

“AGRONOMY: IN ITS RELATION TO SCIENCE.”

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If reference is made to the original rules and constitution of the Royal Society, it will be found that it was founded by the members of the Tasmanian and Horticultural Societies, and in the fourth section it is stated that “the leading objects of the society are to investigate the physical character of the island and to illustrate its natural history and productions.” I believe I am correct in saying that the general tenor of the many papers which, since its initiation in 1843, have been read at its meetings, have for the most part had a distinctly practical, rather than a theoretical, tendency. What I mean is that, excepting, of course those of a descriptive character, such as, for instance, those dealing with the classification or enumeration of species or genera, the subjects dealt with have to a great extent had an eminently practical bearing upon the industries of the State. This being the case, may I presume to suggest that the time has arrived when a more direct attempt might very well be made to stimulate research into the very interesting and wide domain of agronomy? It is true that the proceedings of the society contain many invaluable papers on various agricultural subjects, but I venture to think that no direct or continuous effort has been made to pursue systematic researches into some of the problems which are so intimately associated with our industrial progress and development. It is, I believe, usual in all societies founded with similar objects to those of the Royal Society of Tasmania to divide the work of research and investigation into various sections, so that those members who are specially qualified and interested in certain matters may concentrate their attention on those particular branches, and therefore be enabled to enter more deeply and fully into details than would be possible in any other way. Feeling as I do the absolute necessity of combining scientific with practical knowledge, I am at once brought face to face

with the difficulty, that at the present time there seems to be no machinery in existence, or perhaps I should say, that no machinery has been set in motion which would serve as a channel through which the results of scientific experiments in agronomical theories could be made available to the public, or by which systematic investigations could be carried on. It is obvious that agricultural and horticultural societies do not, and, from the nature of their constitution, cannot enter into the minute and patient study of many matters which nevertheless are likely to have a very practical bearing upon the industries which they represent. It is therefore with this idea that I crave the indulgence of the members of this society while I plead for the formation of a section which would deal with agriculture in all its branches, and especially with those subjects which directly concern its economic and commercial progress. I would point out that at the present time, though there is a large amount of experimental work being carried on, there is practically no record being kept of such discoveries or investigations, and that therefore the State at large gains little or nothing from them. Experiments conducted singly and spasmodically lose much of their value; whereas if submitted to comparison with the labors of others, they assume an importance and interest which would be unattainable in any other way. I do not think that it will be disputed that there are many matters which are at the present time altogether neglected or unnoticed, the better knowledge of which might have a material effect on the industrial and commercial prosperity of the State. May I be allowed to instance a few of them? Taking the branch of agronomical work in which I am personally most interested— that of horticulture— I would call attention to the desirability of establishing some recognised system of nomenclature for our fruits. It must be obvious to everyone that the present confusion is

mischievous and misleading. I know that many people imagine that it makes little or no difference whether a fruit is called by different names, and so they make no effort to arrive at any finality in the matter. A little consideration will, however, show that not only is such confusion discreditable to us, in view of the importance of the fruit industry, but that it also results in direct injury to the growers and shippers. I am aware that this fact has been denied and the possible injury questioned, but I have had many proofs of the correctness of my contention. I can recall instances of growers sending the same kind of fruit by the same steamer, under two different names, and obtaining higher prices for one portion of their consignment than they did for the other. I can further refer to the case of growers who have sent to some of the other States for their trees, and who have received altogether different varieties from those they had ordered, simply because they had given a different name to that by which the fruit was known to the nurseryman. There is a still more weighty reason why we should endeavor to have a uniform system of nomenclature. It is nowadays recognised on all sides that the aid of scientific expert knowledge is a necessity in many of the operations of fruitgrowing. We have to depend on such knowledge for the preparation of the various formulæ which are used in spraying, or in directing us to the best and most economical methods of applying manures. It has already happened more than once to my own knowledge, that valuable information, having special reference to one particular variety of fruit has been published by the fruit experts of some of the other States, but this information has proved either misleading or of no service; because while the experts were referring to one kind, another variety was understood by the growers here. From economic and commercial grounds alone, I think it is desirable that there should be a recognised system of nomenclature established in the Commonwealth. There are, however, other reasons of a more abstract nature which, I submit, would very properly prove a subject for scientific research. It will be found that fruits can be classified under distinct heads or groups, and that there are characteristic

