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Lindley
Symmetry
of
Vegetation

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THE
SYMMETRY OF VEGETATION;
AN OUTLINE
OF THE
PRINCIPLES TO BE OBSERVED IN THE
DELINEATION OF PLANTS:

BEING
THE SUBSTANCE OF THREE LECTURES
DELIVERED TO
THE STUDENTS OF PRACTICAL ART, AT MARLBOROUGH HOUSE,
IN NOVEMBER, 1852.

BY JOHN LINDLEY, PH.D. F.R.S.

(PUBLISHED BY AUTHORITY
FOR THE DEPARTMENT OF SCIENCE AND ART.)

LONDON:
CHAPMAN AND HALL, 192. PICCADILLY.
1854.

Price One Shilling.

THE SYMMETRY OF VEGETATION.

LONDON :
A. and G. A. SPOTTISWOODE,
New-street-Square.

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LECTURE I.

1. THE representation of vegetable forms must always be considered from two different points of view, the actual and the conventional. Nor indeed is it ever expedient to confound them; for though the conventional is based upon the actual, they are in their nature entirely different.

2. I observe that some distinguished men who have previously addressed you in this theatre have expressed an opinion that "Flowers or other natural objects should not be used as ornament, but conventional representations founded upon them, sufficiently suggestive to convey the intended image to the mind, without destroying the unity of the object they are employed to decorate:" that "In surface decoration all lines should flow out of a parent stem, every ornament, however distant, being traceable to its branch and root;" and that, "beauty of form is produced by lines growing out one from another in gradual undulations, there being no excrescences."

3. At first sight it appears difficult to reconcile these statements with another well-known axiom, that "Whatever is beautiful is true;" or, if you please, that "Whatever is untrue is not beautiful;" because, if you are to represent natural objects in a conventional

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manner, that representation cannot be absolutely true. It can only be an approximation to the truth, and the question is, What the nature of that approximation should be?

4. Although I make this remark, I do not dispute the propositions in question taken in a very general sense. I believe them to be perfectly just, and that three axioms were never proposed for the adoption of students more practical and well founded than they are; and I hope it will be found that, as I proceed, my remarks will bear upon these points sufficiently to prove their truth.

5. But what is truth? We say that what is true is beautiful; and what is beautiful is true; yet the great point remains to determine, in what truth consists? There cannot be a doubt that wherever we find that the truth has been absolutely represented, a certain amount of beauty is attached to the representation of it. But it does not follow that the greatest amount of beauty belongs to the most exact representation of an object. Much depends on the manner in which objects are combined. The truth as regards plants, and indeed all things, can only be really judged of by the eye of intelligence.

6. Two persons looking at the same object—one well informed and acquainted with the points which require to be observed, and the other with an uncultivated eye—regard the same thing with different powers of vision, although they both have the same object before them.

7. Other persons seeing all that intelligence can discover, misunderstand the object of their art, and notwithstanding their faithful adhesion to truth, produce the most disagreeable results.

8. Take the case of Bernard Palissy. He had a great reputation, and still has in the eyes of some. He was a man of whom it was said by Buffon that he was so great a naturalist as nature only could produce. Palissy himself describes the source of his fame by saying that he had had no other book than "the heavens and the earth, which are known of all men, and given to all men to be known and read." He was not Greek, he said, nor Hebrew, nor poet, nor rhetorician, but a simple artizan, poorly enough trained in letters. Yet what he, a simple artizan, might learn by putting himself to school with nature, he had come to consider as the highest learning. "You will say," he remarks, "that you must not take heed to my speaking, inasmuch as I am neither Greek nor Latin, and have never even seen the volumes of the doctors. To this I answer that the ancients were men like the moderns, and that they were quite as liable to be deceived as we are."

9. He therefore refused to recognise the "wisdom of his ancestors," and, turning away from books, he, to use his own words, "scratched in the earth for the space of some sixty years and upwards, and searched among the entrails of the same, in order to understand the things which she produces in herself." But look at the example in this museum of what he produced.

10. It cannot be denied that in the dish there preserved he has represented natural objects with very considerable truth, and that the objects have in themselves considerable beauty. No one can say that his lizard is not exceedingly like a lizard, or that the fish and other creatures belonging to the animal kingdom, are not skilful representations of objects

which Palissy had seen ; but, can any one say that they and the dish together form a beautiful combination? We can hardly assert that a dish, an object to be used, on which lizards are sprawling, and crawfish crawling, with cowries round the borders, and all manner of living things moving about among them, can be a beautiful work of art. The things themselves are true and beautiful, but the combination is incongruous, and there is no beauty in the work as a whole. Now that is the point on which attention should be fixed. It is clear from such an example, that when we assert an object which is true to be beautiful, the assertion must be taken with a certain limitation. This point might be much enlarged upon.

11. In all natural objects there exists a law of symmetry, which is characteristic of every form in which the organic world is seen. It does not matter what we select. Take a horse. It is impossible not to see that there is the most perfect symmetry in his structure however inferior the breed to which he may belong. The two sides of the animal answer the one to the other. If you cut him in two, the halves are essentially the same ; leg answers to leg, eye to eye, nostril to nostril, rib to rib, and, in the various veins and muscles, those of the one side correspond with those of the other, within certain limits. So again with birds ; leg answers to leg, and wing to wing, and even feather to feather.

12. It may seem superfluous to mention this, and I only do so for the sake of indicating a universal law.

13. It is hardly necessary to observe that in the shells on Palissy's dish, where less perfect symmetry is observable, circumstances are not the same as in the instances already adduced ; for a shell does not exactly

represent the structure of the mollusc which produces it, although moulded upon its surface, or formed from its secretions. It is wonderful, however, to see how near an approach to symmetry occurs in even inorganic matter when its form is determined by unconscious vital force. This is most especially conspicuous in the whole race of Corallines.

14. Symmetry may be defined to be the general correspondence of one half of a given object with the other half, in structure, or other perceptible circumstances; or the general correspondence of one side of an object with the opposite side, in structure, or other perceptible circumstances.

15. If understood in such a sense, all living objects whatever will be included under the denomination of symmetrical. That which we find universally in the animal kingdom, belongs to all parts of the living world, and must therefore occur equally in plants, however unlike animals they may be. The student's attention cannot be directed too closely to this important law, from which there is no real departure, except owing to accidents; such as those which produce monsters in objects with which we are most familiar. Indeed symmetry in plants arises out of their peculiar nature. It is dependent upon a highly complicated internal structure, which is in itself essentially symmetrical. The basis from which organs proceed being symmetrical, it seems to be an evident inference that the organs themselves should be symmetrical also. A few illustrations will render this sufficiently obvious.

