

PART V.

VAGUE METHODS OF REGULATING PROGENY ADOPTED IN THE BREEDING OF DOMESTICATED ANIMALS.

SECTION I.

GENERAL PRINCIPLES.

MR. CLINE appears to have been the first anatomist who called the attention of breeders to the scientific principles of their art. In this respect, he did indeed little; and he certainly had no idea either of the number and importance of these principles, or of the conclusions to be drawn from them. But it was still something to point out the value of a little knowledge of anatomy, and the importance of capacity in the chest of animals.

Mr. Cline's first proposition, that the external form of domestic animals is an indication only of internal structure, and that the principles of improving that form, must therefore be founded on a knowledge of the structure and use of internal parts, is quite indisputable.

It is mere nonsense and ribaldry, therefore, when Mr. Hunt says, "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, 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."—Mr. Cline asks for anatomical knowledge, not for dissection. Dissection, indeed, first taught us such truths; but we should have been more stupid than we are, if we had not long ere now learned thereby some of the relations of external forms to internal structure.

In breeding, the hereditary tendency of peculiar structure was well known to the ancients. Among the moderns, it is a matter of common observation.

The principle of breeding is the axiom, that "like produces like"—meaning that the progeny will inherit the qualities of the parents.

This principle is held to extend to form, qualities, the consequences of hard work, or ill-usage, and pre-

disposition to, or exemption from, disease—in short to the whole constitution.

It applies equally to sire and dam. “To breed, therefore,” says Mr. Thacker, “in the most successful manner, the male and female should be taken when they are in the highest state of health, and when all the powers and attributes which are wished for, and which it is designed to propagate, are in the most complete order and state of perfection.”

The principle, however, is so vague as to be nearly useless in application. Hence Mr. Cline says, “The theory of improvement has not been so well understood, that rules could be laid down for directing the practice.”—The reader has already seen the more definite laws which must take its place.

In a subsequent Part, I propose to apply these laws a little further to the breeding of domestic animals. In the present, I shall briefly give, chiefly from the best authorities on the subject, their own view of the vague methods at present adopted, under the heads of In-and-In Breeding, Selection, and Crossing.

SECTION II.

BREEDING IN-AND-IN.

It was doubtless from the belief that, on the principles of like producing like, the most perfect parents would produce the most perfect offspring, that breed-

ing in-and-in originated. It was probably, therefore, the most ancient practice.

In some cases, however, the horse, the camel, &c. are said to have refused connexion with the mother. Varro says, "*Equus matrem ut saliret adduci non posset.*" This however is not always the case. Dogs are less averse to such unions: but the disproportion of age is not so great between them.

That this aversion, however, should in any degree, or on any occasion, exist among animals, that it should exist in the greatest degree among mankind, and that such breeding should always be less prolific, are strong proofs of the impropriety of the closest and the strictest in-and-in, namely, that between parents and progeny, &c.

It was, however, an absurd prejudice, as Sir John Sebright observes, "which formerly prevailed against breeding from animals, between whom there was any degree of relationship. Had this opinion been universally acted upon, no one could have been said to possess a particular breed, good or bad; for the produce of one year would have been dissimilar to that of another, and we should have availed ourselves but little of an animal of superior merit, that we might have had the good fortune to possess."

The Arabians, we are told, preserve the pedigree of their horses more carefully than their own; never allow ignoble blood to be mixed with that of their valued breeds; and attest their unsullied nobility by formal depositions and numerous witnesses. Equal attention is paid to the breed of horses by the Circassians, who distinguish the various races by marks on the

buttock. Now, the former at least of these horses being commonly said to be bred in-and-in, while they have yet maintained their high character, is generally regarded as an argument in favour of in-and-in breeding.

Mr. N. H. Smith, however, long a resident among the Arabs, is of opinion, that "colts bred in-and-in [even though not closely or strictly,] show more blood in their heads, are of better form, and fit to start with fewer sweats, than others; but when the breed is continued incestuous for three or four crosses, the animal degenerates."

Experiments made in Bohemia on the breed of horses, tend also to show that the best breeds degenerate when always united in a direct line with their parents.

On breeding in-and-in in cattle, and sheep more especially, Sir John Sebright, after reasonably doubting the procedure of Mr. Bakewell, endeavouring to show that that term does not strictly apply to Mr. Meynell's practice, and observing that none of the advocates for it with whom he has conversed, have tried it to any extent, states that, as "a tendency at least to the same imperfection, generally prevails in different degrees in the same family, by breeding in-and-in, this defect, however small it may be at first, will increase in every succeeding generation, and will, at last, predominate to such a degree, as to render the breed of little value."

Observing that, by selecting animals for one property only, [instead of all that are essential to them,] the same effect will, in some degree, be produced, as

by breeding in-and-in, Sir John says, "The Leicester-shire breeders of sheep have inherited the principles, as well as the stock, of their leader, Mr. Bakewell : he very properly [that must be qualified] considered a propensity to get fat, as the first quality in an animal destined to be the food of man : his successors have carried this principle too far ; their stock are become small in size, and tender, produce but little wool, and are bad breeders."

To breeding in-and-in, says the author of the Useful Knowledge Society's work on cattle, "must be traced the speedy degeneracy—the absolute disappearance of the new Leicester cattle, and, in the hands of many an agriculturist, the impairment of constitution and decreased value of the new Leicester sheep and the short-horned beasts."

In breeding in-and-in in dogs, Mr. Blaine observes, "One thing it is but just to state, which is, that breeding in-and-in among dogs, seems to have more opponents than it has in the multiplication of any other domestic race of animals."

In the same manner, do the best observers generally agree as to in-and-in breeding causing degeneracy, loss of reproductive power, &c., in the offspring—data from which, with others, I deduced the law of in-and-in already enunciated, in which the mother gives character to progeny.—For the sake of pointing out that circumstance, as well as of showing the general opinion on the subject, I have quoted the preceding observations.

I must add, however, that it is truly observed, that breeding in-and-in may, to a certain extent, be em-

ployed in strengthening good properties, in fixing any variety that may be thought valuable, or in developing and establishing the excellent form and quality of a breed.

I must further add, that it appears to me, that no cross can be established and maintained, without what some would call, breeding in-and-in between those animals resulting from it which have the homogeneous or corresponding organization meant to characterize the breed.

SECTION III.

SELECTION.

Here it is first necessary to know the best characteristics of animals, in order continually to select those which most nearly approach these.

By taking advantage, moreover, of the natural tendency to transmit any accidental quality which happens to arise, further power over the race is acquired ; and attention to the same points is continued till, in consequence of the effect increasing, a particular figure, proportion of limbs, or any other quality is established in the breed.

It is not merely by putting the best male to the best female, that the desired qualities can be obtained ; but by other means not clearly defined in the common practice, and dependent on the principles already laid

down.—But my present business is with the authorities as to selection.

“The alteration,” says Sir John Sebright, “which may be made in any breed of animals by selection, can hardly be conceived by those who have not paid some attention to this subject: they attribute every improvement to a cross, when it is merely the effect of judicious selection.”

By this process, says Dr. Pritchard, “distinct breeds of animals, of horses for example, are formed, which are adapted by their peculiar conformation to various purposes of utility. Strength and the more unwieldy form, necessary to great power of limbs, become the character of one race; while another is distinguished for a light and more graceful shape, favourable to agility and celerity of motion.”

So “among the varieties of dogs, one race is remarkable for acute sight, another for fine scent, and a third for greater strength and weight of limbs, pointing them out as fit for the purpose of nightly protection.”

“What has been produced by art,” says Sir John Sebright, “must be continued by the same means.

... We must observe the smallest tendency to imperfection in our stock, the moment it appears, so as to be able to counteract it before it becomes a defect; as a rope-dancer, to preserve his equilibrium, must correct the balance, before it is gone too far, and then not by such a motion as will incline it too much to the opposite side. ... The breeder's success will depend entirely upon the degree in which he may happen to possess this particular talent.

“If one male and one female only, of a valuable breed, could be obtained, the offspring should be separated, and placed in situations as dissimilar as possible ; for animals kept together are all subjected to the effects of the same climate, of the same food, and of the same mode of treatment, and consequently the same diseases. By establishing the breed in different places, and by selecting, with a view to obtain different properties in these several colonies, we may perhaps be enabled to continue the breed for some time, without the intermixture of other blood.”

“Degeneracy of breeds,” says Mr. Knight, (21, December) “I have some reason to believe, may be prevented to some extent at least, by proper use of pastures of a different kind. I had a breed of cattle, so excellent, that I did not like to cross-breed with any other, and I tried the effect of keeping some of the individuals on one pasture and some upon another. The soil of one pasture was strong, argillaceous and red, that of the other, light sandy loam ; and I am inclined to think that one individual grown upon one of those soils, afforded some of the benefits of crossing, when caused to breed with another individual of the same family, but reared upon a different soil and pasture.”

