THE PRINCIPLES OF STOCK BREEDING

BY

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The fundamental principles of stock breeding are based on the laws of organis evolution, and one who would attain the highest skill in the art must have a thorough understanding of these laws. He should also have a thorough knowledge of anatomy and animal nutrition. He must have financial backing that will enable him to obtain animals of high economic importance. The selection of these animals and the determination if the resultant forms are developing as desired demands rare judgement. As Chas Darwin aptly says,"Not one man in a thousand has the accuracy of eye or the judgement sufficient to become a great breeder. If gifted with these qualities and he studies his subject for years and devotes a lifetime to it with indomitable perseverance he will succeed and make great improvements, if he lacks any of these qualities he will assuredly fail."

It is thus evident that there are factors which are dependant on the individual breeder and the financial conditions which surround him. But the laws of organic evolution have a bearing on this industrial art under all conditions and in that light let us consider it. First let us briefly restate those laws as formulated by Chas. Darwin (whose works should be carefully studied by every breeder) and his followers.

I All plants and animals tend to resemble their parents.

II All plants and animals tend to vary from their parents.

III All plants and animals tend to increase in a geometrical ratio.

IV All plants and animals are influenced by their environment.

V All plants and animals must struggle for existence and ultimately the fittest will survive.

That these laws are operating everywhere no scientific or other observant student will deny, and as we shall consider the reader already familiar with many examples of their operation we will pass immediately to a discussion of their bearing on animal breeding. The reader will doubtless recognize the corner stone of value in pure-bred stock rests in the first law, commonly expressed "Like begets like." But in apparent contradiction to this is the law of "variation". Let us consider them together.

Before proceeding to outline the theories advanced by scientists as to the cause of heredity and variation let us first briefly review the results of microscopical study of the process of fertilization. We must pass over the details of that marvelous process only to emphasize that the essential point is the bringing together in a mass the extremely minute thread-like coiled bodies the so-called chromatosomes or filaments one of which is derived from the male and the other from the female parent. As students of Morphology will remember these threads are subject to division into a certain definite number of bead-like parts the number always remaining constant for the same species, yet varying with the different species. But it has been shown that in the process of fertilization that the male and female nucleus of the reproductive cells contain only one-half the number of chromosomes found in growth or vegatative cells. Hence upon union of these cells, a cell is formed having a normal number of chromosomes. This cell is the beginning of the embryo, and by repeated divisions and specialization of parts finally develop into the young animal. However a surprise is here noticed, in that the chromosomes from the two parents do not fuse but remain distinct hence each cell in an individual will have one-half its chromosomes

descendant from each parent.

The hypothesis generally accepted by scientists is that the hereditary characters of the parent are carried over from generation to generation in the chromosomes and that there can be little if any new characters added which were not hereditary to the parents.

Thus we have a hypothetical basis for heredity substantiated by observation. As to variation those characters which are not common to both parents will strive for dominancein the offspring. Further no two offspring will be subject to the same environment, hence on maturity the family forms will vary around a mean, the range of variation depending on similarity of parents and environment.

But there is a second type of variation unaccounted for by any hypothesis yet proposed. We refer to mutations or discontinuous By this we mean the appearance in the offspring of characters not possessed by either parent, yet which dominate in these new characters even when crossed back on the parental type. These variations include "the appearance of extra teeth, extra vertabrae, extra toes, extra joints in toes, extra mammae, extra segements in insects, extra branches in the horns (of deers), and loss of horns. They even include complete changes in color, sudden and complete change in color markings and the appearance of completely hairless animals among hairy animals. Such has been the origin of Polled Durham cattle(double standard) black shouldered peacocks, breeds of which we have record, unrecorded we can almost prove the origin of all polled cattle.

(The plant breeders are making a diligent search for favorable mutations with the hopes of increasing the number of fixed varieties in our cultivated plants.)

