

## INTRODUCTION.

### THE STUDY OF PLANTS.

God made plants for the study of man, as well as for utility and beauty. The seed, ever true to its nature, always brings forth the plant after its own kind; it is therefore the *essential organ*: on its structure is founded what is called the "*Natural System*" in Botany, the outline of which we will briefly state:

Take an acorn, (the seed of the oak), and then remove the outer coat or skin. The seed will voluntarily divide into two parts (called cotyledons, see page 93); nestled in a little cavity at one extremity of the seed is the germ, or embryo plant—this is a miniature oak tree. Now examine a kernel of Indian corn; you will not find it composed of two distinct lobes or cotyledons like the acorn. The germ is seen at what is called the eye of the seed.\*

We perceive in the beginning of the life of plants a great difference between plants of different kinds; this can be readily observed by placing seeds upon moistened cotton in a glass vessel, and watching from day to day the gradual development of the germ. In the difference in the manner of their growth is founded the great division of plants in the Natural System. In the full-grown oak, which has proceeded from the seed with two cotyledons, and in the Indian corn with one cotyledon, there are the following remarkable differences:

*First*—The oak has a *branching* stem. The corn has a *simple* stem.

*Second*—The oak has grown by the increase of tissues *from the outside* of the stem, and the wood is hardest towards the centre. The corn has grown from the *inside*, pushing outwardly, and is hardest at the outside.

*Third*—The leaves of the oak are *net-veined*. The leaves of the corn are *straight-veined*.

We shall now leave the pupil to begin the study of Botany, in which he will be led, gradually, to an understanding of the wonderful organization of the vegetable kingdom, and the different modes of classifying plants.

\* Refer to page 91 for an explanation of the seed and the germinating process.

### CHAPTER I.

#### *Advantages of the Study of Botany.\**

1. You are now about to commence a study which was formerly thought too difficult for children, but which is, in reality, much easier than many to which they usually attend.

2. In Grammar, you can have no assistance from maps or pictures,—every thing in this science depends on the powers of the understanding; and it affords no pleasant objects to delight the eye. But Grammar is a very useful study, and should be pursued while you are young; and other studies, especially the one you are about to commence, will help you to understand it.

3. Geography is easier than Grammar, because you may have maps or pictures of countries before you, and the eye impresses on the mind the relative situation of places, the direction of mountains, the course of rivers, &c.—but if, instead of maps, you could have the countries themselves before you, to examine with your eyes and hands, if you could see the people who live in them standing before you, how much deeper would be your impressions of Geography!

4. You are now to study Botany; here the objects about which you are to learn, will be placed before you, to *see*, to *touch*, and to *smell*. Thus three of your *senses* will be called upon to aid the *memory* and *understanding*; and as flowers are objects of much beauty and interest, your *imagination* also may be gratified.

5. Your *emotions*, too, will be warmed by the thought of His love and kindness who causeth the earth to bring forth, not only

\* NOTE.—It is important, for the teacher to ask the pupils to give the heads of the chapters, either at the commencement or close of the lesson.

1. What is said of the study you are about to commence?
2. What is said of the study of Grammar?
3. What renders Geography an easier study than Grammar?
4. Are the objects about which you study in Botany manifested to the senses?
5. What effect has the contemplation of flowers upon the emotions?

'grass for the beasts of the field, and food for the use of man,' but a rich succession of curious and lovely blossoms for our admiration and enjoyment.

6. In Botany you study things which God has made. When examining plants, with all their wonderful varieties, and observing the wise provision which is made for their growth, and the perfection of the seed, with the mutual relations of the various parts to each other, you must remember to give the praise to Him whose infinite mind directs and watches over the growth of the most humble plant, at the same time that he upholds the vast worlds which he has created, and which every moment need his sustaining care. Every motion we make, every breath we draw, and every pulsation of our hearts, show that this same care is over us too; for without it, we could no more live, than we could have created ourselves.

7. Before attempting any new thing, we should always understand the reasons for so doing. I will now tell you why your parents and instructors wish you to learn something about Botany. 1st. It is a delightful study: it presents you with sweet and pleasant objects, the contemplation of which is calculated to render your tempers mild and amiable. It will always furnish you with an agreeable amusement, which is not only innocent, but of a nature to refine and improve your minds.

8. 2d. If you live in a city, your friends may have house-plants or gardens, and you may sometimes go to public gardens, where the most wonderful plants of all countries are collected, —will it not be pleasant, when you meet with flowers, to be able to find, by examining a book, what are their true names, their characters and habits, and their medicinal qualities?

9. 3d. There are a great many other things too, which Botany will teach you, such as the offices performed by the root, stem, leaves, and other organs of the plant, especially by the different parts of the flower, to which is assigned the care of forming and ripening the seed.

10. 4th. If you live in the country, every mountain-glen, every meadow, the banks of every little brook, and the waysides, will show you the different families of plants, which appear, one after another, from April till October. And many a beautiful blossom will lift up its little head in your rural walks as if to

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6. Whose works do we examine in the study of Botany?

