Anatomical reflections on the form of animals and the new opinions of Henry Cline, Esq. Surgeon / by John Hunt.

ANATOMICAL REFLECTIONS

ON THE

FORM OF ANIMALS,

AND

THE NEW OPINIONS

OF

HENRY CLINE, ESQ. SURGEON,

BY

JOHN HUNT,

AUTHOR OF HISTORICAL SURGERY: AND SALUTARY CAUTIONS RESPECTING THE GOUT.

Scribendi rectè, sapere est et principium et fons. HOR.

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ADVERTISEMENT.

WHEN Mr. Cline's book first fell into my hands, I was proceeding with the second part of my answer to Doctor Kinglake, in which I hope to present the public with a rational plan of treatment for the Gout. But as I intended to wait for Doctor Kinglake's promised publication, I flatter myself that, instead of delay, the present interposition will only be considered a convenient supplement to the vacant interval. And whether the learned Doctor should think proper to stand forward in his own defence, or sink into obscurity, the public may depend upon being shortly presented with an additional discussion of the subject, in what was intended as the summing up of the whole, in the form of a reply.

PREFACE.

To those who are not acquainted with the origin of this discussion, it may be necessary to mention, that one of the most experienced anatomists of the age has thought proper to address the public on the modern method of improving the breed of domestic animals. And as the internal structure of the human fabric has long been the subject of his attention, there is great reason to suppose that he had formed an opinion, that the natural history of the animal œconomy might be fully explained on anatomical principles.

I am truly sensible of the extensive influence which the dignity of situation will always have on the public mind; but it is my opinion, that the anatomist, let him be ever

so accomplished, is not the person who is most likely to be best acquainted with the mechanism of animal life. I do not pretend to assert that anatomy has not thrown great light on the animal œconomy, but still I contend that anatomy and physiology are very different subjects; as we meet with a great variety of evidence during life which it would be impossible to obtain by anatomical investigation. I might here mention the practice of physic by way of illustration, because it has long been supposed to rest upon an anatomical basis. But the same observations are equally applicable to the breeding and feeding of animals as they are to the practice of physic: the former will depend upon our knowledge of animal nature in a state of health, the latter includes the destructive influence of disease.

To search for the vital powers when life is gone, must prove a vain pursuit. But he

who daily views the whole machine in action, who watches all its motions, and estimates its powers, and, when the balance sinks beneath the healthy standard, with cautious hand adds a few grains of salutary influence to turn the scale, will certainly know more about the vital powers than he who, when the spring of life has failed, attempts to pry into the worn out mass, and with unnatural conjectures vainly tries to fill the empty space, and with imaginary powers presumes to show how nature moved the whole with sympathetic sway.

I could exemplify these observations by innumerable instances collected both from modern practice and antient writings, if such evidence should ever be thought necessary; but for the present shall conclude, that in both instances the living evidence (the viva vox naturæ) is of the most importance. I am ready to acknowledge that I am much less

perfectly acquainted with the practical part of the breeding and feeding of domestic animals than I am with the internal structure or anatomical illustration of the animal œconomy ; but as I have so long been situated so near to the centre of the breeding system, and have had such frequent opportunities of conversing on the subject, and knowing the opinions of gentlemen of the first agricultural abilities, I consider myself more particularly called upon to guard the present state of practical improvements against the mysterious delusions of scientific representation.

If any of the great breeders had published a description of the present state of the subject, I should not have presumed to give my opinion ; but when an important branch of that profession, which I so long have made the first object of my attention, is brought forward in illustration of a subject with which it has no natural connection, I hope I

shall not be thought guilty of an unwarrantable presumption if I attempt to place these erroneous doctrines in a conspicuous point of view.

Great expectations have been already formed of the extensive influence of Mr. Cline's publication; and some have gone so far as to consider it as the grand establishment of a new æra in the annals of agriculture. If then some parts of these anatomical discussions should appear rather too extensive, I should urge the importance of the subject as an apology for the intrusion on the reader's liberality. If the new opinions which I have presumed to call in question be erroneous, it is right that the public should be put upon their guard; and if the arguments with which they are opposed be founded upon the evidence of nature, they certainly will be thought worthy of attention: but if truth should lie on the other

side of the question, it will become more conspicuous by this discussion. If I am wrong, my opinions will sink into obscurity, and the Clinonians have an opportunity of boasting that their system is invulnerable;—but if this discussion should only serve to promote inquiry, it may still prove of important service to the cause.

The anatomical observations will perhaps be thought long and uninteresting by those who are not acquainted with this part of the subject, but I wished to make myself intelligible to all. And with respect to the practical part of these observations, I am rather apprehensive that they will be considered much less complete; but for the purpose of obtaining all possible information on this part of the subject, I shall take the present opportunity of assuring all those gentlemen who consider themselves interested in this business, that if they will favour me with their

opinions, whether in the form of observations, objections, queries, or opposition, they may depend upon every degree of attention which the importance of their communications may appear to require; by which the general opinion of the public may be collected into one central point of view, improvements may become progressive, and a second edition of these Reflections rendered more worthy the attention of the public in general, and of those splendid characters in particular who have so highly honoured me with their patronage on this occasion.

ANATOMICAL REFLECTIONS,

&c. &c.

CHAPTER I.

The first Principles of the Breeding System not influenced by Consanguinity.

WHEN great characters present themselves before the public, if those who move in widely distant and far more humble spheres were to withhold their admiration, such conduct might be unjustly attributed either to a want of philosophic views, or to a deficiency of due attention and respect: but if the anatomist, whose time has been employed in the metropolis in the dissection of dead bodies, should presume to teach us how to form the living, and improve the breeding system, which first made its appearance in this county, and has since proceeded with such rapidity towards perfection, the attempt must inevitably prove as abortive as the pretensions are ridiculous; and the probability of success might justly be compared with the supposition, that one of the satellites of the distant planets should be capable of adding splendour to the meridian sun.

I am ready to acknowledge, that this is not the first time that this part of the animal œconomy has attracted the attention of the anatomist, and many experiments were made by Mr. John Hunter for the investigation of the breeding system; but the object of this great naturalist was more to determine the order of classification, and investigate some of the inviolable principles of nature, than the improvement of any one individual species: and as all these great discoveries have served more as a subject of ridicule * than contributed to any useful purpose, if the learned author before us is ambitious of rivalling his predecessor, it is not impossible but he may also furnish a subject for a new Pindaric ode.

Mr. John Hunter endeavoured by crosses between the wolf, the jackal, and the dog, to determine whether they were all of one species; and if the effects of crossing in the present instance could have been determined on experimental au-

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* Hunter with fish intrigues our house regales,
The tender history of cooing whales!
Great in the noble art of gelding sows,
And giving to the boar a barren spouse!
Who proves, what many unbelievers shocks,
That age converts *hen* pheasants into *cocks!*
And why not? since it is deny'd by no man
That age has made John Hunter an old woman!
See Peter Pindar, vol. ii. p. 129, Peter's Prophecy.

thority, the subject now before us might have proved an object less unworthy of the public attention.

The evidence here presented to our view does not in the least tend to prove whether consanguinity presents any impediments to the breeding system, but only furnishes us with a number of examples of the injudicious choice of males and females which did not answer the intended purpose. But as it never was suspected that there were any natural objections to males and females of different families, all the inference that can be collected from these wonderful examples seems to be, that the same care is necessary in the selection, whatever may be the distance of affinity in blood.

The declaration with which these scientific illustrations are introduced to public view is, that "the form of domestic animals has been greatly improved by selecting with much care the best formed for breeding*." But after this acknowledgment, we are immediately told, "that the theory of improvement has not been understood." But this appears to me a strange kind of argument, formed perhaps in logical anatomy, where the success is first acknowledged, and then the principles on which that success is founded supposed to be unknown. Care without judgment would not

* See Cline on the Form of Animals, p. 3.

have answered the breeder's purpose: it is not by care alone that we must expect success; a knowledge of the subject is the first object, the second will be care in the application; and it is my opinion, that the knowledge which has so long been displayed in this neighbourhood will not be cut up with that facility which the vanity of anatomy may suppose.

I do not pretend to say that knowledge and success are inseparable companions; but in the present instance there cannot be a doubt but their success depended upon their knowledge. If it was by selecting the best formed for breeding that the form of domestic animals was first improved, this could not have taken place if the breeders had not known which was best and fittest for their purpose. This was the species of knowledge in which Mr. Bakewell so much excelled; and as his good sense raised him above all vulgar prejudices and superstitious bigotry respecting consanguinity, he did not hesitate to make use of the best forms he could meet with, though they were immediately allied in blood. Before this auspicious æra, a vulgar prejudice prevailed against family connexions, and it was thought that the offspring were always in consequence rickety, and in other respects sickly and diseased; and so long as it was supposed that consanguinity afforded some natural impediments to

improvement, inferior crosses were made use of, in preference to higher degrees of perfection which were near of kin ; and it was on the removal of this prejudice that the Dishley system was first established, the success of which has spread the name and fame of Bakewell over half the world. In a practical point of view such evidence must certainly be considered highly satisfactory ; but if any additional authority should be thought necessary, I shall beg leave to add the sanction of one of the first philosophers that modern physiology has to boast of. Whether the opinion here alluded to is to be found in any of the works of this voluminous writer, I cannot now determine; but as Dr. Darwin's language was particularly expressive, both in conversation and in print, his opinion on this occasion I have no doubt will be considered worthy of attention. I well remember being in company with my learned friend and a gentleman whose critical accuracy is unquestionable, when the conversation turned on a subject somewhat similar to that before us ; I do not perfectly recollect the whole particulars, but in reply to this important question the doctor very pointedly observed, " It is certain, sir, that there is no such thing as incest in nature :" which I think was fully expressive of his opinion, and at the same time may justly be considered a complete solution of the question. If then the objections to

consanguinity be once removed, the perfection of form, independent of the origin, will become the grand object of our attention.

Whatever may be thought of my humble situation in other respects, I certainly have much to boast of. For, though not placed in that meridian where arts and sciences appear to most advantage, and where useful and ornamental accomplishments are the grand objects of attention, I have the unquestionable advantage of seeing the breeding system in all its splendour; my situation being nearly central between Dishley and Quorndon; in the former of which the breeding system was first established, and in the latter we shall find that this interesting subject has, in a variety of instances, been cultivated with the greatest attention and success. For, in addition to the improvement of sheep, the celebrity of the Quorndon Hunt has for many years past attracted the attention of the sporting world; where a pack of hounds, which I believe are acknowledged to be unequalled, has been bred and formed on similar principles; where also may be seen a large collection of some of the first-rate horses in the kingdom. And whenever we meet with examples of high perfection, we may expect to find some satisfactory evidence against the new opinions which have been so recently presented to the public under the sanction of anatomical authority.

In conversation with a gentleman at Quorndon on this subject, I was immediately favoured with the following evidence of facts:—The first in favour of consanguinity was Lord Darlington's Agonistes, by Sir Peter Teazle, out of Wren his half sister. Lord Derby's Wren was got by Woodpecker, out of Papillon, which was Sir Peter's dam; and which is a species of evidence that must appear, *primâ facie*, so applicable to the subject, that I flatter myself no additional comments will be thought necessary.

The other example which was recommended to my attention, occurred in consequence of Lord Sefton's Challenger standing before us, who was got by Lord Grosvenor's Alexander; and with Alexander the Great, these may justly be considered two very powerful examples in behalf of the male parent not being that diminutive object which is so pointedly recommended in this new system of animal nature.

Lord Grosvenor's Alexander, which was a very fine large animal, was also the sire of another fine horse, called Alexander the Great, out of Fairy; the first was out of Medea; and with such examples before us it will not, I hope, be necessary to go either to Barbary or Arabia for the purpose of improving the breed of horses.

