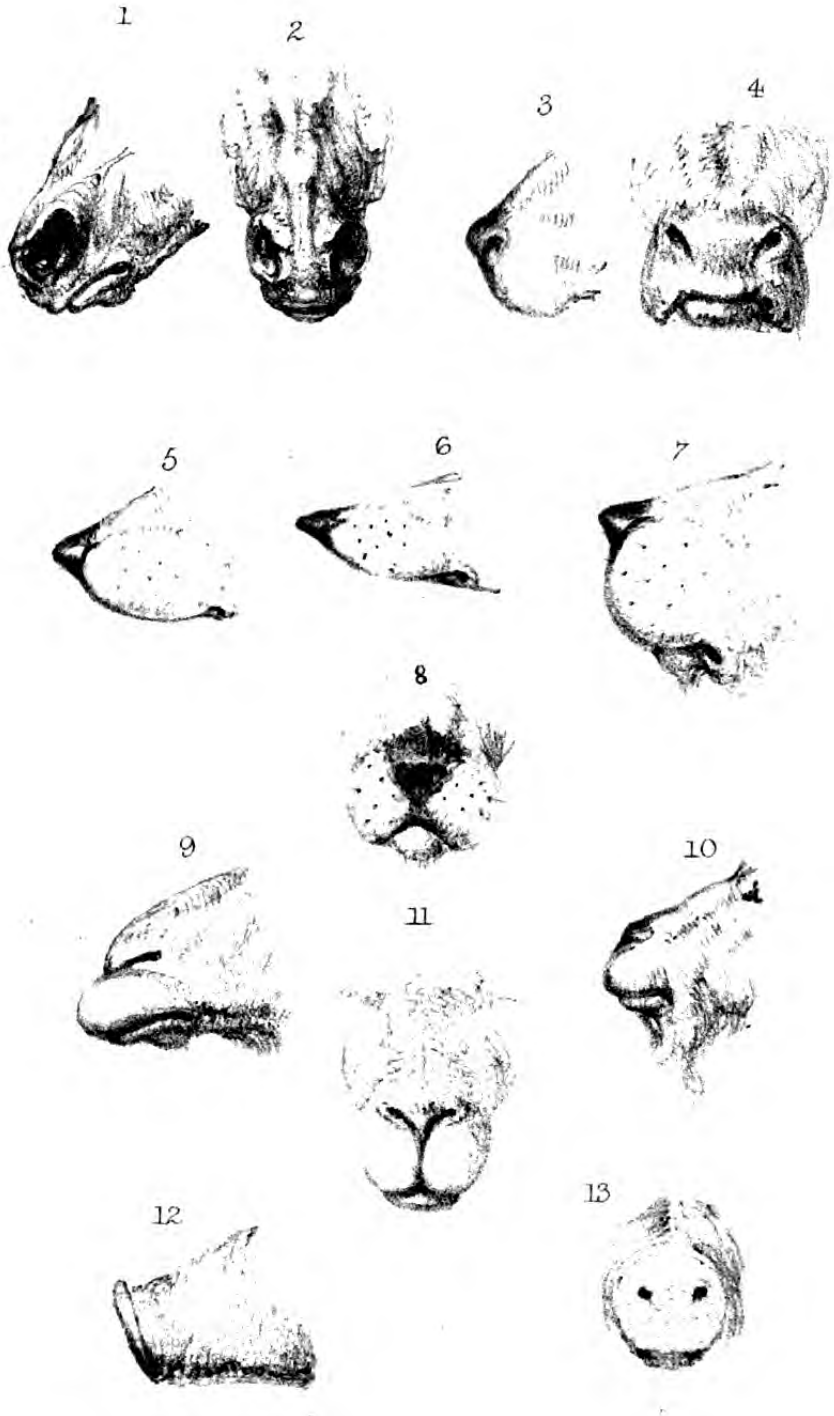
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situated at the side. The upper lip is thin, and lies close over the teeth. (Plate F, Figs. 1 and 2.)

Another variety is to be found in the Ox and Deer tribes. The cartilaginous part is projected so as to become more decidedly square, and is distinctly marked, being destitute of hair. The nostrils are not capable of much distension, and are situated at the angles of the nose, in a diagonal direction. (Figs. 3 and 4.)

Another form, which is a modification of the last, is found in the Carnivorous tribes. The cartilage is projected so as to form a triangular point, more or less acute in different species, the nostrils are reduced to mere slits by the enlargement of the upper lip in two lobes at the side of the muzzle. Two small round orifices are found in front. (Figs. 5, 6, 7, and 8.)

A further modification of this form is to be found in the Camel, Sheep, and Goat tribes, The lobes of the upper lip are greatly protruded before the point of the cartilage, which

is so reduced in size in some species as to become scarcely visible. (Figs. 9, 10, and 11.)

Another variety is to be found in the Hog tribes. The muzzle appears to be truncated, or cut abruptly off, and the nostrils are reduced to two round holes at the end of the nose. (Figs. 12 and 13.)

The muzzles of nearly all Quadrupeds will be found to range under one or other of these classes. The minute variations will characterize the different species and individuals.


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Section II.

The Neck.