To sum up the facts and theories in regard to heredity

and variation, we are sure that each parent contributes one-half of the chromosomes which go to form the offspring, we know that the chromosomes never fuse but that each cell resulting from the original cell receives one-half its chromosomes from its male ancestor and one-half from its female ancestor. We have every reason to believe that the choromosomes carry the hereditary characters. We know from experience that the offspring will resemble its parents, we believe that variation is caused by dissimilarity of parents and environment but we cannot explain discontinuous variation.

We know that the most valuable feature of well-formed live stock is the ability to dominate or stamp that form on its offspring. Hence if our study of variation is of any value it must give us a hypothesis upon which we can formulate a system of breeding by which we can produce dominant animals. Two such hypothesis have been produced.

The First is that the longer a breed of stock has been subject to a definite system of selection for certain characteristics the more dominant will that breed be in those characteristics when crossed on stock bred heterogenously. The most notable system founded on this hypothesis is the Dutch system of breeding Holstein-Friesian cattle. It is a slow but sure method and upon its principles the herd book system of recording animals is based. It will be noticed that this system contemplates the gradual weeding out of undesirable qualities until ultimately none but desirable qualities will be inherited, a result not obtained as yet.

The second system, founded by Robert Blakewell of Dishley Leicestershire, England, about 1750 is explained in the following taken from Sanders "History of Short-horn Cattle" pp 28. "His system contemplated first the selection of foundation stock approximating

in form and character as closely as possible the type sought to be established. With these as a basis, their immediate descendants were inter-bred in such a way as to give a strong concentration of the blood of the original selections. The idea of course was to create a family likeness or type, a group of animals homogenous in blood and uniform in characteristics. Resort to fresh blood was only had when an animal was found that possessed in a marked degree as an individual the particular points desired."

According to our study of fertilization, by this system of breeding every time one ancestor appears in the pedigree of an animal its characters are more apt to dominate in the offspring. And such seems to have been the results of practice for it seems remarkable that no breeder of English stock has obtained prominence of his stock unless he has resorted to this system or some modification of it. Short-horn, Hereford, Angus, Galloway, Jersey, Guernsey, Ayrshire, Red Poll, Polled Durham, and Brown Swiss cattle, Poland China, Berkshire, Yorkshire, Essex, and Tamworth hogs, and Clydesdale, English Shire, Hackney, Morgan, and Hambletonian horses have each felt the magic stroke of its influence. In fact it has become proverbial that almost every winner of recent years at the leading stock shows has an in-bred or line-bred pedigree. In fact it is justly considered as great a factor in the production of the numerous distinct breeds of live stock for which Great Britian is famous. It is the only means outside of advertisement, by which a breeder can make his skill and judgement felt on the stock of a country because simple selection takes generations to accomplish results. But although this is regarded as the most important system in breeding stock yet it has aptly been compared to a double edged sword which cuts both ways and can

