

Variation in Plant Forms.

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## Variation in Plant Forms.

Whenever we think of the great advancement that has been made recently in the department of science - of the great steps that have been taken forward - of the many ideas once so prevalent that have been declared erroneous and thrust aside to be replaced by new truths - whenever we think of this great work that has been done our minds naturally turn toward the man Darwin who has been the shining light guiding so many minds in the path of truth.

No doubt his was the greatest mind that ever contributed to scientific knowledge. In him we see, as Prof. Wallace has said, the Newton of Natural History. It was he, with his great intellect, quick perception, and close reasoning, who created order out of chaos and established on a firm basis all scientific study. His greatest work is on "Origin of Species by Natural Selection and Preservation of the Favored in the Struggle for Life."

This book changed completely the prevailing ideas in regard to the origin of the different species of plants and animals.

Let us notice some of the ideas of the earlier naturalists in regard to this question of species formation or development.



They noticed the slight difference between different species and the idea came to some of them that one form might have been developed from another, but this idea was thought by the popular class to be absurd.

Lamarck, one of the early naturalists thought that the different species were due to different conditions such as food, climate, etc., but the general idea was that the species had always been as distinct and separate as they are now and that they had originated in some mysterious way - in some totally unknown process which they called "special creation."

Prof. Agassiz, one of the greatest naturalists of the last century, firmly believed in this view of special creation and farther, - he thought that each species was created in the locality in which we find them and in just the proportion that we find them.

But since Darwin's work has appeared, every thing has changed. Now every one who has at all earnestly studied the question has accepted Darwin's theory that "species are derived from



allied species by the ordinary process of natural birth," and this is not only applicable to the derivation of one species from another but to the development of many higher groups as well.

This theory of Darwins rests on two main classes of facts— 1<sup>st</sup> Organized beings have the power of reproducing or increasing in a geometrical progression. 2<sup>nd</sup> We always find in an offspring slight variation from the parent.

Considering the fact that plants and animals increase so rapidly— we might think that the earth would soon be over-run with organic life— But this is not the case. The numbers remain practically the same because many individuals die.

They die of starvation, are eaten by their enemies, are destroyed by natural forces, by rain, cold, heat, etc. We find in nature a perpetual struggle for life but many must die— so the question comes up Who shall live and who shall die?

Of course we see that individuals must differ in some respects or this question would be one of mere chance.



And it is true that they do vary in many ways. Some are constitutionally stronger and more vigorous, some may take on an obscure color to hide them, some may take on an odor obnoxious to their enemies, other plants may have the vigor to flower and seed early and thus gain a foothold or plants may be protected by thorns or prickles. Thus we see that in many ways some plants have advantages over others, and, although there is more or less chance connected with their life - the rule is that the fittest will survive.

Prof. Darwin devoted his life to study and experiments that would prove his hypothesis. His theory of specie derivation rests upon what is known as the "principle of heredity" or "transmission of variation". I will try and illustrate this principle — If we grow plants from seed and every year select the best seeds to plant the result will be an improvement over the first.

If we plant seeds from a plant having some variation, this variation



will go on increasing as long as it is useful to the plant. When the maximum of usefulness is reached it may change and a variation in some other line will show itself. In this way a plant may continue to vary - first in one direction then in another until the species looks very different from the parent plant and we may not see the relation at all. Plants which differ in this way are called species.

It is sometimes said that the variation which we find in cultivated plant forms is due to unnatural conditions, and that no such great variation would occur if the plant were left in its natural state. Now this latter statement can be proven erroneous by many examples that we might give showing great variation under natural conditions, and, indeed, we find that this is the rule rather than an exception.

In a large genus like the willow, botanists find it very hard to distinguish species because there is such a



tendency toward variation.

De Candolle made a special study of the oaks of the world and he found them to vary widely in —

1. length of petiole and form of leaf,
2. markings or cuttings on edge of leaf,
3. margins entire, notched or even pinnatifid,
4. tip of leaf acute or blunt,
5. base may be sharp, blunt, or cordate.
6. surface smooth or pubescent,
7. perianth varies in depth and lobing.
8. stamens vary in number.
9. anthers mucronate or blunt.
10. fruit stalks vary in length.
11. number of fruits vary.
12. form of base of cup varies.
13. scales of cup vary in form.
14. the proportions of acorns vary.
15. the time of acorns ripening<sup>g</sup> & falling off varies.