16. Take a section of the stem of any palm tree; of the Sechelles Cocoa nut, for instance. It has a bark similar to what we are familiar with in other plants;

and immediately within it a harder and darker matter, which is tessellated, as if made up of minute fragments like mosaic. The little tessellations or black marks which constitute the dark stain that distinguishes this wood, are all curves, — dark curves, with certain holes or passages in their hollow. But the curious fact is this: the whole of the curves are placed in the same relation to the central part of the stem, their convexity being invariably directed to the circumference; and among the millions of little marks which form the natural structure of this plant, and represent its (internal) symmetry, every one is in the same relative position with respect to the centre. Beautiful patterns might indeed be made out of such bodies. The same thing occurs in the larger part of the order of Palm trees. I do not mean to say that there are no examples to the contrary; many disturbing causes indeed interfere with this arrangement; but if we can observe the curves in the position in which they were originally formed, the relation which they bear to each other is constant. Distortions and disturbances arise from peculiar growth or from accidental causes, which are without the pale of systematic inquiry, and not susceptible of being reduced to any fixed rule.

17. And so with regard to the veins of plants; they too are always distributed in an exactly symmetrical manner. Take any leaf. If we separate it from end to end (along the mid-rib), the one half bears a most striking resemblance to the other. On the one side the veins run to the right, on the other to the left: perhaps those to the right are a little above those to the left, in that case the difference is maintained throughout. If there are four ribs on the

one side, there are four on the other; and if you measure them off, provided the leaf has met with no

LEAF OF THE FIG TREE.

accident, the one vein is as nearly as possible of the same size as the other. If you place the edges against each other, their little indentations will almost fit. In all plants there is the same remarkable correspondence between the opposite sides or the contiguous halves of the same leaf. More complicated examples are easily found. You have a leaf with fifteen divisions on each

side—in all thirty. In all the contiguous divisions of the same leaf there will be thirty also. But the number may *diminish* to twenty; and then, if there are twenty on the one side there are twenty on the other, or it may be reduced to ten on the one side and then there will be ten on the other. In all such cases symmetry is in no degree impaired, whatever may be the amount of complication in the structure of the leaf. Nothing of this kind is more elaborate than what we find in tree Ferns. Myriads of minute divisions contribute to form the general leaf; of those divisions every one of the larger is exactly like its neighbour; they balance each other. As such leaves diminish in length, the size of their divisions also diminishes, and the parts belonging to the internal structure are also reduced in the same ratio; so that the symmetry or balance of parts is still maintained with much exactness.

18. Another leaf has certain projecting ribs: two lines of projections on each side of the mid-rib. Now those projections correspond exactly the one to the other, as far as they go. At last they wear out; but there is no loss of symmetry in consequence of diminished force in the formative powers of the plant.

19. Wherever we look the same pervading rule is found. Such exceptions as may be observed are apparent, not real. In fact the growth of a plant is a system of equipoise, and the result is symmetry. The way however in which symmetry is manifested much varies.

20. In the branch of a sycamore tree the buds are formed in opposite pairs, right and left, fore and

SYCAMORE.

LINDEN.

aft,—right and left, fore and aft,—and so on; and such is the constant rule, any apparent departure arising from accidents to which plants are peculiarly subject, but which ought no more to be taken into account in considering what nature intends, than the occasional mutilations by which the human frame is disfigured.

21. In another tree, the Linden for example, symmetry is displayed in a different way. The buds are no longer opposite, but alternate; one on the left, another on the right, and so on, right

and left alternately, and at equally increasing or diminishing distances. Any one in the habit of examining what purport to be drawings of plants, cannot fail to see that this fact is seldom sufficiently considered, although essential if truth is to be represented.

22. Leaves again, with reference to their position on the branch, present the same regularity as the buds. In the common Olive the leaves are placed opposite each other in pairs, right and left, and fore and aft, — a pair and a pair, a pair and a pair; wherever you turn your eye they are still in opposite pairs, one balancing the other. In an Alaternus, and in multitudes of other plants, the leaves (like the branches) are not opposite, but placed alternately, one above the other, from one end of the branch to the other, and either equidistant, or at equally increasing and diminishing distances.

23. As vegetation ceases or begins to diminish, the distances between the leaves diminish also, still, however, in regular proportion and at a regular rate, until the entire stoppage of growth is effected. The same thing happens when leaves begin to grow; they are at first very near each other, then their distance increases till its maximum is reached. Equidistance continues for a certain length of time; but at last growth slackens, and the distance from leaf to leaf gradually diminishes.

24. However confused the arrangement of leaves may at first sight appear, it will always be found that this is the law which governs their production.

25. What is true of leaves is equally true of their veins, as has been already stated. Venation is perfectly symmetrical, the veins balancing each other on the two sides of the leaf.

26. Not only do the two sides of a leaf balance, but the veins of every leaf on the same plant are formed on the same uniform plan; however great the number of leaves, the veins are developed in the same manner in every instance.

27. It is a great mistake not to look attentively to this point, when the object of the artist is to obtain designs for flat decoration. It is difficult to conceive anything so beautiful as the tracery of veins—their graceful curves and the exact relation they bear to each other, stopping here, expanding there, infinitely varied and nevertheless producing a whole in which there is not the least loss of balance or essential symmetry.

28. It has thus been shown that a plant consists of a centre or branch, on which certain bodies, buds, or leaves, are placed in a symmetrical manner; that all the component parts of those bodies are again placed in a perfectly regular and symmetrical position with respect to each other, one part growing out of another according to certain fixed laws which no natural circumstances can alter.

29. The same principles are manifest among flowers. A flower is a body in which that system of equipoise, of which symmetry is the great result, is as clearly traceable as in branches or leaves, or in the veins of leaves. Either one-half of a flower balances the other, or one series of organs alternates with another, or any deviation from symmetry that occurs in one part is immediately compensated for by some peculiar development specially provided in another part.

30. Take a blossom of the common Goosefoot (*Chenopodium*). It consists of five slender arms or sta-

mens, which are all exactly alike, and opposite which are five other external parts, forming a star with five

FLOWER OF
GOOSEFOOT.

rays, the two series corresponding precisely the one with the other.* This is one of the simplest of known forms: should a flower be reduced much lower, there is scarcely room for the manifestation of special symmetry.

31. The most complicated structures are merely different in degree. In the Rose, in the Crowfoot, in

FLOWER OF VERTICORD.

the Magnolia, or in the Water-lily itself, the same class of facts pervades the organisation. Among those plants in which augmented number produces a very complex condition is the *Verticord*. In this flower we have five fringed bodies on the outside of the whole; those bodies consist

each of five arms, of which the left and right external arms correspond with each other, and the second inner left corresponds with the second inner right arm; so that we begin with a structure of five parts, each of which is subdivided into five others. In the next place five more parts are placed within and between the first, as if to insure the requisite balance. Then come ten (twice five) other bodies (scales), which stand, five opposite and five between the second series of five. Finally, we have ten other parts (twice five again), completing the symmetry of the whole structure, and alternating with the ten

* Its numerical structure is $5 + 5$.

seals which preceded them; the whole presenting a striking example of the way in which, in a complicated structure, the principles of equipoise and symmetry are maintained. Were it possible to weigh the corresponding parts we should, no doubt, find their weights the same as well as their magnitude and form. The numerical proportions of such a flower are $(5 \times 5) + 5 + (5 \times 2) + (5 \times 2)$.