In this notice of selection as commonly practised, I have omitted all the reasons which I deem erroneous, and have confined myself entirely to facts.

SECTION IV.

CROSSING.

Here, as in the two preceding sections, I shall as briefly as possible, state the opinion of a good authority as to each more important point.

"Although close breeding," says Mr. Berry, "may increase and confirm valuable properties, it will also increase and confirm defects. . . . It impairs the constitution, and affects the procreative powers. . . . It will, therefore, always be necessary, after it has been resorted to, to throw in a strong cross, as respects blood, and to refer to such animals, for the purpose, as are unquestionably vigorous and healthy."

In breeding from stock with qualifications of different descriptions, and in different degrees, the breeder "will decide what are indispensable or desirable qualities, and will cross with animals with a view to establish them. His proceeding will be of the 'give and take' kind. He will submit to the introduction of a trifling defect, in order that he may profit by a great excellence; and between excellences, perhaps somewhat incompatible, he will decide on which is the greatest, and give it the preference."

Unfortunately, as the breeder has never been able scientifically, so he has been unable certainly, to accomplish this.

Mr. Wilkinson observes that "the thing generally to be expected from mixing the breeds of animals,

possessing properties differing in degree, is such an union of those properties in the progeny, that they may be greater than in the ancestry on one side, but less than in that of the other. . . . In crossing a cart-mare with a blood horse, no man expects to obtain from the produce, the strength of the former with the speed of the latter: but an animal that is swifter than the cart-horse, yet incapable of drawing so great a burthen."

I have quoted this in order to explain the cause of the fact stated by Mr. Wilkinson.—The intermediate character of the qualities thus reproduced, is owing, not to each parent imperfectly giving its share in the progeny's organization, but to the circumstance that, in their new combination, each series of organs acts with, and therefore modifies, the other.

In connexion with crossing, an interesting discussion has arisen out of a doctrine of Mr. Cline, as to the relative size of parents.

"Experience," he says, "has proved, that crossing has succeeded, in an eminent degree, only in those instances in which the females were larger than in the usual proportion of females to males; and that it has generally failed when the males were disproportionably large . . . 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.

"The improvement depends on this principle; that the power of the female to supply her offspring with nourishment, is in proportion to her size, and to the

power of nourishing herself from the excellence of her constitution.

"The size of the fœtus is generally in proportion to that of the female parent; and, therefore, when the female parent is disproportionately small, the quantity of nourishment is deficient, and her offspring has all the disproportions of a starveling. But when the female, from her size and good constitution, is more than adequate to the nourishment of a fœtus of a smaller male than herself, the growth must be proportionately greater. The larger female has also a greater quantity of milk, and her offspring is more abundantly supplied with nourishment after birth."

My correspondent * * *, alluding to Mr. Cline's tract, observes, (4, February,) "I need not say that, from such a source, the theoretical views stated are excellent; but I think, in practice, I have found some of them incorrect;" and (21, March) "It is always desirable for the purpose of breeding healthy animals, that the females should be large.—But if, as will sometimes happen, some exceptions should occur in a man's herd or flock, and he should wish to breed from females of a small size, according to my experience, he will do right to select large males to put them to. This is contrary to the theory of Mr. Cline."

Mr. Hunt says, "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 . . . 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 have been favoured with the following interest-

ing observations from my friend Mr. Stone, of Knight-on.”

According to “Mr. Cline’s opinion, a bull of this variety [a long-horned bull bred by Mr. Honeyborn of Dishley is referred to] 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.

“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 grand solution of this question,” resumes Mr. Hunt, “is made to depend on the ability of the female parent to nourish the foetus; for which purpose it is supposed to be necessary that the female parent should be larger than the male. But, supposing the argument in no other respect 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. [Why?] 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."

It would seem, however, that she would have to spare, according to her size. The *non sequitur* here committed may be removed, if the vital system is larger in the smaller animal.

"I am well persuaded that small females less frequently fail, both in the production and support of a healthy offspring.

"On the good effects of crossing, we are told [by Mr. Cline] 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 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."

Mr. Knight (16, April,) says, "Mr. Cline's opinions upon this subject are altogether wrong,—whether the animal to be produced be intended for labouring, or living and fattening, upon little food;" and he adds that he has obtained offspring from Norwegian pony

mares, by a London dray-horse, which had the powerful osseous system of the former, the legs only being shortened in order to accompany the mother.

"The error of Mr. Cline," Mr. Knight observes (23, November) "and of those from whom he derived information, arose from their having seen the result of breeding between males of large size, much disposition to fatten, and permanent habits through successive generations, with small females, of hardy constitutions, and without permanent hereditary habits. The male here vastly improved the offspring, the female giving hardness of constitution, and generally much milk."

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PART VI.

APPLICATION OF THE NATURAL LAWS TO THE BREEDING OF DOMESTIC ANIMALS.

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SECTION I.

GENERAL OBSERVATIONS.

THE same laws, it has been already seen, are as applicable to animals as to man :—the law of Selection operating where both parents are of the same variety, when either gives the organs of sense, forehead, and vital system, and the other, the cerebel and locomotive system ;—the law of crossing operating where each parent is of a different variety, when the male gives the backhead and locomotive system ; and the female, the forehead, organs of sense and vital system ;—and the law of in-and-in breeding operating where both parents are of the same family, when the female gives the backhead and locomotive system, and the male, the forehead, organs of sense and vital system.

But no law is dreamt of in the common practice of breeding.

In breeding hunters, says the author of the article Horse in the Encyclopædia Britannica, "observe similarity of shape in horse and mare. As length of frame is indispensable in a hunter, if the mare be short, seek for a stallion likely to give her length. Again, if the mare be high on her legs, put her to a short-legged stallion, and *vice versa*; for it is possible that even a hunter's legs may be too short; a racer's certainly may be."

It is very true that stallions have been known both to give length of body and shortness of limbs. But this effort is as often unsuccessful as successful. How shall it be insured?—As these laws show—by the male, possessed of these forms, having higher voluntary and locomotive power than the female.

"Much more dependence," says the same article, "is now placed on the stallion than on the mare. The racing calendar, indeed, clearly proves the fact. Notwithstanding the prodigious number of very highly bred and equally good mares that are every year put to the horse, it is from such as are put to our very best stallions that the great winners are produced. This can in no other way be accounted for, than by such horses having the faculty of imparting to their progeny the peculiar external and internal formation absolutely essential to the first-rate race-horse."

Such horses do so, because they have the "faculty" of doing so! A very satisfactory way of accounting, indeed! Now, the cause is the same here as were the means indicated in the preceding case. Among good stallions, the best is he who is possessed of the

highest voluntary and locomotive powers, which he accordingly stamps upon his progeny.

But it may be asked, of what consequence is it whether we call the stallion the "very best," or say he has the "highest voluntary and locomotive powers." The difference is, that the first expression states only the fact; the second, at the same time, assigns its reason, which enables us to connect the mere fact with causes and effects, with other facts, and to derive from them useful conclusions.

Opposite conditions would enable the mare to stamp her voluntary and locomotive system upon the progeny—always with some disadvantages.

These remarks exemplify the use of understanding the application of the law of Selection.—The utility of the law of crossing may be similarly exemplified.

"I have often been told," says Sir John Sebright, "that from the beautiful shape of Mr. Elman's South Down sheep, they must have been crossed with the new Leicester; and that from the fineness of their wool, they must have been crossed with the Merino breed; but I do not conceive, that even the skill of this very distinguished breeder could have retained the good shape of the former, without any appearance of the coarseness of its wool, or the fine fleece of the latter, without the deformity of its carcass, had he crossed his flock with either of these breeds."

If "shape" here expresses the locomotive system, and if the wool be an appendage of that system, it is evident that they could not be thus obtained.

These, though brief, are sufficient proofs of the im-

portance of a knowledge of the application of the laws here announced.

It is rather more difficult to observe the application of these laws to animals than to man: 1st. because animals are generally examined in a state of imperfect growth; 2ly. because the details of their forms are more or less obscured by hair, wool, &c.; and 3ly. because, when it is, not only not a cross, but when there is nearly a perfect homogeneity of form between the male and female, no difference can be expected in the result.

Hence my correspondent * * *, who could not perceive such difference in his homogeneous herds and flocks, justly observes (23, February, 1838,) "It may possibly be that my experience relating only to animals which have been bred for many generations by persons having the same objects in view, are all of them so similar in their shape and constitution, that it is difficult to say which parent is the one that the progeny take after." And he adds, "I must beg to add that if you could prove upon scientific principles and practical experience any theory to be correct of the nature of the one you have adopted, you would do a great service to all those engaged in breeding animals."

SECTION II.

HORSES.