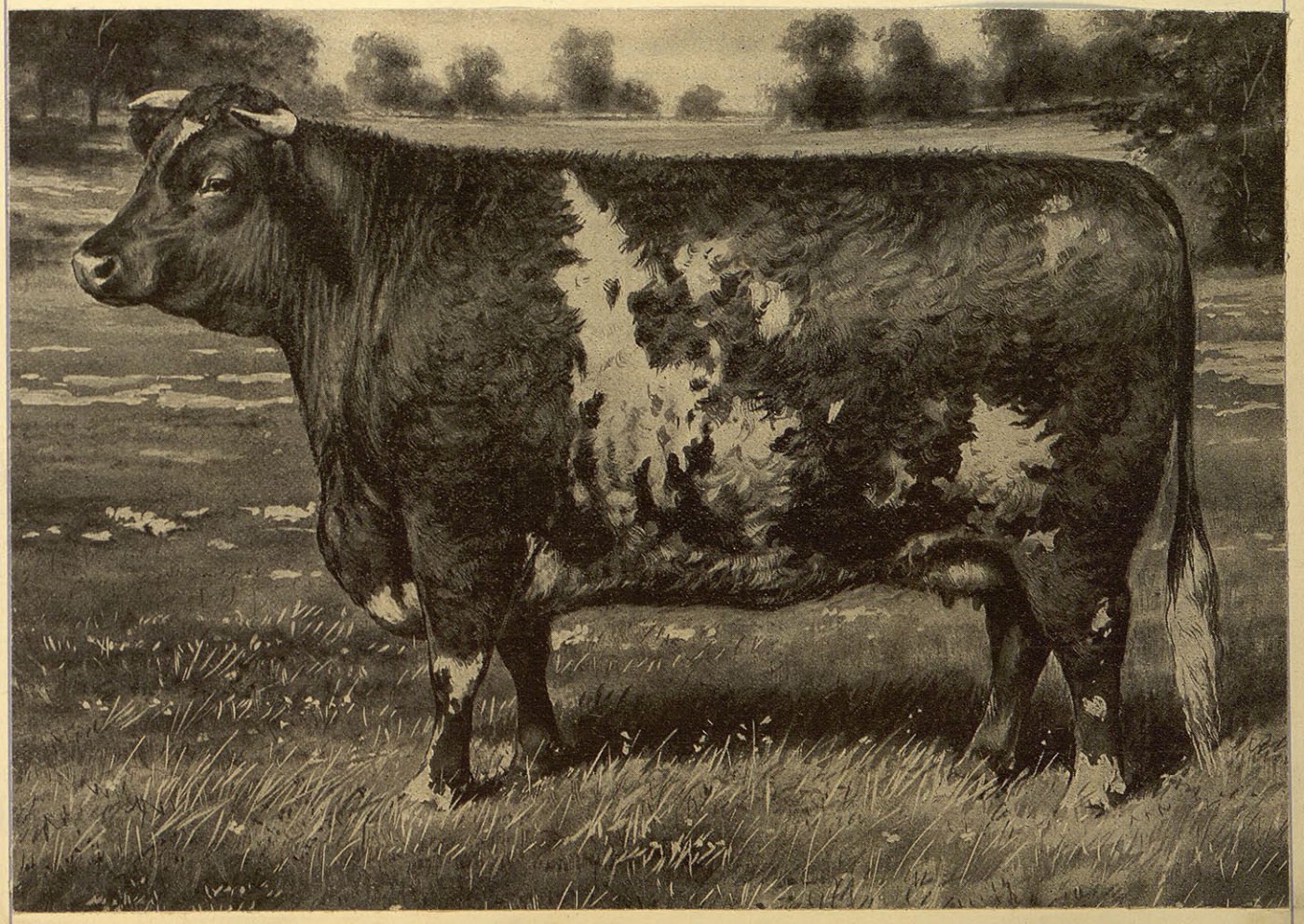
do as great harm as it can do good especially in the hands of the unskilled. It must be used with judgement and results not system should always be kept in mind. For one to continue in and in breeding without the resort to fresh blood means certain ruin by producing monstrosities, stunting the size of stock, weakening the constitution, and deterioratine the other qualities. Hence incestous breeding should never be attempted by a novice, the master breeder knows when to stop, and while in and in breeding has played its part with British breeds yet the herd books are all founded on the principle of continued selection.

It will here be well to note that variation is responsible for the divergence of breeds, and in the foundation of breeds the breeder will recognise no barriers but results. He will choose from whatever source available animals of the desirable types, whether mutations, extreme variations of pure-bred or heterogenously-bred stock, and then by careful mating proceed to fix the type.

The history of our oldest breeds is very obscure but in few if any cases are there evidence that out-crosses were not used. With those breeds whose origen is of recent date we might allude to a few to illustrate the general method of forming a breed. The Poland China hog is justly conceded to be the best American hog and was founded on a heterogenous mixture of spotted hogs grown in several counties in Ohio. Besides other foreign blood including the Chinese and Neopolitan, the Berkshire was used extensively to establish the black color and to give refinement and symetry, and then in and in breeding was used to fix the type. With the Polled Durham breed recently established, polled mutation forms of Short-horns appearing in the Short-horn herds from time to time, were collected and used as a basis for

establishing the "double standard" type. With the single standard crosses of pure bred Short-horns on the common "muley" (polled) for four generations producing polled offspring, the fourth generations were recorded and inter-bred, thus establishing a type.