32. The red *Brugmansia* offers an instance of a more simple arrangement. In this flower we do not at first perceive any symmetry except that the end of the long tubular corolla is divided into five equal lobes, which, if they had been formed by rule and compass, could not be more exactly alike. On the outside of this corolla, upon each of its five lobes are three ribs, in all fifteen, or 5×3 ; and this plant never produces any other number. Upon opening it we find the same number, five, still prevalent in the stamens; and the external cup or calyx is also in reality divided into five triangular teeth, although, owing to the way in which the teeth adhere, this is not at first sight apparent. The fundamental number still being five, this structure is represented by $5 + (5 \times 3) + 5$.

33. All these remarkable examples of floral symmetry seem to show that there is a centrifugal force operating in the formation of flowers, which, being equal in all directions, can scarcely fail to produce such a result.

34. In the ripe fruit of the apple, no symmetrical arrangement of parts is at first apparent; but it once had a perfectly regular structure, in which all the parts were exactly balanced, and even when ripe its symmetry is visible to the eye of intelligence.

At its end will be found five-points, which represent the five external divisions that originally belonged to it. If the fruit is cut across, the five-pointed star in the centre indicates the symmetrical number of the apple to be five. If we count the parts in the apple blossom we find five outer divisions in its calyx; five thin delicate plates next succeed as the corolla; then twenty threads for the stamens; and, finally, five other central points or arms complete the structure; all equal and alike in each series, all placed in a certain fixed relation to each other round a common centre, which itself corresponds with the surrounding organs. This structure is $5 + 5 + (5 \times 4) + 5$.

35. In an ear of corn the same kind of symmetry exists, although more difficult to discover. Each grain stands in perfectly symmetrical relation to the others: one right, one left; each a little higher than the preceding. Even the small scales of chaff which enclose the grains, are placed in an equally symmetrical position with respect to each other. The demonstration of this, however, involves minute details, which need not be entered upon at present. When properly understood it assists in further proving that symmetry is a fundamental law in plants, and that the most dissimilar forms of vegetation obey that law.

36. It is not merely in the higher orders of plants that this symmetry occurs. It equally pervades the lowest. Let the student take for example an *Agaricus* or Toadstool; in this plant, low as it is in the scale of development, symmetry is as much observable as in other species. The Toadstool was originally a sphere. In time it loses that shape but preserves concentricity of outline, and as it does so, organises itself, producing vertical plates. And how

are these plates arranged? It is impossible by any amount of ingenuity to arrange a greater number of such plates symmetrically in the same area. In the first place they radiate from the centre to the circumference; then others are interposed in exact numerical proportions, not touching the circumference; and from this others are finally so directed inwards as to fill every vacant space. We see here a repetition of figures as regular as if they were described by the rule and compasses, and the result is exquisite beauty. Take the half-transparent Campanulate Agaric; observe the mode in which its rays are arranged, and with what admirable symmetry they dovetail into each other. More regular figures cannot be described, and yet they are somewhat different in each kind of Agaric. In a basketful of such funguses, no two species are quite alike, but they agree in being all symmetrical, and eminently beautiful in the arrangement of their parts.

37. Fungi of a much more simple structure continue to illustrate the same fact. There is a fungus called *Sphæria militaris*. In the West Indies is found a great wasp-like insect called a *Polistes*. Out of this grows the fungus which destroys the creature, vulgarly named a Vegetable Wasp. If we observe, first, the shape of the fungus, and then examine its section, we find it covered by equidistant holes, which indicate the places whence the seed proceeds. Every hole represents the mouth of a cavity, all the cavities are arranged round a common centre, are all directed upwards at a particular angle, and are so placed between each other that no one of them interferes with its neighbour, but each balances some corresponding cavity opposed to it.

38. We see the same thing in the common fairy ring,—those rings which we so well know, and which we find in meadows in the country. A fairy ring has a centre, round which there is a circle formed by the Toadstools belonging to it; first, one circle is formed, and then another. The reason is this,—that the seed of the original fungus was *once* a point, from which when it began to grow, threads radiated regularly by virtue of the centrifugal force of organisation already spoken of. The circumference of the organic circle thus formed is alone capable of producing Toadstools, and it continues to do so, as it produces ring beyond ring; until natural obstacles put a stop to the regularity of formation.

39. The toadstool is very low in the scale of organisation, but others equally imperfect still obey the laws of symmetry.

40. We all know what Lichens are—that they form an inferior order of vegetation, in which we usually recognise neither beauty or symmetry. But in some cases they form a succession of cavities, so placed one within the other that we might almost, with a series of cups divided into lobes, form such lichens artificially. The flat lichens indicate the same symmetry, although in a somewhat different manner. They generally appear as a confused mass spread upon a stone or tree, but the intelligent observer sees that they too spread in the beginning equally round an original centre; that lobe balances lobe, and ramification ramification: equipoise and symmetry manifesting themselves every where. The reason why the natural beauty of their arrangement is so seldom observed is, that such plants are peculiarly liable to injury. Stones crush them, men tread on them,

animals bite them, and thus they lose their natural forms.

41. Even in the meanest water plants symmetry is still found. The *Thorea*, which is closely related to a sea-weed, although not strictly one, may be perhaps fished up out of the Thames. In that plant, each little branch is furnished with arms exactly ordered, those on one side answering to others on the opposite side. From its original point of growth it describes a regular figure whilst floating undisturbed, although the accidents to which such plants are subject soon destroy all appearance of equipoise and symmetry. And so it is with the real sea-weeds and all the plants akin to them. From an original centre arms are regularly formed, so that if one leg of a pair of compasses were placed upon that centre, the ends of the arms would all be struck with the opposite leg. In general this is not observed because of the mutilation they undergo when thrown upon the coast; and by reason of other causes which destroy their natural symmetry. But the truth becomes evident when sought with sufficient care.

42. Thus we see that a system of equipoise, to be regarded as the manifestation of a centrifugal vital force, exerted in every direction equally, is discoverable throughout the vegetable kingdom in all its parts. That apparent exceptions to it occur, is not to be denied, but they are merely apparent, as can be easily demonstrated.

