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NOTES ON SOME PLANTS OF THE HIMALAYA.

A PAPER READ BEFORE THE NATURAL HISTORY SOCIETY
OF TONBRIDGE SCHOOL, ON MAY 11TH, 1895,

BY

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(AN OLD TONBRIDGIAN).

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HIMALAYA.

BY COLONEL SIR HENRY COLLETT, K.C.B.

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WHEN your Secretary did me the honour of asking me to read a paper before the Natural History Society of my old School, my heart misgave me, for literary composition is an art in which I have had but little experience; and the one department, or rather corner of Natural History, with which I can pretend to anything approaching an accurate acquaintance, is the botany of the North West Himalaya—a subject that did not at first sight appear to promise much interest for the present audience.

But it occurred to me on reflection that some of you may perhaps at some future time find your way to India, and that at the least, you may have brothers or other relations in that country; so I thought it might interest you to enquire, to what extent some of the common plants and flowers, you are now accustomed to see around you, are likely to be met with in India.

Now I may say at once that on first landing in Bombay or Calcutta, or when journeying across the vast plains of the Indian peninsula, you will see but very few, or perhaps none, of your old friends. From the foot of the Himalaya to the shores of Cape Comorin the trees and plants will, as a rule, be of strange and unfamiliar aspect. But when you begin to ascend the lower slopes of the mighty ranges of snow-capped mountains that close like a huge fortification the northern frontiers of India, the scene suddenly changes, and you will at once joyfully recognise, in many shrubs and wayside flowers, some of the familiar friends of your boyhood.

I have a very vivid recollection of my first visit to the hills, and can almost feel again the delight with which, after nearly two years passed in the arid plains of the Punjab, I found myself on a hot September morning riding up hill along a shady path, the air becoming every moment cooler and fresher, and the roadside more gay with flowers that seemed to me of familiar form and colours. I have now the honour, however, of addressing a Scientific Society, and I feel that it will not do for me merely to indulge in vague recollections of this kind. You rightly expect to be told something precise and exact regarding those pretty flowers on the roadside, and so, with the help of Hooker's "Student's Flora of the British Isles," and the same author's "Flora of British India," we will endeavour to enquire, as carefully and accurately as we can, to what extent we may expect to find certain common types of English plants

or their allies growing on the slopes of the Himalaya. Taking the whole number of English flowering plants, I find that of the ninety-four Natural Orders included in Hooker's "Flora," all but seven—and those of minor importance—are represented in the Himalaya. Please mark the word *represented*, for, as we shall see hereafter, it is the exception to find the exact species as we know it in England, growing even in the temperate regions of the East. In most cases local conditions of rainfall, temperature, the qualities of the soil, the presence of other competing plants, and the thousand other circumstances that go to form what naturalists call the environment or surroundings of a plant, have combined to produce an individual which though manifestly more or less closely related to our English friend, is at the same time certainly different, and bears amongst botanists a distinct specific name.

In order to get some definite and clear notions into our heads on this important point, let us take the first Natural Order we come to on opening our botany book, the *Ranunculaceæ*, or Buttercups, so called from the principal genus the Order contains, and let us see to what conclusions a comparative examination of its British and Himalayan species will bring us. In the first genus, *Clematis*, we have in England a single species called *Clematis vitalba*, popularly known as Old Man's Beard, or Traveller's Joy, and common in the Kentish hedges. In the Himalaya we find no less than fifteen species of this genus—a fact, by the way, that illustrates the comparative poverty of our more northern flora—but strange to say of

these fifteen species, the flowers of all of which any of you would probably at once recognise as being a clematis of some kind, not one *exactly* resembles our 'British *Clematis vitalba*, and so we are entitled to say that this particular plant has not travelled so far to the east as the Himalaya, though there is a species, *Clematis gouriana*, common in the lower hills about Simla which resembles our plant sufficiently closely to attract the attention of the passing Englishman.