The first principle in the breeding system, towards the improvement of stock, must be, that it

is natural to suppose that the offspring will in many respects resemble the parents; the second will be, to make choice of such males and females as approach nearest to what is supposed to be the standard of perfection; and as the most perfect parents are likely to produce the most perfect offspring, it was from this principle that breeding from the same families first originated. But when in such cases the offspring has degenerated, as success is not always certain, the cause has, from a superstitious bigotry, been attributed to some imaginary antipathies, against which nature revolted in consequence of the near affinity in blood.

But if this imaginary doctrine of consanguinity had any rational foundation to rest upon, the first experiments must have failed, and the hypothesis died with the first projector. It is not to be supposed that breeding from the same family is always to be successful; but if we find that it is as much so as when the parents are brought from different families, the principle at once becomes established, and it is reasonable to conclude that it is an object in which nature makes no distinction: and as, in other instances where nature prescribes the bounds, the powers of propagation are withheld, in such as the mule or the free martin*,

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* See John Hunter on the Animal Œconomy, p. 55.

I should consider the production of offspring alone a full and satisfactory answer to this important question.

But whatever may be the origin from which the breeders make their choice, if the offspring do not continue to improve, it certainly would be as irrational to continue the same connexion in blood, as it would be to cross the breed whilst any additional improvement could be obtained. I am ready to acknowledge that it would be impossible to anticipate to what degree improvement might be carried, or what are the limits of perfection; but if for the sake of illustration we were to suppose that the subject was brought to scientific certainty, and that our practical knowledge was equally correct; if after a long successful progress improvement was to cease, I think it would be reasonable to conclude that improvement in that family had been brought to the summit of perfection.

In the breed of sheep, the grand object of perfection is to procure that kind of animal which will, on a given quantity of vegetable food, produce the greatest quantity of mutton. But in the breeding of horses the objects are much more diversified. That form of the race-horse is most perfect which is best calculated for speed. The perfection of the hunter is to possess speed and power united. In the draught-horse power is the

important requisite; and we also meet with a great number of intermediate varieties suitable to other purposes. All these examples furnish us with unquestionable evidence of the possibility of proving the probability of the offspring bearing a resemblance to their parents, and the possibility of improving the breed of animals for different purposes. As a question of science, it is too plain to admit of a doubt ; but in a practical point of view we are surrounded with innumerable difficulties which cannot be reduced to scientific certainty.

If it were necessary to describe a standard of perfection, this would no doubt prove a task of considerable difficulty, as it is still, like all other questions of taste, a matter of opinion. I well remember once being in company with Mr. Bakewell, when a gentleman, who had been round to see his stock, solicited his opinion on their respective merits, at the same time pointing out one in particular, that in all probability he had made the object of his choice; when this very sagacious naturalist with great prudence observed, that it was not his opinion but the public opinion which must determine. There cannot be a doubt but, on all these questions, there is a state of perfection which includes a general symmetry, and comprehends all the beauties of nature. But from a variety of causes, which it would be difficult to explain, it unfortunately happens, that the state of

perfection and the standard of taste do not always coincide with each other. It is probable that few men were more capable than Mr. Bakewell, either of ascertaining the standard of perfection or of inducing the public to a coincidence of opinion, without which the Dishley system would not have been established. If there was a standard of perfection, the question might be soon decided; but as there will always be a variety in the production, it perhaps may be considered fortunate that there is a variety in taste; for, if there was a general coincidence of opinion respecting the standard of perfection, it would then be probable that the requisite characteristics would never be obtained. I have been told by artists of a different description, that it was the opinion of Sir Joshua Reynolds, that for the purpose of painting a Venus—if perfection of the female form could not possibly be obtained, it would be right to procure the nearest standard of perfection that could be met with. But, in addition to the opinion of this accomplished artist, it may not be improper to observe, that if perfection was not to be met with in the same animal, different animals might possess perfection in different parts; and though they could not be all united in the same example, the standard of perfection might still be determined.

This, in my opinion, is the true analysis of beauty, and the most rational illustration which

can be given on the subject. And if we transfer our idea from the lamb-like tribe to the human species, and make the captivating perfection of the female form the object of our attention, we shall find one lady tall, another of moderate size, and a third below the standard of an average proportion; the first thin, the second well proportioned, and the third rather large in comparison of the height; the first shall be dark-complexioned, the second rather fair, and the third a happy medium between the lily and the rose; one shall have a fine forehead, another expressive eyes, and a third delicate features: but without descending any further into this analysis of beauty, I shall beg leave to conclude, that it is only from a happy combination of perfections, collected from a variety of instances, that a general standard of beauty can be formed. As for Hogarth's line of grace and line of beauty, I only beg leave to mention them, for fear I should be suspected of not having read what this learned author has said upon the subject; they have long served to amuse the public, and supply the want of a knowledge of nature, with which this great artist, with all his celebrity, was but little acquainted.

If then we return to what was the first object of our attention, and at the same time admitting that a combination of all the beauties of nature is not to be obtained, it certainly would be a ques-

tion deserving our attention, if we could determine the standard of perfection which we have in view. In sheep, the grand characteristics are few, but of great importance; but the points or external appearances which are considered indicative of these perfections are much more numerous. I am as well convinced as Mr. Cline can be, that the business of digestion and nutrition depends upon the visceral functions; but the effects of the internal operations are best determined by external appearances. It is probable that the perfections of a sheep may be limited to the lightness of the bone, the quantity of flesh, and to such kind of animal as will lay on the greatest quantity of fat with the least quantity of food, and with the most expedition. The anatomist may examine the internal parts with all the accuracy in his power, and suppose them strong and healthy; still it is the external appearances which we must depend on as the characteristics of perfection. These, it will be readily perceived, are all questions of practice, and not of science; and the accuracy of the breeder's opinion must, the same as in other arts, depend alone on experience and observation.

CHAPTER II.

The theoretical Representations of Anatomy exposed to View.

THE next question which is presented to our view was most probably intended as an introduction to a practical illustration of the subject; and as the new opinions on which this practice is to be established are also mentioned, this will with propriety become the first object of our consideration.

We are told, that "the external form of domestic animals has been much studied, and the proportions are well ascertained; but that the external form is an indication only of internal structure;" and that "the principles of improving must therefore be founded on a knowledge of the structure and use of internal parts*;" and consequently that none but an anatomist can be a complete judge of the subject. But if the breeders have long been accustomed to select those best formed for breeding without an anatomical examination, the old method must certainly have the preference,

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* See Cline on the Form of Animals, p. 3.

as it would be impossible to breed from these animals after they had been dissected. It will not prove a sufficient objection to this argument to assert, that by the dissection of one animal the merits of the whole breed may be ascertained, as it is well known to those who understand the business, that great varieties of perfection will take place in the same family; and it must be also evident, that if the degree of perfection is only to be known by dissection, it will be impossible to establish any other criterion of choice but family connexion; and though the own brother to the martyr of this scientific sacrifice be made choice of, it will also be impossible to estimate his perfections till his viscera have been made the subject of anatomical investigation. But with respect to the present state of the progress of anatomy on this subject, as it unfortunately happens that Dr. Hunter* has traced down anatomy to its origin in the slaughter-house, it is not impossible but the anatomical theatre at Dishley might prove much more instructive than that in which the learned author

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* The opportunities of examining the bodies of brutes were so easily procured, that the huntsman in making use of his prey, the priest in sacrificing, the augur in divination, and above all the butcher, or those who might out of curiosity attend upon his operations, must have been daily adding to the little stock of anatomical knowledge. See Dr. Hunter's Introductory Lectures, p. 6.

before us fills the chair. I have seen in the former, great numbers of anatomical preparations, which furnish the most evident examples of the respective proportions of the different parts of the most perfect as well as of imperfect animals; and I have no doubt but the internal parts, as well as the external, have all been examined with the same attention. But after all it will perhaps be asserted, that none but the anatomist can understand the structure, the mechanism, and the functions of the viscera.

The lungs, in the present instance, will become the grand object of our attention; and though anatomy may not perhaps be so well known in the country as it is in the metropolis, yet I shall beg leave, in behalf of our humility, to observe, that Dr. Hunter*, in his last writings, acknowledges

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* Breathing, says Dr. Hunter, we cannot account for *à priori:* we only know that it is, *in fact*, essential and necessary to life. Notwithstanding this, when we see all the other parts of the body and their functions so well accounted for, and so wisely adapted to their several purposes, we cannot doubt that respiration is so likewise. And if ever we should be happy enough to find out clearly the object of this function, we shall, doubtless, as clearly see that the organs are wisely contrived for an important office, as we now see the purpose and importance of the heart and vascular system; which, till the circulation of the blood was discovered, was wholly concealed from us. See Dr. Hunter's Introductory Lectures, p. 80.

that respiration is a subject which is but imperfectly understood. I must acknowledge that this is a question which I should like to dwell upon, and shall wait with impatience till a convenient opportunity, when ample justice may be impartially distributed to all parties; but on the present occasion I am limited in my views, and I hope the anatomist will excuse me, if for a little interval of time the brute creation should obtain the first claim to my attention. If then, as we are told, the whole perfection of the animal is supposed to depend upon the structure and magnitude of the thoracic viscera, every deformity which we meet with must be supposed to have originated from some want of natural energy in this grand basis of animal perfection. But, after all that has been said upon this subject, I am still apprehensive that this learned physiologist, with all his ingenuity, will find it difficult to prove how the deformities, even of the chest, are occasioned by the mal-formation of the lungs; yet without any further explanation we are expressly told, that "the shape and size of the chest depend upon that of the lungs*."

I will not presume with equal confidence to assert, that none of the external parts depend upon the form of their contents, as I think it

* See Cline on the Form of Animals, p. 6 and 7.

might not be impossible to prove that a thick skull may sometimes depend upon a deficiency of brains; or that a thin skull might depend upon the extension, want of consistency, or levity of this important viscus. But with respect to the form of the head, it is to be observed that the brain is certainly formed before the skull; but with respect to the form of the chest, it is equally certain that the whole structure is completed before the lungs have ever been expanded, or have obtained their full dimensions.

Before respiration has taken place the lungs are in an inactive and imperfect state, and afterwards their action depends upon the expansion of the chest, and not the expansion of the chest on the action of the lungs; they expand and contract in obedience to the parts by which they are surrounded. I know that much light has been thrown upon this subject since Dr. Hunter's time; but I am astonished to find at last, that the power of converting food into nourishment should be supposed to depend upon the lungs: after the food is digested and converted into chyle, I believe that the next part of the process is sanguification; and the liver has been supposed by some physiologists to be the grand organ employed on this occasion. But for the purpose of showing the fertility of conjecture on this interesting subject, I shall beg leave to refer the curious reader to the

opinions of Mr. Hewson, who supposed that the blood-globules were manufactured in the spleen. If then such be the follies which originate in the metropolis, it is highly necessary that we humble observers in the country should be guarded against the danger of delusion. But if for a moment we could suppose that the perfection of an animal depended upon the size of the lungs, we are then told that this is a point which may be determined by the form and size of the chest; and consequently it is probable that the breeders in the country would be able to judge with equal certainty, by the external appearances, as the anatomist would determine by dissection.

I am very certain that the fore parts of those animals would not escape the breeder's attention, and their success has proved the accuracy of their knowledge of the subject. But before we can say as much in favour of the anatomist, let me beg leave to ask this plain though important question: Whether, if the lungs were taken out of a number of animals of different degrees of perfection, and then presented to an anatomist for his opinion, after minute examination the anatomist could determine the different degrees of perfection of the respective animals, with equal certainty as the breeders could tell by the examination of their external forms? This new doctrine

might then perhaps be thought worthy of attention; but till some such experiment has been made with unquestionable success, the external evidence must certainly have the preference.