43. If there be any real exception to this universal symmetry, it is in the colours of plants. I understand that Mr. Ruskin declares colour and form to have no connection. In the case of animals I do not question the assertion. It is for zoologists to say

whether it is true or not. But the proposition must be received with considerable limitation if we look to plants. Colour very often has, in plants, an unmistakeable connection with form. In fact, the nature of plants renders it inevitable. Colour in plants,—especially the variegations of colour, mottlings, markings, and blotches, are generally produced by the action of some substance introduced into the system of an organ by its veins. The veins are symmetrical, and the matter introduced through them, acting in the vicinity of the veins, discharges colour. The colour therefore has some relation to the veins, and therefore must be symmetrical.

44. Of this truth endless examples meet us at every step. Any one may procure a piece of the variegated Aloe leaf, in which veins run parallel to each other, from the base to the apex. These veins, towards the margin, appear to have the power of discharging the green colour, and thus the variegation of the Aloe runs in streaks following its symmetrical veins.

45. In the reticulated *Amaryllis* the leaf is always white in the centre; the matter which has the property of discharging colour is confined to the middle mid-rib, and cannot get beyond it.

46. But we need not visit hot-houses to see evidence of this. The variegated Kail, to be found in any cottager's garden, proves the case as well as the most precious production of the tropics. In that plant it is manifest that the red, the white, the yellow, the other tints which harmonise so charmingly with the natural green of the leaf, are each dependent upon the veins, the universal symmetry of which has been so often pointed out.

47. At the same time it must be admitted that there

are cases in which we cannot reconcile the blotches found in plants with any thing like symmetrical arrangement ; but these are exceptions, not the rule ; are probably caused by the colours, dependent upon veins, being accidentally blended ; and upon the whole it is safer to assume in all cases that varieties of colour have really some fixed relation to the veins of the parts in which they occur than to regard them as vague and accidental. So that, notwithstanding Mr. Ruskin's great authority, I think his statement is not borne out by what we know of plants.

LECTURE II.

48. BUT it is time to turn from general considerations to some of the details upon which they are founded.

49. If the nature of vegetation is rightly considered, a symmetrical arrangement is almost inevitable; for what is a plant in the beginning? If we take it at the earliest period in which its existence can be discovered, it is found to be a point, whatever magnitude it may ultimately acquire; that point gradually becomes a sphere, so that it would not be inaccurate to represent the birth of vegetation by a circle. Up to a certain time there is a force acting from the centre to the circumference of this sphere; but after a time the sphere acquires polarity — that is to say, its poles lengthen, and thus we have either a cylinder or a double cone.

50. Such is an abstract notion of a plant. As soon as this extension upwards and downwards occurs, the tendency to assume a spherical form disappears, or becomes so disguised that it is difficult to recognise. The force of development then expends itself in a somewhat centrifugal manner, operating in planes at a short distance from the axis of the stem or main body whence it proceeds.

51. Eventually the results of this manner of growth become visible in a successive formation of parts,

each upon the model of the previous parts; various bodies being thus produced, possessing different characteristics, but all reducible to the same general law.

52. The root appears to be an exception to the ordinary rule; but it seldom enters into the consideration of artists. Its incipient formation is not however at variance with the foregoing general statement. A root is at first a cone, producing regularly from its sides certain arms or threads, spreading equally in all directions. But in consequence of the resisting medium in which a root grows, symmetrical development is soon interfered with. The soil is not like air; and the parts produced in it are impeded by the obstacles they encounter, or injured by insects and accidents, and thus the regular arrangement which constitutes the beauty of vegetation does not appear to occur in subterranean organs. But if roots grew in fluid they would obey the general law, as a simple experiment will show. If an acorn is passed through a card fixed in the neck of a glass filled with water, the card being merely to keep the acorn steady, and if the point of the acorn touches the water, the root will be found as it grows downwards to arrange itself in quite as symmetrical a manner as the parts of a stem.

53. The first circumstance to be noted in the stem of a plant is, that it always in the beginning, and usually at all times, is either a cone or a cylinder. In the majority of the cases with which artists have to deal, a stem is a cone, diminishing very gradually—almost insensibly—from its base upwards. In the oak, notwithstanding its huge bulk, this may be traced; the ramifications become gradually smaller, and almost end in vanishing points, so that however

much the form of a cone is lost sight of, it is still distinctly traceable.

54. In bushes and plants of a similar growth the conical figure is too manifest to require demonstration; their branches, however much extended, diminish regularly to the point, not suddenly swelling and suddenly diminishing, as we often see it in the drawings in print shops, but forming a true conical figure, with the most graceful outline imaginable.

55. Should a stem be cylindrical then it is truly cylindrical, and not deformed by bosses in one place and hollows in another.

56. In branching, every species has its own peculiar arrangement, from which there is no departure. If branches are formed in one way in one part of a plant, they are formed in the same way in all the other parts, so that there can be no truth in figures which represent a plant with branches arranged one way on the right hand, and in some other on the left. In the Syeamore, for instance, the branches are constantly placed right and left, fore and aft, right and left, and so on, appearances to the contrary being owing to accidents—such as the destruction of the buds or rudimentary branches.

57. In the course of its development a branch never forms an angle with the stem which produces it: it always forms a curve. It does not arise as if a hole had been bored into a trunk and a cone been driven in, but gentle curves of various kinds accompany the separation of the branch from its parent, so that nothing but a curve is allowable when representing the junction of a branch and stem.

58. Even the upper or re-entering angle (or *axil* as botanists term it), is also a curve of some kind, for

there are no angles properly speaking among plants. In branches the curves appear to act as braces or buttresses to keep them steady in their allotted place.

59. Certain curves are however peculiar to certain plants, and their forms require to be accurately shown.

60. Another kind of regular arrangement occurs where branches are not opposite, but placed alternately with each other. Thus, in the common Linden tree, although the branch forms a cone as usual, yet its surface is not represented by a right line, but by a line bending from bud to bud, from right to left and from left to right. Moreover, there is usually a slight convexity at the place on which each bud is seated.

SYCAMORE.

LINDEN.

61. It may be that the bends in question are exceedingly slight; they exist, however, and an exact representation

of them constitutes one of the differences between the true and the false in drawing. It may be stated as a general fact, that branches with alternate buds have a wavy outline. Truly straight branches are unusual, except when buds are opposite on the same

plane. In such a case, the outline of the branch is formed by a series of long curves placed exactly opposite each other and terminating at the seat of the buds themselves, as if equal antagonistic forces operating on opposite sides took opposite directions in order to neutralise each other.

62. When branches have to be represented in the absence of leaves, it is important to bear in mind that the scars left by the leaves which once existed on them have a definite form. A leaf always has the lower end of its stalk shaped in a well-defined manner, which varies with species. Now, since scars are the spaces left by leaves when they drop off, scars must correspond with the peculiar form of the object which fell away. If we examine the branches of different plants, we scarcely find two species the scars of which are exactly alike; and gardeners and others accustomed to plants know them, although the leaves are absent, by the peculiarity of the branches and their scars. Take the common horse chesnut as an example. In that plant the scars consist of a double curve, resembling a cresecent with the horns rounded off. This arises from the base of the leaf-stalk of the horse chesnut having that figure. Such differences are often very remarkable, and a person accustomed to observe correctly would as justly criticise a drawing which, representing a branch, the leaves of which were gone, should show it inaccurately in this respect, as if any other fault, more obvious to untrained eyes, had been committed.