In speaking of horses, the circumstance which will occur to every thinker as interfering with these laws,

is the hypothesis of *blood*; for certainly, if that could be transmitted in fourths, eighths, sixteenths, &c., it would be opposed to a doctrine, like that of these laws, according to which it is organization alone which is interchanged, and that always by halves given or taken away. Indeed, I do not hesitate to acknowledge that, if there were the slightest truth in the hypothesis of *blood*, there could be none in the doctrine now laid before the reader.

It is curious, however, that although that unfounded hypothesis exists in the works of almost all writers, yet it was long ago refuted by Osmer; and I cannot do better than quote from his work on the subject, which is so perfectly in harmony with my own.

“Horses who have the finest texture, elegance of shape, and most proportion, are the best racers, let their blood be of what kind it will . . . If I was asked what beauty was, I should say proportion: if I was asked what strength was, I should say proportion . . . A proper length also will be wanting for the sake of velocity: no weak, loose, disproportioned horse, let his blood be what it will, ever yet was a prime racer.

“If it be objected, that many a plain ugly horse has been a good racer,—I can even allow a very plain horse to be a prime racer, without giving up the least part of this system: for instance, if we suppose a horse (with a large head and long ears, like the Godolphin Arabian,) a low mean forehead, flat sided, and goose rumped,—this, I guess, will be allowed to be a plain ugly horse; but yet if such a horse be strong, and justly made in those parts, which are immediately conducive to action, if his shoulders incline

well backwards, his legs and joints in proportion, his carcase strong and deep, his thighs well let down, we shall find he may be a very good racer, even when tried by the principles of mechanics, without appealing to his blood for any part of his goodness.

“We are taught by this doctrine of mechanics, that the power applied to any body must be adequate to the weight of that body, otherwise such power will be deficient for the action we require. . . . The force and power of a muscle consists in the number of fibres of which it is composed; and the velocity and motion of a muscle consists in the length and extent of its fibres. Let us compare this doctrine with the language of the jockey: he tells us if a horse has not length, he will be slow; and if made too slender, he will not be able to bring his weight through. Does not the observation of the jockey exactly correspond with this doctrine?”

I may here observe that my general law, applicable not only to muscles but to all organs, that *the intensity of function is as the length of organ, and the permanence of function as the breadth of organ*, is the foundation of all rational distinction between horses for speed and horses for endurance in draught, &c.

“When we consider a half-bred horse running one mile or more, with the same velocity as a horse of foreign extraction, we do not impute that equality of velocity to any innate quality in the half-bred horse, because we can account for it by external causes: that is, by an equality of the length and extent of his levers and tendons.—And when we consider a half-bred horse running one mile, or more,

with the same velocity as the other, and then giving it up, what shall we do? Shall we say the foreigner beats him by his blood, or by the force and power of his tendons? Or can we, without reproaching our own reason and understanding, impute that to be the effect of occult and hidden causes in one of these instances, and not in the other?

“How many instances have we of different horses beating each other alternately over different sorts of ground! How often do we see short, close, compact horses, beating others of a more lengthened shape over high and hilly courses, as well as deep and slippery ground. . . . And how comes it to pass that horses of a more lengthened shape, have a superiority over horses of a shorter make, upon level and flat courses? Is this effected by the difference of their mechanical powers, or is it effected by the blood? If, by the latter, then this blood is not general, but partial only, which no reasoning man will be absurd enough to allow.

“How many revolutions of fame and credit, have all sportsmen observed in these high-bred families. . . . Observation shows us that on one hand, we may breed horses of foreign extraction too delicate, and too slight for any labour; and on the other hand, so coarse and clumsy as to be fitter for the cart than for the race. Shall we wonder that these cannot race, or shall we doubt that degrees of imperfection in the mechanism, will produce degrees of imperfection in racing! and when we find such deficient, shall we ridiculously impute it to a degeneracy of that blood, which once was in the highest esteem, or to the want of judgment in him who did not properly adapt the

shapes of their progenitors! . . . Shall we confess this, or is the fault in nature?

“If we should be asked why the sons of the Godolphin Arabian were superior to most horses of their time, I answer, because he had great power and symmetry of parts, (head excepted) and a propriety of length greatly superior to all other horses of the same diameter, that have been lately seen in this kingdom.

“If any man who doubts this excellence to be in the blood, should ask how it comes to pass that we often see two full brothers, one of which is a good racer, the other indifferent, or perhaps bad, I know of but two answers that can be given: we must either allow this excellence of the blood to be partial, or else we must say, that by putting together a horse and a mare, different in their shapes, a fœtus may be produced of a happy form at one time, and at another *the fœtus partaking more or less of the shape of either*, may not be so happily formed. Which shall we do? Shall we impute this difference of goodness in the two brothers, to the difference of their mechanism? or shall we say this perfection of the blood is partial? If the latter, then we must own that blood is not to be relied on, but that the system of it, and whatever is built on that foundation, is precarious and uncertain, and therefore fall to the ground of its own accord.

“Where shall we find one certain proof of the efficacy of blood in any horse produced in any age or any country, independent of the laws of mechanics?

“He who has a fine female, and judgment enough

to adapt her shapes with propriety to a fine male, will always breed the best racer, let the sort of blood be what it will."

Having made this valuable quotation from Osmer, I now make

Application of the Natural Laws to the breeding of Horses.

1. These laws show, that the qualities of the sire and dam are communicated to their progeny, not in various and minute fractional parts, but in halves—in the anterior, or the posterior, series of organs, and in no other way.

2. They show that we must neither expect one parent to communicate to progeny both series of organs, or any part of both series of organs; nor, on the contrary, must we expect both parents to communicate to progeny one and the same series of organs, or any parts of the same series of organs.

3. They show that, by regulating the relative youth, vigour and voluntary power of the sire and dam, either may be made to give to progeny the voluntary and locomotive systems, and the other, the sensitive and vital systems; though, if they be well conformed, it is preferable that the sire should give the former and the dam the latter, as being the systems in which naturally they respectively excel.

4. The details arising out of these laws show that pace and speed depend on the posterior series of organs—the locomotive system in particular, and that action depends on the anterior series of organs—the sensitive system—the eye in particular, and that

therefore these qualities must not be expected from one parent.

5. The conclusion which may be drawn from these laws as to individual parts of these systems and their corresponding qualities, are innumerable. The preceding general applications indicate the mode of proceeding as to all of them.

A consideration of these laws will show how erroneous are the usual directions for attaining improvement in breeding.

Both parents, we are told, "must not have a tendency to the same defect, although in ever so slight a degree; for then it will in general be in excess in the produce."—It will be no more in excess than it is in the one parent who gives to the progeny the system in which that defect exists.

We are told "not even to breed from those having a defect in any attribute, unless there is a redundancy in the same attribute in the mate."—The defect will be of no injury, and the redundancy of no advantage, except the system which contains one or the other be propagated.

Such blunders arise out of ignorance of the preceding laws, and of the natural concatenation of organs which they express.

The fourth of the preceding applications will be illustrated by what I have to say of the eye and action of the Arabian.

That form of the race horse is deemed most perfect which is best adapted to produce speed; that of the hunter which gives both speed and power; and that of the draught horse which gives power alone.

To the first of these, for the sake of a few new remarks, I first turn attention.

The native breed of English horses formed the parent stock of the English racer, by furnishing the posterior series of organs, directly or indirectly, and especially superior size and proportion of moving parts. The Arab did the rest, by furnishing the anterior series of organs—the forehead, organs of sense, (eye and, by the 4th application, action,) the vital system, and therefore the density of every fibre, &c. The enlightened reader will see, that this undeniable partition of qualities from these two breeds,—one giving the whole of the anterior organs, and the other the whole of the posterior ones, illustrates the important truths I have enunciated in the natural laws.

This will be farther impressed on the reader by considering the Arab, to whom we are so deeply indebted.

To a cross with the Byerly Turk, we are indebted for the Herod and Highflyer organization; to the Godolphin Arabian, said to be a Barb, for the Matchem organization; to the Darley Arabian for the Flying Childers and Eclipse organization; and to the Wellesley Arabian, believed to be a Persian, for what is said to be the only advantage gained to English race horses, by foreign cross, in later years.

Let us look more closely to the qualities of the Arab, and it will be seen that the whole of them depend on the anterior series of the organs, which, thus going together, corroborate what has been said.

To commence with the organs of sense, it is ac-

knowledge that "his fine and nearly hairless skin, softened and cleansed as it is by frequent copious perspiration, is highly sensible." That his nostril is wide, and his eye open, are two of his most palpable characters. And on these, his great observing faculties—his mind is dependent.

In illustration of these observing faculties, I may remark that, in examining Mr. Theobald's thorough-bred stallions, I was struck with the circumstance that each, in succession, turned and stood with his eyes toward me, while I remained in his box; and, on speaking of it, Mr. Theobald's stud-groom observed that thorough-bred horses never fail to turn their faces to persons who are met to observe them; and that half-bred horses do the reverse.