This little fact regarding the eastward extension of *Clematis vitalba* tempts me to make a digression for the purpose of saying something about that important branch of botanical science, known as Geographical botany, or, as it may be called, the Distribution of Plants, a department of knowledge that has been much extended during recent years, and that has, in the hands of Wallace, Hooker, and others, been made to yield many valuable results. You will have understood fairly well what I mean by the example already given, and the method of enquiry by means of which our knowledge regarding the range of plants has been attained, may be summarized somewhat as follows. To begin with, we have the gentleman known as the systematic botanist—a useful individual whom the ultra-scientific world has been rather inclined to depreciate of late—who takes our Travellers' Joy, or any other plant, from the nearest hedge, examines it carefully from one end to the other, and writes down an exact description of it, containing full details of its habit of growth, and structure of root, stem, branches, leaves, flowers, fruit, and seed. He then dries specimens

of the plant and deposits them in a Herbarium ; gives his plant a name, translates his description into the dog Latin comprehended by the scientific of all civilized nations, and publishes his description, accompanied, if possible, by a good drawing, in a book, or in some recognised scientific journal. By this means botanists all over the world are able to know exactly what particular plant is meant when one or other of them speaks or writes of *Clematis vitalba*, and when travellers bring home collections of plants from foreign countries, and these are compared with the herbarium specimen and the published description, botanists are able, after a considerable expenditure of care and trouble, at last accurately to define the geographical range of this or of any particular plant, and to say, for example, regarding our Traveller's Joy, that it grows throughout Europe from Holland southwards, extending into Northern Africa, and on the eastward to the mountains of Asia Minor. Thus you can understand that in the course of time, and as a result of the labours of many systematic botanists and of many explorers, we have now collected this kind of knowledge regarding many thousand different plants from all parts of the globe. But, I beg you to observe, this knowledge is all founded upon the labours, first, of travellers who are at the trouble to collect the plants, and, secondly, of botanists who describe and compare them, and are thus enabled to publish local Floras, as descriptive lists of the plants growing in particular countries or districts are called. Of course, we often get the botanist and the explorer combined in the same individual, and when this is the

case, it is all the better ; as a matter of fact, however, the mere description of a plant's structure can be taken nearly as well from properly dried specimens as from living plants. You will now be able to see that by co-ordinating the knowledge thus gained regarding the distribution of plants, and combining it with similar knowledge gained respecting the distribution of animals, scientific men are able to arrive at trustworthy conclusions regarding a great variety of natural history problems, among which may be mentioned, as perhaps the most curious and interesting, the deductions which have been drawn therefrom regarding the distribution of land and sea over the earth's surface in bygone ages. For instance, we find our own islands peopled with plants and animals that are all of the same kind as are found on the neighbouring continent of Europe, and we infer that at some period, probably not very remote, these islands were joined to the continent, a conclusion that is further supported by arguments drawn from the sister science of Geology. Or, we find a group of islands, such as the Sandwich Islands in the Pacific Ocean (where I once passed a delightful three weeks), containing about six hundred and twenty species of flowering plants, of which no less than three hundred and seventy-seven, or about three-fifths, are absolutely peculiar to this small group of islands, and exist nowhere else on the globe : facts which warrant the belief, also in this instance supported by geological considerations, that there has never been continuous land communication between these islands and either America or Australia, the two nearest continents.

Many other instances might be given of similar inductions from the facts observed regarding the geographical distribution of plants and animals combined with geological structure, and you will perhaps forgive my reminding you in this connection of the classical investigation by Darwin of the fauna and flora of the Galapegos Archipelago described in his delightful "Naturalist's Voyage Round the World." It was this investigation, you will remember, which led Darwin to undertake the long and laborious series of observations that resulted in the publication in 1858 of his famous book on the "Origin of Species," an epoch-making work that may be said to have established, on a sure scientific foundation, the principle of evolution in the animal and vegetable kingdoms. The Galapegos Islands are a small archipelago about five hundred miles from the western coast of America, and Darwin discovered that though most of the species of animals and plants now living thereon are peculiar to the islands, and are found nowhere else, yet that they all show a marked relationship with the plants and animals of America. These facts led to the conclusion that the islands were originally stocked with plants and animals from America which had during subsequent ages, owing to altered conditions of life, varied into the peculiar forms now seen there: such forms being on various accounts better suited to the circumstances of their island existence than the forms originally imported. This conclusion proved of the highest importance in relation to the question of how species originate, and the moral I wish to draw is that it

could never have been reached except by means of an accurate knowledge of the distribution of animals and plants on the continent of America, and in the islands of the Galapegos Archipelago; for it was on this knowledge that all Darwin's arguments and deductions were founded. You will thus be able to realize the importance to science of first collecting plants, and then accurately describing them.