In the neck a general rule prevails, that it diminishes as it approaches the head, but it varies in relative length and thickness, and in the direction of its usual position. Some are straight, some are arched, and others the reverse; some are held erect, some in a diagonal direction, and some horizontally, and a few incline downwards. (Plate G, Figs. 1, 2, 3, 4, 5, 6, and 7.) The general shape of two nearly parallel lines, however prolonged, will be found in most Quadrupeds. There is a peculiar extension of the skin called a dewlap, found in the Ox tribes, and in some species of the Dog and Deer tribes; but it is strictly an appendage, as the above general form remains distinct. (Figs. 8, 9, and 10.)

The only important variation in form, is at

the upper or back part of the neck, which is known by the name of the Crest. In one great division of Quadrupeds, it is, as has been described, a ridge from whence the neck thickens to the throat, and in this case the crest is decorated with a mane, more or less luxuriant, in different species. (Figs. 4 and 5.) But in the Dog, Cat, Sheep, and some other tribes, the neck is nearly cylindrical, without any distinction of the crest by mane or ridge. (Figs. 11, 12, and 13.)

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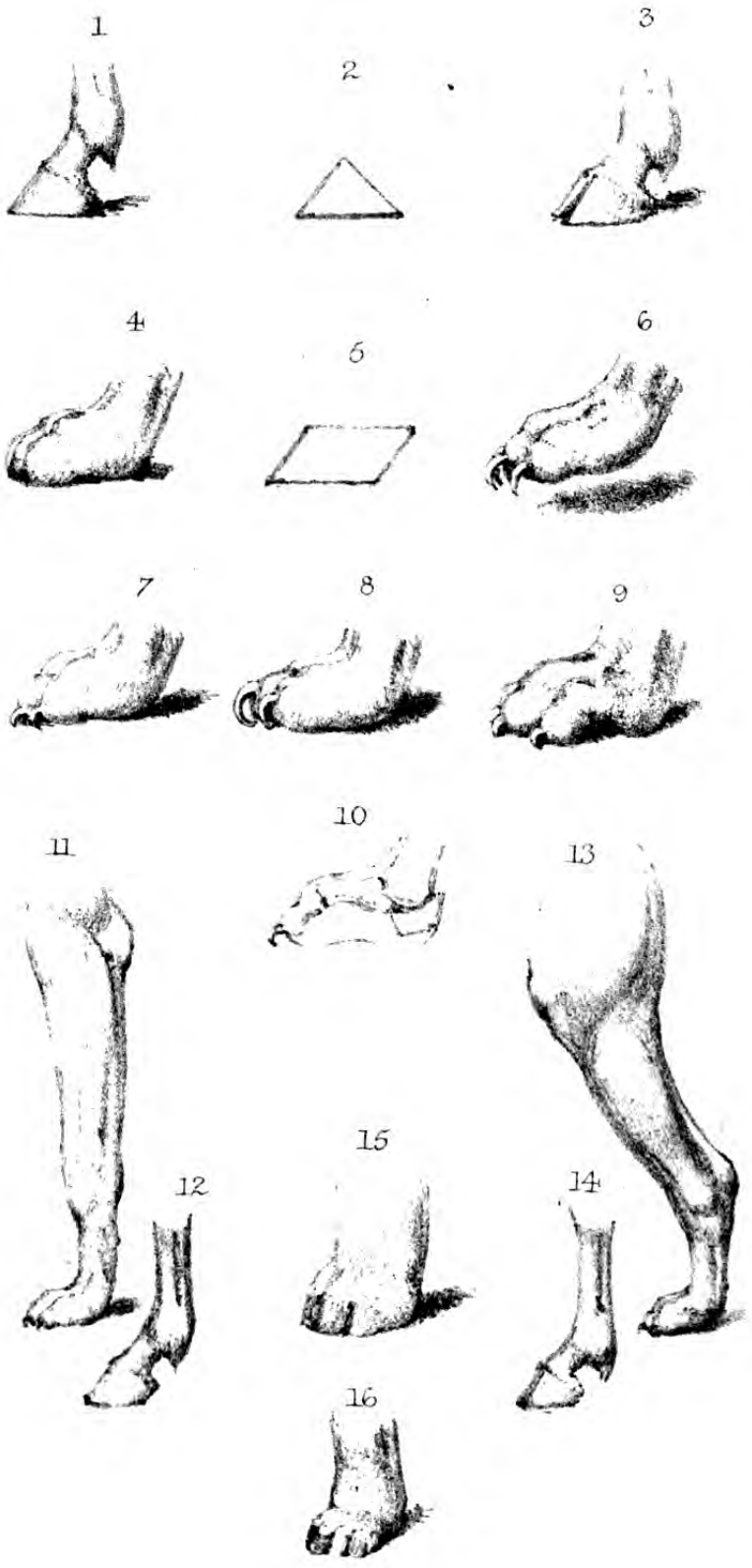

Section III.

The Feet.

The forms of feet will range under two great divisions, hoofs and paws.

All hoofs approximate to a right-angled triangle, whether whole, as in the case of the Horse tribe, or cloven, as in those of Oxen and Deer. (Plate H, Figs. 1, 2, and 3. The relation of the hoof to the leg has been already given.

