



Original remarks on the general framing of the horse : illustrated by plates and a large sectional figure

<https://hdl.handle.net/1874/30925>

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ORIGINAL REMARKS
ON
THE GENERAL FRAMING OF THE HORSE.

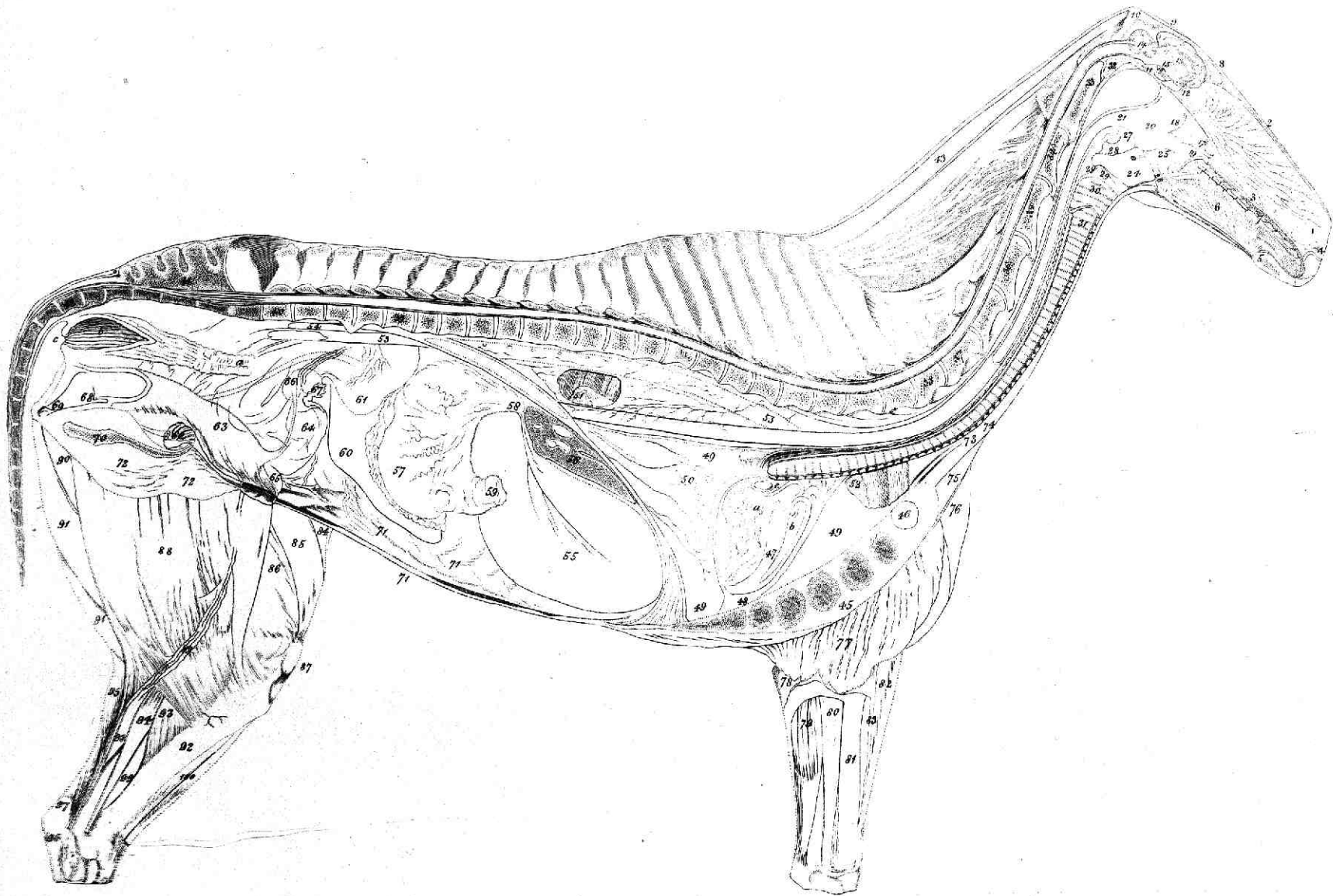
ILLUSTRATED BY PLATES AND A LARGE SECTIONAL FIGURE.

BY B. C. *Second Edition, London, 1842.*

CONCEIVING that a sectional view of the whole horse, if it could be executed, would be a splendid object, and highly instructive for beginners in the veterinary art, and others desirous of a general knowledge of this noble animal, I determined on the trial, and suggested the execution of the drawings to my friend George Kirtland, sen., and with his assistance the section was accomplished by the saw and the knife, and the drawing and engraving of it was made in the year 1808, but more pressing labours on the foot of the horse, and some cross occurrences prevented its being described by me, or published till the year 1813; which edition being now this year, 1842, exhausted, I am induced to renew it with some important additional observations.

Several remarkable circumstances are displayed to advantage by this novel and I believe hitherto (1808) unattempted mode of viewing the animal, as the beautifully varied line and incurvations of the spine, also the extraordinary bend, and incurvation of the *vertebral column* beneath the withers, advancing it over the fore extremities and bringing this part almost to the front parts of the neck, instead of proceeding as a natural external view of the animal would lead us to suppose along the upper part of the withers and neck, is well seen; also the vast length of the *oesophagus*, or gullet, and its passage through the diaphragm into the stomach; also the remarkable and powerful *elastic ligaments* which are supporting the head and neck; the situation and appearance also of the heart, the lungs, liver, stomach, rectum, womb, and the two masses of the brain, are all familiarly exposed in this way, and being engraved upon a large scale, the parts are very distinctly seen, and afford an interesting view of nearly all the internal organization of this most beneficial slave of mankind. The assemblage of so many beautifully formed parts, and the vast diversity of tints also give to the picture a truly rich and unusual appearance.

For certain reasons the division of the body was not made exactly through the centre or middle of the spine or back-bone, but rather on one side, which renders the view more useful, and preserves entire the *Mediastinum*, or *middle curtain*, which separates or divides the chest longitudinally into two chambers, or equal cavities, and which would have been destroyed by such division.



Published by B. Clark 17 Giltspur St. as the Act directs.

Saxton Sculp

The execution however of this figure was not unattended with difficulties ; and especially the reduction of it to a symmetrical appearance after division, in accomplishing which I have once more with pleasure to acknowledge the assistance of my worthy friend Sydenham Edwards, since deceased, whose name as a natural history draftsman in many departments, will long live in just admiration. He died and was interred in Chelsea, where he chiefly resided.

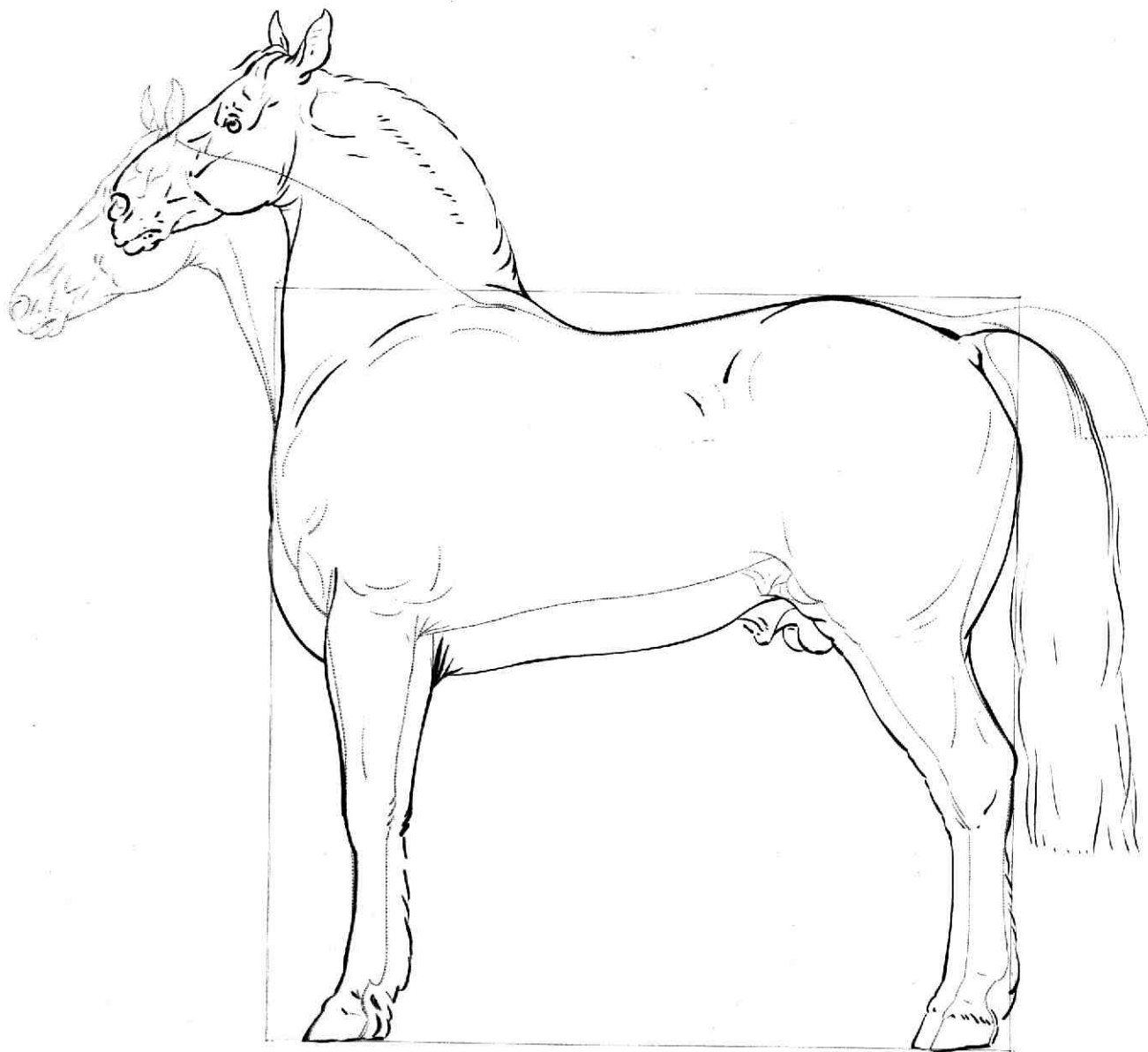
This description is accompanied occasionally, to relieve the dryness of mere reference, and to give it the more interest and utility, with brief remarks on the physiology of some of the parts, and of their diseases, especially where any new, or more correct view of the matter, seemed to call for it.