63. This may be familiarly illustrated by a branch of the Fig tree or the Magnolia, in which a careless observer can probably see nothing beyond what may be found on an Elm or a Linden tree. Undoubtedly,

the branches of Magnolias, Elms, and Lindens agree in having alternate buds with a slight scar beneath them; in these respects, a near similarity is at once seen to exist. But in the Magnolia and the Fig tree there is also found a narrow line drawn round the stem from one side of the scar till it reaches the other, giving rise to a peculiar ringed appearance. The rings are caused by a thin membrane, which was originally wrapped round the leaf when young, being there cast off, and thus producing the scars to which reference has been made. These rings are among the most characteristic peculiarities of the plants in which they occur. Their origin should be studied in the Magnolia or Fig tree, by examining them in the young state* before the parts fall asunder, or are cast off by the plant in its advancing growth.

FIG TREE.

64. If it is wished to see how far these principles are observed in practice by manufacturers, it is only necessary to look at some of the "Swiss muslins" employed as window-curtains. (The pattern produced was intended to represent something graceful and natural; but in reality the artist had achieved nothing more than the butt-end of a firelock, a form wholly unknown in nature, and embracing all the faults which the most fertile imagination could impart to a work of art.)

65. In leaves, objects so much more conspicuous than the stem, attracting attention so vividly, and having peculiarities so much more characteristic, the follow-

ing points demand attention in addition to what has been already stated.

66. Leaves require to be considered from different points of view. Firstly, as to the way in which they are inserted into, or, speaking more correctly, grow out of, the stem. Leaves arise from the stem in a manner determinate in each species, so that it is by no means a matter of indifference how the attachment of a leaf is represented, as some appear to think. The stalks, the peculiar forms of which have been already explained, regulate the mode of attachment. In general the stalk of a leaf is furrowed, there being a channel down the middle of at least the lower part of it, but usually extending from one end of the stalk to the other. Where that is the case, it is evidently necessary, in representing a leaf, to show that the two sides of the furrow embrace a portion of the stem from which the stalk proceeds.

67. In another plant the leaves may have round stalks, not channelled ones. In that case they thin away to the right and left in a particular manner, and flatten as they approach the stem. Unless that flattening is observed by the artist, he will not represent the plant before him. Nothing is more important than to observe the various ways in which the leaves of plants are placed in this respect. In the common laurel the stalk is half-cylindrical, with a furrow on the upper side: next the stem it spreads either way, embracing the stem a little, and below is connected with a slight swelling on the stem itself. If this is attended to, the artist may express the truth. If neglected, he will unintentionally represent something else.

68. In certain cases bodies are present at the base

of the leaf-stalk, which are characteristic of particular races of plants. Such bodies (called stipules) in some cases remain, in others fall off early; and always have a definite figure. For example, take a Geranium (*Pelargonium*), a favourite subject with artists. At the base of each of its leaves there is a very small green scale on either side; so that a drawing purporting to be that of a geranium, would not be correct without these scales, because they are indispensable to the species, as an essential part of its structure. All Geraniums have them, and nothing can be allowed to be a representation of that plant from which they are absent.

STIPULES OF
PELARGONIUM.

69. With regard to the mode of arrangement of leaves, it is sufficient to say that some are placed opposite others; and, some one above the other, on opposite sides of the stem. Those plants which have their leaves opposite, *always* have them opposite; and those which have their leaves alternate, *always* have them alternate. This is not a matter in which the artist can exercise his

DECUSSATE PIMELEA.

caprice; no exigencies of art can justify a departure from this truth, supposing always that it is considered necessary in an artistical point of view to adhere to the truth. Again, leaves, if they are opposite, generally cross each other; that is to say, if we look at the stem from above, the eye rests upon two pairs crossing each other at right angles,

and every other pair stands in the same relative position. From a variety of disturbing causes, however, this fact is overlooked, but it may be generally observed; and this crossing, so apparent in some kinds of plants, is only a representation of the typical manner in which all leaves grow upon a stem. In such a plant as the decussate *Pimelea*, we have this mode of formation shown very plainly, in consequence of the leaves of that plant being stiff, without flexibility and without stalks, so that they cannot be bent out of their places.

70. The mere forms of leaves are infinite, and scarcely require to be dwelt upon, because they readily catch the eye, and are generally tolerably well represented. To one or two circumstances, however, it is material to draw attention. One is the manner in which the edge of a leaf is indented or notched. We all know that leaves are indented in various ways, but it is not a matter of indifference whether they are represented with one form of indentation or another; the truth being, that their edge is always of some peculiar figure in the same species. In one the leaf has notches all round it, appearing as if intended originally to be sharp-pointed, like a saw, but afterwards had the points rounded off. In another plant, each of the principal notches is itself notched in a similar manner, on a smaller scale. Here, again, we see how carefully symmetry is preserved; first we have the general form in itself symmetrical, then each portion is subdivided in the same symmetrical way, from one end to the other; so that, even in so small a matter as the indentations of a leaf, regularity of structure is perfectly maintained.

71. But it is more especially in the veins of leaves

that the characteristic marks of plants are to be found. The veins of leaves are to them what the muscles and veins are to the animal structure. In both cases they are hidden below the surface. We do not actually see them, but we perceive the result of their presence in the elevations, depressions, and undulations of the structure to which they belong. And as we know that in the human figure it is of the first importance to attend to these circumstances, so is it equally necessary in representing plants; for the veins hidden below the leaves have a different management in different species, and that arrangement mainly determines the appearance presented by the leaves to the eye.

72. Generally, the veins are arranged with exact symmetry; they regularly divide into arms, which subdivide into other arms, and eventually lose themselves in minute capillaries, which last produce no particular effect upon the surface. The way in which the veins are arranged is different in different plants, however much they may look like each other, and any substitution of one kind of arrangement for another is fatal to resemblance.

73. For example, take the leaves of the Vine and the Plane tree, in which there is the same general form, so that one might be almost mistaken for the other. The veins of both proceed from the base to the points of the divisions of the leaf. Each division is stiffened by a rib passing from the insertion of the stalk to its point. But some difference in their appearance catches the

VINE LEAF.

eye, and gives each a peculiar character, which ren-

ders it impossible to mistake a Plane leaf for a Vine leaf. In what does that difference consist?

PLANE LEAF.

In the Vine each rib has a number of strong curved lateral arms which set off at a particular angle, branching in a peculiar manner, and if not seen nevertheless indicated, by the little variations of light and shade which their innumerable ramifications, and the consequent elevations of surface, produce.

