

# Heterozygote

If one Homozygote is superior to another, it will out it in the struggle for existence; and the Heterozygotes will no longer appear. We ~~may~~ <sup>need</sup> only consider the case when the Homozygotes are of nearly <sup>equal</sup> survival value.

If in such cases the Homozygotes are both superior to the Heterozygote, mutual infertility will arise, and two species will be formed. The infertility must be of such a kind as to cause no delay in getting a Homozygote mate. This is true of qualities dependent on single factors. Must it not also be true also of any group of factors in an organism? Of course in such a case the splitting action of selection due to infertility is somewhat <sup>inverse</sup> proportional to the number of factors in which infertility to the Heterozygote has to be created.

As to cases of heterozygotes being definitely superior to both Homozygotes to an approximately equal degree, here the action of selection would tend to create sterility when inbreeding takes place between Homozygotes, combined with fertility when they breed with a heterozygote, because in this way most <sup>one</sup> Homozygotes would be produced. If both Homozygotes

must be

Which must be simultaneous in the organism

became equally self-sterile, selection would not eliminate either of them; but the species itself would be more likely to be exterminated because of the production of large numbers of inferior homozygotes. If one homozygote only became self-sterile, it would be exterminated by the other, and the heterozygote, though superior, would disappear with it.

If this is correctly thought out, about which I am uncertain, heterozygotes always tend to disappear, except when they, and the two homozygous forms are of equal survival value, this being a very improbable state of things. It is true that when these qualities are all useless, natural selection will not act, and such useless forms might be more variable.

### Useless Characters

According to the theory of dominance, mutations may from the first be either beneficial or harmful. It cannot be denied, therefore, that mutations of an intermediate character must occur. These must, in fact, be harmless or nearly harmless mutations. Dominance must arise with every degree of obsceness. The extermination of the inferior allelomorph must also take place with every degree of rapidity, from

year to a maximum. Ought we not to see signs  
of these slowly disappearing mutations? The difficul-  
ties connected with useless characters always keeps  
cropping up.

Origin - VI page 126

as to species when they intermingle, "they are gen-  
erally as absolutely distinct from each other in every  
detail of structure as are the specimens taken  
from the metropolises inhabited by each." Can it  
be believed that all these differences of detail  
are dependent on the action of selection?  
Shapes of leaves and flowers are a good example  
of the difficulty.

Origin VI page 149 - "Many structures, now of  
no direct use to their possessors and may never  
have been of any use to their progenitors.  
Does this mean of direct use? I find it seems  
inconsistent with the concluding words of the  
para graph - "... the structure of every living  
creature now is, or was formerly, of some direct  
or indirect use to its possessor." <sup>Can</sup> ~~Prove~~ of this  
be true. ~~The word formerly cannot cover a~~  
~~very long period; if the constant appearance of~~  
~~mutations is a fact? We do not thus get rid~~  
~~of the difficulties due to countless mutations.~~  
~~Descent of Man & Manx Edition 1881~~

allotomorphs appeared in the same individual?  
It seems to me one needs somehow to have  
concurrent variance in the different things  
which have to be simultaneous or altered by  
natural selection. If the variance comes  
from added genes, and not allotomorphs, I do  
not see it makes things easier. Now I am  
nearly sure I have gone off the track  
somewhere, but it seemed fair to put down  
what is in my mind.

Take the series of horse like animals,  
illustrated at New York. Here is a long series,  
all in a sense admirably adapted to their  
environments, and yet a slow progressive change  
apparently always going on. This was the sort  
of fact needing explanation which I had in  
my mind in my article & correcting letter  
in our review. I think it should be kept  
well in view.

Did you notice in today's papers the  
tragic instance of the identical behaviour  
of identical twins?