We have however made too long a degression, and it is high time for us to return to our examination of the English and Himalayan *Ranunculaceae*. Taking the next genus to *Clematis*, namely that of the *Thalictrums*, or Meadow rues, Hooker describes three species as British, and seventeen as Himalayan, thus again illustrating the poverty of our flora as compared with that of the more southern and much larger area embraced by the term Himlaya. In the third genus *Anemone*, we have two British and five Himalayan species: of Larkspur (*Delphinium*) one British species and twelve in the Himalaya: of Monkshood (*Aconitum*) we find one British and seven Himalayan species; while of the remaining British genera of this Order: viz, Pheasant's eye (*Adonis*), Marsh Marigold (*Caltha*), Globe flower (*Trollius*), Columbine (*Aquilegia*) and *Actæa*, or Baneberry, we find them all represented in the Himalaya by identical or closely allied plants. The only British genus of *Ranunculaceae* which we do not find in the Himalaya is the Hellebore: and the only genus which has a greater number of species in the British Isles than it has in the Himalaya is that of the Buttercups proper (*Ranunculus*) of which we count

twenty-one in this country and only eighteen in the Himalaya. We thus obtain, as a general result of our comparative examination of this Order, that, of the ten British genera, all but one are found in the Himalaya, while I may add that the Himalaya possess in addition no less than seven genera of *Ranunculaceæ* which do not exist in our islands, with the names and descriptions of which I need not trouble you. So you see that when the time comes for you to visit the Himalaya, after perhaps two or three years spent in the plains, your eyes will be gladdened by the sight of nine familiar genera of *Ranunculaceæ*, while during your previous stay in the plains, you will have seen but two or three Buttercups sparsely distributed over Northern India, and flowering only during the short cold season : and if you happen to have visited the tropical jungles or Eastern Bengal, you will perhaps also have seen there one species of *Clematis*. But during these years in the plains you would have seen no Meadow Rues, no Anemones, no Larkspurs, or Monkshoods, or indeed any other of the genera we have mentioned as decorating the grassy slopes of the Himalaya. And now let us take another Natural Order, say the *Compositæ*, a large, well defined and almost universally distributed assemblage of plants, some species of which, such as the Daisy, Dandelion, and Thistle, are well known to all of you ; and let us mark what result a similar examination of its genera and species will yield to us. In Hooker's Student's Flora we find forty-two genera, containing some one hundred and sixteen species described as British, while in his Indian Flora we have

eighty-seven genera with three hundred and sixty-two species recorded as occurring in the Himalaya. Of the forty-two British genera, thirty-four have identical or representative species in the Himalaya, thus leaving only eight genera not there represented. Of the one hundred and sixteen British species, we shall, if we have luck and climb high enough, recognise thirty-five on the mountain tops of those far distant regions. We have therefore in the Himalaya thirty-four British genera out of a total of eighty-seven, and thirty-five British species out of a total of three hundred and sixty-two : or in other words, we have in the Himalaya forty per cent. of the *genera* British, but only nine per cent. of the *species* British.

The general conclusion therefore to which we are led by our examination of these two large Natural Orders, is that while our British genera are well represented in the Himalaya, comparatively but few identically the same species extend over both areas. This is so much the case that the non-botanical visitor, who does not accurately discriminate species, imagines himself to be surrounded by what he calls "English plants," whereas the more exact eye of the botanist educated at Tonbridge School, perceives indeed that many of the plants on the road-side bear a general family resemblance to the friends of his youth, but that they nearly all differ in more or less important respects from the English species; and I think that we may now take this inference as established by sufficient evidence. I wish in passing again to draw your attention to the manner in which we have arrived at this deduction. Science is nothing if it be not strictly accurate, and

unless we had the fruits of the labours of many botanists extending over many years to work on, we could never have ascertained even this simple fact, viz:— that the temperate flora of the Indian mountains has a strong family resemblance to the flora of England, though it contains but comparatively few English species. Each of the several hundred species we have dealt with have been carefully collected, dissected, drawn, described, and laboriously compared with its allied species: and it is only from possessing the results of these labours embodied in printed Local Floras that we are able to define with certainty the range of any particular plant, or to say that such and such a British genus is, or is not, represented in the Himalaya.