From the chest our attention is next directed to the pelvis, which is the cavity formed by the junction of the haunch bones with the bone of the rump; and these parts are likely to prove a fertile source of instructive information, to furnish answers to a number of doubts and difficulties, and place this anatomical hypothesis in a clear and intelligible point of view. On this occasion the female pelvis is particularly noticed; but here this grand chimæra must inevitably be exposed: we are told before that the external form is an indication only of internal structure; but it is impossible that the form of the virgin pelvis can depend upon the structure of the future offspring: in this instance the anatomist must be lost; and he who is the best judge of the external form, will be in possession of the most perfect knowledge of the subject. The necessity of the head bearing a just proportion to the pelvis is also mentioned; but it is a subject on which nature so seldom errs, that in this point of view it seems unworthy of the breeder's attention. The business of parturition, I know, is an object of some importance with the shepherd; and I have no doubt but the sheep, like

the human species, are frequently incumbered with more assistance than is necessary; yet I never heard of a lamb being lost solely on account of the magnitude of the head: and, if I may reason from analogy, though thick heads are not uncommon amongst the human species, yet I never met with a case in my own practice where the child lost its life on this account. I do not pretend to assert that a small head will not pass the pelvis with more ease than a large one; but there are other motives with the breeders for considering this an object of perfection. The head is itself of but little value; but in addition to this circumstance a large head is indicative of a bad form, and is accompanied with large pluck and large offals. The same observations are also applicable to long necks, which are inconsistent with the short, compact, and well formed animal. This learned author tells us, that "the length of the neck should be proportioned to the height of the animal, that it may collect its food with ease;" which is so reasonable that I do not suppose any one will object to it. What appears most singular to me is, that such an observation should have been thought necessary.—What could the author of these observations think of the breeders in the country? They certainly must be thought destitute of common sense: or perhaps it was conjectured that they have been breeding monsters for the purpose

of furnishing a museum for a further illustration of the breeding system. It was customary with Mr. Bakewell to exhibit a variety of examples for the purpose of showing the progress of improvement, and illustrating the different degrees of perfection; and it is only in this point of view that the generality of these observations can be thought necessary.

We have now gone through this learned author's new opinions respecting the form of the chest; the pelvis; the head; and the neck, which I suppose is added as an appendix. The muscles and bones are the only two objects which remain unnoticed. The discussion of the former is limited to two lines; and the only inference that we are favoured with is, that large muscles and tendons enable an animal to travel with facility. Perhaps it will be necessary to observe, that the improvement of sheep is the great object of the breeders in this county: but as horses have been also mentioned, they may in the present instance be the grand object of allusion; if so, the facility of travelling is certainly a question worthy of attention: but with respect to sheep, this cannot be a consideration of importance, as they are not permitted to go on foot, but have carriages on all occasions devoted to their service.

Whatever may be the opinion of this anatomist with respect to the bones, they certainly may with great propriety be considered as the basis of the

fabric, and viewed as one of the most important characteristics of animal perfection. But in this it is probable that there is some diversity of opinion, as we are very scientifically informed, that "the strength of an animal does not depend upon the size of the bones, but on that of the muscles." If I were to assert that it depends on the bones alone, I should perhaps be guilty of as great an absurdity; but it is my opinion, that there is no part of the animal mechanism more unquestionable, than that strength and motion depend on the concurrence of these two mechanic powers. It is probable that, on most occasions, the bones and muscles bear a certain proportion to each other; and I think it would not prove an useless task if this analogy could be traced through the different forms of animal nature. Perhaps it would not be difficult to show how the different proportions are best adapted to different circumstances; how the light bone and small muscle of the race-horse are best calculated for speed; and how the large bone and full-bodied muscle of the draught-horse are most possessed of power; and if we direct our views to the feeding of animals for slaughter, I am also of opinion that the light bone and compact form are most fit for this important purpose. There cannot remain a doubt but certain forms are much more disposed to feed than others; and it is equally certain that the respective charac-

ters of animals may be accurately determined without an anatomical investigation of the subject; it is a question only to be determined by the experiment during life; we are not sufficiently acquainted with the mechanism of the animal system to determine points of this kind by an examination of the viscera after death. But whether the cause depends upon the external form or internal structure, it is on the combination of different circumstances that the variety of character and degrees of perfection are first established: but to suppose that large bones depend upon the want of nourishment, is certainly carrying the delusions of hypothesis to their utmost limits; and, whatever may be the form of the hobby-horse's legs, there cannot remain a doubt but the quixotism of anatomy is now riding at full speed.

When horns and the consequent thickness of the skull were the objects of discussion, it was particularly urged that a very large quantity of food was necessary for their production and support, and that the loss incurred in consequence was very considerable. If then it requires large quantities of food for the support of horns and thick skulls, it certainly must be irrational to suppose that large bones are in other instances the production of bad digestion or want of nourishment. It is a contradiction which is irreconcilable, and must inevitably invalidate the arguments on both sides of the

question. If an animal with naturally large bones has but little flesh to cover them, the bones will be particularly conspicuous; but it is the want of flesh, and not the largeness of the bones, which is the natural consequence of imperfect nutrition.

I once knew a very remarkable horse, about sixteen hands high, of a slender make, but light of bone. This horse had a very bad appetite; and as he did not lay on flesh in proportion to the quantity of food, it was reasonable to suppose that digestion and nutrition were also both imperfectly performed; yet with a bad appetite, bad digestion, and bad nutrition, this horse had not large bones; which is a fact in direct opposition to our learned author's theoretical conjectures. In behalf of the accuracy of this interesting narrative I shall beg leave to mention, that the facts above stated are well known, and the celebrated animal here alluded to might rather be considered a public character. He was first sold for fourteen guineas; he was afterwards bought by a gentleman in this neighbourhood for twenty guineas; and being so fortunate one day as to lead the field before the Quorndon hunt, he was immediately sold for a hundred guineas: after this he had every possible care and attention which could be paid to a hunter, but always continued as thin of flesh as he was of bone. All these examples evidently show that the character of the animal is completely

formed before birth, before either the lungs or digestive organs have been called into action. I do not pretend to say that the health of an animal cannot be injured afterwards by bad management or want of food; but the principal object that the feeder has in view is to preserve the original character, and protect the innate perfections.

The business of breeding and feeding forms two very distinct objects of consideration; the first of which will depend on the choice of such animals as are best calculated for the intended purposes. And with respect to sheep, I believe that is considered the highest state of perfection, which will convert any certain quantity of vegetation into the greatest quantity of animal substance, and with the least loss transform the food of sheep into more substantial food for the support of the human species.

If we were to place the business of feeding in a scientific point of view, it is probable that much more will depend upon experimental information than what could possibly be obtained by anatomical investigation; and the proper choice of food will be better determined by experience and observation, than by the most minute anatomical examination of the digestive organs when the vital powers have ceased. When Mr. John Hunter wished to determine what kind of food was by nature designed for the human species, he examined

the teeth and stomach, and compared them with similar parts both of carnivorous and granivorous animals. The learned Dr. Fordyce, depending upon experimental evidence, asserts that "the fibrous and membranous parts of vegetables are clearly not digested, let them be ever so tender or soft," observing that "they pass through the intestines without being decomposed*." And though I do not think this evidence perfectly satisfactory, yet the ingenuity of the conjecture may perhaps be thought worthy of the attention of the learned; not that I am disposed to admit that a slight failure in digestion is a sufficient basis for a new opinion, as we well know that oats will frequently pass a horse's bowels without being digested; and yet it would be a hasty conclusion to assert that horses could not digest oats, and consequently that they were improper food. I have heard of a great physician in Town, who established an unrivalled reputation only by the examination of excrementitious matter; but whatever Dr. Fordyce might have thought necessary with respect to the human species, if he had paid proper attention to this circumstance in other animals, it is probable that he would have been more cautious in giving his opinion. The truth is, that

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* See Fordyce on Digestion, p. 112.

those who see the least, frequently think that they know the most; and consequently, if a London physician never had an opportunity of meeting with this kind of instructive evidence, he must certainly be deprived of some very important information.

If we were to examine all the different theories of digestion, the result would only serve to show the general diversity of opinion; but as the lungs have been represented as the most important organ connected with this part of the animal œconomy, their influence more particularly merits our attention. I do not pretend to have estimated the validity of my opinion by the scale of the thermometer; but the concurring testimony of general observation gives sufficient sanction to the opinion, that protection from cold is highly instrumental in the feeding of animals; in consequence of which it must appear very singular to all those who have the least knowledge of the effects of respiration on the blood, that the subject of animal heat was not made a part of this learned investigation. This is a question on which Mr. Cline has not thought fit to hazard a single observation: but if we look into the writings of Mr. J. Hunter, we shall meet with a number of experiments which may be considered applicable to the subject, though I am sorry to add that they

are not perfectly satisfactory. Some of the experiments here alluded to were made on those animals which are called amphibious, the temperature of whose blood is about thirty degrees below that of the more perfect animals, whose blood all passes through the lungs from the right to the left side of the heart, and in whom constant respiration is absolutely necessary to life. The amphibious animals cannot live without respiration; but in this class of animals respiration is much less frequent, and much more obedient to the will. One of Mr. J. Hunter's delicate experiments was made upon "a healthy turtle*," which must certainly be considered a very proper subject for anatomical inquiry. But with all this evidence before him, it certainly must be considered rather singular, that this ingenious physiologist never reverted to the opinion of Dr. Black, who with great plausibility pointed out this circumstance as an important part of the evidence of nature, in proof of vital heat depending on respiration. Those animals which have warm blood have constant respiration, and the circulation passes immediately through the lungs:—those animals which have cold blood have less frequent respiration, and only a small portion of the blood passes through the lungs. The evidence is so plain, that it is sin-

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* See J. Hunter's Treatise on the Blood, &c. p. 28.

gular that a fact of such importance should have been so little attended to, or that Dr. Crawford's theory of animal heat, which was first founded on the observations of Dr. Black, should now be thought unworthy of attention, because it is liable to some objection which Dr. Crawford never answered. Mr. J. Hunter, after having made a number of experiments on the heat of the blood, acknowledges that it is a subject which he did not understand*; and if he meant by this expression that the subject was involved in a number of difficulties which he was not able to explain, I should suppose that every part of the animal œconomy was surrounded with similar difficulties; and if no degrees of information are admissible, but such as include a perfect knowledge of the subject, I am of opinion that modern physiology will be brought within a very narrow compass. If the motion of the heart and the circulation of the blood are not perfectly understood, we are not to conclude that we have not any knowledge of the subject; and if all the phænomena of respiration are not perfectly understood, we are not to resign that knowledge which we are in possession of. But if ever I should be tempted to enter upon an anatomical investigation of these subjects, I shall certainly, in compliment to Mr. John Hunter, make the turtle

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* See J. Hunter's Treatise on the Blood, &c. p. 15.

the first object of my attention,—as, in addition to the mechanism of the lungs, and the effects of respiration on the blood, it may also furnish us with some very agreeable experiments on the powers of digestion. But what more particularly recommends the turtle to our consideration on this occasion, is, that the carcase of the Dishley sheep and the form of the turtle have been supposed to have a very near resemblance to each other: if therefore the external form depends upon the internal structure, and the lungs are to be considered the grand characteristic of perfection, the lungs of the turtle will have an additional claim to our attention*.