That the reader may entertain some notion of the general plan on which this splendid animal appears to have been framed, we shall precede our description with some observations on the circumstance, in laying it down as a sort of general maxim or fundamental truth, that the body of the horse is formed pretty much upon the square, that is his projected side ; and which property, varied as to its direction and extent, will be found to prevail through all the families and various races of the quadruped world ; such variation being suited to the respective habits, and modes of life of each particular family.

This circumstance of the square form of the body of the horse to an artist not yet made acquainted with it as a general rule, may be an interesting fact to observe, and tend much to facilitate his labours in giving the figure truly, and in the subjoined plate will be seen the exemplification of it: the body, legs, and feet being included in this measure, but not the head and neck ; for example, a line let fall anterior to, or touching the breast from the height of the withers to the ground, forms one side of this square ; another drawn parallel to this and touching the extremity of the buttock forms a second line, or side of the square ; and one extending horizontally along the back, touching the withers and rump and uniting the two former, affords a third line, or side of the square ; and the fourth is formed by a line drawn along the ground, touching the lower edge of the hoof, and uniting the two first, is completing the square.

By the observance of this guide as a general law, varying the outline according to the contour of the respective parts, a symmetrical appearance will be ever obtained : on the other hand if this rule is not known or not attended to, and there is much deviation either way, the figure will appear long-legged or otherwise long-backed. Nor was this curious fact unknown in ancient times, as we learn by Hierocles, a writer on veterinary subjects who lived in or about the period of Constantine the Great, who observes, in the preface to his work, in language that appears ironically meant, "that he did not intend to inquire, in treating of the diseases of horses, whether the black colour could be distinguished from the brown ; or whether the side profile of the horse *should be of an oblong or a square form* ; or whether he might have been foaled in Arcas or Cyrene, Hiberia, or Cappadocia, Thessaly, or Mauritania, or Persia." *Ruel, Ser. Græ. Veterin.*, lib. i., p. 4, *Latinè reddita*, fol. ii. His work however, after this flippant display, is little else than an imitation and copy of Absyrtus.

Many quadrupeds, which in form are less graceful than the horse, have the square lengthened upwards, such are the elephant, the camelopardalis, the antelope, &c. ; but by far the most numerous tribes of animals are deviating from the square in the opposite direction, as the



CART-HORSE and BLOOD-HORSE in the same Square.
also exhibiting their respective differences.

lion, tiger, bear, dog, &c.; and in a much more extraordinary degree the badger, otter, squirrel, weazel, polecat, &c. and the burrowing and creeping animals.

Having noticed the square which the general outline of the horse describes, we shall now venture upon some remarks on the further composition or framing of his trunk and limbs, which may tend to give clearer notions respecting his construction, and of the intentions of nature and advantages resulting from such arrangements. The spine or back-bone being extended horizontally is forming the basis of the machine; the head and neck terminating it at one extremity, and the sacrum and tail at the other.

The trunk of the horse however, taken alone, and separated from the limbs, appears to be fashioned much after the manner of a boat, within which are disposed the various viscera and organs for the life and support of the machine; and the ribs are serving to enclose them as in these vessels; the boat-like form is obviously best suited to cleave and pass through the surrounding atmosphere with the least resistance, and the machine by narrowing anteriorly gives commodious opportunity for the attachment of the fore-limbs. (See Pl. 3.) The *sternum*, or breast-bone, by its perpendicular direction, sharpness, and depth, (more especially in front) strongly resembles the keel of a vessel, and as having also the property of securing the ribs (See also Frontispiece, No. 45); and it may be a circumstance worthy of remark, that the ancients expressed themselves on equitation figuratively by the terms or epithets relating to navigation—hence their equestrian Neptune, &c.—though perhaps it was not the above circumstance of the figure of the trunk that occasioned this mode of expression; but was probably taken from their first receiving from the Egyptians the managed horse, transported to their coasts on ship-board, and hence also it was that the mountainous coasts of Thessaly became famous for the Centaurs, men mounted on horseback, and made by their fanciful imaginations into one animal. Or it might be from seeing the horse steered by the rein as ships at sea are governed by the helm that led them to this figurative mode of expression. For before the discovery of the rein they might have been considered by them as a sort of indomptable animal, and the idea of a rein did not probably at once occur to them, or that they would be likely to obey it.*

This boat-like frame is decked over, or covered in, by the approaching of the ribs above, and is then closed by the spine or back-bone strongly connecting them; and this spinal column is made to carry the head and neck, whilst the opposite extremity of it, after dilating into the broad sacrum, for the important attachment of the pelvis and hind limbs, is diminished and lost in the pointed termination of the tail, which in some animals, as in the greyhound for instance, becomes indeed a sort of rudder in guiding and stopping the animal in his swift runnings. So that the analogy of the trunk to a boat is verified in more ways than one, and if not in all there appears to be no way of conveying so familiar a notion of these structures as by this resemblance or comparison. The ribs are eighteen in number on each side, and we have to remark, from accidentally detecting it, that the first rib is differently attached to all the others, having an

* Perhaps the Parthians, or Numidians, were the earliest riders of horses, and for this reason, that they simply guided them by a short wand held in their hand and without any rein, which was certainly the most simple way of any, and therefore probably the first.

articulation with the sternum, a singular indication of approach to the clavicular groups of animals.

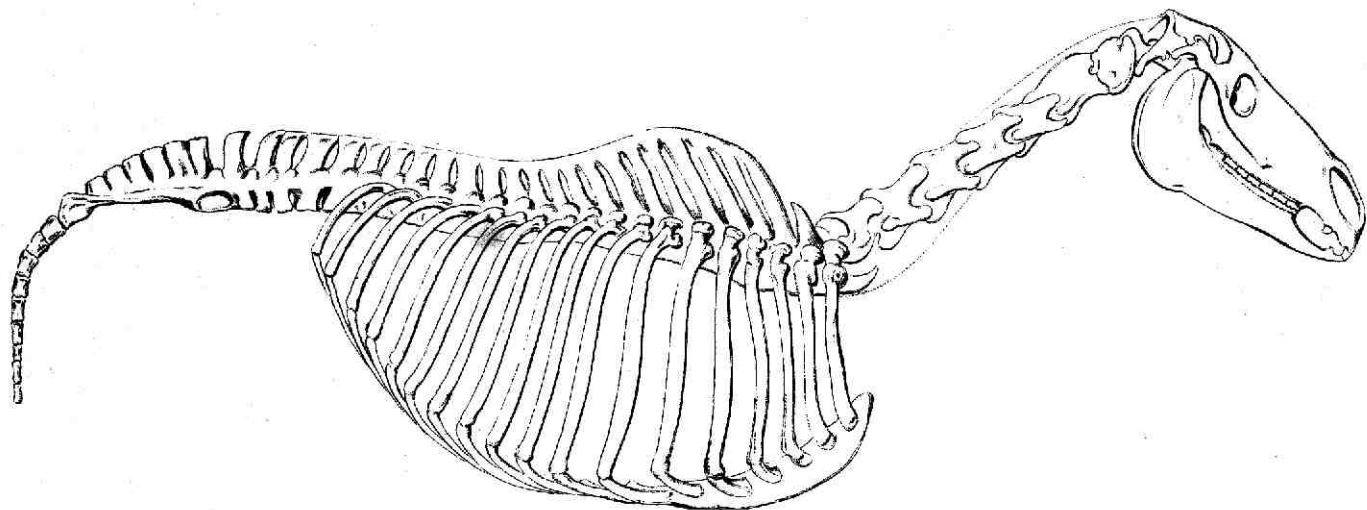
To this frame and suspended to the underside of the back bone are disposed the various viscera, hanging into its cavity; and what is remarkable, *the liver*, the most solid, and weightiest of these, takes its place nearest to the centre of gravity, in the middle region of the cavity, and so falls between the hind and fore limbs; the advantages of its being so placed in the sudden turning round of the body must be obvious, and which has not before we believe been ever noticed, so that it is to the quadruped world it would appear that we must look for the cause and advantages of the peculiar situation of this viscus.

The Stomach, ever varying as to its dimensions and weight, is also placed next to it. Then *the kidneys*, the smallest and lightest of all these viscera, are disposed in that part of the machine where the greatest flexibility is required, viz., about the middle part of the loins. Whilst *the intestines*, large, light, and puffy, are filling up with the *mesentery* the remaining space of the great cavity of the abdomen.

Now the general cavity of the whole entire trunk of the body is seen to be divided into two large unequal chambers or compartments, one forming the cavity of the chest, or *thorax*, and the other the *abdomen*; which are separated from each other by a very stout fleshy curtain called *the diaphragm*, or *midrif*, transversely carried or stretched across this cavity, and is directed from the loins obliquely forwards and downwards to the point of the *sternum*, or breast bone, its middle part white and tendinous, forming a broad disc, or centre, through which passes the *æsofagus*, or gullet; and the direction of this fleshy curtain we may observe, appears to be laid nearly parallel to the lower opening of the abdomen, that is to the great opening which is dependant upon the figure made by the termination of the ribs and false ribs. A third recess is also seen, being a very much smaller compartment, and is provided by the arrangement of the bones of the pelvis, but which is not however a distinct or separate chamber, being part of the great cavity of the abdomen, and this part is called the *cavity of the pelvis*, or *pelvic cavity*. The cavity of the chest also is again subdivided longitudinally, by a process or extension of its membranous lining, called the *pleura*, and which *septum*, or division, is called *the mediastinum*. Both the diaphragm and this are seen interestingly exhibited in the large coloured plate. Also in the frontispiece, plain or coloured.

