

## THE POSTULATED RESEMBLANCE OF NATURAL TO ARTIFICIAL SELECTION

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*"A parallelism that does not exist."*—HERBERT SPENCER (18, 440).

### INTRODUCTION

Much of Darwin's book, "The Origin of Species by Means of Natural Selection" and most of his larger work, "The Variation of Animals and Plants under Domestication," is devoted to exposition of his postulate that "natural selection" is a process comparable to that exercised by man on domesticated animals and plants. A few quotations will illustrate the point.

"The term [natural selection] is so far a good one as it brings into connection the production of domestic races by man's power of selection and the natural preservation of varieties and species in a state of nature." (7, 1, 6.)

"The principle of natural selection may be looked at as a mere hypothesis but rendered to some degree probable by what we positively know of the struggle for existence, and the consequent almost inevitable preservation of favourable variations, and from the analogical formation of domestic races." (7, 1, 9.)

"As man can produce, and certainly has produced, a great result by his \* \* \* selection, what may not natural selection effect?" (6, 72.)

In any discussion much depends on what is meant by the basic terms involved. Let Darwin's own definitions, therefore, prevail. As to natural selection, he says, "Can we doubt \* \* \* that individuals having any advantage, however slight, over others, would have the best chance of surviving and procreating their kind? On the other hand, we may feel sure that any variation in the least degree injurious would be rigidly destroyed. The preservation of favorable individual differences and variations, and the destruction of those which are injurious, I have called Natural Selection, or the Survival of the Fittest." (6, 70.)

As to artificial selection, he says, "We cannot suppose that all the breeds were suddenly produced as perfect and as useful as

we now see them; indeed in many cases we know that this has not been their history. The key is man's power of accumulative selection; nature gives successive variations; man adds them up in certain directions useful to him. In this sense he may be said to have made for himself useful breeds." (6, 25.)

Some rather fundamental differences between artificial selection and the biological events dubbed "natural selection" are obvious on first consideration. For instance, in the artificial process there is always, in the natural, never, a conscious selector; in the former, selection is for the benefit of the selector, in the latter it is supposed to benefit the selected; man makes conditions as favorable as possible for the organisms under his selection; Nature, Darwinians inform us, always puts hers through a merciless struggle for existence. These and other contrasts between artificial and natural selection will be more fully discussed under separate headings.

#### SELECTORS

In artificial selection there is always conscious human choice directed toward definite ends, toward something more than mere maintenance of the existence of races. In nature there is elimination, there is death, but no selector, nor anything comparable to one; consequently there are no definite ends, no objects in view, beyond keeping "seed alive upon the face of the earth." On the other hand, human effort may be directed for generations to the same end as, for instance, increase of speed in horses, milk yield in dairy cattle, or egg production in fowls. In nature the so-called selection by elimination may at one time be the result of climatic severity, at another of disease, again of depredations by enemies, and so on; the number of eliminating agents may be almost infinite. There can be no continuity of development along particular lines as the result of elimination for an infinity of reasons. The fact that steady evolutionary progress is known only goes to show that factors other than those causing elimination are in control.

Writing of artificial selection, Darwin says, "As each new variety is produced, the earlier, intermediate, and less valuable forms will be neglected and perish." (7, II, 231.) By contrast it must be pointed out that in nature where there are no conscious selectors, there will be no judgment as to less valuable forms, and no power to neglect.

## FOR WHOSE GOOD?

Darwin admits the contrast between artificial and natural selection as to beneficiaries. "It is not surprising," he states, "that domestic races should generally present a different aspect from natural species. Man selects and propagates modifications solely for his own use or fancy and not for the creature's own good." (7, II, 232.)

In the "Origin of Species" he further says, "Man selects only for his own good; nature only for that of the being which she tends." (6, 72.) No comment would seem to be necessary in certifying as to this distinction between artificial and natural selection.