I well remember having seen the lungs of a turtle converted into a very pretty anatomical preparation; and I do not forget the astonishment I experienced when I was told that this exhibition might be looked upon as an anatomical curiosity, but was in no other respect deserving of attention. But if the learned physiologist, to whom I am now alluding, could at that time have fore-

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* The carcase of the Dishley sheep, when fully fat, takes a remarkable form; much wider than it is deep, and almost as broad as it is long. Full on the shoulder, widest on the ribs, narrowing with a regular curve towards the tail; approaching the form of the turtle nearer perhaps than any other animal. See Marshall's Rural Œconomy of the Midland Counties, vol. i. p. 382.

seen that the lungs would at some future period be found to be the grand organs of nutrition, this part of the animal œconomy would have certainly appeared in a more important point of view. The learned orator might then have thought necessary to inform the unlearned, that the turtle is an amphibious animal, and to point out the plain and obvious difference in the construction of these organs in this class of animals, and then compared them with those of quadrupeds, which are similar to the human species, whose warm blood gives more animation to the heart. On this new principle, we might have been informed how the most perfect and most crooked forms were made, and also have been shown how the solids and fluids are influenced by each other; and if it was not possible to demonstrate how the warm blood of sheep is productive of wool, and the cold blood of the turtle gives nourishment to the shell, yet the difference of internal structure might certainly furnish subjects for many curious observations. We are told by a very great anatomist, that the similarity of the blood of different animals might be proved by transfusion*; and as this

* Transfusion of the blood of one animal into the vessels of another, proves to a certain degree the uniform nature of the blood; for, as far as these experiments have been urged, no alteration has been observed. See J. Hunter on the Blood, &c. p. 13.

ridiculous experiment seems to have become the hobby-horse of modern times, it certainly would have been a gratification to the curious to be informed, whether by the transfusion of warm blood the action of cold veins could be restored, and the powers of life protected by the reanimating energy of eternal youth. If all these mysteries could have been explained, and all these queries satisfactorily answered, the learned might then suspect that Mr. Bakewell had not been a judge of sheep and cattle, and that the present breeding system was an imposition on the world.

If you want experiments, Mr. Bakewell made them; but not like those of Reaumur or Spallanzani, vainly hoping to discover how the operation of digestion was performed. With far more rational views,—his object was to determine which animal was most disposed to feed, well knowing that it is the blind zeal of philosophy to be searching after causes when we want to obtain a knowledge of effects. With this intent he weighed the sheep and also weighed their food; and by trying a variety of experiments on different kinds of sheep he clearly determined which would produce the most on a given quantity of food. I do not wish to have it understood that those animals, like Sanctorius, lived in scales, or that their egesta as well as ingesta were ascertained by weight and

measure; but their quantity of food was regularly weighed, and their increasing weight as accurately ascertained.

Many of the theoretical writers on the business of digestion have endeavoured to amuse the public as much by their analysis of the different kinds of food, as the anatomists have by their investigations of the animal œconomy. Doctor Fordyce has conducted this species of refinement to its utmost limits; and, for the purpose of tracing the subject of nutrition to its first principles, endeavours to prove that air and water are the first elements of food both to vegetable and animal nature. But suppose all this was strictly true; yet this water and air must be converted into vegetable matter, and the vegetable matter must be digested and changed into animal matter; and though it may be proved that water and air are both necessary on those occasions, yet they are two processes in nature which are as far beyond our power of imitation as they exceed the limits of the human understanding: such little observations may look well on paper, but do not add a single grain to our knowledge of the subject. Dr. Fordyce tried the experiment with a grain of mustard-seed*, but Mr. Bakewell made his expe-

* See Fordyce on Digestion, &c. p. 74.

riments upon acres; and though he never might attempt to investigate either the vegetable or the animal process by which these operations are performed, yet he endeavoured to show how land by the agency of water might be made to produce the greatest quantity of food for sheep and cattle, and how these animals might produce the greatest quantity of food for man.

Air and water may both be necessary as well to vegetable as animal life; but whilst one may be considered an essential part of food, the other is equally necessary for respiration, which Dr. Darwin makes a part of the vegetable œconomy :—

> Leaves, lungs, and gills, the vital ether breathe
> On earth's green surface, or the waves beneath.
> So life's first powers arrest the winds and floods,
> To bones convert them, or to shells, or woods*.

It certainly does not require any very great degree of sagacity to determine that the lungs are an important organ; it is one of those self-evident facts that every one, who knows that an animal cannot live many minutes without respiration, must be convinced of; but Dr. Fordyce never mentions the lungs, or alludes to their agency, either in the business of digestion or nu-

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* See Temple of Nature, by Dr. Darwin.

trition. I would not have it suspected that I am inattentive to the effects of respiration on the blood; but the lungs and the organs of digestion are very different from each other—the one is for the reception of air, the other of food. When the food has been digested in the stomach, it is taken up by the lacteals and converted into chyle*, from which it is conveyed through the thoracic duct to the subclavian vein to be mixed with the blood; but this mixture in the first instance can only be mechanical, and is not completed till the blood has passed the lungs. Before the blood has passed the lungs it must be considered in an imperfect state: for, having supplied the glands with what was necessary for the different secretions, and having furnished the whole system with materials for nutrition, it is then returned to the heart in a very different state to what it was in when before distributed to all parts of the body; and under these circumstances a fresh supply of chyle is introduced into the subclavian vein, for the purpose of making up the loss, and replenishing the

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* Our aliment is not converted into chyle in the stomach or intestines by a chemical process, but is made in the very mouths of the lacteals; or in the mesenteric glands; in the same manner as other secreted fluids are made by an animal process in their adapted glands.—See Darwin's Zoonomia, vol. i. p. 336.

impoverished blood, which had been collected by the veins from the different parts of the system, with the addition of a fresh supply of chyle.

The blood, then changed both in quality and appearance, is brought by the veins from the different parts of the system, and with the addition of a fresh supply of chyle is conducted to the right side of the heart, from which it is sent through the lungs, and is received by the left side of the heart to be distributed to all parts of the body. But in passing through the lungs the blood is changed from a dark colour to a red one; which change, in my opinion, marks the final process of sanguification. But when the blood is thus perfectly formed, and received into the left side of the heart for the purpose of being distributed by the arteries to the different parts for the purposes of nutrition, it is still no more than blood; and it is in the parts themselves that the blood undergoes the final change for the respective purposes. But to assert that the business of nutrition is accomplished in the lungs, would be the same as to suppose that the blood, having passed this organ, was already converted into bone, muscle, fat, &c., and that these parts already formed were swimming down the florid stream; and it would be equally rational to assert, that the red arterial blood was perfectly similar to the white streams which flow from the female breast, or that

it might be compared to other characteristic instances of glandular secretion.

I do not expect that all these observations will be perfectly intelligible to those who are not acquainted with the anatomy of the parts; and yet I am of opinion that an argument may be understood, though the local circumstances are not exactly known. If I have been guilty of misrepresentation, and have endeavoured to establish my argument on false principles, there cannot remain a doubt but the sophistry will be exposed: but if what I have here asserted should remain without contradiction, those who are less acquainted with the minutiæ of the subject may depend upon its truth, which on all occasions I shall be ready to defend.

Such then are the principles of this new system, in which the lungs are not only made the grand organ of nutrition, but we are also informed by this learned anatomist that their power and magnitude bear a direct proportion to each other; and that an animal with large lungs* is capable of converting a given quantity of food into more nourishment than one with smaller lungs; and, therefore, has a greater aptitude to fatten. I cannot say that I perfectly understand what, on this occasion, is meant by large lungs; whether it is

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* See Cline on the Form of Animals, p. 3.

the proportion which this viscus bears to the other viscera, or whether it means the proportionable size of the lungs to other parts of the body. But, setting aside all these critical accuracies, for the purpose of obtaining more satisfactory information on this important question, I have made application to that instructive theatre of anatomy vulgarly called the slaughter-house, and find that there is but one opinion on the subject, which is, unfortunately, in direct opposition to that of the learned author now before us; and I am well convinced, not only by what I have heard but by what I have also seen, that large lungs are invariably attended with large head and large offal; and I have lately seen a very fine example of one of these high-bred sheep which was exceedingly fat, and was astonished to find the lungs so remarkably small. It is not to be supposed that what, in rustic language, is called a sheep's head and pluck, could ever have been seen in the metropolis; but my anatomical neighbours, above alluded to, positively inform me, that animals with large plucks are longer in coming to perfection by one year in three; and that at last they are ill formed, with coarse carcase, and all coarse about them.

If, after an impartial examination of this subject, the facts as here stated should prove true, the method of obtaining animals with large lungs will be less deserving our attention. This we are told

is to be done by crossing, which certainly is not the method by which Mr. Bakewell is supposed to have brought the Dishley breed to such perfection : but it unfortunately happens that this new theoretical hypothesis, which has never yet been tried, is in direct opposition to every part of the present practice, which has so long been made use of with such unparalleled success. Mr. Bakewell made choice of the most perfect from his own flock, and the same family, which is called breeding in-and-in ; Mr. Cline recommends crossing :—Mr. Bakewell was capable of judging of perfection by external appearances ; Mr. Cline depends upon anatomical evidence :—the Dishley breed in the present state of perfection have small lungs ; Mr. Cline thinks large lungs a mark of perfection :—it is the general practice of this neighbourhood to make choice of males which are larger than the females ; Mr. Cline recommends that the females should be larger than the males—and I hope it will not be thought necessary to carry the comparison any further, as this last opinion is in direct opposition to all the evidence of nature. According to this anatomical hypothesis, the females should be large, and the males small : but if we search the whole animal creation, we shall find that the superiority of the male character, both in size and power, is strongly marked.

Whether the lungs of quadrupeds are in gene-

ral too small in consequence of the males being too large, is a question that I will not presume to determine; but it is reasonable to suppose that the learned author before us has well examined the subject, as, according to my limited knowledge of anatomy, I should consider it a question not easy to be ascertained. It will not answer the learned gentleman's purpose to assert, that the study of anatomy has been the grand object of his life; the evidence of the anatomical theatre is inadequate to the occasion: it is not sufficient to obtain a knowledge of the internal structure after death, compared with an emaciated body exhausted with disease; but a knowledge of the parents will be also necessary, and the respective proportions of the father and mother towards each other, which is a species of evidence that would be difficult to procure.

In this situation, then, the question must have rested, if we had not been informed, that "by such a method of crossing the lungs and heart become proportionably larger, in consequence of a peculiarity in the circulation of the fœtus, which causes a larger proportion of the blood, under such circumstances, to be distributed to the lungs than to the other parts of the body; and as the shape and size of the chest depend upon the lungs, hence arises the remarkably large chest, which is

produced by crossing with females which are larger than the males*."

In the first place, I shall beg leave to observe that this is all assertion, without either evidence or argument in support of it. It is a subject on which the anatomical theatre is as silent as the grave: and as I am well informed by all the breeders I am acquainted with, that it is the general practice to make use of males which are larger than the females, I cannot conjecture from what source of information this opinion first originated; and till I meet with some more satisfactory information, I shall beg leave to assert that, if this was a principle in nature, it is a fact which it would be impossible to ascertain. But if the fact is beyond the reach of anatomical investigation, the fallacy of the argument may serve to invalidate the whole: and before I enter on the physiological part of this subject, let me beg leave to solicit the attention of such readers, who are not acquainted with the anatomy of the parts, to this plain question: That if it was known what quantity of blood was sent to the lungs of the fœtus, can any rational being suppose it would be possible to ascertain whether any difference of proportion does take place in consequence of such a method of crossing? That is, if

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* See Cline on the Form of Animals, p. 6.

a female is pregnant by a male smaller than herself, a larger quantity of blood will be sent to the lungs of the fœtus than if the male had been larger than the female? for such are the grounds of this argument, the truth of which in my opinion it would be impossible to prove. But for the information of those who are unacquainted with the subject it may be necessary to observe, that the blood does not circulate through the lungs in the fœtal state; and as the exercise of their functions does not take place till after birth, it is irrational to attribute the magnitude of the lungs to a cause which never had existence.