All paws or feet divided into toes have a form more nearly approaching a parallelogram, termed a rhomboid. (Fig. 5.)

The feline tribes shew no claws until excited —they are concealed within a sheath from whence they are protruded only when the animal is irritated, or desires to seize anything. (Figs. 4 and 6.)

In all the other tribes of Quadrupeds,

having claws, the claws are fixed, and always apparent; in some larger than in others. And in some tribes the toes are longer and more detached than in others, but the form is essentially the same, shewing the distinct joints and the claw attached. (Figs. 7, 8, 9, and 10.)

The relation of the foot to the leg in this division is considerably altered; the paw absorbs all the bones which form the pastern in the hoofed Quadrupeds, and by so much shortens the leg below the knees and hocks. (Figs. 11, 12, 13, and 14.)

There are exceptions to these forms, as in the case of the half hoof, half paw, of the Elephant, (Fig. 15.) Rhinoceros, (Fig. 16.) &c.; but these general forms will enable the student immediately to appreciate the variations.


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Section IV.

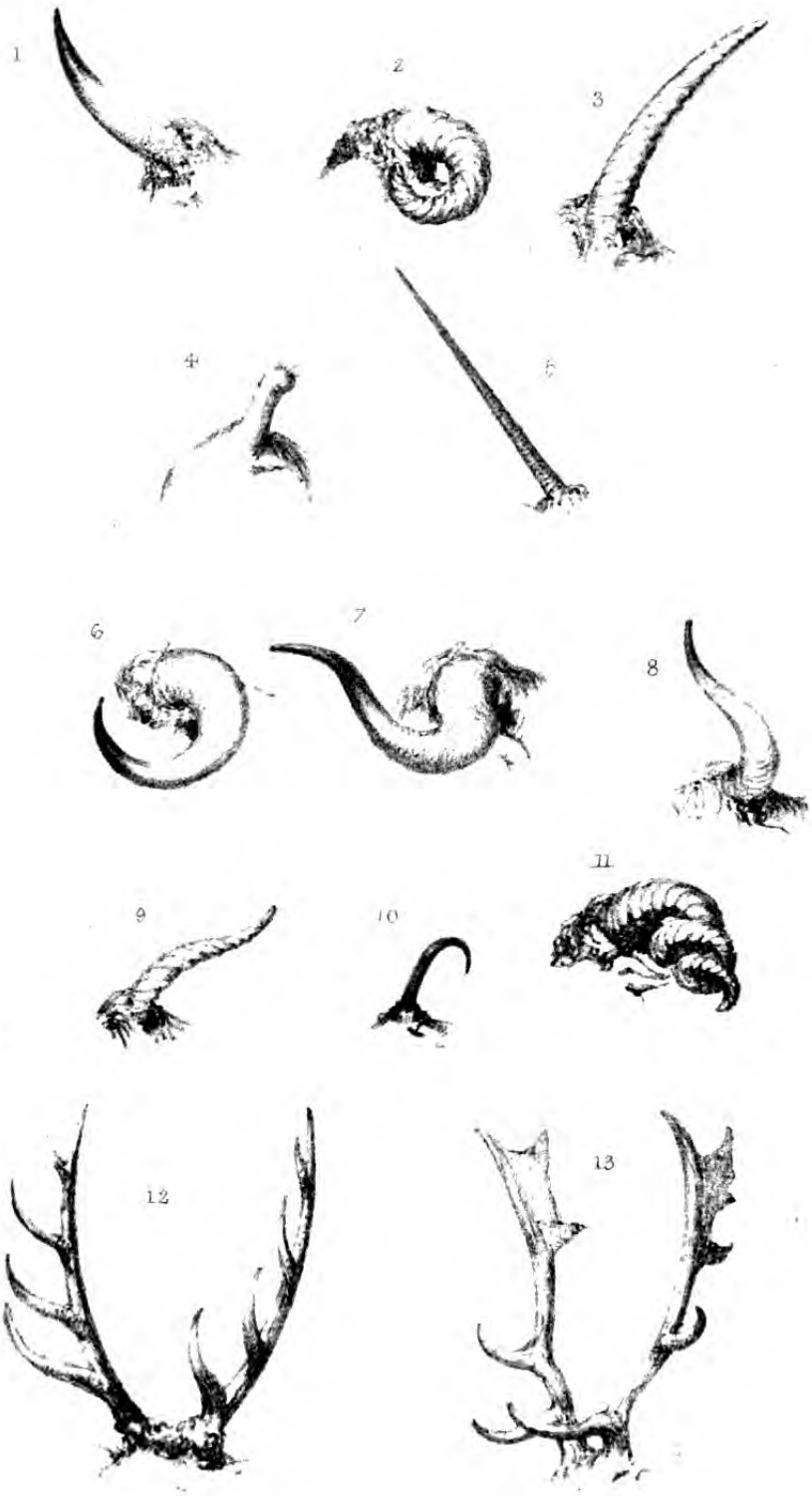
The Tail.