features which will enable the observer to place them in their proper order or group. I would lay down the principle that, as far as may be possible, the names of fruits should convey some idea of their character and quality. This is already done in some instances, and we look for the buttery, melting characteristic in the *Beurre* class of pears. Other names convey some idea of the locality from which they originated. All this may be very proper, but to crowd our fruit catalogues with the thousand and one synonyms, many of which are meaningless and absurd, is surely not a desirable course to adopt. As an instance of what I mean, I was called upon to judge some fruit at one of the principal shows on the North-West Coast, and amongst other exhibits there were three plates of apples which were entered by the names of *Dolly*, *Molly*, and *Polly*. This is an extreme case, I admit, but such incongruities are not so rare as might be supposed. I should like to see the work of classifying and naming our fruits carried out on some distinctly scientific and commonsense basis, and I am convinced that when this is properly done it will be found to have an important economic value to the fruitgrower. Without wearying you with details, it might be interesting to draw attention to one of the modes in which this inquiry should be pursued. Botanical classification is determined very considerably by the various processes of fructification, and in describing fruits themselves the formation of the ovary or seed vessels forms the starting point of our investigations. The variations, however, are in many cases not so obvious as might be imagined, and it is necessary to submit the fruit to close and careful examination, before it is possible to discover distinctive points of difference. With some fruits this is comparatively a simple process, but with others it has yet to be ascertained whether they can be classified by any system, which will be sufficiently invariable to prove satisfactory and reliable. In the case of pears, no system has, up to the present time, been found which can be relied on, for none of the principal structural features of this fruit are invariable. From the same tree—even from the same branch—fruits can be obtained which differ so completely from one another that no reliance can be placed

on any system of nomenclature which is based on the internal structure of the fruit. I do not say that some system will never be discovered, for I believe that we shall sooner or later find some method by which we shall be able to separate and classify all the various species and genera. With apples it is different. Thanks to the careful and long-extended researches of such eminent pomologists as Diel, Dochnahl, and the veteran, Dr Hogg, it has been discovered that there are certain variations in the structural form of the ovary which are sufficiently marked and constant to enable a system of nomenclature to be based upon them. I will briefly describe the process of identification. On cutting an apple in halves from top to bottom it will be noticed that there is an opening from the crown or flower end of the fruit extending towards the core, and that this opening, or tube as it is termed, is shaped either like a funnel, or else is conical. At various positions on the sides of this opening will be found the atrophied remains of the stamens, which are on the inside of the tube, while on the outside of the tube will be seen the remains of the sepals or flower. Patient research has shown that these characteristics are sufficiently invariable to enable the pomologist to separate the different varieties of apples into distinct classes, such as : Apples with a funnel-shaped tube, and apples with a conical tube. These may again be sub-divided into three classes, viz :— Apples with marginal stamens ; apples with median stamens ; and apples with basal stamens. There are also other differences of structure which are sufficiently constant in each variety to enable a reliable classification to be made. Turning to another subject, which, as far as I am aware, has been completely overlooked by our orchardists—I refer to the pollination of fruit trees—I would point out the great importance which this process of nature is to the fruitgrower. It is the answer to the often-repeated question, " Why do not my trees bear better ? " Fruitgrowers have long known, though they may never have tried to discover the reason why, that certain varieties of fruits are less fertile than others. It is, however, now recognised by experts that there is a simple reason for such infertility, and