7. What advantages are first mentioned as connected with the study of Botany?

8. What advantages of the study are mentioned secondly?

9. What thirdly?

10. What fourthly?

ask your notice. If you know nothing of Botany, you may indeed love to look at pretty flowers, and to pull them to pieces, but in this there is little amusement and no instruction. It is when your reason is brought into action in order to examine how these wonderful pieces of work are put together, and to trace their various properties and relations, that the notice of flowers becomes important as a means of improvement.

11. 5th. The study of Botany will teach you to be systematic in other things: you will find that men of science have so arranged plants, that all, even dandelions, daisies, and thistles, have their exact places in the system of classification.—It is this exactness of arrangement which makes us able, amidst so vast a multitude of plants, to find the description of each one. If all the articles in a house were thrown together without order, you would be troubled to find a needle, a pair of scissors, a book, or an article of dress. But by means of system, a person who possesses a hundred thousand articles, may arrange them so that any one can be found at any moment.

12. As a house is divided into apartments, so in Botany the vegetable kingdom is divided into *classes*; as each apartment contains sideboards, bureaus, closets, &c., for disposing of different articles, so each class in Botany contains *orders* in which are arranged the individual plants. There are also subdivisions of *orders* in Botany, which may be considered as corresponding to the different drawers of bureaus, and shelves of closets, so that a Botanist is seldom obliged to look over a whole order before he finds the particular plant which he seeks for. Now some children are very careless with respect to the arrangement of the clothes, books, and other articles, with which their kind friends provide them: it appears to me, that when they see how beautiful is the systematic arrangement of plants in Botany, they will at once resolve that every thing which belongs to them, or that they have the care of, shall be arranged according to some rule, so that they may always find what they want, without being obliged to make a long search for it. I could spend a great deal of time in telling you of the advantages of a knowledge of Botany; but it is better that you should proceed directly to the study, and then your own minds will suggest to you many reasons why it is to be classed among the most useful and interesting branches of science: I will however mention one farther recommendation of this study.

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11. What fifthly?

12. How do the divisions of a house correspond to the divisions in Botany?

13. 6th. I leads us to love and reverence God. Flowers are presents which our heavenly Father gives us. It is therefore proper that we should examine and study them. We see that He who made them must be *wiser* and more *powerful* than the greatest of men—for what man could make the least plant? We can imitate flowers in wax and various other ways, but who can give them life?

None can the life of plant or insect give  
Save God alone——.

14. Flowers may be considered as tokens of God's love to us;—"If God so clothe the grass of the field, which to-day is, and to-morrow is cast into the oven, will he not much rather clothe us?" He

Scorns not the least of all His works; much less  
Man, made in His image, destined to exist,  
When e'en yon brilliant worlds shall cease to be.  
Then how should man, rejoicing in his God,  
Delight in His perfections, shadow'd forth  
In ev'ry little flow'r and blade of grass!——  
Each op'ning bud, and care perfected seed,  
Is as a page where we may read of God.

## CHAPTER II.

*Division of the Sciences.—Different parts of flowers.—Importance of Botanical arrangement.*

15. We are now about to commence our new study.—There are many sciences to be learned by those who wish to be wise, but yet all things which exist in the whole universe may be classed under *two* heads, *mind*, and *matter*.

16. *Mind* or spirit cannot be seen by us, although it exists in all rational beings, and is that within us which *thinks* and *feels*.

17. God is a spirit; he is not like us confined to any *body*, or *portion of matter*, but as the sun's rays spread abroad over the earth, so the presence of God extends to every part of his crea-

13. What advantages are mentioned sixthly as connected with the study of Botany?

14. How may flowers be considered?

15. Under what two heads may all things which exist be classed?

16. What is observed of mind or spirit?

tion; we do not perceive him, because we cannot see *mind*. When our spirits are separated from the body, or *matter*, they will no doubt at once perceive that they are in the presence of God.

18. The science which treats of the *Deity*, and of our duties to Him, is called *Theology*.\*

19. The science which treats of the *Human mind*, is called *Philosophy of the mind*, or *Metaphysics*.†

20. The study of *matter* is sometimes called by the general term *Physics*; it is divided into three general heads.

1. *Natural Philosophy*.

2. *Chymistry*.

3. *Natural History*.

A mere definition of Natural Philosophy and Chymistry would not enable you to understand what these sciences are, but you will soon be able to study them with pleasure and profit.

21. Natural History, or the History of Nature, is divided into,

22. 1. *Zoology*,‡ which treats of animals.

23. 2. *Botany*, which treats of plants.

24. 3. *Mineralogy*, which treats of stones, &c. This science includes Geology, which treats of rocks, the manner of their formation, and the various changes which have taken place on the surface of the globe, since its creation.

25. The word *Botany* is derived from the Greek *botane*, which signifies a plant. The objects of this science are the vegetable kingdom, including every thing which grows out of the earth, having *root*, *stem*, *leaf*, or *flower*.

26. There are two principal departments in Botany; 1st, that which treats of the classes and orders of plants; this is called *Systematic Botany*.

NOTE.—The attention of the pupil should be directed to the notes which point out the derivation of words.

\* From the Greek *Theos*, God, and *logos*, a discourse.

† From *meta*, beyond, and *phusis*, nature.

‡ From *zoe*, life, and *logos*, a discourse.