Mr. Cheselden has expressed himself with more than modern delicacy on this subject, and supposes that about one half of the blood that enters the right auricle of the heart passes through the lungs: but I am extremely sorry that I cannot subscribe to this opinion; for, as there is a particular communication between the pulmonary artery and the aorta, which becomes obliterated after birth*,

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* Part of the blood before birth, and not the whole quantity, as is generally thought, which is brought by the ascending cava to the right auricle, passes at once through the foramen ovale into the left auricle, and the rest flows into the right ventricle with the blood of the descending cava, and thence into the pulmonary artery, where about one half flows into the lungs, and the other half directly into the aorta by

it appears to me most reasonable to suppose that the circulation through the lungs does not take place in the fœtal state: for, as the foramen ovale and ductus arteriosus give passage to the blood before birth, it is not necessary that it should then pass through the lungs; and as these passages become obliterated as soon as the passage through the lungs has been established, we have the same reason to suppose that the blood does not pass through the lungs before birth, as we have for supposing it does not flow through those passages afterwards. And when we consider that the lungs are an useless organ in the fœtal state, it is not probable that they should be enlarged by the circulation of the blood; and at all events it must be plain that this unfortunate appeal to the evidence of anatomy cannot in any point of view serve the intended purpose, but, on the contrary, must convince all those who are acquainted with the subject, on what a humble basis this new theory of the breeding system is likely to be established.

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the ductus arteriosus, which lies between the pulmonary artery and the aorta, which after birth is called ductus arteriosus in ligamentum versus. Cheselden's Anatomy, p. 284.

CHAPTER III.

The Practical Part of the Breeding System exemplified and explained.

If this was the first theoretical discussion that ever had attracted my attention, it might have been reasonable to have concluded that the practice must have fallen with the visionary basis on which it rested. But I have long been convinced that theory and practice have very little connexion with each other; in consequence of which, impartial justice must allow that the practical part of these learned observations has an equal claim to our attention.

The two methods of breeding before alluded to are both mentioned in the statement, but in such vague and evasive language, as if the author rather wished to secure a retreat in case of an attack, than to come boldly forward in support of his opinion. He says, "When a particular variety approaches perfection in form, breeding in-and-in may be the better practice; especially for those who are not well acquainted with the principles on which improvement depends*." What is here

* See Cline on the Form of Animals, p. 6.

meant by a particular variety, in my opinion, wants some further explanation; but whatever approaches the nearest to perfection should be unquestionably the object of our choice. We are told that it may be the better practice; which is expressive of doubt, and the language of uncertainty, that becomes more conspicuous when he intimates that those who are well acquainted with the principles of improvement might pursue a different line of conduct; from which it appears to be a kind of practice which is recommended as a cautious method of proceeding, rather than an explanation of what is absolutely right: but it should be remembered that the object before us is to determine what is best, and not to make apologies for the ignorance or folly of mankind. But the question of consanguinity has been before determined, by which I hope the subject is already placed in a more intelligible point of view. What appears rather singular on this occasion is, that the two methods of breeding should both be recommended in the same page: for, immediately after pointing out the advantages of breeding in-and-in, the opposite practice of crossing is recommended as the most expeditious method of obtaining animals with large lungs, which is here represented as the grand characteristic of perfection. Under such circumstances I must acknowledge that it would be difficult "for those who

are not well acquainted with the principles on which improvement depends," to determine which method to make choice of. But if any one should doubt what I have here asserted, let him carefully examine the page over again, and then tell me whether this description is or is not accurate, and whether he can find any rational foundation on which to establish his opinion.

The first object which is presented to our view respects the proportion which (it is supposed) the males and females should bear unto each other: and, for the purpose of making the subject most conspicuous, the objects are represented in an unnatural state of exaggerated deformity. We are first told that "when the male is much larger than the female, the offspring is of an imperfect form." But it will be right here to observe, that if the female is of a proper form and good proportion, it is natural the male should be somewhat larger; but if it is much so, as is here represented, in all probability the male will be much above the natural size, and consequently is liable to be ill formed and bad proportioned; from which it would be irrational to expect an improved offspring.

The next assertion which we meet with informs us, that "if the female be proportionally larger than the male, the offspring is of an improved

form :" in answer to which I must beg leave to observe, that this is in direct opposition to the practice of the Leicestershire breeders, and in my opinion repugnant to all the evidence of nature. There cannot be a doubt of the possibility of selecting a female which is larger than the male; but this I should not distinguish by the epithet proportional, as I consider it an inversion of the order of proportion for the females to be larger than the males; and with respect to the influence of this new system, I should think it highly irrational to admit a theoretical opinion in opposition to that evidence which has brought the sheep in Leicestershire to such perfection. We are then told, that " if a well formed *large* ram be put to ewes proportionally smaller, the lambs will not be so well shaped as their parents." In the first place, it is to be observed that this is all assertion without proof; but what I contend for is, that neither the male nor female should be large, the most compact and perfect form not admitting of that term. When we speak of a large man or a large woman, the expression implies something above the common size ; and as large animals are seldom so well formed as those of a moderate size, I consider this exaggerated description as a gross misrepresentation of the subject.

But fortunately the decision of this question

will neither be influenced by misrepresentation, nor depend upon assertion, the principles on which these new opinions are founded being next explained*.

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* Since writing the above I have been favoured with the following very interesting observations from my friend Mr. Stone, of Knighton, whose liberal patronage on this occasion I am happy to acknowledge, and whose concurring testimony I am ambitious of recording, as a public sanction to the few practical opinions I have presumed to give on this important subject. As he had read Mr. Cline's book, but never seen my answer, the coincidence must appear more worthy of attention; and that his opinions may appear to the greatest advantage, I shall give them in his own very accurate description, which commences with the following quotation:—

Mr. Cline says, (very wisely) "When a particular variety approaches perfection, breeding in-and-in may be the better practice, *especially for those who are not well acquainted with the principles on which improvement depends.*" He says, "When the male is much larger than the female, the offspring is generally of an imperfect form. If the female be proportionally larger than the male, the offspring is of an improved form." He says, "When the female parent is disproportionately small, the quantity of nourishment is deficient, and her offspring has all the disproportions of a starveling. The larger female has also a greater quantity of milk."

Observations.—I will suppose a particular variety, or an individual in that variety,—and for argument's sake we will take what was considered the best of the prize bulls at the last show at Ballingsloe in Ireland, where a number (I think eight) of different varieties had prizes as the best of their sort. The whole of these were brought into competition, and

The grand solution of this question is made to depend on the ability of the female parent to nourish the fœtus; for which purpose it is supposed to be necessary that the female parent should be larger than the male. But supposing the ar-

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the prize-medal was adjudged to a long-horned bull, bred and sold by Mr. Honeyborn, of Dishley, to the Marquis of Sligo; and from this authority we may suppose that the long-horned bull comes nearest to the standard of perfection. Now from Mr. Cline's opinion, a bull of this variety put to a Lincolnshire, Yorkshire, Durham, or Hereford cow, they being of a larger sort, would be advantageous; but put to a small Devon or still smaller Scotch, it would be otherwise. But from a number of experiments I am decided in my opinion that he is mistaken. I have had from the latter cross as true symmetry of shape, as healthy constitutions, as profitable animals brought to market at unusually early ages, under three years old, as any I ever experienced.

Sheep.—Let us suppose a Leicestershire tup put to a Charnwood Forest or Ryland, (both particularly small), or South Down ewe.—I have seen their offspring as healthy and useful in every respect as from the large Lincolnshire, Durham, Wilts, or any other variety larger than the Leicestershire tup. The improvement, *if any,* from the mixture of varieties of the same species, does not at all, in my opinion, depend upon size, but other circumstances; principally such as true symmetry of form and scale, smallness of bone, lightness of offal, propensity to fatten, &c. Attain these first principles, and hardiness of constitution, size, according to soil, situation, &c. will in general be the consequence: they may and will be the consequence of the other properties, but cannot be the cause of them.

gument in no other respects objectionable, I have no doubt that on examination it will appear evident that small females are best calculated for the purpose. Small cows not only give the greatest quantity of milk, but it is reasonable to suppose that they give the greatest quantity in proportion to their quantity of food. A large-bodied animal must certainly require more nourishment than a small one; and consequently a small animal has more nourishment to bestow upon the fœtus, or to supply her offspring with after birth. I do not presume to point out what is the best proportion; but if the vital powers are only calculated to support a certain bulk, that form most certainly is best which accumulates the most with any given quantity of food, and there is perhaps a form in which the greatest quantity of matter is included with the greatest perfection: but in the present instance the female parent is supposed to be rather small, or below the common size; I will not say that it might not be possible to find a dwarfish female which was incapable of supporting her offspring; but I am well persuaded that small females less frequently fail, both in the production and support of a healthy offspring.

This question may in some degree be illustrated by the effects of pruning fruit-trees and

other vegetable productions. If they are left in a state of nature without pruning, the quantity of wood being great the fruit will be proportionably small, as the quantity of both will be in proportion to the quantity of nourishment taken in by the roots or absorbent vessels; and in consequence of having so large a bulk to give support to, the fruit will be small, and never amount to any great degree of perfection. But when the bulk of the tree is diminished by pruning, a larger quantity of nourishment is reserved for the offspring, and the fruit in consequence is large, and brought to high perfection. I do not say that such analogies are in every respect applicable, but they are sufficient for the present purpose.

If I was here to enter into the question respecting the nutrition of the fœtus, it would not be difficult to produce such a diversity of opinion, and such a chaos of conjectures, as might prove sufficient to bewilder the most enlightened anatomist of the age. But if I was to take up the argument in a practical point of view, I could produce examples without number; and in the present instance they crowd upon my recollection in such multitudes, that if the appeal was necessary I should find it difficult to determine where to make my choice. But till I meet with more satisfactory arguments and less assertion, it will

not be necessary to appeal to the evidence of facts.

When we come to the subject of crossing, we are presented with a number of curious examples on both sides of the question. And in such cases, where experimental evidence has been brought forward, it may perhaps at first view be thought necessary that fact should be opposed to fact, and one set of experiments brought in opposition to the other; but in courts of law we frequently meet with a very different kind of crossing to what we are here treating of, and the validity of the evidence on one side of the question is first put to the test of cross-examination, before it is thought necessary to produce evidence in reply. If then the evidence before us cannot be improved by this kind of crossing, it must certainly be thought unworthy the breeder's attention.

We are told in the course of this elaborate performance, that "to obtain the most approved form, two modes of breeding have been practised; one, by the selection of individuals of the same family, called Breeding in-and-in; the other, by selecting males and females from different varieties of the same species, which is called Crossing the breed*." The first examples which we

* See Cline on the Form of Animals, p. 5.

meet with in illustration of this subject only serve to show that it is possible to improve the breed by a proper choice of males and females, without any particular allusion to either of the two methods above mentioned; and it must appear equally evident from the same statement that degeneracy will be ensured by the use of large ill-formed, ill-disposed, and preposterous animals. When the question had been first so accurately stated, it was reasonable to expect that evidence would have been brought forward for the purpose of proving which method was most to be depended upon; instead of which we find that the whole success depends alone on having small males and large females, by whatever method they may be procured. On the good effects of crossing, we are told that "the great improvement in the breed of horses in England arose from crossing with those diminutive stallions, Barbs and Arabians; and the introduction of Flanders mares into this country was the source of improvement in the breed of cart-horses*."