Tails in Quadrupeds vary from the tuft of the Rabbit and the Deer (Plate I, Figs. 1 and 2.); and the long hairy tails of Horses, Foxes, Wolves, &c. (Figs. 3, 4, and 5.); to the smooth pointed appendage of Cats, Monkeys, and Kangaroos (Figs. 6, 7, and 8.); the bossy extremity of the Lion and Jerboa (Figs. 9 and 10.); and the hairy tufted tail of Oxen. (Fig. 11.) There are also some few so peculiar as to belong only to one tribe, such as the broad flat tail of the Beaver covered with scales. (Fig. 12.)

Section V.

The Horns.

Although there are comparatively few tribes that have Horns, a considerable variety will be found among different species, and even different individuals of some of the same species. With a very few exceptions, they rise out of a sort of bed at the summit of the forehead. Sometimes they stand erect, sometimes they project anteriorly, sometimes laterally, sometimes they incline backward. They are found of plain surface, as in the Ox tribes (Plate K, Figs. 1, 6, 7, and 8), and of twisted surface, as in the Sheep, Goat, and some of the Antelope species. (Figs. 2, 3, 5, 9, and 11.) They are sometimes straight, as in the Giraffe and some of the Antelope species (Figs. 4 and 5); curved more or less, as in the Ox, Goat, and Sheep tribes, assuming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frequently a serpentine form in the former, and twisted so as to resemble a corkscrew in the latter. (Figs. 1, 2, 3, 5, 6, 7, 8, 9, and 10.)

They are found with branches in the Deer tribes, sometimes round like the parent stem, as in the Red Deer (Fig. 12): at others flat and palmated, as in the Fallow Deer. (Fig. 13.) It should be observed, that in the Red Deer all the branches proceed from the same side of the main stem, generally the exterior, but curving forwards.

These extremities, with some other minutiæ which will be noticed hereafter, are the parts in which the variations are found that distinguish different tribes, species, and individuals. But we may assume as a form generally characteristic of the Class of Quadrupeds, Fig. 1, Frontispiece.

If we wish to convert it into an Ox, the spine from head to tail is made nearly a straight horizontal line, the form generally thickened, a dewlap added, feet with cloven hoofs, and a moderate length of tail with a bunch of hair at the end. (Fig. 2.)

If we wish for a Giraffe, increase the length of the neck in a vertical direction; alter the direction of the spine from horizontal to diagonal by deepening the shoulder, and lengthen the legs. (Fig. 3.)

So with all other Quadrupeds.

The minute differences of form in the eyes, ears, noses, and feet, should be reserved until facility is acquired in representing the above general character of any given animal in all motions and positions.

CHAPTER III.

CHARACTERISTICS OF BIRDS.

SECTION I.

General Character of the Class.

THE distinctive differences of this Class from that of Quadrupeds, consist in the disposition of the limbs, which correspond to the forelegs of the latter, in the change of the direction of the body, and of the character of the head.

In this Class, the limbs which correspond to the forelegs of Quadrupeds, are doubled up to the side of the body as wings, and are capable of lateral extension to their greatest length. The mouth and nose are comprised in a rigid horny pointed projection, termed a beak, in which are two small orifices for nostrils. Two other unseen orifices in the head supply the deficiency of ears.

The form of the body differs from that of Quadrupeds, in the general roundness of the shoulders, resulting from the absence of the blade-bones and spine; and in the projection of the upper portion of the hind quarters to an acute angle.

When standing, the whole weight of a Bird is supported upon two legs, corresponding to, and differing very slightly in general character from the hindlegs of Quadrupeds, and the direction of the body necessarily altered from horizontal to more nearly vertical, to preserve the balance of the animal, to aid which the tail is projected in the direction of the body, considerably beyond the legs.

The Thrush is selected as the subject in which the general characteristics of Birds may be developed, from its being the nearest to the desired intermediate character that can be found among the different species, which are sufficiently common to admit of the analysis being appreciated.

The form of the head may be represented as the head of a Quadruped divested of

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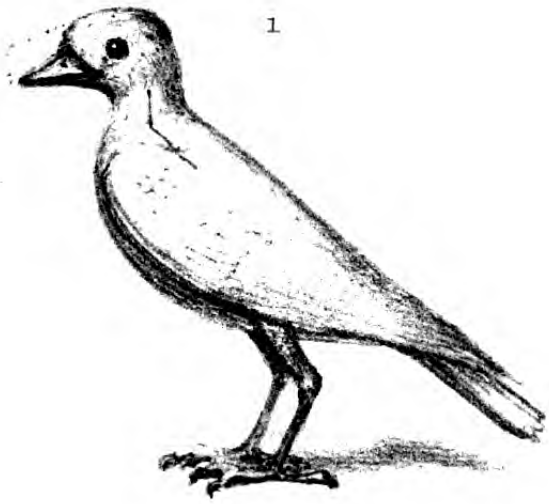