18. What is that science called which treats of the Deity?

19. What is the science which treats of the Human Mind?

20. How is the study of Matter divided?

21. What are the branches of Natural History?

22. What does Zoology treat of?

23. What does Botany treat of?

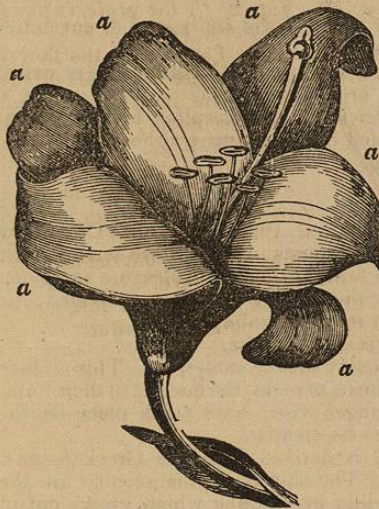
24. What does Mineralogy treat of?

25. From whence is the term Botany derived, and what are the objects of the science?

26. What is systematic Botany?

27. 2d. That which treats of the different parts of the plants and their uses; this is *Physiological Botany*.

Fig. 1.



28. In beginning to study Botany, it is best to examine first the parts of a flower.

29. Here is a *lily*, Fig. 1; that part of it which you would call the blossoms, is the *corolla*;\* this is composed of six parts, each of which is called a *petal*.

30. There are within the corolla six thread-like organs; these are called *stamens*; examine them as they appear at Fig. 2. You see that one part, as at *a*, is long and slender; this is called the *filament*, from *filum*, a thread. At *b* is a little knob which is hollow like a box; this is the *anther*.

\* So called from the Latin *corolla*, a little crown.

27. What is physiological Botany?

28. What is the best way of beginning the study of Botany?

29. What are the botanical names of the blossom of a lily and its parts.

30. Describe the stamens and their parts.

Fig. 2.



31. In the centre of the lily is the *pistil*; this consists of three parts, the *stigma*, (see Fig. 2. *f*) the *style*, (*e*) and the *germ*, (*d*).

32. The end of the flower stem, where the petals of the flower are inserted, is called the *receptacle*; you may see it at Fig. 2. *g*.

33. In most flowers you will observe the corolla standing in a little green cup; this is called the *calyx*.\* The lily has no calyx, but the rose and the pink have.

34. I have now told you of five parts of a flower:

1. *Calyx*—the cup; surrounding the corolla.
2. *Corolla*—the blossom; the parts are called petals.
3. *Stamens*—enclosed by the corolla; the parts are the filaments and anther.
4. *Pistil*—standing in the centre; the parts are the germ style, and stigma.
5. *Receptacle*—bearing the other parts of the flower.

35. Besides these, there are two other parts, which are considered as belonging to the flower: viz. the *pericarp* and the *seed*.

\* The word *calyx* signifies a cup.

31. Describe the pistil and its parts.

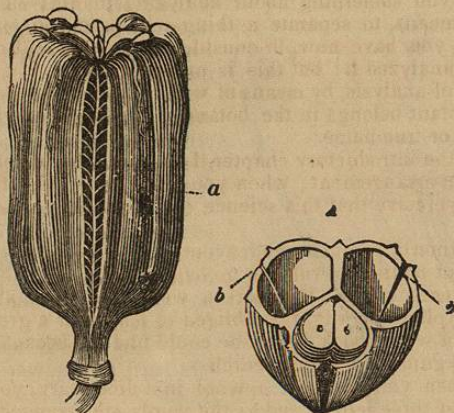
32. What is the receptacle?

33. What is the calyx?

34. Name the five parts of a flower which have been mentioned.

35. What two other parts belong to the flower?

Fig. 3.



36. The *pericarp* is only the germ when it becomes ripe; it is this part of the flower which contains the seed.

37. At Fig. 3, *a* is a representation of the pericarp; you will perceive it is much larger than the germ at Fig. 2. *f*. At *b* the pericarp appears as if cut across, and shows three divisions, these are called *cells*, each of which contains two seeds in the shape of a triangle, as at *bb*.

38. The *seed* is, as you have seen, carefully packed away in little cells in the pericarp;\* this is the most important part of the flower; and it seems as if all the other parts were chiefly intended to nourish and protect this.

39. If you add the pericarp and the seed to the five parts which you have already learned, you will then have *seven* parts of the flower to remember. These are called *Organs of Fructification*, from *fructus*, fruit, and *facio*, to make.

40. I shall hereafter inform you more particularly respecting

\* The word *pericarp* is derived from the Greek words, *peri*, around and *karpos*, fruit.

36. What is the pericarp?  
 37. Describe Fig. 3.  
 38. What is the most important part of the flower?  
 39. How many parts constitute what are called the organs of fructification?  
 40. What is meant by analyzing a flower?

these organs, or members of the flower; but must now proceed to teach you something about analyzing plants;—The word analyze means, to separate a thing into parts; in one sense, therefore, you have now, in considering the different organs of a flower, analyzed it: but this is only to prepare you for another kind of analysis, by means of which you will be able to tell where a plant belongs in the botanical system, and what is its botanical or true name.

41. In the introductory chapter, I spoke of the importance of systematic arrangement; when you learn something of Botany, you will perceive that this science could not exist without system.