With respect to the matter of fact I have nothing to allege, but that all might be as here stated: but surely no one ever doubted that a bad breed might be improved by a mixture with a good one; and if the horses in England ever

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* See Cline on the Form of Animals, p. 7.

were a set of large, ill-formed, awkward animals, and small neat well-formed stallions were procured from Barbary or Arabia, it is reasonable to suppose that great improvements would take place. But as most historians think proper to refer to the authority from whence their information was taken; the time when these improvements took place, and other circumstances, would certainly have been thought worthy the reader's attention. The introduction of Flanders mares is also very ingeniously contrasted with the little stallions from Barbary or Arabia; but we are not told that these little stallions had any thing to do with the improvement of the breed of cart-horses, to which the Flanders mares might undoubtedly contribute if united with the celebrated Dishley black horse or other well-formed English stallions. After all these interesting examples, we are then favoured with this additional information, in behalf of these new opinions, that "the form of the swine has also been greatly improved by crossing with the small Chinese boar*." And though the perfections of the female are not mentioned, it will readily be seen that all these statements are intended to prove that small males and large females form a happy union, which is certain to be productive of an improved offspring. When the boar comes

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* See Cline on the Form of Animals, p. 8.

from China, the first improvement must be by the means of crossing; but if we are to proceed one step further from this period, it must be by selections from the same family, in conformity to the principles of the Dishley system. I am ready to acknowledge that both methods are repeatedly mentioned, but not a single argument is offered that is applicable to the subject. The advantages or disadvantages of a judicious or injudicious choice, is not the question; the object of inquiry is to determine whether consanguinity presents any natural impediments to improvement, and whether in consequence crossing the breed becomes absolutely necessary. If the swinish multitude were a set of large, coarse, ill-formed animals, there certainly was a great probability of improvement taking place by diminishing the size in consequence of uniting a small boar with a large sow; but all this would have been equally plain to the superficial observer without the assistance of anatomical illustration. There is still one question which presents itself,which seems worthy of our consideration, and that is, whether all these great improvements from Arabian horses, Flanders mares, and Chinese boars, were accidental, or whether they were the result of an anticipated system; and we certainly should have been informed who were the first observers, and how the business was afterwards conducted.

The next subject which is presented to our view will not carry us so far from home, as York and London mark the limits of our course. On this occasion the good and bad effects of crossing are both particularly mentioned, from which it must be evident that the breed of animals may either improve or degenerate even when crossing is made use of; which proves beyond a doubt that improvement is not to be ensured by crossing more than by family connexions; and consequently that the object of the breeders is to make choice of that form which is most likely to promote improvement independent either of crossing or consanguinity.

The manner in which this trite description is communicated is perfectly coincident with the representations which have been already noticed, and can only serve to prove that the doctrine of crossing has no more claim to infallibility than the doctrines of the pope. It is indeed on a perfect level with all the other statements, and is much better calculated to amuse the inattentive than to furnish that species of clear and unquestionable evidence which is by nature formed to lead the mind to a knowledge of great and important truths.

The kind of argument here stated having been so repeatedly discussed, the statement is the only object which merits our attention. We are first informed, that when it became the fashion in London to drive large bay horses, the farmers in York-

shire put their mares to much larger stallions than usual, and thus did infinite mischief to thei rbreed, by producing a race of small-chested, long-legged, large-boned, worthless animals*." Now as it is not probable that large bay horses should become fashionable before they existed, it is reasonable to conclude that it would not be necessary for the Yorkshire farmers to try any new experiments, as there could not remain a doubt but the same methods which had succeeded in the production of those horses, which had then become fashionable, would have proved equally successful on a repetition. It certainly also is a question of some importance, to determine from whence these fashionable large bay horses were first procured;—they could not come from Yorkshire; for, if the Yorkshire breed had fortunately coincided with the London fashion, there would not have been any motive for crossing the breed. And with respect to the Yorkshire breeders, I have too high an opinion of the sagacity and good sense of that enlightened part of Great Britain, to suppose that, if any other part of the country had got the lead in the breed of large bay horses, their first attempts would not be equally successful. And that I may not fail, at the same time, to pay all due respect to the taste of the metropolis, it is with

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* See Cline on the Form of Animals, p. 8.

great humility that I beg leave to conjecture, that the large bay horses which were then in fashion were not small-chested, long-legged, large-boned worthless animals; but that they were of a full size, well-proportioned, and not only perfectly agreeable to the first principles of anatomy, but in many respects sufficiently handsome to be looked upon as an ornament to their exalted situation.

If then this representation is correct, the Yorkshire breeders evidently betrayed a want of knowledge of their profession, by making choice of males and females which were improper for their purpose; for, as large bay horses had been procured from other quarters, it is evident that there was nothing unnatural in these productions. But there is another difficulty also presented on this occasion: for, as London was supplied before the attempt was made in Yorkshire, it is singular that the whole Yorkshire breed should have been so materially injured by the experiment. We are told that a similar attempt was made in Normandy, to enlarge the breed of horses there by the use of stallions from Holstein, and with similar success. All these experiments are represented as attempts to enlarge the breed, which, if properly conducted, would, to certain limits, be attended with success; but I cannot consider the

statement with respect to Yorkshire an attempt to enlarge the breed beyond the powers of nature, since at most it was only an attempt to supply the London market with such kind of horses as they were previously in possession of; and if the Yorkshire breeders had no such horses by them, it only proves that the Yorkshire horses are not the best in the kingdom; and if they were not able to improve the breed so as to equal the large bay horses then in fashion, it is reasonable to conclude that the best method of breeding horses was not known in that county.

Not that I mean to cast the least reflection on the Yorkshire farmers, but only wish to show how different the same observations may appear when placed in different points of view, and to protect the practical opinions of the Yorkshire breeders against the theoretical representations of anatomical obscurity. But these examples, if they serve no other purpose, will clearly show how slight the connexion is between a knowledge of anatomy and the breeding system. I know it is a misfortune which the learned often meet with, to find that there are many subjects with which they are totally unacquainted; but that such examples may not be limited to the profession, I shall beg leave to mention a singular controversy which once took place in one of our most

important seminaries of learning. The reverend gentleman who first communicated this curious information, was by the learned esteemed a man of learning, and seldom failed to embellish his conversation with scientific decorations: and when horses became the subject of conversation, he would frequently attempt to prove by mathematical demonstration, that a horse would draw a greater weight with a load on his back than he could without it; and, as a kind of ornamental illustration of a dry mathematical argument, this learned gentleman would sometimes very facetiously relate a satirical conversation that once took place between one of the heads of one of the colleges, respecting the purchase of a horse intended for a carriage, and a country farmer; or, more strictly speaking, this sagacious character was neither a farmer nor horse-courser, but a happy mixture of the two. The horse was brought to Cambridge and exhibited for sale with all those preliminary ceremonies which are regularly made use of on these occasions; and it is probable that he cocked his tail and appeared to great advantage. At the same time it is also probable that the sagacious jockey did not fail to display a greater flow of eloquence than was expected by the learned. Now, as it is well known, and has been satisfactorily proved by the experience of ages, that it is in many instances as

impossible to make an orator as it is a poet, (of the truth of which I could point out innumerable examples,) there is some reason to suppose that the natural flow of eulogy with which the horse's merits were described might perhaps excite a little jealousy in the minds of the learned auditors; but whether this conjecture is well founded, or from what other motive of liberality the retort courteous first originated, I am apprehensive it would now be difficult to determine. But it unfortunately happened, that in the regular enumeration of this animal's perfections, it was observed that he had as many good points about him as any horse that was ever shown for sale. On the mention of the word 'points,' the learned gentleman immediately exhibited symptoms of uncommon animation; and with a satirical sneer, which indicated more of the cynic than the philosopher, hastily replied—"Points!—why the man does not know what he is talking about;—a point has neither parts nor magnitude*."—"Parts," answered the farmer, "I tell you, sir, that the horse has good parts, and as for the other things, I neither know nor care about them."—"Man," says the doctor, (for he was a doctor, and a divine one too), "Man," says the doctor, "you do not understand me; I was think-

* Punctum est quod nullas partes nec ullam magnitudinem habet. Euclid.

ing of his lines and angles ; for though I know it is in vain to talk to such people on such subjects, yet I must tell you that the power of a draught-horse depends on the angles which certain imaginary lines, drawn through the centre of his limbs, and one drawn through his body parallel to the plane of the horizon, form with each other. Then, when these data have been ascertained, and the absolute gravity of the body once determined, let us then suppose the horse placed in a falling position.—" But he never fell in his life," replied the farmer.—" That," said the learned doctor, " is not my meaning ; but when all these data have been ascertained as I have here stated, the influence of the attraction of gravitation might be mathematically demonstrated." " Sir," rejoined the farmer, " this is a new method of drawing, that I never heard of before, but I will be bound for it that he will draw any thing you please." The learned gentleman thinking he should now gain an additional advantage over his unlearned antagonist, dogmatically asked if he thought the horse could draw an inference ? " Sir," said the astonished farmer, " I do not pretend to understand your Cambridge carriages, and, to tell you the truth, I never yet saw such a thing in my life; but I shall not be afraid to lay you the price of the horse that he is able to draw the devil

himself, if that should be required." In consequence of this unexpected repartee, the learned gentleman immediately quitted the scene of action, and left the victorious jockey, as great as Alexander on Bucephalus, in possession of the field.

> Reader, thou likest not my tale—look'st *blue* :
> I tell thee, roaring infidel, 'tis *true**.

From all these instructive examples on the different species of crossing, it must appear unquestionably evident that learning and common sense are not, on all occasions, inseparable companions; and whether any more rational mode of crossing could be established between anatomy and learning for the purpose of the improvement of the breeding system, is a question which perhaps it would be difficult to determine.

On all subjects where arts and sciences are connected, it would prove of considerable advantage, first to determine which of the two was the object of pursuit. It is my humble opinion, that anatomy is still an art, and such as is not likely at present to be brought to scientific certainty; and consequently all analogous reasoning

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* See Peter Pindar, Esq. vol. ii. p. 12.

founded on such principles is not likely to possess a greater degree of perfection than the basis on which it is established. Before new opinions are introduced to public view, it is certainly necessary that the fallacy of the old ones should be exposed; and it is no less necessary, before new opinions are established, that their claims to our approbation should be explained. It is not sufficient barely to assert that "the power to prepare the greatest quantity of nourishment from a given quantity of food depends principally on the magnitude of the lungs;" such new opinions want some kind of proof. I never yet believed in the infallibility of the pope, and I see no reason why I should bow with implicit credulity to these new opinions of Mr. Cline. It has ever been the object of theorists and system-builders to attempt to strain their subjects by the rack of imagination to some scientific form; but if the learned author now before us had for a moment recollected the vast number of visionary systems* which the mysterious confusion of *professional* literature must have so repeatedly presented to his view, he certainly never would have attempted to *involve* the present subject in such a chaos of obscurity.

We hear much of the science of medicine,

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* Atoms or systems into ruin hurl'd,
And now a bubble burst and now a world. POPE.

which at best can only be considered a well regulated system of practical information; and I am well convinced that the improvement of the form of domestic animals is a subject which, like the practice of physic, will still depend on the accuracy of practical observation: we are not sufficiently acquainted with first principles to enable us to judge how the different animal functions are performed; and till the laws of animal life have been more fully investigated or accurately explained, it will be vain to attempt to establish the practice of physic, or place the breeding system of domestic animals on a scientific basis.

CHAPTER IV.

The general Improvements of Animal Nature, and Progress towards Perfection.

If both the breeding and training of animals were not at the present time so accurately understood, and the perfection to which it is arrived exemplified by a degree of success which has now become the admiration and the wonder of the world, the public expectations must have anticipated the most important improvements by the concurring exertions of two such splendid characters, who have at the same time accidentally come forward for the general improvement of animal nature.

