tal man; but to attain the knowledge, to see the magnificent orderliness and progress, to be profoundly impressed with the infinities of space and time which it silently suggests, is to have gained a treasure that lasts as long as life will last. So also geology has a sublimity of it own, slowly reached by many steps and much toil. And, above all, the great ideas of natural law and harmonious adjustment can only be obtained by patient study in the fields of science; and are they not priceless to those who have in any degree won them? Who can contemplate our globe in this orderly system of the universe, with all the delicate adjustments that astronomy reveals, and all the splendid mechanism of the heavens—contemplate our atmosphere,—the distant sun darting its light and heat and power on the globe, and fostering all the varied and beautiful animal and vegetable life, giving rise to winds and showers and fruitful seasons, and beauties of form and richness of colour, filling our hearts with food and gladness; who can know something of the inexorable sequences, see something of the felicitous combination of all the varied forces of nature that are employed,—and not feel impressed and awed by the view; not feel he is in the presence of a Power and Wisdom that as far transcends the power and wisdom of man as the universe surpasses a watch in magnitude?

> " To see in part
> That all, as in some piece of art,
> Is toil, coöperant to an end "

is to see that which he who sees it not is as incapable of estimating as the deaf man is of judging of music, or the blind of enjoying the glories of a sunset. Such are some of the ideas which crown science, and it is not granted to us to attain them except by slow degrees. Step by step must the growing mind approach them; and to exclude from our schools the preliminary steps is to debar from the attainment of such ideas all whose leisure in after-life is so curtailed that they can never break ground in any fresh subject for thought or labour.

To be continued.

On the Ways in Which Mechanical Powers &c., Are Illustrated in the Vegetable and Animal Kingdoms.

(A paper read before the College of Preceptors London; by the Revd. S. Henslow. M. A., F. L. S.)

The paper, which I have the honour of reading to-night, does not profess to be of a high character; nor probably will it furnish much material for useful discussion. My object is simply to draw attention to a few of the exquisite contrivances and adjustments of nature, some of which (from the vegetable kingdom) have never yet been noticed as furnishing illustrations of the mechanical powers.

The animal kingdom is so well known to be replete with beautiful examples of levers, &c., that I shall only attempt to describe a few which seem to possess an especial interest.

Illustrations from the Vegetable Kingdom.—Before describing the mechanical actions as displayed in plants, it will be necessary to state briefly the structure of a flower, and the purposes of its several "*organs*"; so that those who may not already possess that knowledge, may have a clear understanding of their nature and functions.

If the blossom of a Sweet Pea be taken as a type, a brief inspection shows that the outermost *whorl* consists of a small green cup with five minute points on the margin. This constitutes the *calyx*, out of which the coloured parts called the *corolla* appear to rise. The five *petals*, which collectively from the corolla, are of different shapes and receive special names; the largest and uppermost is called the *standard*, the two lateral ones form the *wings*, while the two lowest and partially cohering petals form the *keel*.

Within the keel petals are the *stamens*. Each stamen consists of a thread-like *filament* supporting a two-celled *anther* at the summit. The anther contains a powder called *pollen*, which is the fertilizing agent of the flower. It will be noticed by a very careful examination, that there are in this flower ten stamens. Nine of them are united along the greater part of their filaments; the tips of which, however, and which support the anthers, remain free. One stamen only, lying along the upper side, is entirely free from the others; so that the nine filaments form a tube split along the upper edge, the single free stamen lying along the slit. If now the tube of stamens be carefully removed, they will be found to enclose the fourth organ of the flower, or the *pistil* better known in its subsequent growth as the *pod* full of *pease;* but at this early stage the pease are but rudimentary papillæ, projecting downwards within the cavity or *ovary* along its upper edge. They are now called *ovules.* Three parts of the pistil may be recognized: the broad and hollow part containing the ovules is, as just stated, called the *ovary;* the contracted and solid extremity curving upwards, is the *style;* and lastly, the extreme tip is called the *stigma.*

Now the point which must be borne in mind, though I must refer the reader to some elementary work on Botany (1) for further details, is that *the ovules will not be developed into seeds* (*i.e. pease*), *unless the pollen from the anthers be placed upon the stigma*, by which means the fertilizing power of the pollen is communicated, through the style, to each ovule individually, and which then becomes capable of development into on independent life-possessing seed.

There yet remains to explain the purpose of the following mechanical contrivances—and that is, what has been called *the intercrossing of distinct flowers.* It appears to be a universal law in nature, that continued self-fertilization is undesirable, if not prejudicial, by lessening the vigour of the plant's descendants. That, although there may be stamens and pistil in the same flower (though this is far from being universally the case), and thus secure the possibility, and even probability, of self-fertilization by the pollen reaching the stigma, yet the various mechanical contrivances, as well as all cases of *irregular* flowers, (*i. e.*, where the petals of the corolla are not all of the same form,) are probably adaptations to secure the agency of insects to transfer the pollen from one flower to another.

The Lever.—The examples which illustrate the lever are principally of the third kind; (2) though the genus *Salvia,* "sage" furnishes a most remarkable instance of the first.

In the great majority of plants of the *family* to which the Pea belongs, the flowers illustrate the third kind of lever; for the keel and wing petals are generally locked together by means of small projections on the former, which fit into depressions on the latter; while all four petals have slender supports or *claws*, by which they are attached to the base of the small cup-like calyx, and which form the long arms to the levers. If the point of attachment be regarded as the fulcrum, the resistance of the calyx the power, and an insect the weight; then, when it alights upon these petals, its weight immediately causes them to be depressed, and at the same time the stamens are exposed, the anthers come in contact with the insect, and the latter is dusted with pollen, which it transmits to the stigma of another flower by repeating the same process.

As illustrations, the following genera of the Pea family may be examined - Pea, Laburnum (species of Cytisus), Lupin, Melilot, &c.

In the Red Clover, a slight modification occurs, in that the margins of the standard petal are rolled round and unite below, so forming a tube, to which the claws of the wings and keel are attached, so that the lever is shortened into a sort of spring. The humble bee, which alone visits it, by standing on the "wings,"

(1) Prof. Oliver's "Lessons in Elementary Botany" (Macmillan) may be consulted with advantage.

(2) The Author assumes a knowledge of the simple mechanical powers on the part of the reader.