In further sketching our general view of this exquisite piece of mechanism, we may observe that this boat-like trunk is elevated from the ground on four columns, which are unlike the common pillars of a building, in being bent at large angles in their upper, and more slightly in their lower parts, but are straight near the middle and with joints for permitting the necessary movements.

The fore limbs again are of a different form and character to the hind limbs, which will admit of explanation, by considering their very different offices and the unequal distribution of the weight of the body upon them: the fore limbs being especially formed for receiving and sustaining the greater weight, being nearer to the middle of the body; the hind for impelling the mass forward; as the whole weight of the head, neck, and half of the body is reposing upon the fore limbs, and what is remarkable, and which we may observe on inspecting the coloured



The Vertebral Column & trunk of the Eclipse Horse.

plate is, that the spinal column is tending from both its extremities to form a deep incurvation over the fore legs, and to make there its dip or most depending part, determining consequently the weight towards this point, and these fore limbs therefore by their upright perpendicular position acquire the greatest possible degree of strength for the support of it; and the knee enlarging in the midst, is still augmenting the strength of the column.

It is to be observed, however, that the disposition of the weight, though truly unequal, is not so much so as on a first view it would appear to be, from certain provisions calculated to prevent this. For the horse, if viewed from an elevation, as from a coach-box where his back is seen, will be found to present from head to tail, the figure of a lengthened cone, the point being the head, and the haunches forming the base or widest part of the cone, and being made of stout bone and muscle, are consequently very weighty; so that, although viewed laterally, a much greater share would appear to be reposing on the fore limbs; yet is it of a much thinner and lighter nature than the mass behind: the chest also filled by the lungs, the lightest viscus or material of the whole system, and particularly large in the horse; yet does the head again, placed so far in advance before the body upon the long lever of the neck, give to it a great increase of weight and power over these front parts, tending to burthen the fore legs, and to cause the weight upon these to be much more considerable than upon the hind ones.

We now shall confine our attention to the fore limb itself, observing first the nature of its attachment to the trunk, chiefly by muscle, that being a mode or property the very reverse of the hind extremity or limb, apparently as being designed to afford the greatest elasticity, and yielding to the load: whilst the hind limbs, on the contrary, appear intended to project the mass without any loss of momentum, by having a solid bony union and connection with the trunk by a deep ball and socket joint.

Now the *Scapula* or *blade-bone* of the fore limb in the horse, appears remarkable for its dimensions compared with that of most other animals, and the processes of the dorsal vertebræ forming the withers, are also of unusual length and elevation, to allow ample space for its upper parts to rest against, and affording thereby a peculiarly strong and noble character to the outline of the animal; a construction that appears particularly necessary for receiving the impetus of an animal of such extraordinary weight and powers of action.

In order to comprehend properly the upper portion of this fore limb of the horse, and the names that have been conferred on its different parts, we must resort previously to a close examination of the human scapula, when it will be perceived that no two bones bearing the same name, can well be more dissimilar, as are indeed their uses in the respective animals, from which the greatest confusion of ideas is likely to ensue by an imagined correspondence.

The human scapula, is in fact, an obtuse, somewhat square, or triangular bone, and very short, its angle presented sloping down the back. In the horse, on the contrary, it is a very oblong bone, and comparatively as to its length, narrow; which in birds indeed, is represented by a thin long strip of bone lying along the back. Its surface in the quadruped also, is comparatively smooth and flat, but in the human, considerably tumid and convex, with a corresponding concavity within, and presenting various undulations in its surface, at least in aged bones, and especially those of people who have worked hard in their lives, or have much used their arms.

As the prominent fulness and noble elevation of the human shoulder, is effected chiefly by the acromion and coracoid processes of the scapula, which are directed upwards and supported there by their connexion with the clavicle, giving to the arm a wonderful facility in rotating and swinging about, whereas in the brute, who wants not these motions, it is made a simple machine of support, and of power in the progression of the body, offices of more essential importance to him, we may observe, than are the almost adventitious uses of the human arms, in respect to the human body.

In fact, the horse's bone has no proper acromion or coracoid process; the latter in the human directed upwards, is rising high, and extending itself above and over the joint with the humerus, as the former is also, and may have very well received the name of acromion, or topmost point of the shoulder; but in the horse, this same part is depressed and taking the very lowest point or situation of the bone, having its whole flat superficies above it, going up to the withers and resting against the dorsal processes. And so arranged, the scapula instead of swinging a pensile or pendant arm, is rendered the wide fulcrum and broad basis of the support of the body upon the limb, and its very great length and large surface, afford extensive attachment for muscle, giving it the power of performing these important acts, and for which alone it appears adapted and designed. Now all we can discern of a coracoid, is the appearance of a rounded knob of bone projecting towards the articular cup; and all we can see of an acromion, is the mere thickening of the bone, about the middle of the spine* or ridge of the scapula, and is somewhat curving backwards, which point becomes the librating point of action of this bone.

The neck of the horse's scapula also is made further to contribute to these properties, by being of unusual length and flatness.

These bones thus viewed and considered, will leave no great difficulty in the understanding and comparing of them, and of avoiding all mistakes as to the names of their respective parts.

If any one should feel his left shoulder with his right hand, he would perceive the coracoid process to be its summit or highest point, and that the acromion was giving the handsome rotundity and fulness to the posterior of the shoulder, which balanced by the head of the humerus in front, is forming together an arched figure of two equal sides, and without which singular process of the acromion, the shoulder would have made but a flat, mean, and deficient appearance behind; and would have been wanting also in strength and power for some of its numerous displays of action.

In the lighter animals, as the dog and cat, the shoulder blade appears to be more loosely applied to the body, and is standing out considerably from it at top, thereby acquiring greater freedom and extent of action, and where, by the use of the paws in these animals, there is more resemblance to the human hands; for the weight of the body being as almost nothing upon them, such looseness is not much felt.

The horse's shoulder however, I have observed in travelling, stands out at top from the

* Properly signifying a thorn, but used by anatomists for anything thin or sharp.

bones of the withers, and when the horse is standing careless and at his ease, or resting upon one limb; but when trotting out boldly, it becomes compacted and fine: this appears to be done by the elevation of the body by the pectoral or slinging muscles, which by lifting the body upon the limbs, is elevating the withers, and the shoulder thereby becomes in appearance more closely applied to the ribs and more compacted, so that the body when in motion, will be found actually higher than in a state of rest.

The muscles which attach the fore extremities to the trunk, are connected principally with the scapula, and which are spreading in radiating masses over all the adjacent parts of the trunk and neck, and converging to a focus, are inserted, not to the middle, but to the superior parts of the inside of the scapula, binding it strongly to the body; at the same time, not fixing it, but permitting its movements freely along with the limb: it appears also worthy of particular remark, that the two shoulder-blades, viewed in connexion, form by their approximation upwards, a sort of oblong arch, that is together with the arm and limb, and which arch is receiving the trunk placed within it; and the more this trunk gravitates from its own or any incumbent weight, the more these points of the arch will be drawn together, and so be consolidated, and rendered the more compact and stronger, that it would be next to impossible to break down a machine formed on such principles. (See Pl. 3, Fig. 2.) And there appear also other muscles provided at the lower parts of the chest, which passing beneath the trunk, and being attached to the inside of the limbs, suspend, or rather sling the body between them, giving thereby a liberty and freedom of motion not less necessary than strength to all the movements of the machine: these latter, lifting up the trunk at the time of action to the requisite degree of liberty.

The contemplation of the uses of these muscles of the fore limb, and also those of the arm and fore arm of the horse, if our conjectures respecting them are well founded, will throw much light on the structure and intentions of the same parts in the human anatomy; for very much the same parts exist in both, the horse being only deficient in the muscle of the clavicle, and possessing all the others found in the human arm. For nature grandly simple and tenacious of her plan, extends it through all her animals, modifying it variously however, but not departing from it even in the human structure; the human arms, for example, pendant on the sides, perform very various offices, often more noble it is true, but certainly in one sense, of much less importance than in the brute, where they are the necessary agents of his support and progression; that what they perform in the human structure, compared with these, may be considered as of a secondary or almost adventitious nature: so that in the brute must be sought their primary uses and intentions, and the causes of their form and place; and in this way, more just views we apprehend will be furnished concerning them; at least we venture to suggest it as a matter for the consideration of more able anatomists.

The next member of the limb to the scapula, is *The Arm*, which compared to the human, is very short, and so covered by muscle, that it is generally overlooked, and the fore arm mistaken for it, not extending transversely beyond the outline of the limb. Might we venture to attempt to explain the manner of its use, which we do with a view more to excite others to consider it, than as a solution of its difficulties; we should first observe, that it is disposed

obliquely between the upright column of the limb and the lower advancing point of the *scapula*, and against which it is abutting, and would push it by the application of any force below, or on the foot acting against the ground, in a direction upwards and forwards, but being restrained and held in its situation by the strong muscles connected with it, it becomes opposed to this operation and firmly presents a broad surface or base to receive the impression; the perpendicular although indeed flexible column of the limb, being so disposed beneath it as to fall in a line opposite to the angle which the front and base line of the *scapula* make in meeting at the top of the shoulder, thereby obtaining for it the most extensive surface of support it can be made to afford.