## FITNESS

Artificial selection need scarcely be concerned with the utility of a character to the organism, or even indeed of the general fitness of the latter, while in natural selection, according to theory, utility of characters and general fitness are the ruling factors. This point also is conceded by Darwin, who says:

"It is obvious that a host of artificial races could never survive in a state of nature;—such as Italian greyhounds,—hairless and almost toothless Turkish dogs,—fantail pigeons, which cannot fly well against a strong wind,—barbs and Polish fowls, with their vision impeded by their eye wattles and great topknots,—hornless bulls and rams, which consequently cannot cope with other males, and thus have a poor chance of leaving offspring,—seedless plants, and many other such cases," (7, II, 212), and adds, "Our wonderfully improved pigs could never have been formed if they had been forced to search for their own food." (7, II, 220.) He further states: "With animals and plants reared by man there is no severe or recurrent struggle for existence." (7, II, 309.) Like most voluminous writers, however, Darwin makes some more or less contradictory remarks, one bearing on the present topic being, "With our domesticated animals natural selection checks the production of races with any injurious deviation of structure." (7, II, 420.) In view of swine that can hardly waddle; ducks, geese, and chickens that cannot fly; dogs, chickens, pigeons with impeded vision, etc., this remark can scarcely be taken seriously. The keeping of many such domesticated animals in defensive enclosures, and canaries and other cage-bred birds constantly in cages is eloquent admission that they do have

injurious deviations of structure and are unfit for life in the open. Evidently they have not been selected for fitness.

In artificial selection a considerable fault may be overlooked if a very desirable virtue is present. In natural selection (as defined) elimination for the fault would proceed, no account being taken of the virtue. Artificial selection as a rule degrades organisms in point of fitness so far as ability to survive in the wild is concerned. Natural selection if it acts as claimed must do the very opposite. It is difficult to trace any similarity of the two processes in relation to fitness.

#### STRUGGLE FOR EXISTENCE

The conception of a severe struggle for existence is in reality antithetical, rather than contributory, to the ideal of the survival of the fittest. J. W. Dawson pointed this out clearly when reviewing Darwin's "Origin of Species" in 1860. "We have been told very truly," he says, "that the reason the wealthy and skillful breeder succeeds in producing marked races is that his animals are cared for and pampered, while the savage and the poor man fail because their animals must struggle for subsistence. Nature it appears takes the opposite way, and improves her breeds by putting them through a course of toil and starvation, a struggle not for happiness or subsistence, but for bare existence. We can understand how this should deteriorate and degrade species, as we know it has done in every case of the kind we have observed; but how it should elevate or improve is past comprehension. But does Nature deserve to be charged with such niggardliness, and with so concealing it that all the world seems to be full of happiness and plenty, except where poor man toils on in his poverty?" (81, 112.)

Man's selection is of individuals to live and be given the most favorable treatment practicable, while nature's is of those doomed to die, the survivors according to theory being those that have passed through a struggle for existence so severe as to kill off all but a small proportion of the total number of offspring. Man pampers, and improves his selections; Nature's process as pictured by the Darwinian theory could only leave broken and enfeebled remnants in no wise entitled to be called the fittest. The fact that most creatures under natural conditions are sound and in good condition is proof that they have not been subjected to a ruthless struggle for existence. The

death of some, the escape of others apparently unscathed, very clearly shows the workings of a process akin to chance rather than one of selection.

#### ELIMINATION OF YOUNG

Wholesale destruction of immature stages is the rule in nature. "Selection," if it can be so termed, occurs chiefly before the adult characters, those upon which continuance of the race depends, are developed. Except in highly polygamous species a large proportion of those attaining maturity participate more or less in the reproduction of the species. The plant or animal breeder, on the other hand, must rear his material until adult characters are apparent, and in his most effective operations, until ability to transmit desirable qualities is tested. The process is quite distinct from what does or can occur in nature.

#### PROGENY PERFORMANCE

The term "prepotency," old in breeder's language, signifies marked power to transmit likeness. Darwin remarked, "The subject of prepotency is extremely intricate \* \* \* no one has hitherto succeeded in drawing up general rules on the subject." (7, II, 47.) In their attempts to utilize prepotency pioneer breeders were groping for a tool which later has been firmly grasped and recognized as the most effective at the breeder's command. It is the progeny test.

"The term progeny test as applied to animal breeding, refers to the estimation of an individual's value as a breeder by means of the qualities or performance of its offspring. The earlier practice was to judge an individual by its ancestors as indicated by its pedigree, but more recently the situation has been reversed and now the individual breeding bird [fowl] is judged by its offspring." (Warren, 20, 3-4.)

"The foregoing discussion indicates that the only dependable measure of a bird's breeding value is the progeny test. If this be true, the question then arises as to what value the pedigree has. In reality the pedigree does not have the value placed upon it by many animal breeders. It supplies some history of the performance of a bird's ancestry, but gives no assurance that the same qualities will be transmitted by this bird to its offspring." (Warren, 20, 19.)

"The mean egg production of the daughters of the mating

of a given sire and a given dam is the index of greatest value in determining the breeding potentiality of an individual sire or dam." (Jull, 14, 513.)