42. Formerly botanists endeavoured to give descriptions of plants; but having no rules to go by, they were not able to understand each other. If a person wished to learn about any particular plant, he might be obliged to look over a great many pages, or a whole book, before he could find it; because he had no rule to guide him in his search.

43. When you look out a word in a dictionary, you search for the first three letters, and as the words are arranged by rule, you can find immediately what you wish. If all the words in a dictionary were thrown together without any order, how discouraging would be the task of looking for definitions.

44. Now it is just so with respect to describing plants; we must be guided by some rule in their arrangement.—What shall this rule be? Suppose we should arrange the names of plants in alphabetical order, and then give descriptions of them.—But here is one great difficulty; the names by which people who do not understand Botany call plants, are not the same in different places; persons whose gardens are very near each other, will often call the same flower by different names; and in different countries, the names of plants are expressed in different languages; what we call *corn*, is in French, *blé*, and in Latin, *ceres*. Without some general system, therefore, you perceive we could not learn any thing of the plants of different countries, and could not understand each other even with respect to our own plants.

45. After a great many attempts had been made to class

41. Is systematic arrangement necessary in Botany?  
 42. Why were the botanists of former times unable to understand each other?  
 43. By what rule are words in a Dictionary arranged?  
 44. Would the description of plants in alphabetical order, serve as a rule for botanical arrangement?  
 45. How did Linnæus propose to arrange plants?

plants, Linnæus, of Sweden, proposed to arrange them under *classes* and *orders*, by means of the *stamens* and *pistils*. He had discovered that these organs existed in all plants; that some had one stamen, others two, three, &c. and that it was the same with regard to the pistils, which, although the lily has but one, are numerous in the rose and some other plants. In the next chapter I shall tell you something more of the classes of Linnæus, and teach you how to analyze a flower according to his system.

### CHAPTER III.

*Practical Botany commenced by the analysis of the Pink.*  
*Method of preparing an Herbarium—Botanical excursions*  
*—The study of nature the duty and privilege of intelligent minds.*

46. Plants, as I have told you, are arranged in classes and orders by their stamens and pistils. The largest division is that of *classes*.

47. There are *twenty-one* classes.

48. Each class is divided into *orders*.

49. A plant with one stamen belongs to the first class; as there are some plants here with one pistil, and others with two, there are a first and second order in the first class.

46. What is the largest division of plants?

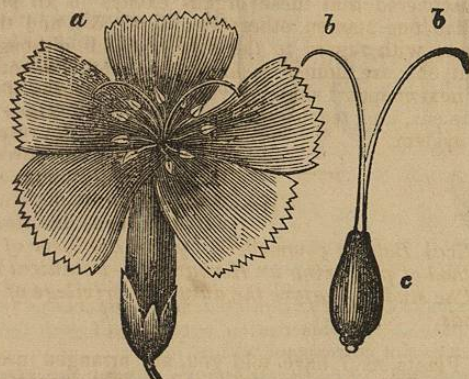
47. How many classes are there?

48. How is each class divided?

49. What circumstances would place a plant in the first or second order of the first class?

### Analysis of the Pink.

Fig. 4.



50. You will understand this better if I give you an example. You shall now analyze a flower in order to find its botanical arrangement and name. Here is a pink. We wish to know in what *class* it is—count the stamens—you say *ten*, therefore this is in the *tenth* class; the name of the class is Decandria (from *deka*, ten, and *andria*, stamens.)

51. We wish to know in what *order* this flower is—count the pistils—you say *two*, it then belongs to the second order of the tenth class; the name of this is Digynia (from *dis*, two, and *gynia*, pistil.)

52. Orders are composed of *families* of plants called *genera*, which is the plural of *genus*.

53. We must, as a third step in our analysis, learn to what *genus* this flower belongs; for this purpose it is necessary that you turn to that part of your book called "*Description of the Genera of Plants*;"\* look for Class 10, Order 2.—Now instead of looking a whole book through, you have only to examine the genera which you find under this order, and to compare your flower with each description until you find one which answers to it.

\* To find this, see the "Table of Contents."

50. How can you find in what class the pink is placed?

51. How can you know in what order the pink is?

52. Of what are the orders of plants composed?

53. What is a third step in the analysis of the pink?

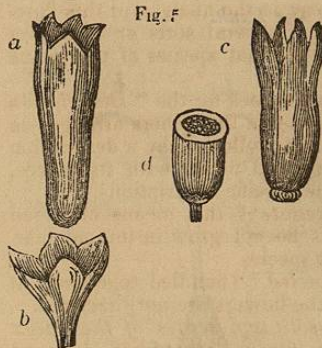


Fig. 5

54. The first genus mentioned is, "HYDRANGEA;" this is said to have a "calyx 5-toothed, superior;" examine the calyx of the pink (Fig. 5, a;) this is five-toothed, or has five notches around the top of it, but it is not superior, that is, the calyx does not stand above the germ. Your flower is not therefore of the genus Hydrangea, because it does not fully agree with the description.

55. SAXIFRAGA. "Calyx 5 parted, half superior;" although the first part of this description agrees with your flower, the last part does not correspond with it.