I will now mention a few more common English plants of other Natural Orders to be found in the Indian hills. Of violets there are several species, the common dog violet being one of them, though not the most abundant: most of the Indian violets are nearly devoid of scent, the English sweet violet not being seen east of the Cashmere mountains. High up, near the snow, at elevations of from nine to ten thousand feet above the sea, and along the whole length of the Himalaya we find a very pretty little yellow violet (*V. biflora*) reminding one in its habit and shape of the English *Viola tricolor*, the supposed origin of the garden pansy. Strange to say that though this yellow violet, which is also found in the Alps, rarely descends below nine or ten thousand feet in the Himalaya, I found it when in Burma, in a far more southern latitude, growing at less than half

that altitude on the hills bordering on the Siamese frontier. I mention this fact as an illustration of the capricious manner in which some plants appear to be affected by mere altitude above the sea. St. John's worts are also common plants, three of the Himalayan *Hypericums* being almost precisely the same as English species. The Indian Brambles number many beautiful species, and Sir Joseph Hooker has made the observation that the species of this puzzling genus appear to be better defined in the Himalaya than is the case with the *Rubi* of Northern Europe.

It is curious to observe how in some large genera, such as the Brambles and the Hawkweeds (*Hieracium*), the numerous species are all more or less connected with each other by intermediate links, rendering the identification of the species as described in Floras a difficult, and indeed in some cases, an almost impossible task. The fact is a good illustration of the extremely arbitrary nature of the term "species," and of the difficulty in such genera, at least of defining what particular forms should be regarded as species, and what as varieties. It is all very well, for instance, to take a small genus as *Primula*, at least as developed in our British Flora, and to say that we have five distinct species. No one is likely to dispute the assertion. But if, on the other hand, we take the British Hawkweeds, the case is entirely different; Hooker gives us ten species, all except one owning several so-called sub-species or varieties; Babington gives us thirty-three species; while specialists, that is botanists who have made a special study of the genus, have recently presented us with a list of no fewer

than one hundred and three specific names, besides varieties. The same remarks apply to the Brambles, and to other genera that might be named. The fact is that in these assemblages of closely allied and much varying plants, we seem almost to have caught Nature in the act of manufacturing species, to see her as it were in her workshop. Reasoning from what we believe to be analogy, it is not perhaps too much to expect that in some future age, distinct forms of Hawkweeds will have asserted their superior fitness for surrounding conditions, connecting links will have disappeared, extreme variability will have ceased, and we shall have a series of clearly defined species, instead of a number of slightly differing forms, as we have at present. Of course all plants always vary more or less, and it would probably be impossible to find any two examples of a species that exactly correspond in every detail of their structure. When therefore we talk of the description of a plant, the term must be understood with discretion, and you must not expect, especially when dealing with a large Flora like that of India, to find the individual specimens you have gathered agreeing in every detail with the descriptions printed in your book. Practice and experience can alone lead to a sound judgment in these matters, for such subordinate points as colour, hairiness, etc. are extremely variable, and appear to depend in great measure on local conditions of soil and climate.

But to return once more to our Himalayan plants. Perhaps nothing will more strike the new arrival with astonishment, especially in the moist climate of the