Mr. Hillier, the Master of the Horse at Astley's, whose opportunities of observation are very great, assures me of the accuracy of this observation, and adds that thorough-bred horses, in threatening, are apt to lift one of their forefeet, instead of a hind one, as half-bred horses do.

As to their mind generally, some may question even its existence, and still more, our means of knowing its peculiarities. But, in default of a better knowledge of the brain—the organ of the highest faculties of the mind, we need only know what are the habits and the wants of any animal, in order to know its mind. The horse must know well the qualities of the ground in relation to his pace and speed, the extent of leaps, the nature and the strength of the obstacles that oppose him, (hence he breaks through a hedge or a slender bar, but clears a strong gate) his own velocity

compared with that of his opponent, the degree of skill possessed by his rider, &c. He has not, therefore, his large brain without its use; and these views will lead to a better investigation of it, by the comparison of organization and function.

But the Arab has all his faculties cultivated or capable of great cultivation. "The horse of the desert," as Gibbon says, "is educated in the tents among the children of the Arabs, with a tender familiarity which trains him in the habits of gentleness and attachment." And of the great superiority of his observing faculties over those of all other horses, Mr. Hillier assures me.

Yet the author of the article Horse in the *Encyclopædia Britannica*, says, "their efforts to win a race, we consider to be merely limited by their physical powers, the effect of a proper arrangement of their parts; and that the operation of the mind or spirit, has nothing at all to do with it. . . . The spirit of emulation cannot be ascribed to the race-horse;" and, as might have been expected, he inconsistently adds, "If his temper be really bad, he either runs out of the course, to the great danger of his rider, and to the inevitable loss of his owner and those who have betted on his winning, or he 'shuts himself up,' as the term is, and will not head his horses, although in his power to do so."—His spirit of emulation is known to every groom.

So much for his organs of sense, forehead and their functions.—Now as to his vital system, comprising the rest of what, for brevity's sake, I have called his anterior series of organs.

It is not for the size and proportion of his locomo-

tive system, that the Arab is renowned, but for its intimate structure. Now, the intimate structure of every organ—the number and density of their fibres—are entirely dependent upon the vital system, and particularly on the capillary arteries by which they are secreted. In the Arab, therefore, we see the excellence of his vital system in the peculiar character of the intimate structure of his organs—not in their size and proportion.

Accordingly, the writer last quoted says, “the Arabian horse possesses a firmness of leg and sinew unequalled by any other in the world . . . Bones being the weight to be lifted, serve only to extend the parts; and it is evident, that such as are small, but highly condensed, like those of the deer, and the horse of the desert, are, by occupying less space, and containing less weight, more easily acted upon by muscular force, than such as are large and porous, and for a greater duration of time, without fatiguing the acting powers . . . All the muscles and fibres of his frame are driven into closer contact than those of any other breed; and by the membranes [tendons] and ligaments being composed of a finer and thinner substance [his leg being flat and wiry,] he possesses the rare quality of union of strength with lightness, so essential to the endurance of fatigue in all quick motions. He thus moves quicker and with more force, by reason of the lightness and solidity of the materials of which his frame is composed.

Thus his anterior series of organs is nearly perfect.

But more is wanted than this.—The size and proportion of his locomotive system is defective. Osmer,

accordingly, says, "The Turks choose these Arabian horses when young, because, if continued long in the hands of the Arabs, they are *small, stunted* and *deformed* in shape; whereas, when brought into Turkey, a land of greater plenty than the deserts of Arabia, they acquire a greater perfection both of size and shape . . . Shall we wonder that his offspring, produced in [England] a land of plenty, of whom the greatest care is taken, who is defended from the extremity of heat and cold, whose food is never limited, and whose vessels are filled with the juices of the sweetest herbage—shall we wonder, I say, that his offspring, so brought up, should acquire a more perfect shape and size than his progenitor?"

As to the defects of the locomotive system in the Arab, the author of the article Horse in the Encyclopædia Britannica, says, "Accurate observers must have noticed, that the greater part of the horses brought to this country as Barbs and Arabians, have exhibited a *palpable deficiency in the points contributing to strength*, and the *want of general substance*."

Osmer enters further into details. "We seldom see," he says, "any of these horses sent us from abroad, especially from Arabia, but what are more or less *disproportioned, crooked* and *deformed* in some part or other . . . Though their shoulders in general exceedingly incline backwards, yet their forelegs stand very much under them; but in different horses this position is more or less observable . . . The Godolphin Arabian,*

* The Godolphin Arabian was purchased out of a water-cart in Paris, and

when I saw him, stood bent at knees, and with his forelegs trembling under him."

The posterior series of organs having, then, been improved in proportion and shape by the English horse, we cannot wonder, that, as observed by the Encyclopædist, "The immediate [uncrossed] descendants of the Eastern horses, have, almost without an exception, proved so deficient of late years, that our breeders will no more have recourse to them than the farmer would to the natural oat, which is little better than a weed, to produce a sample that should rival that of his neighbours in the market . . . Were the finest Eastern horse that could be procured, brought to the starting-post at Newmarket, with the advantage of English training to boot, he would have no chance, at any weight, or for any distance, with even a second-rate English race-horse."

But I cannot agree with that writer when, in a tone

consequently of uncertain caste, but evidently the horse of the desert. He was said, on what authority I know not, to be a Barb. As to his great head, there was more in it, I suspect, than even Osmer seems to have imagined. This brings to recollection what the Rev. — Daniell says of a fox-hound. — "Although a small head is mentioned as one of the requisites of a fox-hound, that is to be understood as relative to beauty only; for as to goodness, large-headed hounds are in no wise inferior. As an instance: amongst a draft of young hounds from Earl Fitzwilliam's was one, of whom Will Deane, his huntsman, made this remark in his letter, 'that he could not guess at Lord Foley's dislike to the hound called Glider, then sent, which was of the best blood in the country, being got by Mr. Meynell's Glider out of Lord Fitzwilliam's Blossom, and was moreover the most promising young hound he had ever entered; unless his Lordship took a distaste to the largeness of the head; but he begged leave to assert, that although it might appear a trifle out of size, there was a world of serious mischief to the foxes contained in it.' The event justified Deane's prediction in its utmost latitude, for Glider was a most capital chase, and long a favourite stallion-hound, notwithstanding the magnitude and inelegance of his head."

of unwarrantable triumph, he says, "Having once gotten possession of the essential constitutional parts necessary to form the race-horse . . . we ourselves have, by a *superior knowledge* of the animal, and the means of availing ourselves of his capabilities, not only by rearing and training, but by riding him also, brought him to a pitch of excellence which will not admit of farther improvement."—The result has indeed been excellent; but it has not been owing to "superior knowledge." We could cross the Arab only with what we had; what we did was done from sheer necessity, not from knowledge; and the best proof of that is, that, till this moment, the theory of that cross was unexplained.

Having, some years ago, communicated to a person employed on the subject, a few observations on the relative offices of the posterior and anterior limbs of quadrupeds, I have transcribed them, as peculiarly applicable to the horse.

The length and conformation of the posterior extremities, especially constitute the point of speed. The longer these extremities *cæteris paribus*, the greater the speed. Running, physiologists observe, is a succession of leaps, and it is undeniable that those animals are the best leapers which have the longest posterior extremities, whether they be quadrupeds or insects, as the hare, grasshopper, &c. I say, *cæteris paribus*, or other circumstances being the same; for if these circumstances are less advantageous, as is the diminished tension of muscles, and quickness of contraction in the frog, &c., then the resumption of

the spring may not take place, and the succession of leaps, which constitutes running, may be imperfect.

I shall now show that speed depends entirely on the construction of the posterior extremities of the animal.

1st. The greater weight of all swiftly running animals must be toward their anterior part ; for (as may be illustrated by throwing from the hand any missile loaded at the end) if this were not the case, if swiftly running animals were heaviest *à posteriori*, they would, at every leap, be actually thrown heels over head.

2ndly. The heaviest parts of animals are those which are chiefly passive, or have nothing to do with speed, as the head, neck, chest, spine anteriorly, ribs, viscera, &c. ; and hence it is that these parts must as inevitably be placed forward in animals, as the most powerful organs of motion, the posterior extremities, must be placed backward.

3rdly. A mass thus thrown forward is much more easily and swiftly moved than a mass that is dragged ; for the mass which is thrown forward clears obstacles, free from impediment ; while the mass which is dragged suffers from both.

Hence it follows, that it is the posterior extremities alone which can by any possibility cause speed.

Having thus determined the function of the posterior extremity, I shall now advert to that of the anterior one.

I have no hesitation in asserting that this part contributes little to speed. Its chief action is, not to impel, but to stop ; and the little it does contribute to progression, is merely in dragging up the posterior ex-

tremity towards its place through a part of the space covered by the extension of the body.

Examine its functions in every way, and it is evident that it can do no more than this. While the posterior extremity has the power of projecting the body through space, occasionally to the distance of several times its own length, the anterior extremity, after receiving and stopping that impulse, can only drag up the posterior through a portion of space covered by the body, without causing it to pass through one inch of free space.