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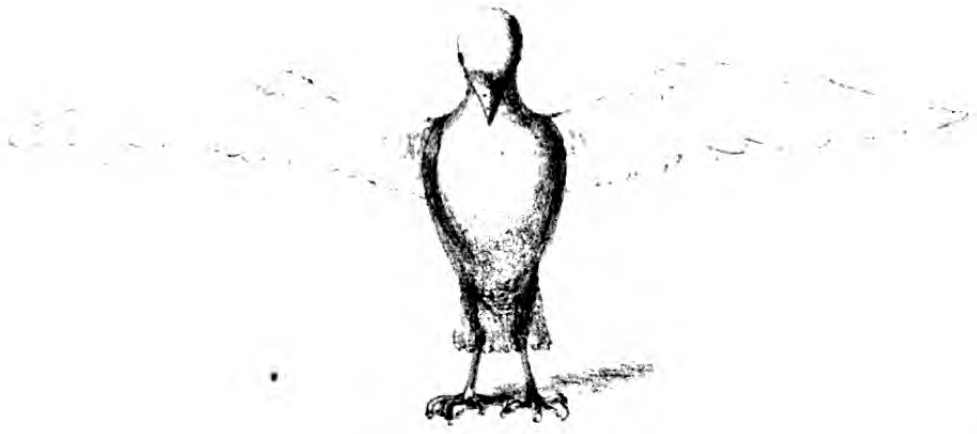


external ears, and with the mouth and nose reduced to a pointed beak, nearly the same length as the rest of the head.

The neck is a flexible cylindrical tube of equal thickness throughout, and in length about half that of the head, attached, similarly to that of Quadrupeds, to the hinder part of the head and the upper part of the shoulders.

The head and neck thus formed are attached angularly to a body nearly cylindrical at the shoulders, and gradually diminishing to the tail; the line of the back being straight, and of the breast curved. The depth of the chest at the widest part is equal to the length of the head.

The wings when closed, form a line parallel with the breast.

The legs, similar to the hindlegs of Quadrupeds, are formed of two joints placed angularly, with feet that have three claws in front, and one behind placed flat on the ground. The upper joints of the legs range nearly parallel with the breast, and join the body at nearly the middle of the length:

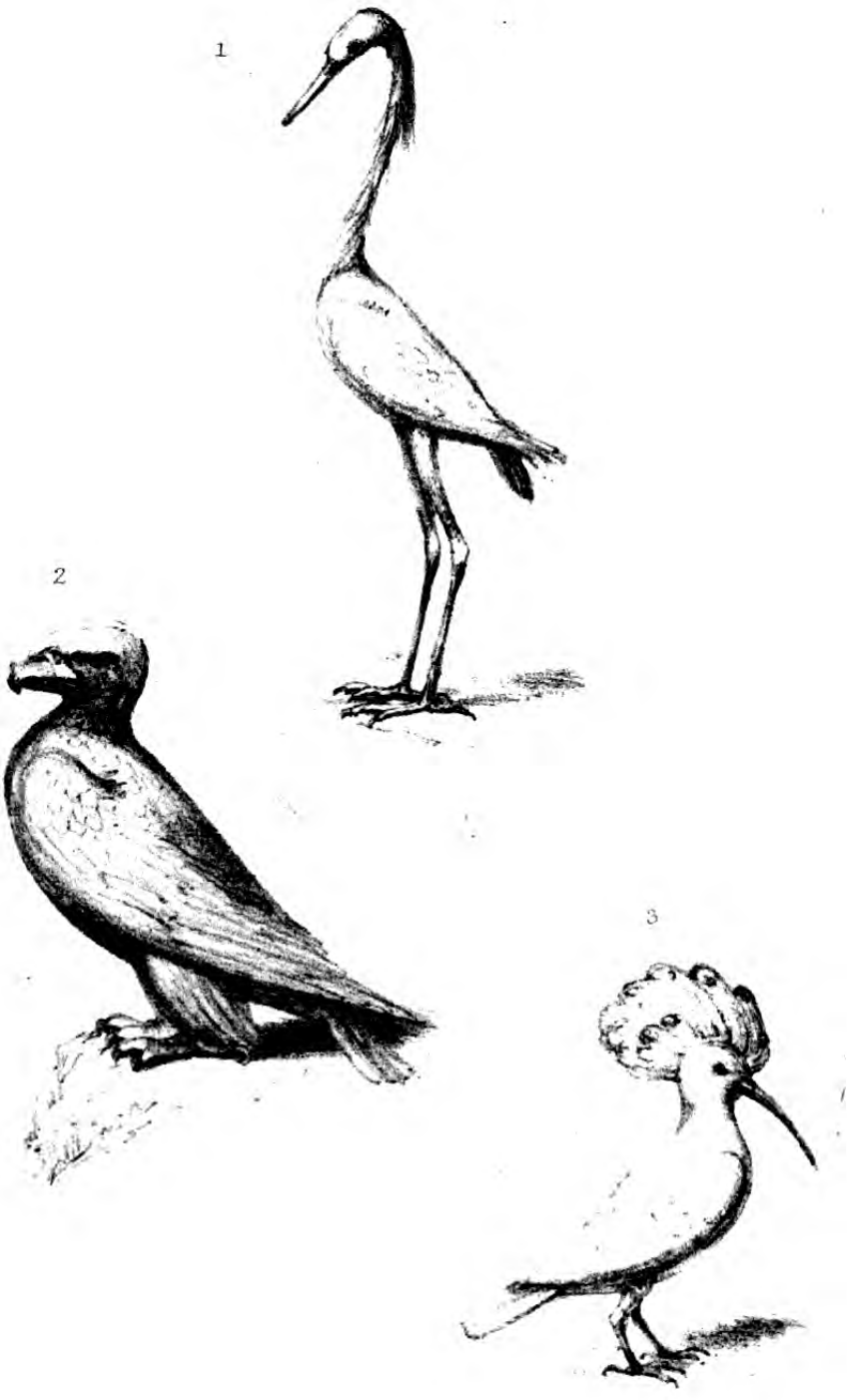
they are partially concealed by the folded wings.