But it is with him who enters the business of breeding stock already recorded that the question of going outside the breed for blood to improve the parent stock is strongly considered. In England and America certain pure bred stock associations allow animals having four or five crosses of pure bred sires on foundation stock resembling the breed are admitted to registry. That this is a sound policy is admitted by the best authorities. The new blood seems to have a renovating effect on the stock already closely bred.



Refused for registry on account of short pedigree.

Although many breeders would not admit it, there is strong evidence that Amos Cruickshank, the celebrated Scotch Short-horn breeder, introduced a dash of West Highland blood into his cattle. It is claimed that the golden colored hair so frequently seen on Cruickshank cattle is characteristic of West Highland cattle, also it is claimed that there is frequently born a reversiary type closely resembling the West Highland cattle. But if Cruickshank did use this blood, on top of it he placed the best blood of England, producing a type which was ultimately to save the breed from the advance of other beef breeds, did he sin against the principles of stock breeding? Or are the advocates of purity of pedigree committing a crime against the interests of pure bred stock when they place pedigree above results? Dominance of desirable qualities is and always must be the true measure of right breeding.

We must now pass to the consideration of the law that "All plants and animals are influenced by their environment." We have already noted that animal life begins not as commonly supposed, at birth, but at the union of the male and female neculi. Hence environment commences at this period, and since it is a fundamental principle of stock feeding that the younger the animal the more plastic it is, if we would produce ideal forms we must begin early.

No matter how pure the blood, nor how strong the hereditary characters, improper food or mal-nutrition and trying physical conditions will certainly have their influence. Professor Henry of the Wisconsin Experiment Station has demonstrated that the organs and bones of an animal can be materially influenced by the kind of feed furnished them.

The pregnant mother should be supplied with food containing a variety of bone and muscle forming constituents and further she should have sufficient exercise and other sanitary conditions which will keep her in good health. From birth to maturity the better the food and care the better the mature animal. The herdsman recognizes this when he gives the future prize winner two dams to suckle. The commercial feeder also realizes the bearing of this principle when he refuses to allow his calves to pass the winter on the range. T.F.B. Sotham of Hereford cattle fame, thus speaks on this point. "When equally well bred the range bred cattle are equal in quality to any cattle.

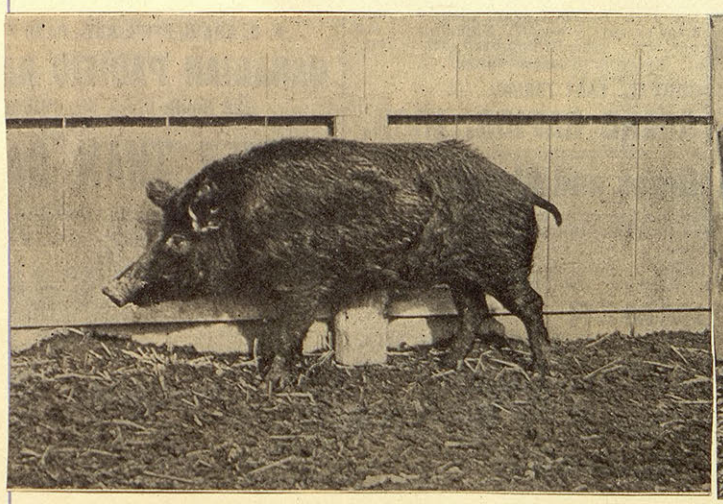
Range bred.

"The calves are dropped in the spring and while following their dams, are until frost comes, equal in size, weight, and condition to calves farm raised. It is the severe winter exposures that stunts their growth. The frame must grow and if it have insufficient support the milk fat and even the flesh will be drawn on to sustain its imperative demands." To which we need only add that a shock to the calf will be strongly felt at maturity, and the winter on the range will serve to fix the type for life. Avoid the winter and you will have stock fully equal to those raised on the farm. This has been fully demonstrated by the winnings of range bred cattle, thus handled at the recent stock shows.