Mr. Knight is of opinion that we err in cultivating the race horse only for speed, and not for endurance. "Horses," he says (23, November,) "with comparatively short legs, are best made to win long races; the force necessary to move long legs rapidly for a considerable time exhausts the power of the animal; and compact animals, other qualities being given, feed upon the least food."—(8, January) "What enormous expense has been employed in improving the blood horse in this country: yet the blood horse is most certainly a much feebler animal in respect to power of carrying weight, or of sustaining the fatigue of a long race, or any race if the ground be soft and wet, than it was fifty years ago. The breeders have destroyed the constitutional powers of the breed of the animal by excess of stimulation, in over feeding the young animals through successive generations, and they have looked to the legs of the animal for speed, instead of the constitutional power, which gives motion to his legs."

In breeding horses, subject to the laws enunciated, it is not only necessary that the organization of the

animals selected should be of the most perfect kind, a certain age, exercise and perfection in every function are essential.

Mr. Theobald thinks that "the horse should be positively mature before covering." A mare may breed at three or four years old: at an earlier period, breeding will interfere with the developement of her structure and strength.

That developement which is conferred by exercise is not less essential, both during growth and in adult age. A stallion will then have progeny far superior in such attributes, to those of a sire kept in inactivity. Hence it is indispensable that a stallion kept for covering, should be duly exercised. Mr. Thacker observes, that, if a stallion be prevented even by accidental lameness from obtaining exercise, he is sure to be deficient in muscular powers, and to convey that deficiency to his offspring."*

It is of great importance, that the parents should have all their natural powers in absolute perfection. A horse or a mare's being no longer capable of ordinary work, or having suffered from hard and continual labour, is certainly injurious to progeny.

Constitutional infirmity, or the having a tendency to fail in their legs and feet, during training is fatal; and the mare that has slinked her foal is always liable to that accident.

* I know a horse who broke his leg in running a race when three years old, and who has since been kept for covering mares, not being capable of any thing else, or even of travelling for that; but his stock are not promising, though he is exceedingly well bred, of a good size, and not deficient of good general shape.

As, then, are the organization, the maturity, the exercise, and the perfection of the natural powers in the parents at the time of reproduction, so will be the perfection of the progeny. And all these conditions may, with advantage, be applied to man and woman.

SECTION III.

CATTLE.

The best cattle have the face rather short; the muzzle small; the horns fine; the neck light, particularly where it joins the head; the chest wide, deep and capacious; the tail broad and fat toward the top, but thin toward the lower part, which it will always be, when the animal is small boned; the lower part of the thigh small; the legs short, straight, clean, and fine boned, though not so fine as to indicate delicacy of constitution; the flesh, rich and mellow to the feel; the skin of a rich and silky appearance; the countenance calm and placid, denoting the evenness of temper essential to quick feeding and a disposition to get fat.

Two of our finest varieties of cattle are the Hereford and the Durham. Of these, Mr. Knight (23, November) says the form of a perfect Hereford, and that of a perfect Durham, ox, or bull, or cow, are very similar, except that the Durham breed have shorter horns.

“The improvers, as they are called, of the Durham cattle, feed very highly; their young animals are

kept in a fattened state from their birth; and they have brought to market more perfect animals, at an early age, than any other. But every breed of animals which has, through a few generations (two or three is sufficient,) been overfed, requires similar feeding; and the extraordinary animals which the Durham breeders have sent to Smithfield, have come there, I am sure, deeply insolvent—in other words, they have not nearly repaid the expenses of feeding them. The offspring of such animals require and can digest more food than others who have lived upon little.

The Durham breeders once tried their breed against the Hereford, when the Durham consumed 12,775 lbs. more of turnips, and 1,714 lbs. more of hay, in the winter in which they were fattened; whilst they gained much less in value than the Herefords. Our breeders have tried hard, by offering 100 guineas to 10, to provoke them to another trial; but without success.

“All growing animals including mankind, ought to be sufficiently well fed to preserve health and strength, but never to be stimulated by excess of food. The children of parents, however, who have, through many generations, been well fed, would perish if given no more food than would be sufficient for an Irish or Highland Scots peasant child.”

In reply to the imputation that, in the hands of some breeders, even the Herefords are falling into the defect of fat preponderating over flesh, he says (16, March, 1838,) “Some varieties of the Hereford cattle certainly have this defect; but not all. In re-

fining the muscle, some breeders have certainly reduced it too much; but the modern Herefords present generally much more lean flesh than either the Devons or Sussex."

The chief qualities sought for in cattle are the tendency to fatten on little food, and that to yield abundance of rich milk.

The tendency to fatten is indicated chiefly by the capacity of the chest.

"Animals of all species," says Mr. Knight (8, January,) "all other qualities being given, are, I think, capable of labour and privation, and capable of fattening, nearly in proportion, as their chests are capacious: but the habits of ancestry will operate generally very powerful."

"It is the width and depth of frame," says Mr. Berry, "which confers weight, and not the mere circumstance of great height . . . While equally great, if not greater, weights can be obtained with shorter legged animals, they are, independently of other recommendations, generally found to possess better constitutions and greater propensity to fatten."

It is curious that those who breed cattle and sheep for the butcher, should not consult him on the subject; and that he is not admitted among the judges at the Smithfield Club. They ought certainly to see and understand the dead animal as well as the living one, in order to know whether they have judged correctly in the awards they have made. Without this test, may they not commit great injustice?

Mr. Giblett, of Bond street, whose business and experience are among the most extensive in London,

and whose mind is observant and reasoning, dissents entirely from so much of the doctrine of Mr. Bakewell as asserts that the best animals are those which fatten quickest on least food; for although he advocates proneness to fatten fast, with good form and symmetry, yet it is a *sine qua non* with him that every animal should also have a much larger proportion of muscle than of fat, and he has publicly declared that, for want of attention to this, most of the sheep, in particular, bred on Mr. Bakewell's principle, are made more fit for the tallow-chandler than the consumer.

In addition to this testimony, Mr. Giblett favoured me with a striking demonstration of this fact in the carcasses of two bullocks, one weighing one hundred and twenty stone, the other eighty only, but of which the latter was relatively by far the more valuable.

It will be gratifying even to the artist to know that Mr. Giblett's beau ideal of cattle does not differ from his own—that it is the animal displaying all its natural power in highly developed muscular masses, and not the artificial monster consisting of masses of vibrating fat laid on in lumps and patches.

The breeder looks to a narrow interest—he thinks he can get a quicker return for fat than flesh—his herds and flocks are calculated chiefly to produce the former—his bulls and rams fetch him immense sums—and he will maintain this system till he finds it a losing one, which ere long he must do, unless he profit by the hint now given.

As to the characteristics of a good milker, my correspondent, * * *, (11, January) says, "Some persons

believe that they can form some judgment upon this: I cannot."

Certainly, both fattening and the production of milk appear to require a good vital or nutritive system—meaning still the tubular system, which transmits and transmutes the animal liquids. Women and cows wanting that system in good state, will be destitute both of fat and milk.

In relation to the latter, French women who have a bad vital system, are at once meagre, bad breeders, flat busted, mustached, hoarse-voiced, bad complexioned. And something analagous will doubtless be found in kine.

On this subject, Mr. Knight (8, January) says, "I am afraid that some of the defects of the French women are to be found amongst the superior classes, particularly, in this country. The girls are generally much more 'flat-busted' than they were sixty years ago. I now see them with different feelings; but I can see forms with the same eyes; and several observant women have noticed the change. Look at the pictures of women a century or a century and a half ago, and the bosoms of the women there represented are not similar to those of modern times. Excess of application to acquire accomplishments, and particularly music, has, I suspect, operated injuriously; and I do not think that such stimulants, as tea and coffee, have been beneficial."

Thus much seems generally true as to both properties—fattening and milking. The next object is to trace the distinctions which subsist between them.

Now, fat women appear to have relatively a smaller

bosom; and what bosom they have is less formed of the glandular masses with secrete the milk, than of the fatty substance which is interposed between these: their bosom, therefore, as a secreting organ, is less than it appears to be. Thinner woman, on the contrary, (always providing the vital system is good,) have a larger bosom; and it is composed of palpable glandular masses, not of fat. There is, therefore, a foundation for the popular preference of wet nurses who are rather thin than fat. I believe there is a pretty general feeling of the same kind with regard to cows as milkers. And I believe the Alderneys, while they produce rich milk, (having long heads, &c.) have little power of fattening. If it be so, it is important, even if there were no other consequences to be drawn from it.

In reply to these observations, Mr. Knight (8, January) says, "The constitutional disposition to form fat, is certainly hostile to the disposition to give milk. . . . Cows which give little milk often present large udders, which contain much solid matter; and, to inexperienced eyes, a two years old Hereford cow would give a promise of much milk, where very little would be given. . . . A narrow forehead, and a long face, nearly of the same width from end to end, as in the Alderney cow, certainly indicates much more disposition to give milk, than the contrary form, which I have pointed out as indicative of a disposition to fatten."