that many fruits are practically self-sterile. What I mean is, that it has been proved that some fruits are almost entirely incapable of being fertilised by their own pollen, and require cross-fertilisation before they can become fruitful. This is a very interesting question, and presents some striking features. It has been proved to demonstration that certain fruits should never, as is ordinarily the case, be planted in blocks together. I need not point out how important such a question is to anyone who intends to plant out a new orchard. It is probable that all our fruits would be improved by affording them the fullest change of pollen that can be obtained. This can be easily effected by alternating rows of different kinds, and without adding very materially to the difficulties of picking and separating the varieties. To show how real the advantage is which may be gained by adopting this course, I may mention the case of a large pear orchard at San Jose, in California, which contained 4000 Bartlett, or, as we know them here, Williams's Boa Chretien pear trees. For some years this orchard was absolutely unproductive, but when the owner, in despair, cut down alternate rows and regrafted them with other kinds, immediately the fruit began to set, and he has obtained a good yield ever since. Long before I had heard of this and similar experiments, my attention had been drawn to the subject, and as far back as 1889, I began to make a series of experiments, which, to my mind, were conclusive. As I believe they afford a complete proof of the contention I am making, that certain kinds of fruit are naturally more or less self-sterile, I will briefly describe them. I took a series of 32 blossoms of the Winter Nelis pear, one of the shyest bearers we have, and for a number of years in succession, I fertilised the blossoms—one-half with pollen from the same cluster of buds or from the same tree or variety, while the other half I cross fertilised with pollen from some other variety, which was generally that of the Napoleon or Vicar of Winkfield. The results of these experiments for the first three years were as follows :—Out of 16 Winter Nelis blossoms, fertilised with Winter Nelis pollen, on an average only one fruit set ; out of 16 Winter Nelis

blossoms, fertilised with Napoleon pollen, on an average 15 out of the 16 set their fruits. I have since then repeated this experiment with almost precisely similar results, and I can also point to several living examples of trees, that were previously infertile, now bearing good crops, owing to a portion of them having been grafted with scions from another variety. The most striking instance of the successful results of cross-fertilisation is to be seen in the orchard of Mr Eccleston, on the Bridport road, near Scottsdale. This gentleman has systematically grafted a portion of each tree with scions of another variety, selecting in preference sorts which ripen with pollen about the same time. The results of this treatment have been in every way satisfactory. Without unduly taxing your patience, I should like to mention that, as the period during which such experiments can be carried on is extremely limited, there is all the more reason why we should enlist as many observers as possible. A blossom which expands, say, at 7 o'clock in the morning is fertilised, and has begun to contract by 10 at the latest, when, of course, nothing more can be done in the way of experiment. I will not attempt to detail any more of the subjects which I consider should engage the attention of observers, beyond remarking how little notice has been paid to the first principles of successful manuring. The elementary idea of returning back to the soil that which has been extracted from it never seems to enter into the minds of many of those who year by year expend large sums in applying manures, which in some instances are inappropriate and unnecessary, while the actual wants of the trees are unconsidered. It would be of immense value to the orchardist if we knew more definitely the exact proportions of the manurial substances which are exhausted year by year by an average crop of fruit. No chemical analysis of the soil will tell us what amount of plant food is available to the trees, for the chemist extracts by his acids in a few moments that which it may take the trees years to procure naturally in a soluble condition. Before I close I should like to refer to one more subject about which we practically know nothing, but which must exercise a very marked

influence on the vitality and vigor of our trees. I allude to the relation between stock and scion. We know that the result of grafting is to perpetuate the variety from which the scion has been taken, but we do not yet understand how far the scion is influenced by the stock. That it has an influence there is not the least doubt, and it has been shown that by continued grafting and re-grafting on stocks of an early or late variety the season of a fruit can be either hastened or retarded. The only authority on this subject that I know of is the celebrated animal artist, Mr Harrison Weir, who has for upwards of thirty years been carrying on experiments which have proved beyond question that the influence of the stock on the scion is more important than is generally supposed. The common idea of grafting is that it makes no difference what kind of stock is used so long as we can get the scion to take. I need only instance one case to show the fallacy of this idea. The Kentish cherry stock is frequently employed as a stock for grafting; those who have so used it must have noticed that, while the scion grows freely the stock does not keep pace with it, so that it is no uncommon occurrence to find the scion above the graft fully three or four times the circumference of the stock below. I submit that in this direction there is scope for further investigation. I could go on enumerating many other subjects which are not only interesting in themselves, but which both directly and indirectly would have an important economic value to the fruitgrower. I have said enough, I trust, to show that, in one branch of agricultural work alone, there is a wide scope for systematic and careful research and investigation. The ordinary farmer or fruitgrower has not the time, nor in some instances the facilities, for conducting experimental work, and it is therefore to my mind necessary that this should be carried out by those who have more leisure, and who have better opportunities for conducting such investigations. I am convinced that if the members of the Royal Society see fit to establish a section to deal with matters such as those I have referred to, very great good might be effected, both from a scientific as well as an economic point of view.