56. SAPONARIA. "Calyx inferior" (under the germ,) "1 leafed," (all of one piece;) "tubular;" (long and hollow like a tube,) "5-toothed;" so far this description applies to your flower.—But the next circumstance, "calyx without scales," is different from what you see in the pink, (See Fig. 5, b.)\*

57. "DIANTHUS. Calyx inferior, cylindrical" (long and roundish;) "1 leafed, with 4 or 8 scales at the base; petals 5," (See Fig. 4, a) "with claws," (the petals long and slender at the lower part;) "capsule" cylindrical, 1-celled (the capsule is a kind of pericarp;) "dehiscent," this means gaping, as you see at Fig. 5, c, which represents the capsule or seed vessel of the pink as it appears when ripe, the valves or pieces which compose it, open of themselves as if for liberating the seeds. At d the capsule appears as if cut horizontally, showing the seeds all contained in one cell. Fig. 4 at c shows the capsule as it appears when the pink is in blossom, at which time it is called the germ. As this flower agrees in every particular with the last mentioned description, you may be certain you have now found its genus; the pink then belongs to the genus DIANTHUS.

\* This represents the scales of the calyx of the pink.

54. Why does not this flower belong to the genus *Hydrangea*?  
 55. Why is it not of the genus *Saxifraga*?  
 56. Why is it not *Saponaria*?  
 57. Why is the pink of the genus *Dianthus*?

58. You have a fourth step to go in the analysis of this flower; for each genus is composed of several sorts or species of plants.—It is necessary to know to what species of the genus *Dianthus* this flower belongs.

59. Look in the latter part of your book for the "Description of species of plants."\* Here you find the genera arranged in alphabetical order, each genus being followed by a description of its species. If you have a natural flower with its leaves, you can now compare it with the specific descriptions.

60. "*Armeria, flowers aggregate*;" this means clustered together on one stalk; but pinks do not grow in this manner therefore the plant is not of this species.

61. "*Barbatus, flowers fascicled*," (bundled together;) it cannot be this species, because the flowers are not fascicled.

62. "*Caryophyllus, flowers solitary, scales of the calyx sub-rhomboid*;" (sub-rhomboid means somewhat diamond shaped,) "very short, petals crenate," (scalloped on the edge,) beardless, (without hair or down.) The pink is in all respects answerable to this description. It is also added, that the leaves are "linear," which means long and narrow; "subulate," signifies pointed at the end like a shoe-maker's awl; "channeled," signifies having a groove or channel running through the leaf.

63. You have now learned the class and order of the pink, with the genus and species to which it belongs. The botanical name of the pink is,

DIANTHUS caryophyllus.

It belongs to,

Class 10. DECANDRIA. Order 2. DIGYNIA.

64. Having analyzed a flower, you must now take one of the same kind, and lay it between sheets of paper to dry, having a weight placed over to press it. Every person who would become a Botanist, should preserve specimens of all the plants he meets with. A book of such specimens is called an *herbarium*.

65. There are few parents who would not delight to see a handsome herbarium made by their child. There is no diffi-

\* See "Table of Contents."

58. What is the fourth step in the analysis of a flower?  
 59. Where are you to look to find the species?  
 60. Why is not the pink of the species *armeria*?  
 61. Why is it not of the species *barbatus*?  
 62. Why is it not of the species *caryophyllus*?  
 63. What have you now learned respecting the pink?  
 64. What is an herbarium?  
 65. Describe the process of preparing plants for an herbarium.

culty in your affording your parents this gratification. All that you need in pressing plants, is some sheets of paper, (newspapers will answer, they are better than more firm and stiff paper) a board, and a stone or some other weight to press the plant. Some leaves and flowers of the plant should be carefully spread out upon one sheet of paper, and half a dozen other sheets placed over them;—the board with the weight should then be laid upon the upper sheet of paper. The plants at first, ought to be taken out and placed between dry sheets of paper as often as once or twice a day. Some will dry in a few days, others require more time.

66. When you have as many as fifty specimens prepared, you can then arrange them in a blank book, fastening upon the first page of each leaf one or more flowers, either with glue or by means of cutting through the paper and raising loops, under which the stems may be placed. By the sides of the plant should be written the *class*, *order*, *genus*, and *species*, and also the place where found, that is, whether in dry or wet ground, low or mountainous, &c., and also at what season of the year. Such herbariums would do children much credit if prepared to be exhibited at public examinations of their school.

67. Young botanists, as well as those who are older, may derive great pleasure in making excursions into the fields, and upon the hills and mountains, for the purpose of collecting plants. Thus they learn to love every blossom which springs up under their feet; their hearts beat with pleasure when they meet with some little strange flower, which exhibits new traits in the character of the vegetable race. Every murmuring brook shows its banks clad with flowery treasures; the forests and groves exhibit another, but not less beautiful assemblage of plants; and the mountain, the valley, and the sea coast, have all their own peculiar vegetable productions.

68. Did the great Being who created such a profusion of these beautiful and curious objects, and who also gave to children eyes to see, hearts to love, and understandings to study them, intend they should pass them by with neglect? No, my dear children, it is your duty, as it should be your pleasure, to search into the wonders of created nature, to exercise your mental faculties, and to animate your pious feelings in thinking much upon the works of God.