This tends to corroborate what I have said as to thinness, with a glandular structure of mammæ, being favourable to milking.

If, however, we could discover, between fatteners and milkers, a difference of organization in other respects—a difference existing prior to their becoming milkers, it might enable us to predict, at an early age, what the maiden or the heifer will become in this respect.

Now, fat animals are more generally those of the north, where cold diminishes sensibility. Fat, indeed, appears to be the means which nature very extensively employs to lower sensibility by interposition between the skin and the central parts of the nervous system. Fat women and other animals, accordingly, have not only less sensibility and irritability of the skin, but of the organs of sense generally, eyes usually blue, soft, languid, not brilliant, penetrating, &c. Thinner animals, on the contrary, are more generally those of the south, and have more acute sensibility, and, among women, more brilliant eyes, and large mammæ—themselves organs of exquisite sensation. Hence, the women of Egypt and Africa generally, who have a good vital system, have also large organs of sense, and have, both in ancient and modern times, been famed for the magnitude of their mammæ, capable even of being turned over the shoulder to suckle the infant on the back. “In Meroe crasso majorem infante papillam,” said Juvenal; and the fact is equally notorious at the present day.

In reply to these observations, Mr. Knight (previous date) says, “I do not doubt that you are right respecting the use of fat in cold climates; all sleeping animals, through winter, go to sleep in a fatted state.

. . . I do not think that breeds of cows, which

give much rich milk, are very hardy. The Alderney cows are what the Herefordshire farmer calls very *nesh*, that is, very incapable of bearing hardship of any kind, and particularly cold. [Consequently of greater sensibility.] Cows which give much milk have the power of eating and digesting much food, and they require, whilst they give much milk, a very abundant and good pasture. The breeds of cows which give less milk, and present greater disposition to become fat, are generally less *nesh*, and will fatten upon less food. . . . The influence of the *feelings* is very considerable. I have observed that whenever a young Hereford cow disliked being milked by the dairy-maid, she soon ceased to give milk; and I do not doubt that, in all cases, if the calves were twice every day permitted to suck after the dairy-maid had finished her labour, the cows would longer continue to give milk, and in larger quantity."

This tends to corroborate what I have said as to greater sensibility being favourable to milking.

If this led only to distinction of these two kinds as to milking—namely, that of fatness and thinness, and that of smaller and larger organs of sense and greater or less sensibility,—it would still be valuable, as showing, either at a later or an earlier period, what we may expect in this important particular. But perhaps its utility may extend still further, and enable us to improve the race.

It may form a basis for our determining whether, in endeavouring to improve a breed, fatteners may most easily become also milkers, to some extent; or

milkers may, to a similar extent, become fatteners; and what are the circumstances which would most favour such partial interchange, if not absolute improvement.—Indeed, from these principles, I would conclude, that an animal fattening in the north would become a better milker in the south, where more genial temperature would render fat less necessary, would increase sensibility, and would cherish the secretion of milk, so intimately connected with that excitement of the reproductive functions which warmer climates produce.

These views as to animals appear to be confirmed by some facts as to woman. We know that the flow both of the catamenia and of milk is less in cold climates, and greater in warm ones. Accordingly, while the mammæ are small and the milk scantier in dry, high and windy regions, the very opposite is the case in warm, low and humid ones, where women suckle their infants for a long time.

Thus, as these two desirable qualities are both dependent upon one system, and as they are opposed to each other, (for excess of one secretion is always more or less at the cost of the rest,) they will be most easily obtained by being distinctly sought for, and the animal of diminished sensibility will most easily fatten, while the animal of increased sensibility will most readily yield milk.

These views are confirmed by the conduct of the London dairy-men. While they acknowledge that the Alderneys yield the best milk, they keep none of them, whatever they may pretend, because these animals are peculiarly delicate, and more especially

because they cannot, after being used as milkers, be fattened for the butchers. The York and Durham cows suit them best.

In certain constitutions, however, and, *to a certain extent*, there is a compatibility between fattening and milking.

Mr. Knight (23, November) says, "The disposition to give much and rich milk, and to fatten rapidly, are *to some extent* at variance with each other; but I have seen cases in which cows which have given a great deal of rich milk, have given birth to most excellent oxen, the cows themselves, however, always continuing small and thin whilst giving milk.

"I very confidently believe in the possibility of obtaining a breed of cows which would afford fine oxen, and would themselves fatten well; but, as great milkers require much more food than others, the farmer who rears oxen, does not think much, perhaps not enough, about milk, and is in the habit (which is certainly wrong) of breeding his bulls from cows which have become his best owing only to their having been bad milkers."

My correspondent * * * says (11, January) that "fattening and milking *to a certain extent* are compatible."

Mr. Wilkinson says rather more strongly than is consistent with physiological laws, "I have frequently found cows that are great milkers, to keep themselves at the same time in high condition, to feed with the quickest despatch when dried of their milk, and whose descendants will arrive at the earliest maturity—a

practical proof, that a great tendency to feeding is not incompatible with a great tendency to milking."

They are to be procured, he thinks, "by selecting those animals that are most perfect in point of form, in quality of flesh, and so on ; and again by selecting out of these the very best milkers." He adds, "the property of milking is inherited as readily as that of peculiarity of shape."

"In the selection of bulls," he observes, "that besides attending to those properties which belong to the male, we ought to be careful also, that they are descended from a breed of good milkers, at least if we wish the future stock to possess this property."

These last observations bring me naturally to the

Application of the Natural Laws to the Breeding of Cattle.

The first three applications are the same as for the horse. To save the trouble, however, of referring to them, I repeat them here.

1. These laws show that the qualities of the sire and dam are communicated to their progeny, not in various and minute fractional parts, but in halves—in the anterior, or the posterior, series of organs, and no other way.

2. They show that we must neither expect one parent to communicate to progeny both series of organs, or any part of both series of organs ; nor, on the contrary, must we expect both parents to communicate to progeny one and the same series of organs, or any parts of the same series of organs.

3. They show that by regulating the relative youth, vigour and voluntary power of the sire and dam, either may be made to give to progeny the voluntary and locomotive systems, and the other, the sensitive and vital systems; though it is preferable that the sire should give the former and the dam the latter, as being the systems in which naturally they respectively excel.

4. The details arising out of these laws show, that the capability of fattening and that of producing milk being dependent on the same system—the vital, and abundance of one secretion being attended by diminution of others, either capability is best insured by being distinctly sought for, the former in the animal of diminished sensibility, and the latter in that of increased sensibility—a rule which, on being submitted to Mr. Knight, is well borne out by his observations, and which must, wherever one of these qualities alone is sought for, be of the greatest utility.

SECTION IV.

SHEEP.

IN breeding sheep, the first object is to procure the kind of animal which, on a given quantity of food, will produce the greatest quantity of mutton.

Here Dr. Jenner's observation to Sir John Sebright (the truth of which, Sir John says, has since been confirmed by his own experience)—that no animal whose chest is narrow can easily be made fat, is well illus-

trated in the meagre Merino sheep, which are in general contracted in that part.

In this, however, there is some inconsistency with Mr. Hunt's account of the Dishley sheep, for which he refers to Marshall's Rural Economy of the Midland Counties. "The carcass of the Dishley sheep," he says, "when fully fat, takes a remarkable form; much wider than it is deep, and almost as broad as it is long; full on the shoulders, widest on the ribs, narrowing with a regular curve towards the tail; approaching the form of the turtle nearer perhaps than any other animal . . . I have," says Mr. Hunt, "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."

Mr. Giblett's objections to excessive fattening are as applicable to sheep as to cattle.

Both fattening and the production of wool appear to require a good vital or nutritive system, and sheep defective in that system will be more or less defective both in fat and wool.

Large heads, and long necks and legs, are inconsistent with excellence in that system.

It has been already observed, that fat appears to be the means which nature very extensively employs to diminish sensibility by interposition between the skin and the central parts of the nervous system. Accordingly, we find that, when sheep feed upon luxuriant plains, where little muscular exertion is required, a great accumulation of fat accomplishes this purpose. When, on the contrary, they feed upon the scanty herbage of mountains, where great and incessant mus-

cular exertion is requisite, fattening becomes impossible, and sensibility, which would otherwise be unprotected, obtains an exterior covering of the finest wool.

The sheep of the Spanish sierras and those of Shetland equally exemplify this. In such localities, not merely does muscular exertion prevent the deposition of fat, and expose the nervous system to more powerful impressions, but increased cold attacks it, and renders the finest and densest woolly covering indispensable. In Shetland, even the bristles of pigs are sometimes crisped, and converted into a coarse wool; and it is remarkable that, in that country, when the few summer months produce a more luxuriant herbage, the sheep fatten rapidly. This last fact I have from the personal observation of Dr. Copland, and nothing can more strongly confirm the views I have here presented.