Whereas, in the Plane leaf, although we do not find the arms missing, yet they are very much less curved, and the side veins are so sunk in the leaf as to produce little inequality of surface, but to leave the leaf almost flat. Nor is this all. In the Plane the ribs do not quit the stalk as they do in the Vine leaf, and hence again arises a characteristic difference. In the Vine, the principal ribs radiate from a common point, situated exactly where the stalk joins the leaf. In the Plane, the principal ribs spring from a point at a considerable distance above the place where the stalk joins the leaf. Out of this, not to mention other important peculiarities in the veins, grow some of the characteristic features which enable the eye unconsciously to distinguish a Vine leaf from a Plane leaf; and so in other cases.

74. As a general rule, it will be found that the arrangement of veins on one side of a leaf is the same on the opposite side, so that, as was before observed, each side of the leaf balances the other. In reality,

these veins are the passages through which the sap of the plant is conveyed into the leaf. There is a

SYCAMORE LEAF.

“main” (the mid-rib) along which sap passes, and thence it flows into veins and veinlets to be uniformly distributed. We can easily conceive, looking at the methodical manner in which every thing in nature is arranged, that such ramifications will be placed in the same manner on both sides; the object they have to

serve on either side being the same.

75. Sometimes leaves do not stand precisely in the same position with regard to the stem as in common cases. If we examine a laurel, we find that the leaves are so placed that the planes formed by the upper and lower surfaces are presented, the one to the sky, the other to the ground; and so it generally is. But in some plants it is otherwise, and this difference so affects the whole character of the plant that the distinction becomes of great importance.

76. In certain instances, that of the Iris for example, the edges are turned upwards and downwards, so that the planes of the leaf are at right angles to the earth. This circumstance cannot escape notice in such a plant as an Iris, but it occurs not uncommonly also among trees, when it may be easily overlooked.

77. There is a graceful race of plants inhabiting New Holland, in which every leaf is placed so that

the edge of it is next the stem, and the other edge is turned in the opposite direction. The colonists call them *wattles*, botanists call them *Acacias*. It will be obvious that, if an artist, neglecting this, were to place the leaves in the common position, he would not represent an *Acacia*, whatever merit his work might have in other respects.

78. With regard to the more forms of leaves, these, as has been already observed, are so easily taken in

HORSE CHESNUT LEAF.

by the eye, that it is needless to dwell upon them, beyond one or two small points. Leaves are very often divided in the same manner as in the Horse chesnut, which by the way is a beautiful example of the symmetry of those organs. Such leaves are called digitate, or fingered. Very much like them, yet materially dissimilar, are those of the Christmas rose; for although in the two plants the leaves have the same fingered appearance, yet, in the latter, the fingers at the side are very different in origin from those in the middle; whereas, in the Horse chesnut, they have

all the same form, and all originate in precisely the same manner. In the Christmas rose the side leaflets have branched stalks, but the middle leaflet has an undivided one; so that, while in the one plant the leaflets are placed like the radii of a circle, in the other they spring from a branching base in which little radiation is perceptible.

79. Similar resemblances, yet differences, may be found in the veins themselves, of which the Vine and Plane will be found also to offer a good illustration.

80. It has been already stated that the different sides of leaves are essentially alike, and that we do not usually find leaves with one side different from the other. Hence all those drawings, in which this principle is neglected, may be assumed to be misrepresentations of nature. And yet this truth is forgotten by men of whom something better might be expected. There has been lately published a little work on architectural decoration, in which will be found a drawing of a frieze or moulding covered with the foliage of the Ivy. But the artist does not make the sides of his Ivy leaves correspond. On the contrary, one side of his leaf is twice as large as the other; yet no such leaf as that would be found in the Ivy, unless it were a monster. A similar fault has been committed by the same author in the tracery of foliage proposed for decorating the capital of a column. It is not only doubtful whether the leaves employed all belong to the same plant, as is intended, but the two sides of the leaf will not balance each other, as they ought to do. The result is a one-sided design, of which nature knows nothing.

81. It may, indeed, happen that the symmetry of foliage is in certain cases disturbed by the habitual

production of leaves, one side of which is larger than the other. Such leaves occur in the Elm tree and the Begonia. In both these instances one side is regularly larger than the other, every leaf being necessarily formed upon the same plan in that respect, owing to a peculiar mode of development when very young. But observe how such leaves stand on the stem; the larger side of the leaf is invariably directed away from its branch, and the smaller towards it. This is the case throughout the whole structure,—the larger sides next the eye. It seems as if such leaves were most developed on the side where they are most strongly struck by the light when young. But in these instances there is no irregularity of form, nor any real interference with that symmetry which has been so much insisted upon. If each half of the leaf does not balance the other, at least one half of the plant balances the other half.

82. Examples of drawings, executed in exact conformity to these principles, will be found in such works as the Sikkim Rhododendrons, illustrated by Mr. Fitch; in any of the figures of plants executed by the French artist Rioereux, or in those by the late Ferdinand Bauer, whose *Flora Græca*, in ten volumes folio, contains 1000 exquisite representations of plants, upon which the scientific botanist in vain attempts to exercise his critical skill. Still finer examples of admirable pictorial talent, combined with great knowledge of the subject, are to be met with in the same artist's unpublished drawings of Passion flowers, preserved in the library of the Horticultural Society. In these drawings every angle, every curve, every elevation or depression, every detail of form or position, all in short that

constitutes truth, and which the eye of an artist can see, is produced with almost the fidelity of a photograph. The result is a surprising degree of resemblance, and consequently of beauty. The botanist imagines that he beholds the living plants themselves, and the mere artist recognises in every detail forms of such exquisite grace as could by no known means have been obtained except by the most skilful application of the laws of symmetry.

LECTURE III.

83. WHEN a plant begins to produce flowers, a great change occurs in its manner of growth, sometimes suddenly, sometimes extended over a considerable time. If the appearance of a flower is sudden, there is little alteration among the leaves antecedent to the appearance of the flower; but when the flowers appear slowly, several intermediate forms have to be noticed before the flower itself. Of this some indication is found in the sweet-scented Colts-foot (*Tussilago fragrans*). The ordinary leaves of this plant are long-stalked, and almost circular, with a heart-shaped base. Such leaves are replaced by degrees by bodies of the same kind as themselves, but of different dimensions and a different form. For instance, shortly above the bottom of the stem, the stalk of the leaf is widened enough to surround the stem completely at the base; but of that circumstance scarcely a trace could be found in the beginning. A succession of similar and gradually increasing differences will be seen to follow, each imperfect leaf becoming more and more unlike the first, till at last we reach the parts among which the flowers are produced. Now, this gradual diminution of magnitude, this change from one condition to another, is extremely common in the branches of plants producing flowers; and all the circumstances belonging to it require to be care-

fully observed. It is not allowable to represent these matters, though small, at random, for each is somewhat different from that which preceded it, and the differences may be characteristic of different species.