Eastern Himalaya, than the extraordinary variety and profusion of the ferns, and the multitude of forms which the members of that beautiful order assume. I have heard a good botanist say that he could gather at least three hundred species within a short walk of the station of Darjeeling, and though my personal experiences of that locality are small, I can well believe it. Even in the neighbourhood of Simla where we have a severe winter with much frost and snow, and a dry season that sometimes lasts for three or four months without a drop of rain, I have myself gathered nearly seventy species. Now compare these numbers with the thirty-eight species of ferns we have scattered over England, Scotland, and Ireland, and you will have some idea of the good time that awaits those of you who are fern hunters, and whom a happy destiny may hereafter lead to Darjeeling. Of all the graceful forms in Nature, I often think that none attain the extreme beauty of simplicity exhibited by the tall stem and waving fronds of a tree fern; and these exquisite plants may be seen spreading their finely-cut pinnules over the dense foliage of a tropical jungle by anyone who will take a railway ticket from Calcutta to Darjeeling, an easy journey of less than twenty-four hours. Another beautiful form of fern life that is strange and unexpected to anyone acquainted only with European ferns, is the climbing *Lygodium*, which twines its slender stem round the culms of the gigantic elephant grass that cover miles of low-lying country along the base of the Eastern Himalaya.

I have said that the visitor to the mountain regions of

India finds himself surrounded by temperate, and often by British types of vegetation, but the flora of the Himalaya is not, of course, exclusively composed of these plants, as it includes many others of strange and tropical aspect. I may perhaps be permitted to advert for a few minutes to one of the most common and conspicuous of these. As the traveller passes through the bare hills which intervene between the forest of the lower ranges, and the pine-clad slopes on which the modern city of Simla is built, he will be struck by the frequent apparition of tall candelabra-like looking plants with thick fleshy stems, which, in common with most European residents, he will probably put down as some species of cactus. But if our observant traveller should happen also to be a botanist, and to possess some knowledge of the distribution of plants, he will be aware that, except the prickly pear (which has no doubt been introduced), plants of the cactus order are found only in America. When further he proceeds to examine the numerous small yellow-green flowers that the column-like branches bear along their edges, and especially when he notes the thick, sticky, milky juice that exudes when he pulls off a flower by its stalk, he will have no difficulty in making up his mind that these strange looking plants with fleshy green angular branches rising up to a height of from fifteen to twenty feet probably belong to the Natural Order of Euphorbiaceæ, a widely spread and most valuable Order in the East, which our traveller will remember as represented in England however by only three genera, namely, the lowly Spurge, the coarse weed called

Dog's Mercury, and the common Box. When our traveller arrives at Simla and is able to compare the flowers he has torn off with the description in the Indian Flora, he will no doubt ultimately identify his plant as *Euphorbia Royleana*, so called after the famous old Dr. Royle, one of the fathers of Indian Botany, who more than fifty years ago published a grand old-fashioned work on the plants of the Himalaya, which is to this day a valuable and useful book. It is curious to observe the manner in which this species of *Euphorbia* has, so to speak, assumed the appearance of a cactus, and to endeavour to trace the reason of its departure from the habit of its nearest relatives. The cactuses, as we know them in our greenhouses, are, you will remember, very odd-looking plants, characterised by thick fleshy succulent stems and branches and a general absence of true leaves. The reason usually assigned for these peculiarities of structure is that cactuses grow in the arid plains of Mexico and similar places, where evaporation in the dry air is so rapid that ordinary leaves and stems would soon dry up and be killed. Now the *Euphorbia Royleana* is a plant of the stony hillsides of the outer and lower ranges, where a fierce sun draws out the scanty moisture from the soil, and where for several months in the year everything gets quickly dried up. The conditions of existence of this *Euphorbia* are in fact very much the same as those of the cactuses of the Mexican plains, and our plant has, we see, adopted similar means to escape death by dessication. Indeed, several plants belonging to different Natural Orders could be named which have

adopted the cactus habit as the most suitable to their surroundings. There is a vine not uncommon in the Lower Himalaya, *Vitis quadrangularis*, whose stem is thick, fleshy, and angular like that of a cactus. Again, on the dry plains of Upper Burmah, we have a composite, *Notonia crassissima*, which, as indicated by its name, is remarkable for its thick, fleshy branches. And once again, on the rocky limestone hills of the Peshawar frontier, there is a plant called *Caralluma edulis*, one of the *Asclepiadaceæ*, an order which in England we can only see in greenhouses, with fleshy, angular branches, exactly similar to those of a cactus, and which are, as indicated by the name, cooked and eaten as a vegetable. Thus, speaking merely from memory, I have named three other plants belonging to three different and widely separated Natural Orders, all growing in hot, dry situations, and all characterised by possessing the thick, succulent stems and branches of the *cactaceæ*, natives of the plains of Mexico. Nothing in the vegetable world is, I think, more worthy of note than the fact that plants, having no possible community of descent, adopt identically the same, or closely similar means of protection from similar dangers or enemies. The same thing occurs among animals and insects, and shows how often, though not invariably, similar structures are produced in similar surroundings.