From these principles, I am disposed to conclude, that an animal fattening in the south or on the plains, would produce finer wool in the north or on the mountains.

In corroboration of these views, Mr. Knight, (8, January) says, "The fineness of wool is certainly injured by heat; but the attention of man and hereditary habit can do much."

"On the whole," says Dr. Pritchard, "it appears that a considerable change is speedily produced on the fleece of the sheep by the influence of climate . . . The argali, according to Pallas, is covered with hair, which in summer is close like that of a deer, but in winter becomes rough and curled, resembling coarser hair intermixed with wool."

Dr. Hancock, from his own observation, informs me, that in Guyana, the English sheep loses its fine wool in about two years, and has its place supplied by coarser hair.

"If sheep are highly kept," says Sir John Sebright, "their wool will become less fine, but in other respects its quality will not be deteriorated . . . A regular supply of food to the sheep is essential to the growth of good wool; for that part of the hair which grows when the animal is in a high state of flesh, will be thick, and that which is grown when it is reduced by hunger, will be weak and thin; and consequently the thickness of hair will always be irregular, if the animal passes from one extreme to the other."

The observation made with regard to fattening and milking in cattle appears to be applicable to fattening and the production of wool in sheep—namely, that the animal of diminished sensibility will most easily fatten, while the animal of increased sensibility will most readily produce wool.

It is with physiological reason on his side, that Sir John Sebright says, "Perhaps the great secretion of yolk, [bulb] so essential to the production of fine wool, and which is excessive in the Merino sheep, may be incompatible with the fattening quality."

Fattening and the best wool appear, however, in some constitutions, not to be altogether incompatible.

Dr. Copland, in the following letter, testifies that he had seen the Shetland sheep, remarkable for fineness of fleece, become fat when well fed during the summer.

Dear Sir,

The Shetland sheep are very small ; their faces are small and short ; and their legs are long, relatively to the proportions of the south country breeds.—Their fleeces are generally fine and soft, commonly white, but sometimes grey, brown, or brownish black, and rarely spotted or of different colours. The finest fleeces are usually white, and the points of the wool are somewhat coarser and more curled than the rest. The Shetland mutton is delicate and finely flavoured.

The stunted heath, the grassy sides of the bare hills, and the commons of the country, are the chief pasturages, both in summer and winter. During the latter season, the sheep have no other shelter than is afforded them by the cliffs or abrupt acclivities within their range. In the spring, however, those which are intended to be killed at the end of summer or autumn, are, in parts of the country, conveyed to small islands, which abound with a rich grass, or other pasture, where they often become as fat as the best south-country sheep ; but, in their usual ranges of common pasturage, they are rarely very fat. These ranges are commonly elevated from two or three hundred to one thousand or one thousand five hundred feet above the level of the sea ; but about the end of autumn and winter, the sheep leave the highest for the lowest elevations. And even on the approach of a storm or of inclement weather in summer, they choose the lower and more sheltered situations. When they remain towards night near the summits of the higher hills, it is a sure indication of some continuance of very temperate or fine weather.

In situations near the sea, they sometimes come down to the shores, particularly in winter, and when the ground is covered by snow, or the milder sea air thaws the snow in these parts, and allows a scanty herbage to spring up for their sustenance. When the ground is more completely covered by snow, they sometimes have recourse to the fuci on the sea shore as the tide retires, but this is rarely the case. They as rarely receive any sustenance from their owners; and, when they do, it consists chiefly of refuse cabbage-leaves, &c.

I believe that in many parts, the fine wool is much coarser than formerly, owing to the introduction of south-country breeds of sheep.

I am, dear Sir, yours truly,

Bulstrode-street, 2, Feb. 1838.

JAMES COPLAND.

To Alexander Walker, Esq.

In answer to the question, "In sheep, are fattening and the production of the best wool incompatible?" my correspondent * * * (11, January) says, "My experience is in long-wooled sheep: and among the Leicester breed, the inclination to become fat and to the production of the best wool is certainly quite compatible. I rather think that the sheep which produce the finest wool will fatten quicker than those that produce coarser wool."

Of our two most remarkable breeds of sheep, Mr. Knight says, (8, January) "The Spanish sheep is (I can adduce satisfactory evidence) the old Tarantine sheep; and its habits are so established that, even in rich pastures in this country, it retains through many

generations its fine wool not perceptibly changed . . . A well-formed Leicester sheep will gain in a short time great weight of flesh and fat, and it must be admitted to have a good constitution: but it is nevertheless a very *nesh* animal—it can bear neither fatigue, nor hunger, nor hardship of any kind.”

Sir J. Sebright, as already observed, doubts the assertion that the beautiful shape of Mr. Elman’s South Down sheep was obtained by crossing with the new Leicester, and their fine wool by crossing with the Merino Breed.

In putting to my correspondent * * * the question, “Is the supposed origin of Mr. Elman’s South Down sheep, or rather their improvement by crosses with the new Leicester and the Merino, probable?” his reply (11, January) was, “I believe Mr. Elman always denied that there was any such cross in his sheep, and I know that a skilful man may produce so great an alteration in the character of any breed of domestic animals by carefully and steadily selecting from among them, as breeders, such as possess the qualities he wishes to obtain, and rejecting such as he does not, that no outward appearance of any such breed would induce me to disbelieve the word of a respectable man. It certainly is possible that Mr. Elman may have crossed with the Leicester; but for the reason first given, I do not believe he did. It is in the highest degree improbable that he ever could have crossed with the Merinos.”

I have already observed that the error which all such questions imply—an error which I did not perceive when putting the one last mentioned—is, that

they suppose the production of wool not to depend on the same system with the shape of the animal. As, however, they both depend on the locomotive system, it is evident that, in every cross, they must both be given by the same animal, and consequently that the wool cannot be derived from one, and the shape from another.

It is scarcely necessary to observe, with Sir John Sebright, that the fineness of the fleece, like every other property, may be improved by selection in breeding.

Cattle and sheep, are alike required to be mature, of full stature, in good health, perfect vigour, and in entire possession of all their faculties, when the male is put to the female for breeding.

The Application of the Natural Laws to the Breeding of Sheep corresponds so nearly to that for the breeding of cattle (except as to the 4th head,) that it need not be repeated here.—An additional rule also springs out of the third paragraph preceding this one.

PART VI.

VAGUE METHODS AFFECTING PROGENY, ADOPTED AMONG MANKIND.

As, under the vague methods regulating progeny adopted in the breeding of domesticated animals, I availed myself of the authority of the best observers, I follow the same plan here.

Of these methods, Camper gave a melancholy picture. Some, he says, "for the purpose of having handsome children, have recourse, as Pliny observes, to ridiculous means and magical conjurations; while others consult the state of the stars, as Quillet advises in his *Callipædia*. In short, nothing has been too whimsical or too absurd to be resorted to for this purpose."

In more recent times, many have indistinctly seen that "the hereditary transmission of physical and moral qualities, so familiarly acted on in breeding domesticated animals, is equally true of man."

SECTION I.

BREEDING IN-AND-IN.

Of in-and-in breeding among mankind, Dr. Hancock (15, August) says, "To the want of renovation, I conceive, we may chiefly attribute the barbarism which, for unnumbered ages, has reigned in Africa, and probably in the South Sea Islands, and amongst the aboriginal tribes of America; and a jealousy of strangers, perhaps, has kept the Chinese stationary for many thousands of years.

"The Arowacks and other American tribes roam at perfect liberty through their native forests and savannahs, but, as it were by one universal magic spell or enchantment, they are all kept most strictly to their respective tribes; and by such isolation, through a long succession of ages, they have dwindled into pigmies compared with those whose races are renovated and refreshed by inosculation, or engrafting of other varieties."

For the obstacles that, among ourselves, are frequently opposed to the union of persons of different classes, the chief motive is the desire of keeping in a state of wealthy ease the few who support aristocracy against the many who obey. The marriages of the former, therefore, frequently depend upon wealth and rank, without any regard being paid to personal qualities; and the consequences are, that the qualities that originally elevated one class above another pass away, and their families rapidly degenerate.

“The marriages of high rank and of hereditary wealth,” says Sir Anthony Carlisle, who has long and well observed these things, “are generally concocted in their muniment rooms, where the estates of heirs and heiresses are entailed, together with the personal peculiarities, moral defects, and hereditary diseases of each family, and perpetuated as far as law, sheep-skins, signings and seals can extend them. Hence the frequent termination of such inbred races; while, in every ancient village, of considerable, though not shifting population, the names of humble families have continued for more ages, although ill recorded, than those of the proudest gentry.”

We cannot, therefore, be astonished to see that, in marriages thus founded wholly in interest, and accompanied either by perfect indifference or by inconceivable antipathy, the results are domestic misery, sterility, or weak and unhealthy children, and numerous crim. con. actions.