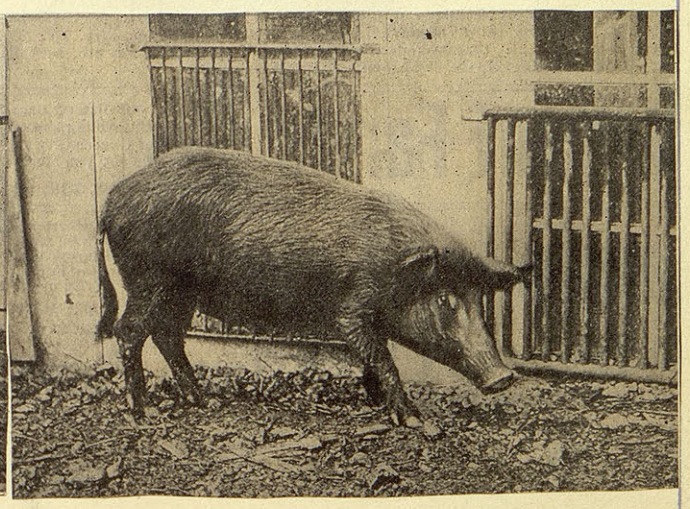
THE GRAND CHAMPION CARLOAD AT HOME.

Range Bred.

To further illustrate the influence of environment, the Wisconsin Experiment Station has been working with that type of hogs familiar to western agriculturists commonly called " razor backs". The Station captured a male and female of this type in the wilds of

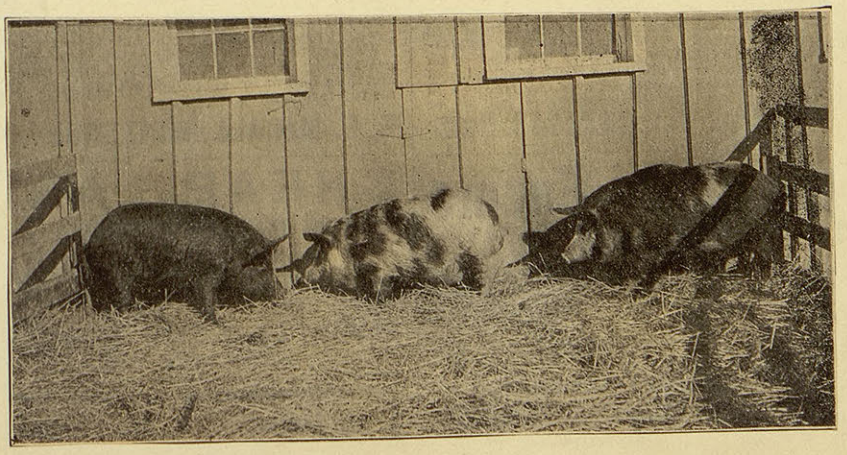


Adam

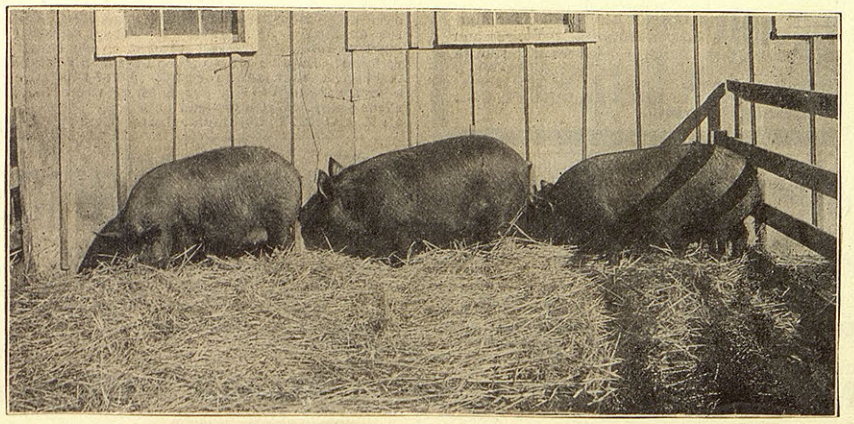


Eve

Indian Territory and is determining the influence of environment on succeeding generations. The following is taken from a preliminary report of their results (19th Annual Rep., Wisconsin Experiment Station, pp 40.) "In the columns of Table I giving the total gain and weight of each generation it will be seen that while the three pigs of the second generation made a gain of 266 pounds in eleven weeks, the three pigs in the first generation made a gain of only 196.