84. Take any common umbelliferous plant; it will probably be found that the base of the lowest leaf passes completely round the stem; that the next is in the same condition; but that the one which follows does not surround the stem more than halfway; that the next scarcely surrounds it at all; and at last a scale is found fixed to the stem by only a slight point of attachment. Now, this gradual reduction of size and alteration of form, is characteristic of many plants, although it may not occur in others. It must be further remembered that in a structure of this nature, as in leaves themselves, the most exact order is observed in the arrangement and placing of the several parts. It may happen that the flower-leaves now spoken of fall off when young, in which case scars will be left; as happens in the Ivy. The Ivy at one time bears flower-leaves similar to those observed in the sweet-scented Coltsfoot, but much smaller and more fugitive. They fall away early, leaving nothing but scars to indicate their existence. It would therefore be as great an error to represent the Ivy when in full flower, with the small flower-leaves upon it, as it would be to omit them in a case like that of Coltsfoot.

85. The branches on which these flower-leaves grow require to be represented in the same manner as the branches that bear common leaves; and what has been said already respecting the curves—the peculiar flat curves—which are observable in the configuration of branches at the places where the leaves

are set on, applies also here. It is attention to such points that indicates a knowledge of the anatomy of vegetation, exactly as minute accuracy of another kind is evidence of an artist having studied the osteology of the human face. The manner in which the flowering branches are arranged is quite as constant as that of the ordinary branches of a stem. It is not allowable to represent some divisions of the flowering branches one way, and some another, for they have all their own definite form and peculiar distribution.

86. As an instance of this the common *Laurustinus* may be selected. The natural arrangement of the

LAURUSTINUS.

flowering branches in that plant is of the following nature. There is in the first place a stalk. That stalk is terminated by a flower, which may be numbered 1. At the base of No. 1. grows a pair of small scales, from within each of which shoots forth a curved arm, having at its end another flower (No. 2.), and another pair of scales. The last produce each yet another arm, terminated once more by its flower (No. 3.), and the scales belonging to it; and thus the development proceeds, continually re-

peating itself in the same manner as it began. In this way one number one comes first; a pair of number twos second; four number threes third; eight number fours fourth; and so on. The consequence is, that No. 1., being the oldest flower, opens first. All those numbered 2., being of the same age, and placed in the same position, open next; then follow all the threes, then the fours, and so on, according to their respective ages. If we now suppose that, instead of having one pair of arms terminated each by a flower, we have seven arms radiating from a common point, like the ribs of an umbrella, and each subdivided, on the same principle as the *Laurustinus*, a still more complicated arrangement of flowers and much seeming confusion would be the result. Nevertheless, it would by no means be confusion and uncertainty, but an exact and methodical arrangement.

87. It will be found that in all cases the manner in which flowers open is fixed; their order of expansion is subject to certain fixed rules, which the artist must carefully observe. In the *Hyacinth* the first to open is the lowest on the spike, that above follows, then the next higher up, and so on. In all plants something of the same kind is observable; usually the oldest flowers are the lowest and the youngest highest, sometimes the youngest flowers are the lowest and the older ones highest. Be the arrangement what it may, truth demands that arrangement to be carefully observed. Take as an example the *Chrysanthemum*; in this plant what is called the flower is in reality a considerable collection of flowers, having no stalks, and packed close together upon the flat circular expanded end of a branch, called a receptacle. It is the nature of this plant always to open its

flowers from the circumference of the receptacle towards the centre, and never in any other way; and the same happens in thousands of plants allied to it. In such plants we always find that the first flowers which open are on the outside, and that those in the centre open last. If, then, a drawing should represent the flowers in the centre open, and those at the circumference closed, that drawing would be faulty; it would be untrue to the nature of the *Chrysanthemum*, and of all plants in which this kind of structure exists. Similar remarks might be made upon all the other modes in which flowers are arranged.

88. Flowers are frequently drawn in the state of a bud. Now the parts of a bud require as much to be placed in their natural position as those of the open flower. If truth is to be represented, the position of the parts in a bud can by no means be neglected. Take that of a *Camellia*. In this flower the parts are placed one over the other, like tiles on the roof of a house, but in a manner characteristic of the *Camellia*. One stands outside all the others, then comes another a little larger, within the first, so that we cannot remove the second till the first is taken off. Within the second is another, larger still, and immediately within that, on the opposite side, another; and so on. It is, therefore, obvious that since it is the nature of the *Camellia* to consist of scales so arranged, that there shall be one outside all the rest, and another within that, but outside the remainder; and since this order is observed throughout, that arrangement requires to be represented as far as the parts are visible to the artist. Other flowers have other arrangements of the parts of the bud, each peculiar to

itself. The structure of the flower bud is therefore no less important than that of the expanded flower.

89. Let us next consider what a flower is when looked at in the most general manner possible. A flower is a series of rings, or, as botanists term them, whorls, all placed ring within ring. In a common Crowfoot we have two rings of parts, five green scales in the outside ring, and five petals forming a second ring, within the first. This is a very simple structure; but in whatever degree a flower is complicated, or however numerous its parts may be, they will be found to consist in all cases of rings, one within another, not placed accidentally or with any uncertainty, but always arranged in a manner constant in each species. Take for example the crimson *Datura*. In that flower there is first an outer portion, or five-angled green body, the angles of which are equidistant, and the interspaces the same, the whole originating from a circle or ring at the end of the stalk, and consisting of five parts, each having a strong rib at its back. The second ring is the coloured part called the corolla, which also consists of five parts. If cut through at the bottom it actually forms a circle. In this case we have two rings, consisting each of the same number of parts. But there is yet another, a third ring, which again consists of five parts, and they too, if traced downwards to their origin, will be found to start from a ring just within the second. Thus we have three rings, that on the outside with strong well marked angles, forming a five-sided figure; the next a tube with five divisions, and then a third with five stamens.

90. This is a very common structure; and equally common is the position in which the parts of each

ring stand with respect to each other. It is by no means a matter of indifference how that is represented. In the *Datura* the five parts of one ring always stand *between* those of the next ring, and not opposite to them. That is the general rule. When an exception to it occurs, as in a *Lysimachia*, a *Primrose*, or similar plant, the circumstance must be carefully noted. It sometimes happens that the number of parts in the rings of a flower does not correspond. There may be, for instance, five parts in the outer ring, and five in the second; and not *five*, but *twice five*, or some other multiple of five, in the third ring; in general, indeed, the numbers are all multiples of each other, so that if you have three or four in one part you have three or four or some multiple of those numbers everywhere else. This is one great cause of the extraordinary symmetry of flowers; and, however it may be hidden, owing to the manner in which flowers sometimes grow, it is always ascertainable.