Now I think by this time you must have had a sufficient dose of botany proper, and I will forbear from inflicting on you further descriptions of the numerous interesting plants of the Himalaya. The subject indeed is almost

indefinite in extent, and I am reminded of a certain evening, several years ago, when I was strolling through the Eden gardens at Calcutta, and noticed a tree in flower which was new to me. Wishing to get at least the native name of it, I asked a Bengali who was passing by whether he could tell me, "Sir," he at once replied, "that is the *Bassia latifolia*." "Why, Baboo," I said, "you are quite a botanist." "No Sir," he replied, "botany is too vast a science for me, I am only an agri-horticulturist." I have often thought that this modest Baboo, who was, as I afterwards ascertained, the energetic owner of the best nursery garden in the neighbourhood of Calcutta, was quite right. Botany is a vast science, but the fact ought I venture to think, rather to induce you to take it up than to repel you from it. There are so many branches of botany, that every one of us can suit his taste. We have, among others, economic botany, treating of the uses of plants and their products; physiological botany, or the study with the microscope of the internal structure of plants, and of the manner in which their several organs accomplish the processes of nutrition, reproduction, etc.; and we have systematic botany, or that branch of the science which endeavours to classify plants into orders and genera, according to their apparent natural affinities, so as to facilitate their recognition when we meet with them in the field. This last may be said to be the foundation on which the others rest, for it is only when you have ascertained the name of the plant you have gathered, that you are able to learn what has been written about it in botanical works; to understand its relationship

with other plants ; and to trace its distribution in other countries. Indeed so obvious is the importance of knowing the right name of a plant, that many people who have not attended to the subject, imagine that the whole science of botany consists in giving names to plants, and in nothing else. It is, of course, the branch most generally taken up by beginners, and rightly so, for it forms the only sure and stable foundation on which to build a superstructure of more extended knowledge.

Many people are deterred from taking up botany by the long names given to plants, and by the alarming appearance of the technical terms used in botanical literature ; but this objection is common to all sciences. No one can study chemistry, or geology, or zoology, unless he will take the pains to learn the language peculiar to each, and it is the same with botany, a knowledge of its technical terms is a necessity that cannot be avoided. As a matter of fact, to anyone possessing your advantages of a classical education, the task is not difficult, for the technical language of botany consists of terms almost entirely derived from Latin or Greek. That precise phraseology is necessary for the development of any science is obvious, for the first necessity of a science is accurate description, capable of being exactly understood, and it is impossible to draw up such a description unless terms of recognised value and of strictly limited application are employed. As to the Latinised names of plants, I am not prepared to defend them in all cases, but it is impossible to employ local or common names ; first, because such names are often popularly applied to more than one plant, and

secondly, because we want to use names that will be accepted by botanists of all civilised nations, and we could hardly expect a Frenchman or a German to adopt "Jack by the hedge," or "Codlins and cream," as scientific names. For these reasons Latinised names have been adopted, and it has thus come to pass that when, for example, we talk of *Rubus fruticosus*, botanists of the whole civilized world know we are referring to the particular species of bramble known in England as the blackberry.

Though I quite agree that for any one commencing to tackle botany, it is best that he should begin by learning to recognise the plants he gathers in his walks, you will soon find yourselves wandering into one or several of the delightful by paths of botanical research which the genius of Darwin has opened out to the lover of Natural History. You will discover, for instance, that the structure and life histories of plants in connection with their insect visitors and contrivances for ensuring cross-fertilization, offer endless problems for investigation and possess an interest that can never pall upon an enquiring mind. It is a curious fact that an ingenious German, Conrad Sprengel by name, more than a hundred years ago, in 1793, published a book entitled "*The Secret of Nature in the Form and Fertilization of Flowers, Discovered*," in which for the first time he showed how the colours, scents, and singular forms of flowers, all served some useful purpose in their economy of life. Sprengel clearly understood that insects were attracted to flowers by their scents and bright colours, and that in

endeavouring to procure the honey secreted within their petals, they frequently transferred the pollen of one flower to the stigma of another: but he failed to take the next step, viz: to show that these adaptations of flower structure to insect visitors were of advantage to the plants themselves. This link in the argument was, however, supplied in 1799 by Andrew Knight, who, after experimenting on peas, laid down as a general law of Nature, that in no plant does self-fertilization occur for an unlimited number of generations.