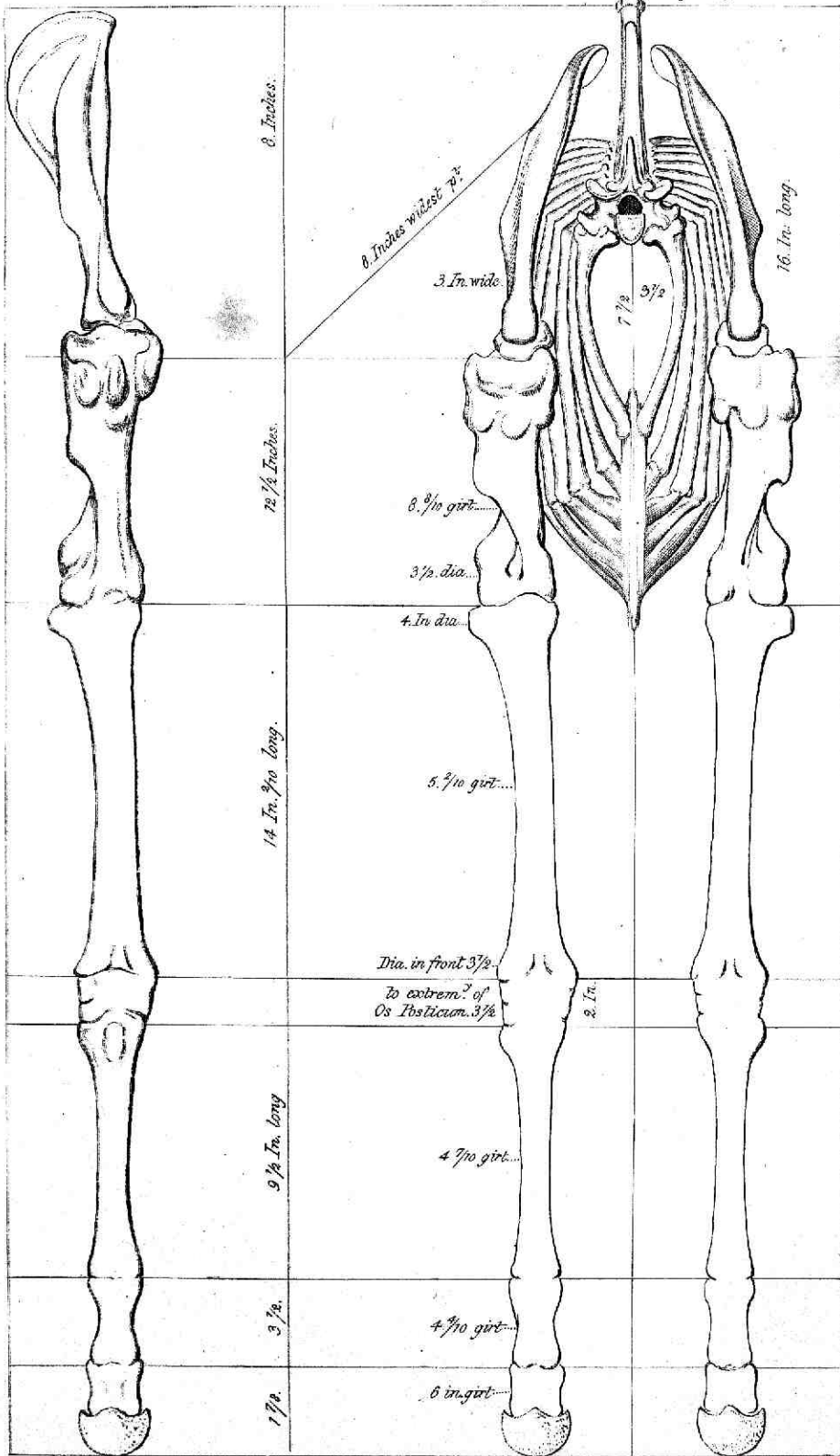
Now the Arm bone or Humerus next, being held as it were in equilibrio between the upright part of the limb and the *scapula*, becomes as an oblique librating beam, and the chiefest power in giving play to the limb, the obliquity of this bone being maintained, and the collapse of its angles prevented, which it makes with the *scapula*, by the peculiarly stout muscles which are passing round the front of the joint; whilst others at the opposite end of this bone, appear disposed to prevent a collapse of the angle which it is making with the upright column of the limb, which column appears to be situated in a state of rest beneath the middle line of the breadth of the *scapula*. And proceeding from the humerus, and attached to the olecranon, or elbow, (which in the horse is constituted a fixed and firm part of the radius) and filling the great triangular space between these two bones, are five strong deltoid muscles, which prevent a collapse of the fore arm with the humerus, and when in action, these are forcing the body forwards upon the limb previously advanced and fixed on the ground.

The *Fore Arm* succeeds below, and is situated as we have said, almost perpendicularly beneath, and while it strongly supports, is extending the limb and elevating the body; and round whose head or upper part, are assembled the muscles whose tendons go to the knee and foot.

The *Shank* presenting almost a naked perpendicular column of bone, and much shorter than the preceding, is farther contributing to extend the limb and to afford the power of deployment, and terminates by meeting the pastern bone and forming with it the fetlock-joint, making there a pliant angle, upon which part of the weight and impression is dissipated, the rest with diminished rigour being carried obliquely forward towards the foot, for it must appear evident, that if the foot had been situated directly under the perpendicular line of the limb, the weight would have been much more severely felt and oppressive, still none of the weight can in reality be lost.

Finally occurs the *Basis or Foot*, possessing a remarkable elasticity for destroying the effects of the impression of the weight, and also with an insensible covering of horn for the contact and abrasion of the soil. Its plan, if we may be allowed the expression, appears to be, that placed before the limb, it should receive near its front parts, the obliquely advancing pastern and coronet-bones from the fetlock joint yielding to the weight; and that then the hoof, by taking a reclining direction backwards, should convey the impression or weight backwards again towards the posterior parts of the foot, where its elasticity and spring principally reside, by means of the furch and the double inflexures of the hoof, thus prevent-

Extreme length from 1st to last rib. 37.5 In.
 grst intern. Width of Chest. 17 1/2 In.



From Strömmer to Forams Spinales 17 In. to summit of Withers 25.

ing any direct reaction to the fetlock or concussion to the trunk, and affording ease and liberty to all the various parts of the foot as to the body: and which is in conformity also with the general design of the fore limb and its attachments in easing the weight of the body, and in softening the impression of the stroke; the fore foot therefore, as we have remarked, is very differently constituted to the hind, in possessing more elasticity and extent of bearing on the ground, a wider sole, and a larger, thinner, and less upright hoof, which will enable us satisfactorily to account for the more injurious effects of the iron shoe upon it, than upon the hind foot; and not, as has been hitherto erroneously supposed, from the hind feet being more exposed to the dung and urine of the standing of the stall.

The hoof of the horse having been an object of our particular solicitude and attention, we here advance the most improved views we have been brought to respecting it:—

The hoof of the horse, is most admirably constructed of a cylindrical circle of horn, gradually diminishing in height from the front, the circle interrupted and broken at its posterior part, with the ends or extremities inflected or turned inwards towards the centre of the circle, thereby creating a triangular open space or cavity for the insertion of the *furch* or *frog*, which is everywhere attached to the upper edges of these inflexions, and like the bow-string to the bow, the *furch* is made of a softer and more elastic horn, yielding readily to the bow-like actions or movements of the wall of the hoof, its true and real office: for the *furch* is not performing, as has been heretofore strangely imagined, the operation of a wedge, in forcing asunder the inflexions, but is almost wholly passive, receiving their impression and dilating laterally in concurrence with them through their whole course, for the contrary, it is clear, would have been the very inversion of good mechanics, or as the using a softer to rend a harder body; or the employing a wedge of dough to cleave a block of wood.

The wall of the hoof formed entire in front, presents a more solid and stronger resistance to the ground, than does the hoof of any other animal, but is possessed of certain elastic provisions, by which the liberty of all its parts is maintained, and the horn being of an extraordinary tough nature and insensibility to the soil, and being provided with an unceasing power of restoration by growth, it completes the limb.

We hope these suggestions respecting the nature and properties of the foot, may lead to much more enlightened views and practices as to its treatment, and subvert the present baneful measures in the defending it.*

The Hind limbs situated almost at the other extremity of the body, have a less load upon them, and less occasion therefore for the perpendicular line of support, but are bent into vastly more acute angles, and being thrown into a general backward direction, they obtain the necessary impetus for the projection of the body, especially during very accelerated movements, we therefore may distinguish these as the *Propellers* of the machine, and the fore legs as the *Supporters* of it.

* The reader is referred for a more extended account of this beautiful organ, to the *Hipponomia*, Second Edition, 1829; and of its destruction by common shoeing, to the *Podophthora*, with twelve elegant plates of new objects.