In the little *Anemone Caroliniana* the variation is very noticeable. Fifty-five flowers were examined and they were found to vary in many ways. The greatest number of sepals found in one flower was 36. Two flowers had 14 sepals each — which was the minimum number found



Below may be seen the representative curve which shows no uniformity.



I have spoken of variation in leaves and flowers but plants may vary in many ways.

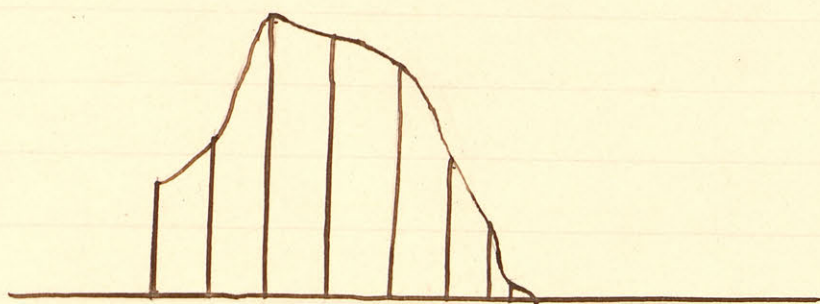
We all know that in this world no two human beings are exactly alike so with other animals — they each possess an individual countenance —

and the same phenomenon occurs in the vegetable kingdom. If we stop and look closely at the plants we shall find many, many little differences. They may be in size, in mode of growth, shape or color of leaves or flowers or fruit.

We also find in plants what we call constitutional variation. Plants may vary in such a way as to become gradually adapted to a different climate than the parent had. The orange, it is said, was very tender when first taken to Italy, but gradually became acclimated



There was variation between these numbers - and we can easily see by means of a curve that the variation is not uniform. - There seems to be no law regulating it. Below we have drawn the irregular curve showing the variation in the number of sepals.



The width and length and color of sepals varied noticeably. We found a white color generally on the upper surface, while the color on the under surface was white or shading from a pink to a blue.

On examining the leaf of *Alseodaphne glabra* I found quite a tendency toward variation in form, size, and number of leaflets.

Number of leaflets -  
Number of leaves possessing  
above number of  
leaflets

|  | 5  | 6 | 7  | 8 | 9 |
|--|----|---|----|---|---|
|  | 17 | 9 | 70 | 8 | 1 |

Total counted

105



and now it is perfectly at home there.

Some plants differ widely from others of the same species in their constitutional power of resisting frost and extreme heat.

Besides this variation in individual plants we find what is known as bud variation. - a term meaning any "unusual or striking form or branch appearing upon a plant."

No two branches on a tree are exactly alike. Some may grow longer, some more erect, others have greener leaves, or there may be many differences among the branches.

Then, too, it would be hard to find two leaves exactly alike in every way, and the flowers also may vary much in form, color, etc.

The causes of this bud variation are thought to be the same as the causes that create the differences in individual plants - that is - the different conditions in regard to food and temperature.

Every farmer boy knows that the best



apples grow up in the top most branches, but I wonder if he knows why it is so? These top branches by means of their position receive the most food from the air and in the presence of the bright sunlight the food is quickly and thoroughly elaborated.

We find in plants a struggle for existence between the weak and strong branches the same as we found existed between weak and strong individuals.

The principle of selection ~~may~~ <sup>can</sup> be brought to bear upon these bud variations and we can by graftings and cuttings perpetuate these variations.

Every horticulturalist when he wants the best quality of scion will take it from the top branches. Many of our best known roses and carnations - also other flowers have been grown from cuttings. Florists have selected the branches that had a tendency to vary and in this way a great many varieties have been grown.

In many plants, as the banana and pineapples, seeds are practically unknown.



but by bud propagation we have obtained many varieties.

Bud variations are commonly less noticeable and less marked than seed variation - Why is this?