"The idea of rating bulls by the progeny test is not new. Such historic livestock improvers as Bakewell and Cruickshank are known to have hired out bulls to their neighbours, bringing them back into their own herds again if they proved themselves by their progeny. The underlying principles of the progeny test are sound genetically. It is the aim of the scientific breeder to assess the transmitting abilities of his stock and, as has been mentioned, this is scarcely ever possible to a sufficient degree in the case of the female, although more often available in the case of the male with his large number of offspring. With ten daughters to a bull out of ten different dams, there are ten indications of the transmitting abilities of the bull, against only one of each individual dam. In the process of proving a bull it is obviously of primary importance that all his daughters be considered—that there be no selection. Systems which allow of the practice of testing only the best daughters or of considering a bull proved when he has a fixed number of daughters exceeding an arbitrary level of production are very inadequate. Information on the numbers and performances of low producers is as valuable as it is on the high producers." (Edwards, 9, 820.)

"Selection has as its objective the identification and propagation of those superior individuals which are believed to be capable of reproducing their good qualities in their offspring. Here the progeny test becomes extremely valuable, for by its aid—and I think no one will question its indispensability—it is possible to obtain a reading of each breeder's worth and thus recognize those individuals that should be continued in active service as well as the best manner of mating them in the future." (Goodale, 11, 486.)

"Improvement is next to—if not actually—impossible when bulls are selected for breeding at random, which is what selection without a progeny test amounts to." (Goodale, 11, 496.)

"Practically everywhere, the plant-breeders have abandoned their selection according to individual merit \* \* \* and resorted to some system of judging plants after their progeny." (Hagedoorn, 13, 191.)

"Repeated attempts by plant breeders, working with different species of both self-fertilized and cross-fertilized crops,

have failed to discover any sound basis for selection of parent plants except that which involves a progeny test." (Kirk, 15, 515.)

"Any of the progeny tests are better than selection on type and pedigree only." (Warwick & Copeland, 21, 181.)

From these positive statements of a number of modern authorities, it seems unquestioned that the progeny test is the most effective basis for selection available to either plant or animal breeders. It is obvious without discussion that the method can have no part in "natural selection."

#### PEDIGREE BREEDING

While the progeny test looks towards the qualities of offspring, pedigree breeding pays most attention to those of ancestors. This method, while still used, was of greater importance in times prior to widespread recognition of the value of the progeny test. It was, however, and still is an important part of artificial selection but of course cannot occur in nature.

#### COMMENT IN BRIEF, MOSTLY FROM OTHER AUTHORS

The usual fertility of domestic races when crossed is in strong contrast to the usual mutual infertility of natural species.

Races created by artificial selection, left to themselves, tend to revert to the original type. Natural species tend to continue as they are.

In artificial selection the old form may be preserved alongside the new. In natural selection the new is supposed to supplant the old.

The changes in natural evolution seem to be characteristically slow while very striking changes have been produced in a few years by artificial selection.

"Natural selection is not a force like that of the breeder who looks over his animals and selects some few that have a given character especially developed. The word 'selection' is here misleading. There is in nature no selector and no selecting. Nature does not select the best, but simply eliminates the worst. There is a great difference between a process that consciously picks out the best and one that unconsciously eliminates the worst." (Conn, 3, 70.)

"Under unconscious or natural selection only the most deficient of these characters are rejected; under conscious or

artificial selection by man only the most proficient are saved.” (Cook, 4, 279.)

“Domestication \* \* \* shows us only the conditions in which constructive evolution does not take place, even in nature.” (Cook, 4, 361.)

“While artificial selection involves intelligent choice in the destruction of superfluous individuals, natural selection, \* \* \* is non-selective. It involves destruction but not construction.” (Cuénot *vide* Gerould, 10, 121.)

Artificial selection proceeds under environmental conditions that are made uniform as possible; “the external environment when natural selection occurs is exceedingly complex.” (Bucholz, 1, 278.)

“Artificial selection sets a uniform standard of excellence of performance for all participants,” (Bucholz, 1, 279); in “natural selection” this is rendered impossible by the great diversity of environment.

While it will not be admitted by staunch selectionists, elimination in nature (or “natural selection”) is very indiscriminate. “In fact so complex is the environment \* \* \* that accident and chance really play a major role.” (Bucholz, 1, 279.) In artificial selection, on the contrary, individuals in the least undesirable may be rigidly eliminated.