The joints of the legs are equal in length with the head and with each other.

When all these points are put together, we have for the general characteristic of Birds in profile, Fig. 1, Plate L. In front, the chest being cylindrical, and the head diminishing from the eyes to the point of the beak, it becomes Fig. 2.

As in Quadrupeds, the distinctive variations between the different species of Birds, depend upon the relative proportion of the extremities to the body in themselves, and to each other.

Thus we have for the general form of Birds, Fig. 1, Plate L., which becomes a Heron, by lengthening the head, neck, beak, and legs (Plate M, Fig. 1.); and an Eagle, by drawing back the neck, making the bill hooked, and feathering the legs to the feet (Fig. 2.): by adding a crest, and a longer tail and beak, it will become a Hoopoe. (Fig. 3.)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Section II.

Motion of Birds.

The motions of Birds are walking, jumping, and flying. (Plate N, Figs. 1, 2, 3, 4, and 5.) The variations in form resulting from these motions, are principally to be found in the wings in flying. The legs are moved in the same limited manner with those of Quadrupeds, and the only change in form is in the foot or claw, which at times is contracted as in Fig. 6.

In flying, the upper portion of the wing when extended, is bounded by parallel curves; and the lower portion diminishes from the joint to the extremity. (Fig. 7.)

The lower portion is equal in length with the body, and the upper portion half as long.

The motion of the wing is vertical, or up and down, and when fully extended, they project laterally in curves. (Figs. 3, 4, and 5.)

When the wing is elevated and seen in profile it becomes Fig. 7.

And when the wing is only partially extended, as occurs on the Bird preparing to alight upon the ground, it becomes Fig. 8.

CHAPTER IV.

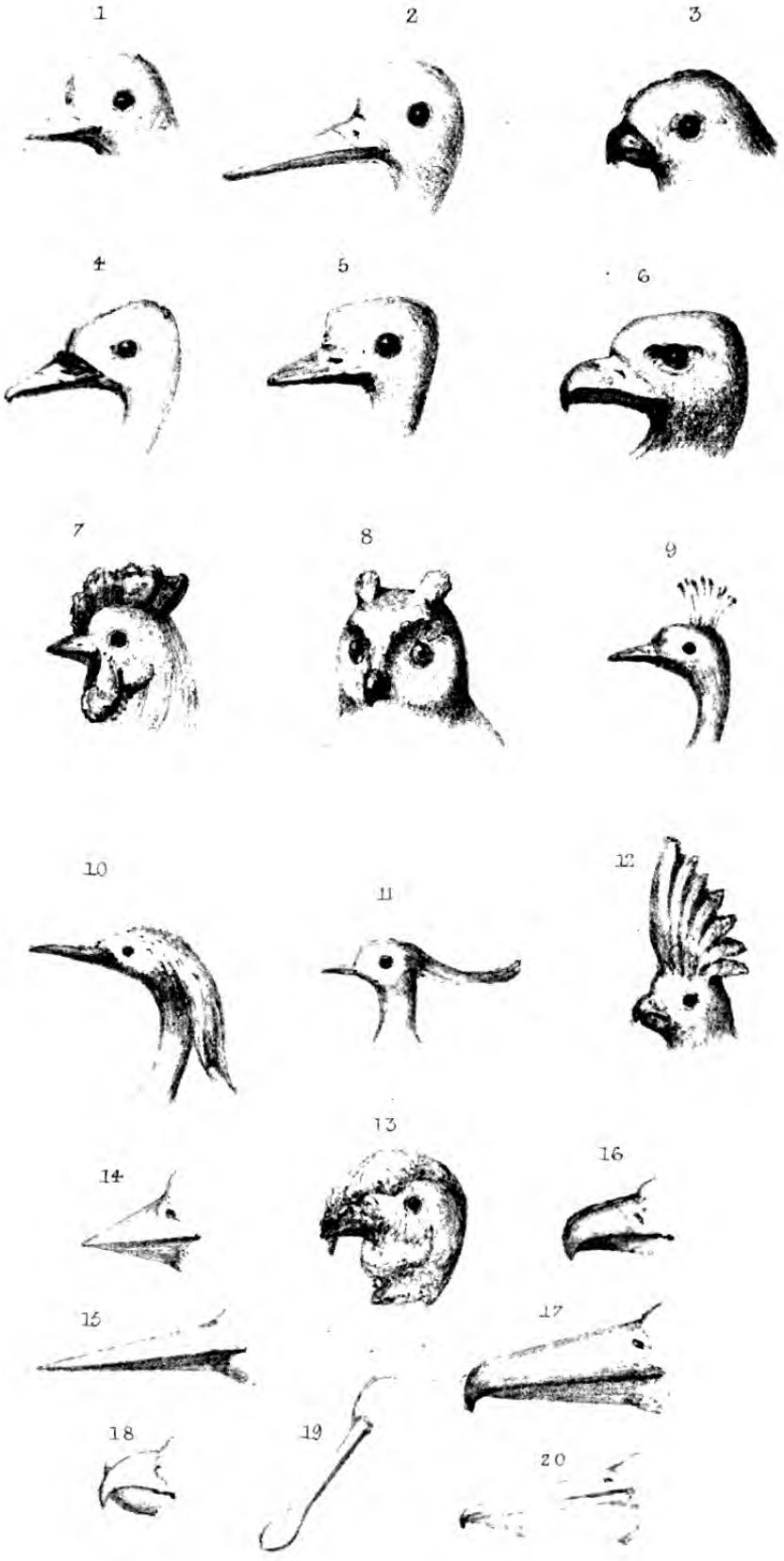
Characteristics of Birds.