Yours sincerely,

Samuel Dawson

"Descent of man. Library Edition 1888 Chap II page 92  
[This Chapter does not seem to appear in the 1871 Edition]

He "did not formerly consider sufficiently the existence of structures, which, as far as we can at present judge are neither beneficial nor injurious, and this he believed to be one of "the greatest oversights as yet detected" in his work. On page 93 he speaks of "peculiarities of structure, which neither are now, nor were formerly of any service to them, and which, therefore, are of no physiological importance". He seems to have become more convinced in 1874 of the existence of useless structures.

than before

### Variability as a test of N. S.

N. S. must act more quickly on the more important characters, and not at all on useless characters. I have been told that some one has sought to prove that N. S. has been at work by showing that the most important characters were the least variable, but that the results were negative. I do not see how the test could fairly be made. The rate of action of N. S. in different cases, and the rate of change in surroundings ought to be known. There is no common measure for intellect and height, for example. If ~~the~~ common measure is based on the degree

of variability, the argument becomes circular, and all qualities must be shown to be equally affected by N. S. We want a measure dependent on the difference in the rates in which mutations appear and <sup>or</sup> their magnitudes, and this we cannot get. All the same, though it may be illogical, the uniformity in the differences of structure in minor matters between intermingling species seems to me now to be inexplicable.

### The Species Problem

Bateson writes in his book, I think entitled Materials for the Study of Variation, page 16, that organisms are "arranged in a discontinuous series of groups," that environments pass "insensibly into each other," and consequently that organic forms "cannot have been broken into a discontinuous series of groups by a continuous environment." If we look at China covered with crackle (a sometimes at dry paint) we see it <sup>is</sup> divided into areas differing in size and width of separation from other areas. This is due to a shrinkage of a nearly continuous and uniform glaze, on the surface of the china. What has occurred is very nearly what Bateson said was impossible.

My pet analogy

This ~~is~~ appearance on china q'uis, in my opinion, the best picture of the formation of species. Crackles are, like species, "literally well defined objects." *Origin* page 128. A species may be defined as ~~an~~ aggregates of interbreeding individuals, of varying sizes and peculiarities of structure, which usually form the tendency of the individuals belonging to any such group to become more uniform in regard to their qualities. This tendency towards uniformity acts like the shrinkage of the glaze, and must tend to make organisms separate into groups.

I have discussed this point to the best of my ability in my *Organic Evolution* (Cambridge 1921) and will not here go over the same ground.

The only remaining difficulty seems to me to arise in regard to useless forms. I am not sure that somewhat more reliance might not be placed on the Hagedorn effect as a helping cause, though certainly not <sup>by</sup> itself.

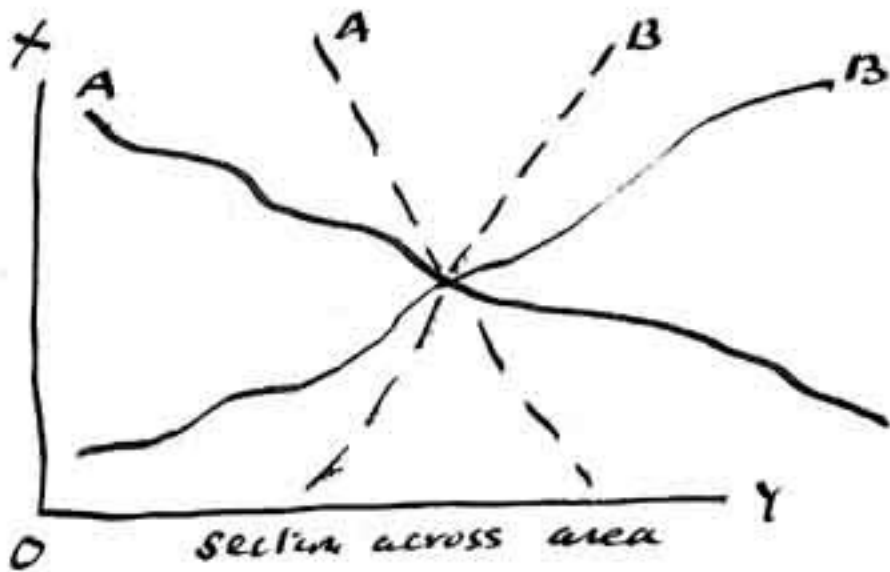
The pages of the *Origin*, as quoted in my Cambridge pamphlet, do not refer to the East edition. Sub-tract eight from the numbers there given, and you get near the numbers in the 4<sup>th</sup> 2 page edition.

The question of overlapping species give rise to some nice problems. See *Origin* bottom of page 126

Hand  
written  
thought

If two species in the same area are equally well adapted to their surroundings, then the contest between them depends solely on the relative rate of multiplication. Does not this tend to make each species take a definite area for itself? My father seemed to see this, but not with mathematical exactitude, and I am not quite sure that I see it either.

{ degree of adaptation to surroundings  
 { numbers in area.



A & B 2 intermingling species

L-O