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66. How should dried plants be arranged in a book?  
 67. What is said of making botanical excursions?  
 68. What is said of paying attention to the works of God?

## CHAPTER IV.

*Introduction to Practical Botany continued—Latin and Greek Numerals—Classes of Linnæus.*

69. You have been taught to analyze one flower;—while you were doing this, did not many thoughts seem of themselves to come into your minds? You examined a lily; you found it had *six stamens*, and *one pistil*, and it is very likely you thought that if the pink was in the *tenth* class and *second* order because it had *ten* stamens and *two* pistils, the lily must be in the *sixth* class and *first* order—it is so.

70. Now when you learn one fact it will bring many new thoughts to your mind; and this furnishes great encouragement for you to study; since you not only gain the knowledge which is the immediate object of your search, but are enriching your minds with many connected ideas which follow in its train.

71. You will, perhaps, now think that all flowers are classed by the *number of stamens*, but this is not correct, for as some have more than a hundred stamens, such an arrangement would be making quite too many classes; and besides, it is found that such plants as have more than ten, often vary in the number of stamens, so that only the first ten classes depend on this circumstance.

72. Linnæus discovered that the stamens of some plants grew upon the *calyx*, and others upon the *receptacle*; the rose is of the former kind, and the poppy of the latter.

73. Take off the petals of a rose and you will perceive the stamens to be inserted upon the calyx; for this reason it is of the 11th class; and because it has many pistils is in the 13th order.

74. The name of the genus is *Rosa*. In this genus are many species; as *Rosa muscosa*, or the moss rose, which has upon its calyx and stems a collection of hairs resembling moss. *Rosa alba*, the white rose, distinguished not only by the whiteness of its petals, but by peculiar circumstances of the leaves and stems.

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69. After learning the classification of the pink, what should you infer respecting the class and order of the lily?  
 70. What should encourage you to learn?  
 71. Are all flowers classed by the number of stamens?  
 72. Are the stamens of all plants placed in the same position?  
 73. Why is the rose in the 11th class, 13th order?  
 74. What is observed of the different species in the genus *rosa*?



75. The apple blossom appears like a little wild rose, it belongs to the same class and order as the rose, but is of a different genus.

76. If you examine a poppy, you will find numerous stamens growing upon the receptacle or top of the flower stem, this is therefore of the 12th class. It has but one pistil, and is therefore in the 1st order.

77. Having made you acquainted with some of the principles in Systematic Botany, and taught you how to proceed in the Analysis of flowers, I shall now give you to learn the Latin and Greek numerals, which, added to certain other words, compose the names of the Classes and Orders.

It is not in Botany alone that a knowledge of these numerals will be useful to you; many of our most common words are compounded with them; for example, *uniform* is from *unus*, one, and *forma*, form,—*octagon*, is from *octo*, eight, and *gonia*, angle, &c.

## NUMERALS.

78. Latin.	Numbers.	Greek.
Unus,	1.	Monos, single.
Bis,	2.	Dis, twice.
Tres,	3.	Treis.
Quatuor,	4.	Tettares.
Quinque,	5.	Pente.
Sex,	6.	Hex.
Septem,	7.	Hepta.
Octo,	8.	Okto.
Novem,	9.	Ennea.
Decem,	10.	Deka.
Undecem,	11.	Endeka.
Duodecem,	12.	Dodeka.
Tredecem,	13.	Dekatreis.
Quatuordecem,	14.	Dekatettares.
Quindecem,	15.	Dekapente.
Sexdecem,	16.	Dekaex.
Septemdecem,	17.	Dekaeptha.
Octodecem,	18.	Dekaokto.
Novemdecem,	19.	Dekaennea.
Viginti,	20.	Eikosi.
Multus,	Many.	Polus.

75. What is said of the apple blossom?

76. Why is the poppy in the 12th class, 1st order?

77. Is it in Botany alone that a knowledge of Greek and Latin numerals is useful?

## CLASSES OF PLANTS.

79. These are founded upon distinctions observed in the STAMENS.

80. All known plants are divided into *twenty-one classes*.

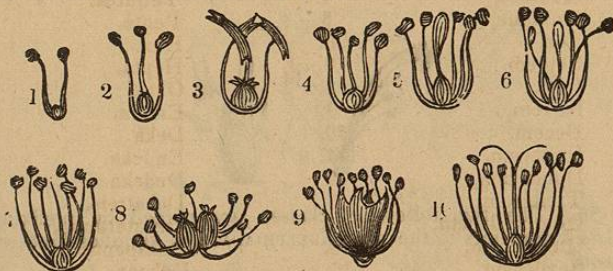
81. The first twelve classes are named by prefixing Greek numerals to ANDRIA, which signifies *stamen*.

82. The first ten classes depend on the number of stamens

## CLASSES.

	Names.	Definitions.
83. Number of Stamens.	1. MON-ANDRIA,	<i>One Stamen.</i>
	2. DI-ANDRIA,	<i>Two Stamens.</i>
	3. TRI-ANDRIA,	<i>Three Stamens</i>
	4. TETR-ANDRIA	<i>Four Stamens</i>
	5. PENT-ANDRIA,	<i>Five Stamens.</i>
	6. HEX-ANDRIA,	<i>Six Stamens.</i>
	7. HEPT-ANDRIA,	<i>Seven Stamens.</i>
	8. OCT-ANDRIA,	<i>Eight Stamens.</i>
	9. ENNE-ANDRIA,	<i>Nine Stamens.</i>
	10. DEC-ANDRIA,	<i>Ten Stamens.</i>

Fig. 6.