Details.

The principal variations in the Characteristics of this class of Animals, are to be found in the same parts as those of Quadrupeds, the extremities. There is a general form of body and legs that is characteristic of the whole class. The back is flat; the shoulders round; the breast is formed by a continuation of the curve of the shoulders, but extended so as gradually to diminish to the tail. (Plate L.)

As in Quadrupeds, the body may be more or less long, in proportion to the thickness or depth of chest; and, in some few exceptions, the back is more or less convex or concave; but this form may be assumed as

generally characteristic of Birds. The various species will be distinguished by the relative *proportion* of the extremities to the body, and by some differences in the *forms* of the extremities, which will be separately noticed. The variations in the form of the body are very trifling, and few in number, so as to become exceptions to the general rule. The same may be said with regard to the proportions of the body in itself.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Section I.

The Head.

The principal variations in the heads of Birds consist in the form of the beak, and the proportion it bears to the cranium, which also varies slightly in relative length and width, and in the arched top being more or less depressed or flattened (Plate O.); it is also decorated with a variety of crests, from the comb of the Cock to the plume of the Hoopoe and Cockatoo. (Figs. 7, 8, 9, 10, 11, 12, and 13, and Plate M, Fig. 3.) And in some few tribes of the Gallinaceæ, loose flaps of skin called wattles depend from the lower part of the head. (Fig. 13.)

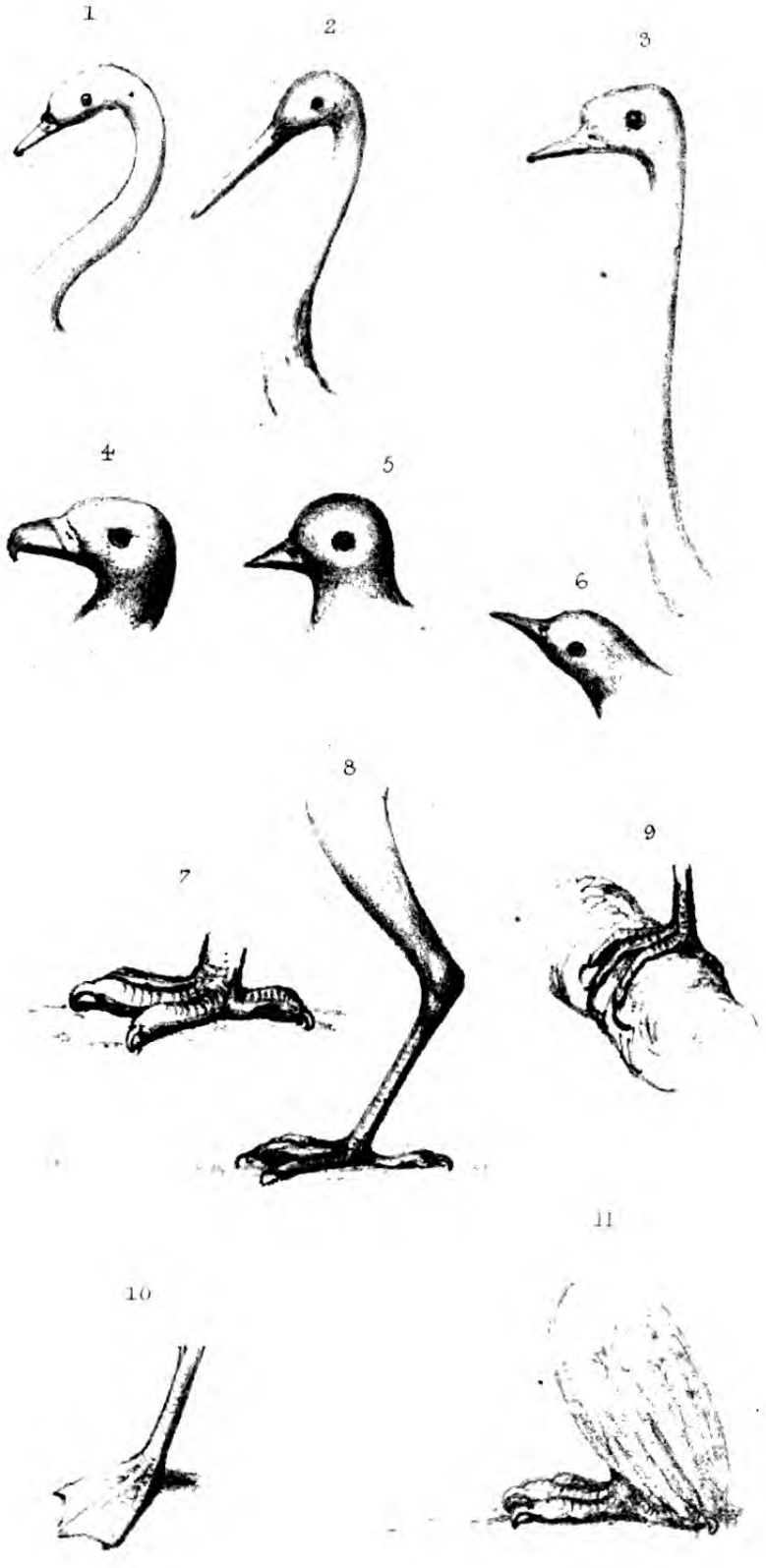
The beak may be ranged under two classes, straight and hooked, and in both the upper mandible is largest.