Moreover, as Mr. Lawrence observes, it is in the rulers, in those to whom the destinies of nations are entrusted, and on whose qualities and actions depend the present and future happiness of millions, that the evil is at its height: laws, customs, prejudices, pride, bigotry, confine them to intermarriages with each other, and thus degradation of race is added to all the pernicious influences inseparable from such stations. . . . The strongest illustration of these principles will be found in the present state of many royal and aristocratic houses in Europe: the evil must be progressive, if the same course of proceeding be continued.

SECTION II.

SELECTION.

Mr. Lawrence observes, that "a superior breed of human beings could be produced only by selections and exclusions similar to those so successfully employed in rearing our more valuable animals. Yet, in the human species, where the object is of such consequence, the principle is almost entirely overlooked . . . Hence all the native deformities of mind and body, which spring up so plentifully in our artificial mode of life, are handed down to posterity, and tend, by their multiplication and extension, to degrade the race. Consequently, the mass of the population in our large cities will not bear a comparison with that of savage nations, in which, if imperfect or deformed individuals should survive the hardships of their first rearing, they are prevented by the kind of aversion they inspire, from propagating their deformities."

"If the same constraint were exercised over men," says Dr. Pritchard, "which produces such remarkable effects among the brute kinds, there is no doubt that its influence would be as great. But no despot has ever thought of amusing himself in this manner, or at least such an experiment has never been carried on upon that extensive scale, which might lead to important results . . . Something of this kind was indeed attempted by the kings of Prussia, but their project referred to stature . . . It is well known, that the king of Prussia had a corps of gigantic guards, con-

sisting of the tallest men who could be drawn together from all quarters. A regiment of these huge men was stationed during fifty years at Potsdam. 'A great number of the present inhabitants of that place,' says Forster, 'are of a very high stature, which is more especially striking in the numerous gigantic figures of women. This certainly is owing to the connexions and intermarriages of the tall men with the females of that town.'

"Certain moral causes, however, have an influence on mankind, which appears in some degree to lead to similar ends. . . . In countries where the people are divided into different ranks or orders of society, which is almost universally the case, the improvement of person which is the result of the above-mentioned cause, will always be much more conspicuous in the higher than in the inferior classes."

"In no instance, perhaps," says Lawrence, "has the personal beauty of a people been more improved, by introducing handsome individuals to breed from, than in the Persians, of whom the nobility have, by this means, completely succeeded in washing out the stain of their Mongolian origin. 'That the blood of the Persians,' says Chardin, 'is naturally gross, appears from the Guebres, who are a remnant of the ancient Persians, and are an ugly, ill-made, rough-skinned people.' This is also apparent from the inhabitants of the provinces in the neighbourhood of India, who are nearly as clumsy and deformed as the Guebres, because they never formed alliances with any other tribes. But, in the other parts of the kingdom, the Persian blood is now highly refined by

frequent intermixtures with the Georgians and Circassians, two nations which surpass all the world in personal beauty. There is hardly a man of rank in Persia who is not born of a Georgian or Circassian mother; and even the king himself is commonly sprung, on the female side, from one or other of these countries. As it is long since this mixture commenced, the Persian women have become very handsome and beautiful, though they do not rival the ladies of Georgia. The men are generally tall and erect, their complexion is ruddy and vigorous, and they have a graceful air and an engaging deportment. The mildness of the climate, joined to their temperance in living, has a great influence in improving their personal beauty. This quality they inherit not from their ancestors; for, without the mixture mentioned above, the men of rank in Persia, who are descendants of the Tartars, [Mongols,] would be extremely ugly and deformed."

These effects are every where observed. Captain Cook, describing the people of Owhyhee, says, "The same superiority which is observed in the Erees (nobles) in all the other islands, is found also here. Those whom we saw were, without exception, perfectly well formed, whereas the lower sort, besides their general inferiority, are subject to all the variety of make and figure that is seen in the populace of other countries."

SECTION III.

CROSSING.

“In some parts of Ireland,” says Dr. Pritchard, “where the Celtic population of that island are nearly unmixed, they are, in general, a people of short stature, small limbs and features: where they are mixed with English settlers, or with the Lowlanders of Scotland, the people are remarkable for fine figures, tall stature, and great physical energy.

“Pallas informs us, that even intermarriages of Russians and Tartars with the Mongolians, who differ widely from both of these races in their physical character, are very frequent in Mongolia. . . . The children born from these marriages are thus described in Pallas’s Memoir on the Mongolian Nations. These children have agreeable and sometimes beautiful features, whilst those of an origin purely Kalmuc or Mongol, preserve, till ten years of age, a countenance deformed and bloated, a cacochymous aspect, which disappears only with the growth of the body.”

“In Paraguay, the mixed breed constitutes, according to Don Felix de Azara, a great majority of the people termed Spaniards or white men; and they are said to be a people superior in physical qualities to either of the races from which they have sprung, and much more prolific than the aborigines.*

* “Ces métiés s’unirent en général les uns aux autres, parcequ’il ne passe en Amérique que très peu de femmes Européennes, et ce sont les descen-

"The offspring of the Dutch by the Hottentot women," says Moodie, "are distinguished for uniting in their persons the vices of both races. In point of understanding, they are superior to the Hottentots; and, by what I have seen of them, I should think that, under other circumstances, many of them would show a decided superiority over the Dutch. They assume it over the Hottentots, with whom they live, and hate the white population, to whose society they can never aspire. They are also a taller and stouter race than the Hottentots, and share in some degree in the constitutional tendency of the Dutch to corpulence. The intermixture of races seems to improve the intellectual powers as much as it does the bodily proportions."

In South America, Dr. Hancock (15, August) says, "The mulattoes, unfortunately and ungenerously held in degradation, are not naturally inferior, I believe, to their fathers, either in moral or physical powers,—but certainly, far in advance of the primitive African race. At least, we may say, they are above the medium of the two castes from which they spring.

"It is a well-known fact, that the Samboes of South America—the progeny of blacks and Indians, are remarkable for their physical superiority over their progenitors of either side.—But I need only allude to

dans de ces métiis qui composent aujourd'hui au Paraguay la plus grande partie de ce qu'on appelle Espagnols. Ils me paraissent avoir quelque supériorité sur les Espagnols d'Europe, par leur taille, par l'élégance de leurs formes, et même par la blancheur de leur peau. Ces faits, me font soupçonner non seulement que le mélange des races les améliore, mais encore que l'espèce Européenne l'emporte à la longue sur l'Américaine, ou du moins le masculin sur le féminin."

these people: I believe they have been duly noticed by Humboldt and other travellers.

“Many obvious examples, however, might be adduced, where people are less kept under restraint—as at St. Domingo, and in those called Maroons at the back parts of Surinam. These originated from negro deserters from the Dutch estates, who formed settlements up the Courantine, and intermarried with the native tribes; and this union has produced a most athletic and vigorous race of men, active and enterprising, who present an extraordinary contrast compared with their ancestral line of either side. Some of these, on trading projects, we met with in the interior in 1811, at Mahanarawa’s, (the Carib king,) where, indeed, the aboriginal natives, who are comparatively timid, would scarcely dare show themselves. I presume that, at this time, all the neighbouring tribes combined would scarcely be a match for them.

“It is not only, however, in the mingling of distinct races that we observe an amelioration or improvement in the progeny. Results nearly equal, perhaps, arise from intermarriages amongst different tribes of the same caste. This is exemplified in the striking superiority of the creole negroes, in corporeal and mental powers, compared with their African parents who came from different tribes. Of the Maroons in the West India Islands, Dallas observes, ‘They displayed a striking distinction in their personal appearance, being blacker, taller, and in every respect handsomer than those on the estate.—In their person and carriage, erect, lofty, indicating a consciousness of superiority, vigour appeared in their muscles, and

their motions displayed agility. They possessed most, if not all, of the senses in a superior degree.'

"The Caribes are the only American tribe who, without restraint, take wives from the other tribes adjacent; and their superiority over all their neighbours is too well known to require a word in illustration.

"I do not know if the progress of the American republic may not be, in some measure, attributable to the circumstances here considered. The Americans—a melange of all the different nations of Europe, though mostly of English, Scottish and Irish descent, are noted for activity and enterprise; and their march of improvement, in practical science, the mechanical arts, and commerce, has surpassed what could have been anticipated in a people cast into a wilderness so distant from the civilized world. Their rapid increase and improvement has attracted the admiration of all Europe, and they have offered to the world a splendid example of justice and national freedom.

"May I suggest a hint for your consideration?—It appears to me probable, that the most magnificent empires have owed their foundation chiefly to great migrations, or im-migrations, of the human race."

From the authorities now quoted, it is evident that, destitute of principles as is crossing among the varieties of mankind, its advantages have been generally observed and acknowledged; and this preliminary was necessary to my showing, in the next Part, what constitute the best intermarriages among mankind.