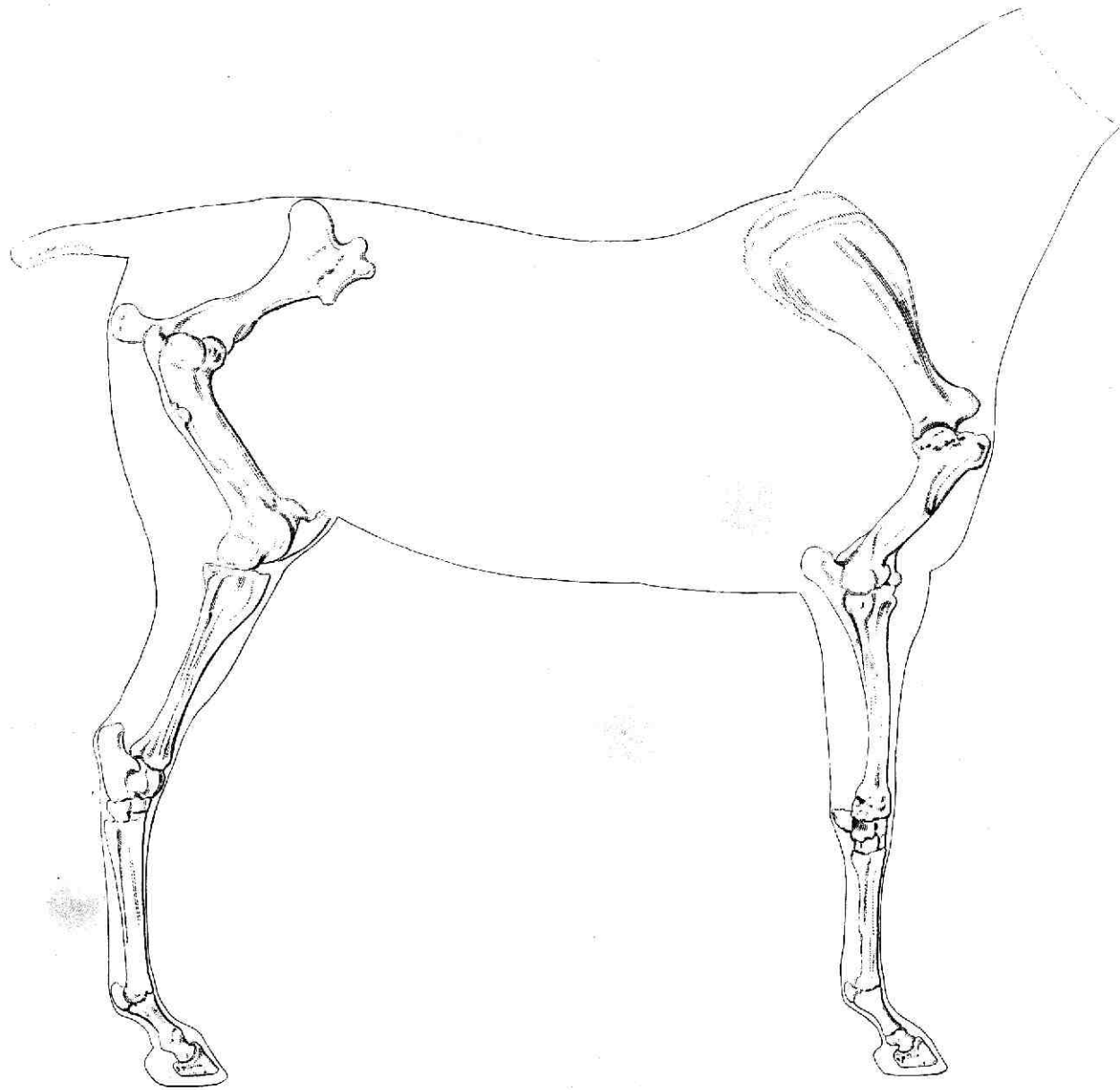
It is by the angles of the fore limbs deploying, and of the hind limbs closing under the body and fixing on the ground, and then returning again to a state of extension, that the body is forced forward, and that nothing of the momentum should be lost, these hind limbs possess a solid bony connexion with the pelvis, by ball and socket joints, as was formerly stated.

And it is to be remarked, that the *Ilium* or *Haunch Bone*, widely branching out in these limbs, appears to hold a sort of correspondence, but reversed and opposed to the situation of the shoulder blade in the fore extremity, and is actually a separate piece from the pelvis, from which it can readily be detached by the scalpel, being held to it by ligament only. Though it will not materially affect the view we are taking of it, whether it be considered as part of the limb, or as part of the main trunk, or as common to both.—This widely branching bone allows of vast surface for the attachment of the immense muscles which project the body; and with its two coadjutors, the *ischium* and *pubis*, which are all three meeting in one point to form the socket or *acetabulum*, for the reception of the head of the femur, or thigh bone, making together a ball and socket joint of great strength, from whence the two bony columns of the hind limbs, proceeding to the ground in a direction nearly parallel, not converging as do the fore limbs, their forces are thus more powerfully directed upon the mass they have to remove, or transport, the frame of the pelvis, first receiving their impression and conveying it to the trunk and rest of the body.

The *Femur* or *Thigh-bone* being articulated nearly at the same height or level as the point of libration of the scapula, which is somewhat higher than its middle, so this bone very similarly situated as to height, is placed between the *ilium* and column of the limb, as the arm is in the fore extremity, but reversed in its direction, advancing forwards to the stifle, as that does backwards to the elbow (See Pl. 5): it is describing however in its range of action, a much greater portion of a circle, passing in strong movement, even considerably behind a perpendicular line falling from the acetabulum to the ground, and going to a very great extent forwards, thus powerfully projecting forward the mass of the body.

The *Tibia* or *real leg-bone*, next succeeds, and is projected backwards; and next, the bones of the *hock* or *tarsus*, and to these succeed the *metatarsus* or shank, and then the two bones going to the foot, as in the fore extremity. The hoof however, presents a slight difference, in being harder, narrower, and more perpendicular or upright, in conformity with the impelling powers and hardness of the rest of the limb.

I was led to observe in frequently dissecting this hind limb at the Veterinary College in the years 1791 and 2, a singular variation of structure in the horse from the smaller animals, which seems worth recording here. It is this, that the horse appears to be driven forwards almost by the limbs alone and their muscles, whilst the dog and cat and other of the smaller animals, which in comparative swiftness exceed the larger, effect their speed more by the muscles of the back, some of which are inserted into the inside of the ilium in rather an extraordinary way, and are acting there with great power upon the line of the spine, and bending it like a bow and shooting the body forwards; this circumstance appears to have been overlooked by Douglas in the *Myologia Comparata*, though written expressly on the anatomy of the dog: in the horse, on the contrary, this part of the ilium is occupied by the muscles of the thigh, and



*Exhibiting the Angles of the Limbs contra-dispersed,
also the chief points of his Outline.*

it is perhaps the rigidity arising from the magnitude of the spine in the larger animals, that has rendered this principle incompatible or inconvenient to be applied with them, and may be the cause of its not being pursued. In observing the hind legs of any animal, it may be presumed, with tolerable certainty, whether speed or strength was intended to prevail, and in what degree, by the acuteness of their angles and the length of the limb: thus the hind limb of the elephant and camel is nearly a straight column; whilst the leg of the dog is crooked to a proverb.

A limb when detached from the trunk with its apparatus of muscles about it, makes the appearance of a very lengthened cone or pyramid, whose point being inverted, is made to meet the ground, and its broad basis to connect it to the body and give it play.

Having noticed separately the fore and hind limbs, we now take a view of them in combination, in order to remark a very beautiful provision in their arrangement: and we ought also to state, that this fact was not of our own observing, but was communicated to us several years back by St. Bel, the first professor of the Veterinary College, and was probably not unknown to the veterinary schools of France. It is this, that the bones of the two limbs of quadrupeds are contra-disposed in the angles of their upper parts, sustaining by this means the body reposing between them; the shoulder-blade, for example, is placed inclining backwards or towards the loins; the haunch-bone, on the contrary, is inclining forwards towards the shoulder, opposed to it, and directed somewhat after the manner of two rafters in the covering of a roof; but their distance is so considerable in this animal, that the fact might easily escape notice: the two bones below these, the arm and thigh-bone, are in like manner opposed, the thigh-bone passing obliquely forwards to the stifle, the arm backwards to the elbow; the tibia again is directed backwards to the hock, and the *cubitus*, or fore arm, though nearly perpendicular, is found a little advancing forwards in the opposite direction; the remainder of the limb to the fetlock, is made a simple perpendicular column (see fig. 5): it is obvious by this arrangement in the angles of the limbs so contra-disposed or opposed to each other, that the trunk, which reposes between them, will be supported and held up, if the open state of these angles is maintained; for it will appear evident, that if these angles had all of them been formed in the same direction in both limbs, the animal must have inclined and fallen backwards or forwards, as the disposition might happen to be.

These arrangements may be very well observed on the living animal, but still better as also some other parts of these observations by a view of the skeleton: to maintain their opposing forces, and prevent the collapse of these angles, will be found perhaps one of the most important uses of the muscles of these extremities, though hitherto but little attended to.

Having viewed the outline of the frame of the body, also the trunk and the limbs separately and combined, and interspersed several detached remarks made at various times during our studies formerly, and by some additions brought them into something like a methodical arrangement where none before existed, so we hope they may serve as an imperfect beginning or basis for receiving more fully digested views, and stimulate others to the farther prosecution of the subject. We now conclude our labours in this way, with one remark more respecting the moving powers of the limbs, and their distribution to effect the great object of progression, which has appeared to us not to be merely obtained by the flexor and extensor

muscles, but is contributed to, if not chiefly caused, in several instances at least, by what have been called the abductor and adductor muscles: for it may be seen on examination, that in the upper parts of the extremities a four-fold position of the muscles is provided, being placed before, behind, and on either side the limb, the two former bending and extending the limb directly, have been called the *extensors* and *flexors*, those on the sides drawing the bone to the outside or inside, according to their situation, considered singly, have been called *abductors* and *adductors*, or, as they bring the limb towards or carry it from the body; these latter, we believe, can be made essentially to co-operate in the progression of the animal, in the following manner, viz. by contracting or acting at the same moment of time on both sides the limb, which, if with nearly equal forces, the bone will not in this case be drawn in either of those directions, but will be compelled to take a course in the diagonal, or at right angles to these, in the direction of the flexors and extensors, with great power, describing a somewhat similar line that a stick would, placed against a wall at one end and drawn by two cords at the other with nearly equal force, it would not long remain stationary, but pass in a perpendicular line between the two opposing cords, and describe a portion of a circle perpendicularly between them; in this, or some similar way, these muscles could be of constant use, otherwise the largest and most powerful muscles in both extremities would appear to be almost idle masses of flesh, and truly idle offices have been assigned them, as turning out the limb a little, or inwards a little, or grasping bodies, for which the animal can have no occasion, steadying the body, &c., conclusions drawn from insulated views only, and such offices would be truly unimportant, if not wholly useless, in these animals: we leave these remarks however, for a more digested consideration; and now proceed to notice the numerous objects presented to us in the sectional exhibition of this interesting animal.