In the former, it tapers more or less in

different species, from the head to the point, without much difference in shape, other than proportionate length and width. (Figs. 14 and 15.)

In the latter, it frequently tapers but little until it has reached the part at which it suddenly curves over the lower mandible. This kind of beak also varies in relative length and thickness. (Figs. 16 and 17.)

The exceptions of the Crossbill and Spoonbill and the Pelican (Figs. 18, 19, and 20,) scarcely require to be pointed out.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Section II.

The Neck.

The only variations which need be mentioned, in the necks of Birds, are in relative length and thickness, and in mode of carriage.

The long necks, such as of the Swan, Crane, Ostrich and Heron tribes, are generally carried erect, with more or less graceful serpentine bend. (Plate P, Figs. 1, 2, 3; and Plate M, Fig. 1.)

The short necks are sometimes drawn back, as in some of the Eagle tribe (Fig. 4.); sometimes held erect or nearly so, as in the Passerine tribe (Fig. 5.); and sometimes projected forward, as in the Woodpecker and Creeper tribes. (Fig. 6.)

Section III.

The Legs.

These, it has been stated, resemble the hind-legs of Quadrupeds, but the upper parts only are covered with feathers. The lower parts are straight forms, equal in thickness throughout, more round and slender than the legs of Quadrupeds, and covered with a scaly skin. (Plate P, Fig. 8.) The feet may be described as resembling paws, but with three toes only, greatly separated in front, and sometimes one behind. The claws are long, and vary in proportionate size and strength. (Figs. 7 and 9.) In the aquatic tribes the feet are webbed. (Fig. 10.)

In some few tribes, as those of the Eagle and the Owl, the feathers upon the upper part of the limb are large and long, so as frequently to conceal the form to the foot. (Fig. 11.)

Section IV.

The Wings.

When the wings are folded down to the side, nothing is seen but the curved line describing the exterior edge. The points merge into the tail. (Plate L, Fig. 1.)

When extended, the upper portion of the limb, hitherto unseen, appears of a form bounded by two curves: to which the lower part is attached on the interior edge by nearly a straight line, and on the exterior by a sudden inversion of the curve from concave to convex. (Plate N, Fig. 7.) When the wing is fully extended, the lower portion becomes sometimes less curved, by reason of the expansion of the penfeathers forming the point, and the interior edge becomes nearly straight. (Plate Q, Fig. 1.)

The feathers are in ranges in the upper portion of the wing, to which the penfeathers make another in the lower. They overlap

each other; and in the inside of the wing the upper portion present only the edges farthest from the body, and in the lower it is the reverse. It may be said that the lines describing the feathers curve *towards* the body in the upper, but *from* the body in the lower portion of the limb. (Fig. 2.) On the outside of the wing the opposite arrangement appears. (Fig. 3.)

The variations in the forms of the wings of the different species of Birds are principally in the relative length of the upper portion, which becomes much greater in the larger rapacious tribes, such as Vultures, Eagles, &c. (Fig. 4.) In these the upper portion is equal in length with the lower; and when the bird is perched the wings fall away from the body, and the bird has almost the appearance of preparing for flight. (Fig. 5.)

The Penguin and Ostrich tribes have wings so peculiar as to become the exceptions to the general form, which should be noticed when the student is more advanced.


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Section V.

The Tail.

The general form of the tail may be assumed as a few straight, slightly diverging feathers, projecting in the direction of the body, (Plate Q, Fig. 6,) or elevated at an obtuse angle, in which case the feathers are ranged vertically or set up edgeways instead of horizontally. (Fig. 7.)

The feathers are sometimes less rigid, and do not diverge, but converge to a point which droops slightly, as in the Numidian Crane and the Pheasant (Fig. 8.); but these instances are few, and must be considered, with the curved appendage of the Cock (Fig. 9.), as exceptions.

The general form varies in length, and in proportion to the size of the bird; from the tail of the Wren to that of the Turkey, and from the Partridge to that of the Peacock.

THE

END OF PART

II

LIST OF PLATES.

In Part I. the Plate which should have been marked O. was marked P., and *vice versâ*. The error is immediately apparent on reading the description.