First Generation.



Second Generation.

"It may be that the pigs of the first generation made as good gains for food consumed as those of the second generation yet the data presented clearly bears out that fact that they fall far behind in the rate of gain and we may safely, from their appearances as presented in the accompanying photos, say that they are not nearly up with the pigs of the second generation in their ability to consume large quantities of food or to assimilate and store the food nutrients in their body tissues." While the experiment is not yet complete results so far are very favorable for environment. In fact we must admit that great breeders have always been expert feeders (the alternate however is not true) hence environment helps to make the breed.

Every system of breeding takes cognisance of the law that all plants and animals tend to increase in a geometrical ratio. By means of this law it is possible, if no artificial barrier is interposed, to substitute any breed of stock with any other breed. Any system of breeding which curtails the maximum operation of this law, i.e. which lessens the fertility should be carefully considered and if possible avoided, as the function of pure bred stock is fundamentally reproduction. This is justly urged against in and in breeding, hence the caution against the novice using it. Proper feeding has a dominant influence on fertility. Over-fat cattle, stock fed on a

highly carbonaceous ration, as corn, are not as fertile as those given a variety of feed and plenty of exercise. Stock fed on rations lacking in mineral matter are also poor breeders, as the pregnant mother must have the proper nutriment or she cannot develop the foetus, and the sire will be apt to become sterile if improperly fed.

Many will contend that law of the "struggle for existence and the survival of the fittest", does not operate in animal breeding. Considered in the light of evolution perhaps it does not, but there are certain phases of it which have a powerful bearing on this art. First we contend that the breeding of pure bred stock is an economic industry, whose prime object is the improvement of the general live stock of the country. Hence those breeds of stock which best fulfil the economic wants of a country will ultimately replace an inferior breed. For instance that breed of hogs which best fulfils the following requirements will ultimately be bred.

I. Very prolific, as Tamworths.

II. Early maturing as Berkshire.

III. Symetry, as Poland China.

IV. Ability to make the most flesh on 100 pounds of feed.

V. Large percentage of lean meat.

VI. Disease resisting power.

Not that the exixting breeds must be replaced but they must be bred true to a higher standard or sink into obscurity. Utility not fancy points must ever be the object sought by the true breeder. The zeal for "red cattle", black horses or black hogs must never be allowed to overshadow utility and true merit. Short-horn cattle breeders had a far- reaching example of the folly of their rush for the style, color,and pedigree of Bates cattle in 1873, which

was only checked after great financial loss, by the forward march of the"rent paying type" of Cruickshanks and in an indirect way by the omnipotent forces of the beef types found in the Angus and Herefords.

We have thus briefly outlined the bearing of the laws of evolution on stock breeding, an art on which an encyclopedia might easily be written. And then when all available knowledge had been tabulated it would be found that the ability to use that knowledge is far superior to the possession of the knowledge when results are the judges.

And while it bears more on the methods than principles we might prophesy as to the probable scientific manner of breeding stock in the future. As to dairy cattle and fast horses, and perhaps draft horses, the test of results is easily applied. The Babcock test is rapidly demonstrating the profitable breed of dairy cattle, and a record of feed consumed of course checks the work of each cow. Improvement should be rapid along this line. With trotting horses the Wallace's Year Book has adopted a system which other associations might imitate. Each year the winning of each sire's offspring is tabulated and furnished the breeders thus making quickly available valuable blood.

With draft horses the custom adopted in France with Percherons has a powerful influence upon the breed. This consists in government control of breeding stock, and the compelling the castrating of undesirable types.

But with beef cattle and hogs the breeder must record besides the ordinary pedigree requirements the record of the number of pounds of feed it has taken to make 100 pounds gain. And the record of the slaughter house test should be preserved by the careful breeder. And as we have elsewhere mentioned the idea of breeding disease-resisting stock must have more attention in the future.