NOTE. The pupil should be required to give the derivation of the names of the classes; as "Monandria, from *Monos*, one, and *Anária*, stamen," &c.

78. Repeat the numerals.

79. On what are the classes founded?

80. How many classes are there?

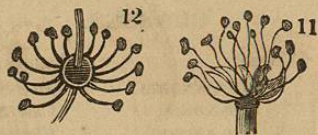
81. How are the first twelve classes named?

82. What classes depend on the number of stamens?

83. Repeat the names of the first twelve classes.

84. Number and position. { 11. ICOS-ANDRIA,\* (Eikosi.) 20  
 { 12 POLY-ANDRIA, (Polus.) many. } Over ten stamens inserted on the Calyx. Over ten Stamens inserted on the Receptacle.

Fig. 7.



85. The two following classes are named by prefixing Greek numerals to DYNAMIA, which signifies *power* or length.

- Number and relative length. { 13. DI-DYNAMIA, } Having four stamens; two of which are longer or more powerful than the other two.  
 Number and relative length. { 14. TETRA-DYNAMIA, } Having six stamens; four of which, are longer or more powerful than the other two

Fig. 8.



86. The two following classes are named by prefixing Greek numerals to the word ADELPHIA, which signifies *brotherhood*.

- { 15. MON-ADELPHIA. } Stamens united by their filaments in one set or brotherhood.

\* The name of this class does not now designate its character, since the number of stamens is often more or less than twenty.

84. What are the two classes which depend on the number and position of the stamens?  
 85. What two classes depend on the number and relative length of stamens?  
 86. What two classes have their stamens united by their filaments?

16. DI-ADELPHIA, } Two brotherhoods.  
 The next class is named by prefixing SYN, signifying *together*, to GENESIA, which signifies *growing up*.  
 17. SYN-GENESIA, } Five united anthers. flowers compound.

87.

Fig. 9.



88. The next class is named by an abbreviation of the word GYNIA, which signifies pistil, prefixed to ANDRIA, showing that the stamen and pistil are united.

- Position. { 18. GYN-ANDRIA, } Stamens growing out of the pistil.  
 The two following classes are named by prefixing numerals to ÆCIA, which signifies a house.

89. Position. { 19. MON-ÆCIA, } Stamens and Pistils on separate corollas upon the same plant or in one house.  
 90. Position. { 20. DI-ÆCIA, } Stamens and Pistils in separate corollas upon different plants or in two houses.

Fig. 10.



91. The name of the last class is a compound of two Greek words, CRYPTOS, and GAMIA, signifying a *concealed union*.

87. What class has the stamens united by their anthers?  
 88. What class has the stamens growing out of the pistil?  
 89. Describe the class Monœcia.  
 90. Describe the class Diœcia.  
 91. Describe the class Cryptogamia.

Natural. } 21 CRYPTO-GAMIA. { *Stamens and Pistils invisible, or too small to be seen by the naked eye.*

Fig. 11.



Lichens.

Mushrooms.

Ferns.

Mosses.

92. All plants are either *Phenogamous*, with stamens and pistils visible, or *Cryptogamous*, with stamens and pistils invisible; the first twenty classes are of the former, the twenty-first class of the latter kind.

93. You have now been taught the classes into which plants are divided—It is important that these should be well understood, and that as early as possible, you collect some plants of each class.

## CHAPTER V

### Orders of Linnæus—Synopsis of Classes and Orders.

94. THE classes are divided into *Orders*. Each class usually contains several orders; you will best learn to distinguish them by practice in analyzing plants, though it is proper you should learn their names, and the circumstances on which they are founded.

### ORDERS OF PLANTS.

95. The orders of the first twelve classes are founded upon the number of *PISTILS*.

92. What general name is given to the first twenty classes, and what are the plants of the twenty-first class called?  
 93. What have you now been taught?  
 94. How can you best learn to distinguish the different orders in each class?  
 95. On what are the orders of the first twelve classes founded?

96. The orders are named by prefixing Greek numerals to the word *GYNIA*, signifying pistil.

### ORDERS.

	<i>Names.</i>	<i>No. of pistils.</i>
97.	1. MONO-GYNIA,	1.
	2. DI-GYNIA,	2.
	3. TRI-GYNIA,	3.
	4. TETRA-GYNIA,	4.
Orders found in the first twelve classes	5. PENTA-GYNIA,	5.
	6. HEXA-GYNIA,	6. <i>this order seldom found</i>
	7. HEPTA-GYNIA,	7. <i>this still more unusual</i>
	8. OCTO-GYNIA,	8. <i>very rare.</i>
	9. ENNEA-GYNIA,	9. <i>very rare.</i>
	10. DECA-GYNIA,	10.
	13. POLY-GYNIA,	<i>over ten pistils.</i>

The classes vary as to the number of orders which they contain.