Plate 4, figure 2, is showing how the body is supported by suspension between the two upright columns of the fore legs, by an arch formed by the approach of the shoulder blades, which in more weighty and therefore slower animals, are nearly perpendicular, and not so reclining backwards as in the horse. In order to record their dimensions, we may observe, these limbs were sketched by the actual admeasurement of the bones of the skeleton of the celebrated ECLIPSE horse, now in my possession, that a comparison might be made at any future period with this noted race horse. The skeleton, I may inform the reader, is a natural one, and the bones cleared from every thing but the ligaments of the joints which hold the bones together. These dimensions were taken by a flat two-foot rule placed parallel to or by the side of the limb, and the intersecting lines were drawn as nearly as possible through the middle of the openings of the joints. The girths also, or circumferential measures, were made with a piece of tape of about $\frac{3}{8}$ of an inch wide. This figure on a larger scale, was done by Edwards after accurate admeasurements; he mistook however in all his drawings the top of the horse's shoulder for the acromion, deceived probably by the name. In the first edition these drawings were mislaid and could not be found, and under the pressure of the moment, as good a figure as the wood engraver could give me was used instead; afterwards the original drawings being found, I had them reduced by a scale, and engraved.

REFERENCES TO THE FIGURE.

THE HEAD OF THE HORSE, compared with most other quadrupeds, is remarkable for its length and dimensions, formed by an increased size of the cavities of the face, and by the extraordinary elongation and width of the jaws. The actual cavity containing the brain, not occupying more than perhaps a sixteenth or a twentieth part of the entire head, the rest being made up of cavities of thin bone; and there is no prominence or overhanging of the os frontis or its cells in the horse. The eye is sufficiently prominent on the side for him to see before, and also behind him, and quick, full, and globular, gives great animation to the countenance; and when under agreeable excitement, his dilated nostril, broad full lips, and capacious mouth, impart a peculiar vigour and strength of expression, and with a noble generosity of disposition to forgive injuries, that surpasses perhaps every other animal.

PARTS OF THE HEAD, Fig. 1.—The *Septum*, or longitudinal cartilaginous division of the nose, covered by the Schneiderian or olfactory membrane; it is the seat of catarrhs or colds, various farcy-gleets and ulcerations, and of the true glanders. The blood-vessels are seen ramifying on its surface, enlarged from inflammation and disease. The lower part of the *Septum* is perfectly white, the cartilage being destitute of its membranous covering abraded by the saw. 2. The *Nasal Bones*. 3. The *Palatine Bones*. 4. The *Inter-Maxillary Bone* holding the upper incisor teeth. 5. The *Symphysis* of the lower jaw early in life obliterated and forming the lower jaw into one bone. 6. The *Tongue*. 7. The white dense membrane covering the palate, the lower half of double thickness, forming transverse bars, and is the seat of the *lampers*, where it rests against and falls below the upper incisor teeth; beyond this the six grinder teeth at the farther side of the mouth are also visible. 8. The *Os Frontis* and its cavities. 9. The *Parietal Bone*. 10. The basillary process of the *Occipital Bone*. 11. The *Sphenoidal Bone*, forming with the occiput the basis of the skull. 12. The *Ethmoidal* and its cells. 13. The *Cerebrum*, or greater brain, with its alternate layers of medullary or white, and cineritious or darker matter. 14. The *Cerebellum*, or lesser brain, with its white arborescence or *arbor vitæ*, from which proceeds the spinal chord. 15. The *Plexus Choroides*, is the red near it; *Corpus Callosum*; and the white bulb near it, the *Corpora Quadrigemina*: all these parts may be best seen in a section as large as life, of the horse's head, done by G. Kirtland about the year 1806, with the parts of the throat also in section. 16. Is a remarkable mucous gland lying behind an eminence of bone, called in the human *Sella Turcica*; it is called the *Pineal gland*, also the *Crus Cerebri*.

OF THE FAUCES.—The nostril in quadrupeds generally terminates the face downwards, the mouth being situated behind it, and the lips are here performing the double office of lips and fingers, to which last in section these have a strong resemblance. 17. A capacious opening continued from the left nostril, and passing over the bones of the palate, is seen the chief organ for the admission of air to the lungs. 18. A remarkable convex valve, formed of cartilage, closing the opening of the *Tuba Eustachiana* or *Eustachian Trumpet*, or passage leading to the ear; for a particular description of this part, see Plate II of the Section of the head above referred to. 19. The *Velum Palati*, without a distinct *Uvula* in the horse. 20. The great cavity of the *Fauces*, leading into 21, the passage of the *Æsophagus* or *Gullet*, lined throughout with a thick white membrane or cuticle, loosely adhering to the canal or

muscular pipe, and in the ruminants wholly covering the maw, or first stomach, and in the horse extending over a considerable portion of the upper part of the stomach; the *Cesophagus* enlarges near the stomach and becomes paler.

OF THE AIR PASSAGES.—These parts have been attempted here to be introduced entire, having been represented in section in the Plates of the head by Mr. Kirtland, above referred to. 24. Is the Atlantal cornu of the *Thyroid Cartilage*, being part of the *Larynx*, or valvigerent head of the wind-pipe. 25. The *Epiglottis*, or *Valve*, which shuts down during deglutition, preventing the food from passing into the windpipe or trachea. 26. The short limb of the *Os Hyoides*. 27. The convex reflexed edge or lip of the *Arctenoid Cartilage*. 28. The same covered with muscle. 29. The *Cricoid Cartilage*. 30. The beginning of the *Trachea*, or *Wind-Pipe*: this part is very frequently absolutely crushed, and more or less injured, by rough hands squeezing and pinching it under the pretence of ascertaining broken wind, of which it appears to be an uncertain criterion; or at least but in the last stage of it, when other symptoms and an attention to the nostrils and flanks are more sure guides. Two fine horses I have seen destroyed by this gross practice, and others with difficulty of breathing, which has never been recovered from, the membrane lining the pipe being dislodged by the gripe and stopping the passage has created suffocation. See article *Broken Wind* in Rees's Cyclopædia, and since published separately. 31. The *Cartilaginous Rings of the Trachea*, about sixty in number, posteriorly broken and thinner at the lower part of the pipe where it enters the chest, they are converted into oblong thin elastic plates, at least at the back part of the trachea, and tiled one over another, for permitting perhaps the contraction or collapse of the canal to the quantity of air required by the lungs. This canal is smallest about its middle, gradually dilating to either extremity.

OF THE SPINE, OR BACK BONE.—The irregular curving line described by the spine is truly remarkable and worthy attention, and is exposed advantageously by this sectional view: it appears to be inclining downwards in both directions from its two extremities to form a curve at its lowest part over the fore limbs, and determining as it were, the weight upon these two upright pillars of support; the dorsal processes which we call the withers, are of prodigious length in the horse, filling up and strengthening this otherwise externally hollow part; the extreme points of these bones serve also to form the prominent outline of the withers, a part nobly characteristic in its contour of this race of animals: the extraordinary length of these bones also most usefully serve to fit them for the application of the long and large elastic ligaments supporting the neck and head, larger perhaps proportionably than in almost any other animal, and farther advanced before the body; these are attached to the second vertebra chiefly, leaving the atlas quite free; and they afford also a lodgment for the muscles to sustain and move these parts, as also a rest for the shoulder-blades. Along the back and loins, the spine is gently raised into an arch upwards, useful in opposing the weight of the suspended viscera in the cavity of the abdomen, and in bearing burthens externally brought upon the back; forwards, it is carried in its passage almost to the front parts of the neck, where, from an external view of the animal, the eye would certainly not be led to suspect it, ascending rapidly to the head from the fore legs: the Camel being deficient in these processes of the withers, the hollow wavering neck makes this construction much more obvious externally: and a second and lesser arch of the spine is formed at the sacrum, being somewhat raised above and also convex below, affording superior width and a firmer support thereby, for the powerful operations required by the hind limbs in projecting the body.

In respect to the individual members or pieces composing this bony column, their particularization is not necessary; its leading divisions we shall however notice, beginning at the head.

The first vertebra, 32, bears the name of *Atlas* in the human skeleton, from its supporting the globe of the head; but in the horse and other quadrupeds it may be said to suspend rather than support it, so that the same name will but indifferently apply. 33. Is the second cervical vertebra, and called in the human *Dentator*, having angular or tooth-like projections: it is of remarkable length in the horse, with a lofty longitudinal crest on its back serving for the strong attachment of the cervical ligaments, a detached portion of which, passing over the atlas, is sent to be inserted in the occiput. 34. Seven are the number of the cervical vertebræ, which number, according to that excellent observer John Hunter, obtains in nearly or quite all the families of known quadrupeds, whether long or short necked. Between the articulations or joints of these vertebræ, there is interposed an elastic cartilage, expanding when there is a remission of pressure upon the column of these bones. 38. The first *Dorsal Vertebra* and commencement of the withers. 39. The last *Dorsal Vertebra*: their number varies, there being usually eighteen in the horse, sometimes nineteen. 40. The last of the *Lumbar Vertebra*: and over this there appears a remarkable space between two of the *Dorsal Apophyses*, or upright processes of the vertebræ, which space is occupied only with ligament, or the muscles of the back, and appears given to afford opportunity for the greater flexibility of this part of the spine in turning; and in the lateral movements, it is to be remarked also, that the superior branch of the ilium, or haunch bone, is disposed opposite this opening, that strength should not be wanting, and to prevent the danger of a dislocation from too violent or sudden lateral distortion. 41. The *Os Sacrum*. 42. The *Os Coccygis*, and *bones of the tail*, diminishing to the extremity, and solid, terminate the column. The ass's tail is said to have two more bones than the horse's.