The zeal of Sir John Sinclair in every branch of agricultural improvement has long been known. It was to his solicitations that the public were indebted for the philosophy of vegetation, from the fertile pen of Dr. Darwin, under the title of Phytologia; and now, that it has fortunately happened that the concurring opinions of one of the first anatomists of the age should coincide with his present labours, on another part of the subject equally interesting, we may certainly expect to

see the business of breeding, feeding, and training, all reduced to scientific certainty.

What appears rather singular on this occasion is, that Sir John Sinclair's paper should be inserted in the Medical Journal*, and Mr. Cline's nine pages should be printed in quarto, for the purpose of being assimilated with the Communications of the Board of Agriculture. I shall not presume to conjecture what were the sentiments of these two learned writers, but their language admits only of one construction;—the latter was labouring to establish the improvement of the brute creation on the anatomy of the human species; and the object of the former was evidently to form a system of improvement for the human species on the best regulated œconomy of the brute creation.

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* "In the course of the very extensive inquiries regarding health and longevity, in which I am at present engaged, it naturally occurred, that much useful information might be obtained from ascertaining the means by which persons, who are trained to athletic exercises, are brought to that height of strength and activity which it is necessary for them to acquire; and by what processes the speed, the strength, and the courage of the brute creation can be improved. With a view of obtaining a knowledge of the facts from which such important consequences result, the inclosed paper and the queries therein contained were drawn up." See Medical and Physical Journal, June 1st, 1805, No. 76.

The anatomist describes the principles of the breeding system, and the management of infancy; the agriculturist attends to the business of feeding, and the conduct of their riper years.

I cannot suppose that there ever was a period of time since the origin of literature when the cacoethes scribendi was so truly epidemical: but whatever may be the opinion of the learned, the evidence is too striking to admit of doubt, that there are a great number of the arts which never can be brought to scientific certainty; and in many cases our knowledge at best depends so much on personal attention, that the highest perfection of the art is ultimately limited to private judgment and individual opinion. If a perfect knowledge of the arts could be delineated upon paper, the genius of a Michael Angelo or a Raphael would no longer bespeak our admiration or merit our attention. If it were possible to give a prescription of the colouring, and directions for the brush, the art might then be recorded with scientific certainty, and become transferable for ever. But in all these sublimities of taste, we are taught by the experience of ages that the accomplishment is personal, and can neither be communicated nor described. And if, in pursuit of the same argument, we should for a moment suppose that the practice of physic could be brought to the same perfection, one system of

perfection would then be established, and the different branches of the profession would all be reduced to the same level; and any old woman, who was capable of reading a plan of domestic medicine, would then be equal to the first physician of the age. And with respect to domestic animals, it must be equally evident, that if the whole was once reduced to book knowledge, all the sublime mysteries of the art would be immediately exposed, and every person who could read be at once initiated into the profession.

But in the investigation of the works of nature, the artist will frequently meet with difficulties which he cannot perfectly understand, and such as he consequently is not able to describe. Yet this kind of knowledge, imperfect as it may appear, will enable him to form an opinion superior to those who have not penetrated so far, and to obtain that accuracy of discernment in his profession which from books alone it would be impossible to procure. The medical tribe may study Latin, Greek, and Hebrew, if they please; but practical information is the species of knowledge which will ultimately stamp the value of the professional character; and it was that which gave Bakewell a pre-eminence over all the agricultural literati of the age.—The pen may record improvements already known, but it is by intense application and thoughtful attention that the disco-

veries must first be made. The bulk of scientific information is not to be increased by adding one volume to another, any more than animals are to be made to exceed the bounds prescribed by nature by crossing the breed.

On the present occasion, this learned author informs us that he has collected two hundred volumes on the subject of health and longevity, from which he intends to form a regular system of information and instructions. This must certainly be considered a wonderful undertaking; to attempt to assimilate such an endless variety of opinions, and to arrange all the unconnected arguments which such an extensive miscellany must afford*. The evidence of nature would have proved a much more instructive source of information; and those who have not been accustomed to examine such evidence would not be

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* "But in particular he has to rely on the treasures of knowledge, regarding health and longevity, published by various authors who have already written on these subjects, and of whose works he has made a collection to the number of about two hundred distinct treatises or volumes, every one of which is, either directly or indirectly, connected with the proposed inquiry. From this immense mass he proposes to extract whatever seems to be peculiarly valuable." See Sir John Sinclair's Prospectus. Medical and Physical Journal, page 529.

capable of forming an accurate opinion of the observations which other writers had previously made on the same subject. I should much rather, in the first instance, have turned my views to the state of population and civil policy of this country, not doubting but the language of nature would have furnished much more rational information than all the voluminous writings of the learned. But this would lead me into a labyrinth as mysterious as the voluminous writings on longevity, and as unconnected with the first object of these inquiries as anatomy is with the breeding system. For these reasons I shall therefore omit to notice the political parts of this subject, and more so as I am well convinced that it would be impossible to reduce such kind of regulations to practice; in consequence of which the discussion must ultimately prove an useless intrusion on the liberality of the public. The last object in the long catalogue of proposals is, the "Police of Medicine, and the Means of promoting its Improvement." This, then, I consider a part of the subject in which I am highly interested, and am always disposed to enter upon with as much energy and zeal* as ever this learned author applied his

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* "Though (says Sir John in his Prospectus,) naturally possessed of a sound constitution, untainted by any hereditary dis-

mind to political pursuits; and as I am well convinced that the first step towards improvement is the correction of errors, it is with this view that I have now taken up my pen. For instead of improving the practice of physic by this miscellaneous species of investigation, and promoting health and longevity, such general discussions of professional questions, by writers who must of necessity be absolutely unacquainted with the first principles, are much better calculated to serve the cause of empiricism or add obscurity to a mysterious subject. It may here be necessary to observe, that the first principles above alluded to are not to be discovered by the knife of the anatomist after death, any more than the first principles of the breeding system. The cure of diseases and the improvement of domestic animals cannot take place after death, and can only be understood by an attentive observation of the animal functions during their active state.

There are two circumstances which particularly merit our attention in the commencement of these

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ease; yet, about six or seven years ago the author had fallen into a weak and enervated state, and found himself unequal to the task of managing his own private concerns, of prosecuting useful inquiries, or of applying his mind to political pursuits with his former energy and zeal." See Medical and Physical Journal, No. 76, p. 529.

observations. The first is, that the circulation of the blood and the free transit of the blood through the lungs form the basis of this system of health and longevity*; but what is still more worthy of attention on this occasion is, that Sir John Sinclair with great propriety mentions the effects of respiration on the blood as the principal operation of the lungs; and as digestion and nutrition are never mentioned, it is reasonable to suppose that the learned author before us had never seen Mr. Cline's observations on this subject. For if, according to Mr. Cline, the lungs are to be considered the organs of digestion and nutrition, then the former description of the subject must be imperfect; and if Mr. Cline's opinion is erroneous, it then would have been proper that the question should have been placed in an unquestionable point of view. I do not pretend to assert that there is a direct opposition in the present instance; but a want of coincidence in my opinion is nearly si-

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* "Next to the free circulation of the blood through all the body, terminating in the surface, that of the free transit through the lungs is essential to health. The oxidation or chemical change produced by air upon the blood is essential to its vital properties. A free and powerful respiration is most essential to a fresh colour of the face, to lively spirits and cheerful feelings, and to the healthy and vigorous actions of the body." See Medical and Physical Journal, No. 76, page 532.

milar. This learned author speaks of a free circulation of the blood through all the body, and a free transit through the lungs. These I consider as ambiguous and indefinite expressions; and, that we might be able to estimate the value of this new species of freedom, I should have been glad to have seen an opposite representation of the subject. The circulation of the blood is a subject to which I have previously paid some little attention*; but whether Sir John Sinclair's opinion, or Mr. Cline's opinion, or my opinion, has the greatest claim to the attention of the public, is a question of too great delicacy for me to determine. If we look into the writings of Boerhaave, and those of his mechanical disciples, we should meet with a great number of doctrines respecting obstruction and *error loci*, which are now I hope exploded †; and though obstruction and *error loci* may sometimes imply a want of freedom—if these are the doctrines which the learned author alluded to, they should have been explained.

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* See Historical Surgery, Sec. 10, p. 47.

† "There never was a man perhaps, more followed and admired in physiology, than Boerhaave. I remember the veneration he was held in; and now, in the space of forty years, his physiology is—it shocks me to think in what light it appears." See Dr. Hunter's Introductory Lectures, p. 98.

I have already observed that Dr. Hunter and Mr. J. Hunter have both mentioned the imperfection of their knowledge of respiration and the functions of the lungs; and, though there is not a perfect coincidence between Mr. Cline and Sir John Sinclair, they have both given their opinions without the least reserve; but whether the lungs are paramount in the business of digestion and nutrition, or whether their functions are limited to some chemical influence on the blood, we have the satisfaction of knowing that it is the opinion of both these learned writers, that the lungs are now considered the basis of the breeding, feeding, and training systems.

This then being the theory on which the breeding and management of sheep and horses have been brought to such perfection, and which this learned agriculturist wishes to transfer to the human species; if nature had not already fixed the ne plus ultra, it would have been impossible to foresee to what perfection human nature might have in time arrived. But at all events the present view will not be thought presumptuous*,

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* Presumptuous man! the reason would'st thou find,
Why form'd so weak, so little, and so blind?
First, if thou can'st the harder reason guess,
Why form'd no weaker, blinder, and no less?

though a running-horse or a game-cock may possess perfections which man cannot attain. It is more than probable that those who are not amateurs in these pleasing arts and sciences may be so sceptical as to doubt the accuracy of this description; and those who have never heard of the ingenuity which has been exerted on these occasions may not be disposed to believe that the method of training running-horses and game-cocks can ever be made applicable to the human nature. For these reasons I think it necessary to assure them, that these proposals do really make a part of some very ingenious speculations on the health and longevity of the human species*. Here, I have no doubt, an ostentatious writer would wish

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Ask of thy mother earth, why oaks are made
Taller or stronger than the weeds they shade?
Or ask in yonder argent fields above,
Why Jove's satellites are less than Jove? Pope, p. 5.

* "Would it not then be a most important addition to the facts we already know concerning the means of improving and insuring long life, if authentic information could be procured from those districts where athletic exercises prevail, what are esteemed the best and surest processes for training men for foot-races, trials of strength in wrestling or boxing matches, or for raising the strength and courage of game-cocks, or improving the wind, strength, and speed, of running-horses to their highest pitch." See Sir John Sinclair's Prospectus. Medical and Physical Journal, No. 76, p. 533.

to stop, and not lose so proud an opportunity, that he might search the classic page with vain pedantic eye, and call those antient heroes who fought for Greece and Rome to give protection to this noble cause. But with views more patriotic, we may here inquire where the records of British valour decorate the historic page.

If we look back to the time of the barons, when party zeal gave rise to civil wars; and when, instead of civilized debate, political opinions were decided by the sword; when the population of the country was in that degree, that the produce of the soil with little labour yielded much more than was sufficient for their support, and arts and sciences were but little known, except the art of war; when the proud chiefs first bribed their vassals, by what is called Old English hospitality, and then with rustic sports filled up their vacant time, and with athletic exercises trained them up for war.—In this rude state of vassalage, strength and activity were the greatest merits which they had to boast of; and if they served their lords in battle, or rather civil war, their leisure time was spent in indolence and ease. But in the present state of civilized society, when population has become more fertile than the soil, and commerce forms the anchor both of our protection and support; now that the arts are cul-

tivated, and manufactures and commerce become the grand objects of attention, it is necessary that we should also exercise the mind.