98. The orders of the 13th class, *Didynamia*, are but two.

1. GYMNOSPERMIA. From GYMNO, signifying naked, and SPERMIA, signifying seed, implying that the seeds are not enclosed, *seeds usually four, lying in the calyx.*  
 2. ANGIOSPERMIA. From ANGEION, signifying bag or sack, added to SPERMIA, implying that the seeds are enclosed, *seeds numerous in a capsule.*

99. The orders of the 14th class, *Tetradynamia*, are two both distinguished by the form of the fruit.

1. SILICULOSA. Fruit, a *silicula*, or roundish pod.  
 2. SILIQUOSA. Fruit, a *siliqua*, or long pod.

100. The orders of the 15th and 16th classes, are founded on the number of stamens, that is, on the characters of the first twelve classes, and they have the same names; as *Monandria*, &c.

101. The 17th class, *Syngenesia*, has its five orders distinguished by different circumstances of the florets, as:

1. EQUALIS. Stamens and pistils *equal*, or in proportion, that is, each floret has a *stamen*, a *pistil*, and one seed. Such florets are called *perfect*.

96. How are these orders named?

97. Repeat the names of the orders.

98. What are the orders of the 13th class?

99. What are the orders of the 14th class?

100. In what classes are the orders founded upon the number of stamens?

101. What are the orders of the seventeenth class?

2. **SUPERFLUA.** Florets of the disk perfect, those of the ray containing *only pistils*, which without stamens are *superfluous*.
3. **FRUSTRANEA.** Florets of the disk perfect, of the ray neutral, or without the stamen or pistil; therefore *frustrated*, or useless.
4. **NECESSARIA.** Florets of the disk staminate, of the ray pistillate; the latter being *necessary* to the perfection of the fruit.
5. **SEGREGATA.** Florets *separated* from each other by partial calyxes, or each floret having a perianth.

102. The orders of the 18th, 19th, and 20th classes, like those of the 15th and 16th, depend on the number of stamens.

103. The orders of the 21st class, Cryptogamia, constitute six natural families.

1. **FILICES**,—includes all *Ferns*, having the fruit on the leaves.
2. **MUSCI**,—Mosses.
3. **HEPATICÆ**,—Liverworts, or succulent mosses.
4. **ALGÆ**,—Sea-weeds, and frog spittle.
5. **LICHENS**,—Lichens, found growing on the barks of old trees, old wood, &c.
6. **FUNGI**,—Mushrooms, mould, blight, &c.

104. No confusion is produced in taking the character of some classes, for orders in others; for example: if you have a flower with ten stamens, *united by their filaments into one set*, you know by the definition of the classes that it belongs to the *class* Monadelphia, you can then, because it has ten stamens, place it in the *order* Decandria of the same class.

Having explained the principles on which the artificial classes and orders are founded, we will now place them before you, in a synoptical or general view.

105. "SYNOPSIS OF THE CLASSES AND ORDERS OF LINNÆUS."\*

	CLASSES.	ORDERS.
No. STAMENS	{ 1. MONANDRIA, 1 stamen. 2. DIANDRIA, 2. 3. TRIANDRIA, 3. 4. TETRANDRIA, 4. 5. PENTANDRIA, 5.	} Number of styles, if styles are wanting, number of sessile stigmas. Monogynia, 1. style, or one sessile stigma. Digynia, 2. Trigynia, 3. Tetragynia, 4. Pentagynia, 5. Hex

\* We say of *Linnæus*, because there are other systems of classing plants, though none so generally adopted, or so proper for the learner.

102. On what do the orders of the three following classes depend?
103. What are the orders of the class Cryptogamia?
104. Does any confusion follow from taking the characters of some classes, for orders in other classes?

No. STAMENS	{ 6. HEXANDRIA, 6. 7. HEPTANDRIA, 7. 8. OCTANDRIA, 8. 9. ENNEANDRIA, 9. 10. DECANDRIA, 10.	} agynia, 6. Heptagynia, 7. Octogynia, 8. Enneagynia, 9. Decagynia, 10. Polygynia, any number over 10.			
			Number and Position.	{ 11. ICOSANDRIA, over 10 stamens, on the calyx. 12. POLYANDRIA, many stamens, not on the calyx.	} 1. Gymnospermia, seeds naked. 2. Angiospermia, seeds in capsules.
			Connexion of the Stamens by filaments or anthers.	{ 15. MONADELPHIA, filaments united in 1 set. 16. DIADELPHIA, filaments united in 2 sets. 17. SYNGENESIA, anthers united—flowers compound.	} Characters and names of preceding classes. As, 1. Monandria, 2. Diandria, 3. Triandria, 4. Tetrandria, 5. Pentandria, 6. Hexandria. Disk and ray florets compared. 1. Æqualis, 2. Superflua, 3. Frustranea, 4. Necessaria, 5. Segregata.
Invisible or Caducous.	{ 21. CRYPTOGAMIA, stamens invisible, wanting, or very caducous.	} Natural families. 1. Filices, 2. Musci, 3. Hepaticæ, 4. Algæ, 5. Lichens, 6. Fungi.			

NOTE.—The teacher cannot too much insist upon a thorough knowledge of the names and characteristics of the classes and orders.

105. You may now repeat the names of all the classes, with their orders.