We ought not to pass over without noticing it a knob or callous of bone growing to the under-side of the lumbar vertebræ, and situated opposite the articulation or joint, which formation has been the effect of excessive labour, or over proportioned loads to the powers of the animal, inflaming and disordering these bones, and causing them to coalesce by ossific deposit, creating much pain and suffering to the animal. Some horses appear lame behind from these ossifications; being in the neighbourhood of the kidneys, others have a difficulty in staling; others in backing with their load appear to suffer excruciating pain; and some cannot be made even to attempt it by the severest usage: it may also be observed on careful inspection, that four or five of the dorsal vertebræ, are in a similar manner knit together by bony deposit, and the joints or separations in these are obliterated from the same causes probably. The mare, the subject of this representation, was one of the horses of the Dunstable stage, and was brought to the slaughter-house dead, having very suddenly died, and as was apprehended from being over-driven.

The *Spinal Marrow*, or *Cord*, a continuation of the white parts of the brain, is seen loosely lodged in its canal in the upper parts of the bodies of the vertebræ, sending off branches of nerves to all the parts it is passing through, in its long course; and this spinal cord has been lately detected as having a hollow canal through its centre, by Mr. Sewell.

OF THE UPPER PARTS OF THE NECK.—Between the processes of the withers and the cervical vertebræ, is a large deep triangular space, filled up chiefly by muscle, but having in the middle longitudinally a ligament of extraordinary strength and elasticity, forming upwards *the Crest*; it is of a yellowish white colour, and divided into several portions, through which are seen the red fibres of the muscles of the neck; a separated and very distinct flattened cord of this ligament is seen extending from the extreme point of the processes of the withers to the back of the head, 43, inserted strongly into the *occipital bone*. It may be useful to observe, that it is these ligaments when over distended, or

injured by blows near their insertion, that lead to the disease called *Pole Evil*. And these ligaments, as we have formerly stated, being in a high degree elastic, appear to be the cause of that singular appearance in the dying horse of the head being drawn backward; for the weight of the head being removed, the horse at this time usually lying on his side and all muscular exertion ceasing, these ligaments uncontrolled powerfully pull the head towards the withers backwards, and with such force as often to create considerable surprise. Above these ligaments is a mass of fatty cuticular matter, which becomes distended by high feeding, and makes the crest full and hard to the feel of the hand, and also carries and maintains his noble mane. This part with us was anciently called *the Chine*, and was derived perhaps originally from the Greek word for the neck, *αυχνη*, *aucheen*. Hence we have it in old farriery books the "*mourning of the Chine*," that is, farcy discharges from the nose were most ignorantly supposed to proceed from this part. It is liable also by neglect to a disease called *mange*, especially in the coarser bred horses, which may be readily got rid of by the assiduous application of soap and the water-brush; and in very inveterate cases, the use of a mild red precipitate ointment may be required. This term *mange*, we get without doubt from the French *démangeaison*, signifying *the Itch*.

OF THE THORAX.—This cavity is posteriorly bounded by the *Diaphragm*, or in common language the *Midriff*, which like a curtain, obliquely separates it from the abdomen; in its circumference muscular, in its centre tendinous, which this section exhibits in an interesting manner. This muscle is greatly concerned in respiration, and is the chief cause of the heaving and agitations of the flanks in broken wind, and other complaints affecting the lungs or intestines, affording often a useful means of judging of danger and of the approaches of death in these animals. The great trunk of the *Aorta*, or chief artery, is seen passing through it near its insertion into the loins, and below this is seen the *Œsophagus* or *Gullet* also passing through it to go to the stomach. Anteriorly the cavity of the chest is maintained and supported by the *Sternum* or *Breast-bone*, 45; its deep or wide surface presents several irregular rounded patches of redder and more porous bone, being the places of insertion of the ribs; the uppermost of these 46, is singularly covered with smooth cartilage, as though it was designed for a moveable joint, and may have some reference to the *clavicle* of animals. Near the middle of the lower part of the chest is seen *the Heart*, 47, with its two chambers, the great and lesser ventricle, *a. b.* the former impelling the blood through the body, the latter through the lungs only; at the upper part of the heart and over these chambers, is seen the white internal coats of the *Auricles*, *c.* for receiving the blood returning to the heart, and large openings are seen for its ingress to the heart and passage to the ventricles. The Heart is loosely surrounded by a membranous bag, 48, called the *Pericardium*, formed by a duplication of the *Mediastinum*, 49, 49, 49: the *Pericardium* is attached below to the *Sternum*.

THE LUNGS, formed of two large lobes, occupy the two cavities of the chest, having the mediastinum and heart between them; there is also a smaller central lobe to the lungs, which posteriorly surrounds the heart, and is seen divided. 50. The three openings are three of the air-pipes or *Bronchial vessels*, continuations of the canal of the wind-pipe throughout the lungs, and are supposed to terminate in cells, which late observations lead us to doubt. Through an opening in the *mediastinum* purposely made, 51, is seen the left cavity of the chest with a portion of the extremity of the left lobe of the lungs, collapsed from the admission of air into the cavity; another portion of the lobe is seen near the upper extremity of the sternum in the anterior part of the left cavity 52: the ribs are also obscurely visible through the same openings, their internal surface being covered with a fine membrane called *the pleura* which lines the cavity of the chest, and is reflected over all its viscera. The oblique fibres between the ribs are the *intercostal* muscles. The large tube or cylindrical pipe 53 near the back

bone is the *aorta* or main blood-vessel from the heart, distributing the blood to all parts of the body; it is seen passing into the abdomen, where it is partially laid open, and above this opening another blood-vessel is visible, which is the *vena cava*, 54, or *great vein*, bringing back the surplus blood to the heart and lungs.

OF THE ABDOMEN. Lying against the diaphragm, making a noble appearance, is seen *the Liver*, being the left lobe of this viscus, 55. A smaller middle lobe is divided, exposing two or three orifices of blood-vessels, whose white coats strongly contrast with the general colour of the part 56. The liver of the horse is singularly circumstanced in having no *cyst* or *gall bladder*. The liver of the horse from very high feeding with oats and distressing work is subject to be destroyed, much in the same way as fermented liquors act upon the human liver; the disease so induced is called *Farcy*;* too low and watery food, and exposure in damp cold ground, will also induce the same complaint, especially after high feed.

Passing backwards in the order of their occurrence, we next observe *The Stomach*, 57, a single pouch, but possessing within three or four different surfaces, approaching, though distantly, in structure to the stomachs of the ruminating animals.

The stomach of the Horse and of others of his race or family, is made the singular habitation of the *larvæ* or *grub* of three or four distinct kinds of *Bots*† or *Oestri*, whose curious history and mode of propagation we have endeavoured formerly to unfold in an essay published in the third Volume of the Linnæan Society's Transactions, and since in a separate treatise, with representations of them in all their states. The curvature of the stomach presented to the liver, is called *the Small Arch* by anatomists; and its exterior convexity opposite this, *the Large Arch*; the entrance to the stomach by the gullet, 58, the *Cardiac Orifice*, its exit where the intestine has been removed, *the Pylorus*, 59. Behind the stomach, and of a bluish red colour, is seen *the Spleen* or *Milt*, 60, its usual companion, and perhaps serving some useful office in regulating the digestive process. We cannot forbear stating very briefly, that in an experiment made in the year 1792, in throwing in more fluid into the stomach of an ass than the animal was willing to drink, or than was necessary to digestion, and on introducing the hand through an incision made into the abdomen after some little time had elapsed for the digestion to be completed, this viscus appeared, on again introducing the hand, to have lost its flaccid feel, and to have become turgid, as though it had received the superfluous fluid; we mention it that it may be confirmed or otherwise by future observers in their researches respecting it.

Immediately above the spleen is seen *the Kidney*, 61, receiving its artery from the Aorta, and *the Ureter* passing from it and going to be inserted in the side of the bladder, being enveloped by membranes, its view is somewhat indistinct. 62. Is *the Bladder* collapsed and corrugated, being nearly empty of urine. Above this and lying upon it, is *the Vagina*, 68, and *the Uterus* or *Womb*, 63, the latter very small in these animals, the foal being contained, not in the womb, but the *Horns* of the womb, 64. The horn of the other side is cut off, that it should not obscure other parts, 65. To the extremity of the left horn of the uterus, and lying upwards in the figure, is attached the *Ovarium*, 66, and near it the *Fallopian Trumpet*, 67, a membranous twisted funnel, which conveys the impregnated egg from the ovarium, where conception commences, into the horn of the uterus; arrived there and adhering to its internal coats, it becomes the *Fœtus*. Within the *Vagina* is seen the opening of the

* From *farcio*, to *cram*, the legs being swollen throughout like a stuffed pudding.

† We conjecture from the French, *bout*, the end, from their appearing at the extremity of the rectum.

Urethra, 68, and the *Clitoris*, 69, projecting backwards, which in these animals gives it the appearance of being inverted in respect to its position in the opening of the human *Vagina*; but which is explained when the prone position of the animal is fully considered.

Above the *Vagina* appears the *Rectum* or *Arse-gut*; the other intestines being necessarily removed to afford a clearer view of the different organs of the abdominal cavity; *a.* is a piece of the sacculated part of the *Rectum*; the balls of dung appear to receive their form and become hardened in these pouches; *b.* is a terminating sac to the intestines, a receptacle of the dung, and appears to consist externally of longitudinal fibres, having internally a loosely adhering coat, flaccid, wrinkled and red, covered with a thick slimy mucus; the longitudinal fibres of the external sac being muscular, and contracting from the stimulus of the accumulation of the dung balls, and shortening thereby, protrudes the inner loose pouch with all its contents outwards, and forms it into numerous circular folds, which on account of their appearance and colour, have been sometimes called the *Rose*; the longitudinal fibres of the external sac ceasing to act, and the abdominal muscles relaxing, it is by the weight and descent of the intestines again drawn within the abdomen: *c.* is the *Sphincter Ani*, or *Circular Muscle* closing the rectum externally.