Still botanists of that time failed to perceive the significance of these observations, the *Zeitgeist*, or spirit of the age, was unfavourable, and for nearly seventy years Sprengel's discoveries and Knight's law remained neglected and forgotten. It was in 1858 that Darwin recalled attention to the subject in his "Origin of Species," and when a few years later he published his "Fertilization of Orchids," the interest of the world was thoroughly aroused, and we now have a number of books dealing with flowers and insects, among which I would recommend to your attention, the "Fertilization of Flowers," by Müller, in its English translation. You all of you, no doubt, have at least a bowing acquaintance with Orchids, and have admired their beautifully coloured and strangely shaped flowers. Now, before Darwin's time, and it is almost humiliating to human nature to state the fact, botanists were content to regard these wonderful flowers as insoluble riddles, and the meaning and purpose of their curiously constructed organs were alike unknown. Generations of

botanists had pulled these flowers to pieces, and had arranged the Orchids into sections and genera, but none of them knew why the pollen mass of the common purple orchis had a little sticky knob at the bottom of its stalk, or could explain the manner in which the different parts of the Lady's Slipper were co-ordinated to facilitate its fertilization by insects. Darwin's laborious patience, and acuteness of observation, have now explained to us how every detail of an Orchid's structure subserves some wonderful purpose, and is arranged to ensure the cross fertilization of the plant by its special insect visitors.

In all the range of Natural History literature there is, I think, no one book of such absorbing interest as Darwin's "Fertilization of Orchids," that is, if you are not content with merely reading the text, and looking at the pictures, but will take the trouble to get the flowers themselves, and with penknife, needle, and magnifying glass, work out for yourselves the structures he has so lucidly explained. In this manner alone is a real and practical knowledge of the subject to be gained. And here I may observe that this bit of advice applies to all branches of Natural History study. Whenever possible see things for yourselves; never be satisfied with merely reading about them; knowledge experimentally gained is an abiding possession, but knowledge obtained by only reading about what other people saw is evanescent as the morning dew. We hear a great deal now-a-days about evolution, as explaining the present wonderful variety of animal and vegetable life, but in order to attain clear and just ideas of

what is meant by the term, it is essential that a man should gain a practical working acquaintance with at least one branch of biological science. To accomplish this, believe me, is better than to read a hundred times through all the books that have ever been written on the subject. Now the study of the biology of plants possesses the great advantage that it can be pursued without taking animal life. If anyone wants thoroughly to understand the mechanism of a watch, he must take it to pieces; and precisely the same reasoning applies to the necessity of dissecting an animal if one wants to understand zoology, or a plant if one wants to understand the principles of botany. Zoology is, of course, equal, if not superior, to botany, both in importance and interest, but owing to the fact that in the latter one works with plants, and in the former with animals, botany is more convenient, more pleasant, and altogether easier as a subject for practical investigation.

Finally, and with many apologies for having kept you so long, will you permit me, as an "old boy" in every sense of the words, to urge those of you who have not joined this Society to take up, and it cannot be too soon, if not botany, at least some other department of Natural History as a study, independent of whatever work you may find to your hand in the line of life you may adopt. It is good for a man to have some study in hand to which he can turn his attention as a change and relaxation from the serious business of his life. A man with a "hobby" is proverbially a happy man, and when the time comes for him to make room in the battle of life for younger

men, he will still possess an interest in existence, and will not find himself reduced to the reiterated perusal of his daily newspaper.

Believe me that it is well worth your while even from this point of view to take up a hobby of some kind, and of all hobbies, none are capable of providing such pure and inexhaustible sources of pleasure and interest as a Natural History hobby.