91. This symmetry of flowers deserves the most careful attention. In some shape or other it is always

FLOWER OF PHALAENOPSIS.

present. Even the white Butterfly plant, unsymmetrical as it seems to be, is no exception. That singular flower consists of two rings of parts, each made up of three. The second ring not only grows from within, but the parts are placed

within each other exactly according to rule. Nevertheless, there is an apparent want of symmetry, for,

although there are three external parts which are all alike, yet the three inner, which alternate with them, differ among themselves. This circumstance is of frequent occurrence; that is to say, although general symmetry is observed, and the number of parts in one ring corresponds with those in another, yet the particular parts may be of unequal magnitude. When that is the case, the necessary equipoise is restored by a corresponding development in the other rings. For instance, if the front of one ring happens to be larger than its back, then in the next ring the back will be larger than the front, and so on; or some similar compensation will be discoverable, and the same mode of adjustment is observable in the two sides of any one separate organ. In the white Butterfly plant, for example, what is called the lip consists of two arms exactly like each other; there is also a halbert-shaped central piece, with the two arms also like each other; the central piece is itself terminated by a pair of tendrils of exactly the same length, the same colour, the same breadth, and alike in all other respects. If divided lengthwise, the two halves would be precisely alike. Symmetry, therefore, is not in any degree lost, even in such irregular cases as that of the White Butterfly plant (*Phalanopsis*).

92. It sometimes happens that the parts of a flower are unequal-sided. The rule for the parts of a flower is the same as that for leaves; if a line be drawn from the base to the point, through the middle, both halves should be alike. In the case of unequal-sided leaves, general symmetry is maintained by the larger and the smaller halves always bearing the same mutual relation to each other throughout the whole plant. The same thing occurs in unequal-sided

petals. Take the *Hypericum*. In that plant, a line drawn from the base to the point of its petals, through that part which corresponds with the midrib of a leaf, describes a curve, and leaves one half of each petal twice as large as the other. Here, although there is a difference between the magnitude of the two sides of each petal, nevertheless the petals so stand that the general symmetry of the flower is preserved notwithstanding. Should the large side of any one petal be placed on the right hand of the observer, all the other large sides will be on the right hand also, or *vice versa*. The flower of the common *Oleander* is a favourite object with artists, and in it the very same peculiarity is observable. If neglected, that which is most characteristic of the *Oleander* flower is omitted, and resemblance fails. Little points of this nature are more common than is imagined, and are overlooked continually in the representation of flowers.

93. Another apparent exception to the law of symmetry occurs in the common *Candy-tuft*. This flower

FLOWERS OF CANDY-TUFT.

consists of four petals, two long and broad, two smaller and short. There seems to be no correspondence between the two sides of the flower, and symmetry appears to be missing; but if the general mass of flowers in the *Candy-tuft* is examined, it will be

found that all the large petals are turned with the most exact regularity towards the circumference of the circle formed by the flower-head, and that consequently all the small petals turn towards the centre.

94. And so it is throughout the endless forms in which the organs of plants vary. Irregularity is always reducible to regularity, and want of symmetry to symmetry, by some plan of compensation, into the exact nature of which it is for the student of art to inquire with all diligence. Such are the fundamental principles by which the artist must be guided, who would pourtray the Vegetable Kingdom as it is presented to us in nature, and who would learn to avoid the manifold errors into which so large a number of flower painters are continually falling.

95. One word more, and I have done. If the principles which these remarks have been intended to ex-

DIAGRAM OF RASPBERRY
FLOWER.

plain are important to those who would represent vegetable forms as they are, they have, if possible, a still greater bearing upon those compositions in which plants and their parts are to be employed conventionally. It is to be hoped that the time is approaching when

good taste will shrink from huge bouquets hung upon curtains, or carpets loaded with mountains of fruit, or muslin dresses made uncomfortable with eternal garlands of leaves and flowers, put in with a due regard to impossible perspective, and incomprehensible light and shade. Refined taste is shocked at such offences against common sense, and seeks eagerly for that which is beautiful without being ridiculous. Is it not possible that devices of botanists, not intended for decoration, but for the representation of ideal truth, may lend some assistance to the manufacturer? Botanists are accustomed,

for the purposes of abstract science, to project the parts of plants, and especially of flowers or fruit, upon plane surfaces, preserving all the organs in their due position with respect to each other, but neglecting form and other minor attributes. Such projections they call diagrams. Their nature and the mode of constructing them will be best understood by an example; for which purpose the Raspberry flower may be selected. In this flower the centre is occupied by a number of small grains forming a circular heap, each grain having a thread or style proceeding from its end; these would be represented in a diagram by numerous circles, with or without the threads. Next the grains comes a fleshy rim which may be represented by a wavy line. Beyond this stand about twenty stamens, the expression of which would be as many rays, with oblong or globular heads. On the outside of the stamens are placed five petals, imitated by as many curves of any form; and then come five green leaves in two rows, indicated by any five points. This gives a regular figure which represents to the eye of a botanist a Raspberry flower; but, by certain slight alterations of form or proportion in the constituent parts, the same diagram may be made to change its whole aspect without changing its material form; and of these changes I should think that intelligent artists might avail themselves. Some hundreds of thousands, nay millions of variations of this are conceivable, and they seem to answer all the exigencies of manufacturing art.

96. I certainly think that, in this way, much may be done by the taste and skill of those who know how to apply principles to practical purposes. I have

no doubt that if an artist were to take the Victoria Lily, and project all the multifarious parts of it, of different forms, upon a plane surface, and make such changes in it as would be perfectly allowable for such a purpose, consistently with the structure of plants, he would obtain an elaborate pattern, in which taste could find no fault, and in which unintelligent surprise would find much to admire.

97. In conclusion, I would ask you to bear in mind these axioms ; that the nearer nature is approached, the nearer we approach to that which is beautiful in form. Of truth, then, the artist must never lose sight ; truth must be paramount under all circumstances. But truth may have more meanings than one ; we may have absolute truth or conventional truth. Truth, moreover, is not to be confounded with reality. A monster is truth ; the most deformed of human beings is a thing which may have existence, but it is not a true representation of what occurs in the human figure ; it only represents an exceptional state.

98. In the sense in which truth is used, in questions of art, absolute truth must always be observed in pictorial representation. That I take to be a fundamental principle ; for unless minute details are introduced into the delineation of plants, as well as of animals, we may have rude representations indeed, but nothing to satisfy the eye of intelligence.

99. With regard to conventional designs, general truth is quite sufficient ; and provided the principle of symmetry, equipoise, and those other circumstances which have been so much dwelt upon in these Lectures, are sufficiently regarded, it matters little in what particular manner the representations of vege-

table forms are given. It is, however, indispensable that the parts should bear a certain relation to each other, and that relation must be what actually exists in nature. Let this be attended to, and it is impossible that any great fault can be committed.

THE END.

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