We now trace the lower outline of the figure. 70. Is the *Symphysis of the Pubis*, or place of union of the two bones composing it: this part is formed of an extraordinary depth or width in these animals, affording ample surface for the attachment of the muscles of progression. 71. The *Parietes*, or *Coverings of the Abdomen*, internally lined with a fine membrane called *Peritoneum*, which is extended over all the viscera, and partakes very frequently of their disorders. The lowermost edge of the boundary line of the abdomen below this, is termed by anatomists the *Linea Alba*, *g.* being a white line formed by the concurrence in the middle of the abdomen, of the tendons of its various muscles. Here the cavity of the abdomen is contracted and drawn up, from the weight of the intestines being removed. 72. Is the udder of the mare. The rudiments of the *Mammæ*, or *Teats*, which are found with the males of most quadrupeds, were discovered by Daubenton in the horse in the prepuce, or sheath of the penis (See Buffon's Natural History); and afterwards Hunter made the same remark.

73, 74. The *Sterno-Mastoideus Muscle*. 75. The *Sterno-Thyroideus*.

OF THE LIMBS.—The division being made nearly through the middle of the horse's body, does not interfere with or affect the limbs, but exposes very advantageously their inner sides; and that the plate might be rendered as extensively useful as it could be, we stript the limbs of their skin, and several tendinous envelopements and the exterior muscles are brought into view for representation.

IN THE FORE EXTREMITY is seen the lower part of the *Brachio-Cervical Muscle*, 76, passing down from the neck to the middle of the arm, extending and carrying the limb forwards very powerfully by the distance of its application from the centre of motion in the joint above; and extensive in its action on account of its length, occupying nearly the whole line of the neck; the use the horse makes of his neck is often seen in the gallop, especially if a little fatigued, but which by the absurd use of the bearing rein, is often rendered useless; it forms with the *Pectoral Muscle*, 77, a strong aponeurosis, extending over all the muscles and tendons of the upper parts of the limb, bracing them and forming a strong aponeurotic cord or tendon inside the fore arm. 78. The *Olecranon*, *Ulna*, or *Elbow*. 79, The *Flexor Magnus Carpi*, rising from the *Humerus*, or *Arm-Bone*, and terminating on the *Post-Carpal Bone*, which bone forms the bold angular prominence posteriorly in the outline of the back of the knee. 80. *Flexor Mesocynii Internus*, or *Internal Flexor of the Shank*, terminating on the internal prominence of the head of the shank bone. 81. The *Radius*, or *bone of the fore arm*, mistaken generally for the arm of the horse,

which is above it, short and concealed by its fleshy muscles. 82, 83. *Extensor Mesocynii*, and *Extensor Pedis*, extensors or straighteners of the limb after flexion, and carrying the body forwards to it fixed on the ground, one tendon passes to the shank; the other to the foot.—For a more particular description of these muscles, see Rees's Cyclopædia, article *Anatomy Veterinary*.

OF THE HIND EXTREMITY.—84. The *Tensorius*, or *Fascia lata muscle*, whose tendinous expansion, or aponeurosis, embraces nearly all the muscles of the limb; it is advantageously situated for carrying the limb forwards. 85. The *Vastus Anterior*, which with its neighbour and congener the *Vastus Internus*, 86, and the *Vastus Externus*, on the opposite side, are all contributing to one effect, being strongly inserted in the *Patella* or *Knee-Cap*, 87, which part is the real knee of the horse, but termed with us *the Stifle*, perhaps on account of the hollow pit or indent and rising skin about and surrounding it: the shortness of the thigh of the horse and its thick fleshy muscles almost conceals it from observation, it scarcely extending beyond the parietes, or line of the abdomen. The tibia at this joint is provided with a remarkable cushion of cartilage for the condyles of the thigh to work upon or act against. 88. A very broad flat fasciculated muscle (*Adductor Complanatus*), powerfully acting in conjunction with the abductors on the other side of the limb in supporting the upper part of the tibia, and in forcing the body forwards upon the limb when it is fixed on the ground; passing through a slit or division of this muscle, is seen a large vein, 89, usually termed with us the *Plate Vein*, perhaps from the French *Plât Veine*; though according to Daubenton in Buffon's Natural History, what the French call the *Plât Veine*, is situated on the inside of the fore extremity, lodged in the hollow or channel on the inside of the radius, or fore arm; the misapplication of names in common use in this art, is not unfrequent with illiterate shoeing smiths as may be expected, the greater share being French, and which appear to have been derived from the Low Countries, or our Norman ancestors. 90. Is the *Sacro Tibialis Internus Muscle*, powerfully acting in connexion with its opposed muscle on the opposite side, viz. *Sacro Tibialis Externus*, in propelling the body from the limb made fixed on the ground. 91. The *Sacro Tibialis Posticus*, a congener in its effects with the two former. 92. The *Leg Bone*, or *Tibia*, which with the muscles disposed about it, has been sometimes with us called the *Gambril*, which appears to be a useful distinction, separating it from the other parts of the limb, is perhaps derived from the French *Jambe*, and is the *Jambriil*, or *Lesser* or *Shorter Leg*, and not inaptly applied when compared with the larger upper parts of the limb: it is this part which is commonly mistaken for the thigh of the horse, whose shortness and concealment we have noticed before. 93. The *Poplitalis Muscle*, much the same as in the human. 94. The *Perforans Minor*, or *Auxiliary Perforans*, combining in the horse the properties of the *Tibialis Posticus*, and *Flexor Longus Pollicis Pedis*, of the human anatomy. 95. The *Gastrocnemius Muscle*, forming the calf of the leg in the human anatomy; its very stout tendon is inserted into the point of the *Os Calcis*, or *Hock*, 96, which part though placed so much above the ground, is corresponding to the human heel; and this tendon, in allusion to the ancient tale of Achilles being dipped by the heel in the river Styx, has been called the *Tendo Achilles*, 97. It has appeared to us to be the lower or second point of insertion of this tendon and its coadjutory ligaments that causes the disease called *Curb*, when strained and over exerted by the power which the *Os Calcis* has upon the parts below. 98. The *Perforatus Muscle*, taking its rise in the hollow pit or fossa on the outside of the thigh bone, at the back of the tibia, forming a tendon, which becoming flat and wide, covers over and strongly embraces the above insertion of the *tendo Achilles* at the point of the hock, and assisting it also by taking attachment to the side of the *Os Calcis*; below the hock, becoming a simple cord again, it passes through a restraining ligament, and arriving at the back of the fetlock joint, again dilating, it forms anteriorly a smooth

annular ligament for the passage of the tendon of the *Perforans*, and then finally terminates by adherence to the lower extremity of the pastern bone, and by spreading laterally to the sides of the coronet bone. In man there is also a *Perforatus*, but much shorter, taking its rise upon the *os calcis*, and then divides into as many tendons as there are toes; the foot of the horse, simply designed for support and progression only, often combines in one muscle the properties and structure of two or three, which are distinct in the human, as in the case of the above muscle, and which makes it difficult to follow closely or compare, and much less name them, after the human anatomy. Availing myself of the opportunity the mention of these parts gives me of introducing some account of the disease called *Grease*, which invades them not unfrequently, and appears generated by damp, wet, and cold applied to them, especially in the decline of the year. Washing and slopping horse's legs on coming in from their work, is the most usual source of it; dry rubbing with a soft wisp and leaving them till the next morning, is better; long exposure to dirty roads in the commencement of the Winter, will also produce it, and chills indeed of any kind. It is attended with considerable inflammation, pain, and suffering, especially by the distention of the edges of the chaps when the animal is moved. The discharges which are highly fetid if allowed to remain any time on the parts, and are supposed, and not without reason, to be poisonous, producing the cow-pox on the teats of the cow, and therefore allied to small-pox, and perhaps by some singular concurrence of circumstances its progenitor. *The cure* is accomplished best by keeping the sub-fetlocks ever warm, poulticing for a few days, giving purgatives or diuretics to carry off the inflammatory disposition, then with denicatives, such as *Ægyptiacum*, the sulphat of zinc in solution, to dry up and heal the sores. A too dependant situation of the hind legs in the stable, is also injurious; turning them round therefore, with their heads to the heel posts for a few hours every day, is beneficial. *To prevent* it all washings without the most careful drying, should be avoided, and forbidden, especially whilst hot. The name is probably derived from the greasy unctuous appearance of the discharge, for the French call it *eaux de jambes*. 99. The *Perforans*, rising behind the head of the *Tibia*, is terminating under the coffin bone, dilating beneath the furch. 100. The *Extensor Longus Pedis*, and the *Tibialis Anticus Muscles*; a remarkable restraining ligament is also seen here confining them down to the bend described by the joint.—For further particulars respecting all these muscles and parts, and some of the viscera, the reader is referred to an article published by the author in Dr. Rees's Cyclopædia, entitled *Anatomy Veterinary*.

P.S. As a very ungenerous and ridiculous attempt has been lately made to cast a doubt on the identity of the Eclipse skeleton, now in my possession, it may not be amiss in this place to notify, that this celebrated horse never went out of Dennis O'Kelly's hands, dying at his estate of Canons Park in Hertfordshire, of the gripes. St. Bel, then about to be made professor of the Veterinary College, made a natural skeleton of his bones, leaving the ligaments attaching the bones together, so that they could not in any way be changed. A few years after, Dennis O'Kelly gave this skeleton to my friend, Edmund Bond, of Lower Brook Street, Grosvenor Square, who dying, his widow who still lives, presented it to me in consequence of my assistance in disposing of her business and collecting her debts, &c.; and it never was in any other hands whatsoever. The bones also themselves, which are remarkable, would sufficiently evince their genuineness to any person not wilfully blind or prejudiced. Sixty guineas were offered me for it by the College of Surgeons, and were refused, a hundred being demanded for this invincible monarch of the race-course.

FINIS.