There are probably several causes. The phytons originate from one parent, not from two; the environments of the phytons are less varied than those of individuals.

Some one has said, "as generations increase the tendency to variation must be greater because the impressions of a greater number of ancestors are transmitted to it."

If parents are considerably unlike each other in their characters there will be greater variation. Hence crossing tends to produce new forms and it also tends to strengthen the offspring.

Now, since we have noticed a few points in regard to this tendency to vary and adapt themselves better to conditions, let us see what man has done by taking advantage of these tendencies. He may, by carefully growing any particular variation increase it. This is called "natural selection."

Suppose we have a plant with an



edible fruit and we wish to increase the size of the fruit. We select the seed of the largest fruit we can find and plant them giving them good soil and other advantages. The result will be that the average size of this season's fruit will be increased. Again select the seed from the largest fruit and plant them. Continue this - year after year and we will obtain an improved kind.

Curious examples of what may be done by cultivating - or perpetuating and developing these variations are found in the cabbage and lettuce growing in our gardens. Some varieties have the leaves arranged in a round, solid head - some have curiously crinkled leaves - and others have a purplish leaf.

From the same species as the cabbage comes the braccoli and cauliflower in which the leaves are similar to the original form but the flowers are developed into a round, compact mass.

The brussels sprouts are another form of the same plants in which the whole mode of growth has been altered.



We find little bunches of leaves growing on the stem.

In some plants the ribs of the leaves have been thickened and become a delicate vegetable.

In the Kohlrabi the stem grows into a turnip like mass just above the ground. All of these mentioned above - developed as they are in different directions - originate from a species of plants which may still be found growing wild.

We may increase and multiply variations in any part of the plant. The examples given above are variations in leaves principally but in peas, beans, and such plants we select the variations in pod development, while the flower remains practically the same.

In such plants as the potato and turnip it is the underground parts that we have taken care to cultivate.

We may, by selecting variations, obtain varieties differing much in color, form, size, time of ripening, etc.

When we think of the many varieties of apples - Apples of all sizes, colors,



and flavors - apples that vary in time of flowering and ripening, apples that vary in so many different ways - we almost exclaim - "Is it possible that all of these have been developed from one species?"

Yet this is true. It is now known that all apples came originally from the hedge crab known as *Pyrus malus* - which may still be found growing wild in many places.

All of our garden vegetables and plants have been developed in just this way - by taking care to improve the variations. But often it is hard, and in some cases impossible to trace them back to their wild, uncultivated ancestors, because man has been growing them for so many years and they have varied in so many ways that they are wholly unlike their original parents.

Most of our cereals are unknown as truly wild plants.

This tendency toward variation has been taken advantage of, also in the cultivation of flowers.



The florist watches for any little difference and, if he thinks it will benefit the plant or add to its beauty, he takes pains to cultivate it and increase it. In this way when a certain flower, as the rose or Carnation, becomes fashionable many varieties are grown.

Man, in his cultivation of different varieties has worked solely to please himself - to satisfy his love for the beautiful, or his desire to get something new and the result has shown many strange things.

Some times in his work he has cultivated variations that are useless and sometimes even injurious to the plant. For example - some flowers have been doubled and grown in such a way that now they will produce no seed at all and we must always grow them by cuttings or grafts.

Now since we see that there is always this tendency in plants to adapt themselves better to conditions - constantly undergoing modifications which give them supremacy over



other species, why do we still find such low forms of life as diatoms, fungi, algae, etc.? Why have they not been improved?

The reason is that they occupy a place in Nature that no other plant could occupy. They have no competitors — no rivals — and there is little or no power to change or modify them.

In order that plants may vary there must be competition of some kind. There must be something to be gained — some motive for action.

This struggling and rivalry we find going on all the time among the higher plants, and this is all the time leading them more and more toward perfection.

But what will be the effect of all this? Prof. Wallace says — "Its primary effect will be to keep each species in the most perfect health and vigor — with every part of its organization in full harmony with the conditions of its existence."

It prevents possible deterioration



in the organic world and produces that appearance of exuberant life and enjoyment of health and beauty that affords us so much pleasure." and it is this that makes this world the pleasant place that it is.