I do not pretend to say that those who are employed in manufactories are equally strong and healthy as those soldiers who have been well seasoned to the field; but there are numbers, in manufactories, of ingenious heads and useful hands, who never would be fit for soldiers, whose health would not enable them to bear the camp, and yet are useful members of society in their respective situations. It is a well known fact amongst military gentlemen, that if a newly raised regiment is immediately taken into actual service, very great numbers die in the first campaign, whose natural infirmities or feeble state of constitution will not stand the test of seasoning, in consequence of which those that remain prove strong and healthy soldiers. They are not made strong and healthy by their situation, but are by nature fitted for the service; and as those who are not strong and healthy die, it is only the strong and healthy which remain.

The same observations are equally applicable to the state of the poor; whose children, exposed to hardships, appear in perfect health; but when we consider the numbers of weakly children that fall martyrs to their situation, we shall, I hope, no longer contend that poverty is congenial to health.

The satiated moralist and epicurean physician may both write as long as they please against what is invidiously called pride and luxury; but if I am to give my opinion on this subject, I have no doubt but on an impartial inquiry these rational dictates of nature will be found of more importance than has in general been represented;—they are both very laudable inducements to industry, and become the just reward of our reciprocal services. What is malevolently called pride is the grand spur to cleanliness and external decency, which in many instances will prove a great protection to our health against the intrusion of disease; and what is censoriously called luxury is no more than a rational cultivation of the dictates of nature, to supply the irresistible calls of appetite with palatable wholesome food, for the preservation of health and strength, and the due performances of all the important duties of human life.—It is a principle that may be traced from the palace to the cottage, and may justly be considered one of the brightest links in the chain of civilized society, which is inseparably cemented with the main spring of human happiness.

But at a time when the productions of agriculture are inadequate to our support, it becomes necessary that we should extend our views to manufactures and commerce, for an additional supply of the necessaries and the comforts of social life.

But neither manufactures, commerce, nor agriculture, were the offspring of the pen.

If we take a view of the cotton manufactures with all their ramifications, the perfection to which the arts have there been brought furnishes us with an endless subject of unceasing admiration. But the business of cotton-spinning alone, which is the grand foundation of the whole, displays a splendour of mechanical ingenuity that must give the arts and manufactures of this country a pre-eminence over all the nations of the earth, even if we had nothing more to boast of.

I am ready to acknowledge, that the public are under as great obligations to Sir Richard Arkwright for the business of cotton spinning, as they are to Mr. Bakewell for his great improvements in the breeding system: but Sir Richard was not a literary character; and yet if learning and the sciences could have been of any advantage to his views, he would not have lost sight of their concurring powers. I have been well informed, that Sir Richard once made application to a gentleman of considerable learning and great scientific accomplishments, and who had also so much improved many branches of mechanics, as nearly to have brought them to mathematical accuracy. In reply to which, this learned gentleman candidly acknowledged his intimate acquaintance with many of the mechanic arts, both in a prac-

tical and scientific point of view; but to this ingenuous acknowledgment he also added, that cotton-spinning was a business which he did not understand.

The truth is, that arts and sciences have frequently as little connection with each other, as learning has with common sense. If, for instance, it sometimes happens that an apothecary and surgeon should understand the practice of physic better than physicians, the reason must be obvious; the former learn the business as an art, the latter study it as a science: the former have very early opportunities of observing diseases in the light in which nature placed them, the latter view the subject through a medium in which it must be unintelligible. And for the same reason, those who study agriculture and the breeding system as an art, will have a much more perfect knowledge of the subject than those who depend on books. It would no more be in the power of the learned to form two such characters as Mr. Bakewell or Sir Richard Arkwright, than it would have been for Paracelsus or Dr. Hunter to have made a man*.

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* What medicine 't was that Paracelsus
Could make a man with, as he tells us.
See Hudibras, vol. ii. canto iii. l. 299.

It may here be necessary to observe, that this satire was not

These observations will perhaps be thought by some to have as little connection with the breeding of sheep and cattle, as the training of race-horses or the feeding of game-cocks have with human nature. But as this learned author has thought fit to make these the basis of his argument, I see no reason why the different species of animals may not, with equal propriety, mark the different degrees of perfection in the animal world, as be placed for signs in the zodiac for the mensuration of the heavens. It is the perfection of animal nature which is the object; and the greater the variety of examples, the more extensive may be our knowledge of the subject. But, unfortunately for this hypothesis, the method of improving the breeding system cannot be extended to

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founded upon fiction, but is sanctioned by a quotation from the learned writer, giving a description of the very curious and interesting process. Dr. Hunter certainly does not go quite so far; but in my humble opinion his observations have an equal claim to our attention. This learned physiologist says, "Let us then in our imagination make a man; in other words, let us suppose that the *mind*, or immaterial part, is to be placed in a corporeal fabric, to hold a correspondence with other material beings by the intervention of the body, and then consider *à priori*, what will be wanted for her accommodation." And on the same subject the inquisitive reader may consult the opinions of Mr. Tristram Shandy, Gentleman; Spallanzani on Generation; and Darwin's Zoonomia, vol. i. sect. xxxix.

the human species, the laws of nature not being subject to such restrictions. In the brute creation, it is only the most perfect forms which become the great objects of attention; whereas it is one of the most important duties of civilized society to give equal protection and support to the whole; and it is a great happiness which the weak and infirm have frequently to boast of, that so far from being useless members of society, they sometimes render the most important services to the state. Amongst rational beings, their services do not depend so much upon the powers of the body as the mind. The propagation of the human species may be looked upon as the commencement of immortality, which is a business too sacred for the laws of man to prescribe the bounds. It is one of the great principles of nature implanted at the creation, and may justly be considered one of the first commands of God.

But if the health and longevity of the human species are found to depend upon principles which do not admit of such immediate regulation, the management of the brute creation will prove more within our power; at least we can certainly remove the imperfections with which the present system is encumbered; and it will unquestionably be found an object well worthy the attention of the public, if by such improvements of the present methods we should contribute to promote the

health and preserve the lives of many useful animals. The great care and attention which are now paid to sheep during the season of parturition must have saved the lives of numbers, which either must have perished for want of a little manual assistance, or immediately have been lost without that careful attention which the delicacy of their native situation might require; in consequence of which it might frequently happen that the community might be deprived of some of the most perfect productions of nature. But if we take a view of the other side of the question, we shall meet with a line of practice as irrational and destructive as this is commendable and advantageous. The subject which I wish more particularly to allude to on this occasion, is the great injury which is done to the health of the males by first feeding them for exhibition, and then suddenly reducing them for service; which is certainly a method of treatment very different from that before mentioned, of guarding against the inconveniences to which they are naturally exposed. But with all due deference and respect to the learned, and those who should be better acquainted with the subject, this, in my humble opinion, is creating difficulties and increasing dangers for the sole purpose either of amusing the ignorant, or of gratifying the vanity of those who are pleased with ostentation.

If those gentlemen who come into this neighbourhood for the purpose of taking sheep, and some at great prices, were to consider their own interest, they certainly would discountenance the plan of experimental feeding. In the first instance it serves to disguise the imperfection of the animal, and deceive the parties; and when the sheep is reduced for business, the imperfections become more conspicuous, dissatisfaction takes place, and the animal falls short of their expectations. On this occasion reflections are too frequently cast upon the proprietors, who are with great illiberality accused of imposition, when, at the same time, the embarrassment depended alone on the prejudices of the opposite party. But a question of much more importance is presented to their consideration, as the health of the animal is so frequently injured by this method of practice. In the first instance the whole appetite of absorption is rendered torpid by satiety; and glandular secretion is afterwards impoverished for want of that supply which the dictates of nature have an undoubted claim to. From these causes a state of general debility is the immediate consequence, which produces impotency to one party, and is the cause of barrenness in the other; from which it must frequently happen that some of the best ewes will be rendered unproductive for the season. For such important disappointments

no adequate compensation can be given, and dissatisfaction must be the inevitable result to both parties.

For the purpose of remedying such inconveniences, I have no doubt, that if a few gentlemen who possess a more perfect knowledge of the subject would once endeavour to point out the evidence by which the perfections of an animal could be ascertained without this disgraceful process, the health and life of many of the first-rate animals might be saved: and, in a little time, I am well convinced that those who had been before accustomed to depend alone on experimental evidence, for fear it should expose their want of better judgment, would in the first place search for information; and whether they were or were not successful, rather than expose their ignorance they would then make choice of a sheep which might be considered more in a state of nature, in preference to such pampered animals, those monsters of their kind, which are frequently so incumbered with their useless load, that they may justly be considered neither fit to live nor die. If on this occasion we look to the expense with which this process is attended, it on that ground becomes a very important object; but when we recollect that the health of the animal is considerably injured, his life frequently in danger, and sometimes lost, without the least pro-

spect of any rational advantage, it certainly would be a great improvement to the present system if this destructive prejudice could be once removed. And for the purpose of making this question an object of general attention—as premiums are frequently offered for improvements in the different branches of agriculture, I would here beg leave to propose that some handsome premium should be offered to that person who should point out the most certain marks of perfection in male sheep, without the evidence of experimental feeding.

If ever there was a popular institution, which was particularly calculated to promote the improvements of agriculture and the breeding and feeding of domestic animals, it was that which was established by the boundless munificence of the late Duke of Bedford, where that splendid character, like the sun in the centre of the system, spread his influence over all which was within the sphere of his attraction, and gave new light to what before appeared obscure. To this point a great variety of new discoveries were collected, where examples of the progress of improvement were brought from distant parts of the kingdom, which afforded an opportunity of having the different breeds both of sheep and cattle compared with each other, and their respective merits ascertained ;—where a considerable number of very ingenious experiments were exhibited to public view, and a vast

variety of agricultural improvements set in competition with each other. And though I am well convinced, that in many instances experimental inquiry is as fruitless an operation as searching after the philosopher's stone; yet, whatever were the merits of the respectable candidates for professional fame in the highly cultivated field before us, the freedom of competition knew no bounds, and all parties were perfectly well satisfied, that the hand of impartiality would never fail to give to virtù its reward.

The first specimens of improvements were here collected, and the amateurs of the different branches of these accomplished arts invited to give their opinion with that candour and liberality which are inseparable from the soil. By such liberal patronage these useful arts were made a subject of general attention, and a passion for improvement cultivated in favour of agriculture and the breeding system, by which a new species of patriotic virtue has been established, and the patriotism of antiquity illuminated with modern splendour; in consequence of which new arts and sciences have been presented to public view, which are no less ornamental to our country than propitious to its protection and support. Under such auspices all useful arts must flourish; the example is sublime; and long, I hope, will be remem-

bered with veneration and respect. But if the trembling patriot could for a moment fear that the immortal name of Russell should ever be no more, the fame of the most noble Francis Duke of Bedford still would shine to give new light and animation to the world.

Jamque opus exegi, said Ovid of old,
Which Darwin sublimely has quoted;
But the records of fame will in future unfold
The applause which to truth shall be voted.

POSTSCRIPT.

For the satisfaction of those gentlemen whose liberality has anticipated this publication under the title of Anatomical Speculations, it will be proper to observe, that on more mature consideration, the term not being thought perfectly applicable to the subject, that of Anatomical Reflections has been substituted, as more expressive and appropriate. And as it was at first intended that this work should have appeared in Quarto, it may also be necessary to mention, that the printing had commenced in the present form before the author had been apprised of the mistake; and as several impediments to the publication had previously taken place, it was considered more respectful to the Subscribers to proceed in the present form than incur the hazard of any additional delay. But if this first essay should be honoured with the approbation of the public, and another edition called for, neither the elegance of external form, nor any other object of improve-

ment will be permitted to pass unnoticed. Under these circumstances it is hoped that such imperfections will be excused ;—but whatever may be the opinion of the public on these questions, the subscribers may depend upon every possible attention ; and directions will be given to Mr. PHILLIPS to supply those gentlemen who reside in or near the metropolis, to whom the subscriptions may be paid.

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