“Where, as in nature, the variable offspring of an occasional cross goes under into the multitude, under cultivation aberrant individuals are apt to be noticed and given a chance to show their value. Under cultivation both processes in evolution, on one hand heightening of variability by crossing, and on the other hand reduction of variability by isolation, selection and colonization are exaggerated far beyond anything we can ever hope to find in nature. Propagation of plants and animals under domestication is essentially different from propagation in nature, as the former is essentially a continued system of colonization.” (Hagedoorn, 13, 231.)

“Man introduces animals into new conditions, teaches them new habits, or develops old habits, and the inevitable consequence is, that a considerable change takes place which transmutes species quite apart from any selective influences.” (Coe, 2, 132.)

“Natural Selection, which is supposed to dominate nature and largely to direct the transmutation of species, must act, if it acts at all, under disabilities which would make all the

efforts of Artificial Selection futile, and yet the experiment of Artificial Selection is cited as the most convincing proof of the reality of \* \* \* (Natural) Selection. \* \* \* No practical man would think of adopting the method which is supposed to take place in nature, because he knows that it would be a complete failure." (Coe, 2, 155, 156.)

"The essential factors which have been involved in the production of our best fruits, grains, vegetables, flowers, etc., have been (1) the improved conditions of domestication, (2) mutations, leading at once to new and better forms, (3) hybridization, which by new combinations of characters and as a result of heterosis has led to amelioration, and (4) the purification of previously mixed races or varieties by selective sorting. It is to the overwhelming importance of one or a combination of these factors that the 'experience of breeders' points and not to Darwinian selection." (Pearl, 17, 81.)

#### SUMMARY

There are enumerated in previous pages some fifteen to twenty differences between the processes of artificial and "natural" selection, and these are not all that have been pointed out in the literature. In several respects the two processes are diametrically opposite in character. Some of the most effective factors in artificial selection as pampering, conscious choice, and preservation on the ground of ancestral pedigree or progeny performance cannot possibly be a part of "natural selection."

On the other hand, the intensity of elimination of the immature, the rigid destruction of variations "in the least degree injurious," the severity of the struggle for existence, reducing every generation, whatever its increase, back to its original numbers, features which by hypothesis, or in fact characterize "natural selection," are quite different from the processes of artificial selection.

Darwin tried to show how "natural selection" is similar to the art of breeders, but if he had ever contemplated the matter in reverse he would have realized that the methods he attributes to Nature are not imitated by man, and that if they were the achievements of artificial selection would have been quite impossible.

To those fond of equations it may seem elementary to say that if  $a = b$ , then  $b = a$ . Even so elementary a test, however, has not been applied by selectionists to the dogma discussed

in this paper. If "natural selection" is similar or analogous ("precisely analogous" according to Romanes) to artificial selection, then artificial selection should be similar or analogous to "natural selection."

For variety's sake let us turn to the *Encyclopaedia Britannica* for definitions. There we learn that in artificial selection "the choice of the individual for further breeding is determined by (1) its appearance, (2) the record of its ancestry (pedigree) and (3) the record of its progeny (the progeny test)." (Crew, 5, 296.) All of these criteria can operate only through conscious choice and the second and third of them must have the aid of records. Surely only a hardy spirit can believe that anything at all comparable exists in nature.

As to "natural selection," we read, "according to Darwin, then, the chief factors which contribute to the process of evolution are variation, heredity, and the struggle for existence. To their combined action he gave the name 'natural selection' in analogy with the similar process carried out by man on domestic plants and animals." (Goodrich, 12, 920.) Since variation and heredity must be considered as of more or less the same value whether in the artificial or the natural process, it is apparent that everything depends on the meaning of "the struggle for existence"—Nature's "selecting" device. Extracting briefly from the definition of this struggle it appears that, "There is a perpetual competition for space, food, and all necessaries of life. \* \* \* If one [species] increases it must be at the expense of some other. \* \* \* on the average only two individuals can survive to replace the parents out of the whole number of offspring. As a rule the greatest destruction takes place when the organisms are quite young. \* \* \* Just as the intensity of the struggle may be measured by the death rate, so a variation is advantageous in so far as it lowers this rate; and this gives a measure of its 'selection value'." (Goodrich, 12, 923.)

We see nothing here of special care, or of conscious choice, of pedigree breeding, or of progeny testing, the whole of artificial selection; we see instead a formidable array of destructive processes all of which so far as possible are excluded from artificial selection.

If belief in "natural selection" depends on its analogy to artificial selection then that belief can scarcely prevail.

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