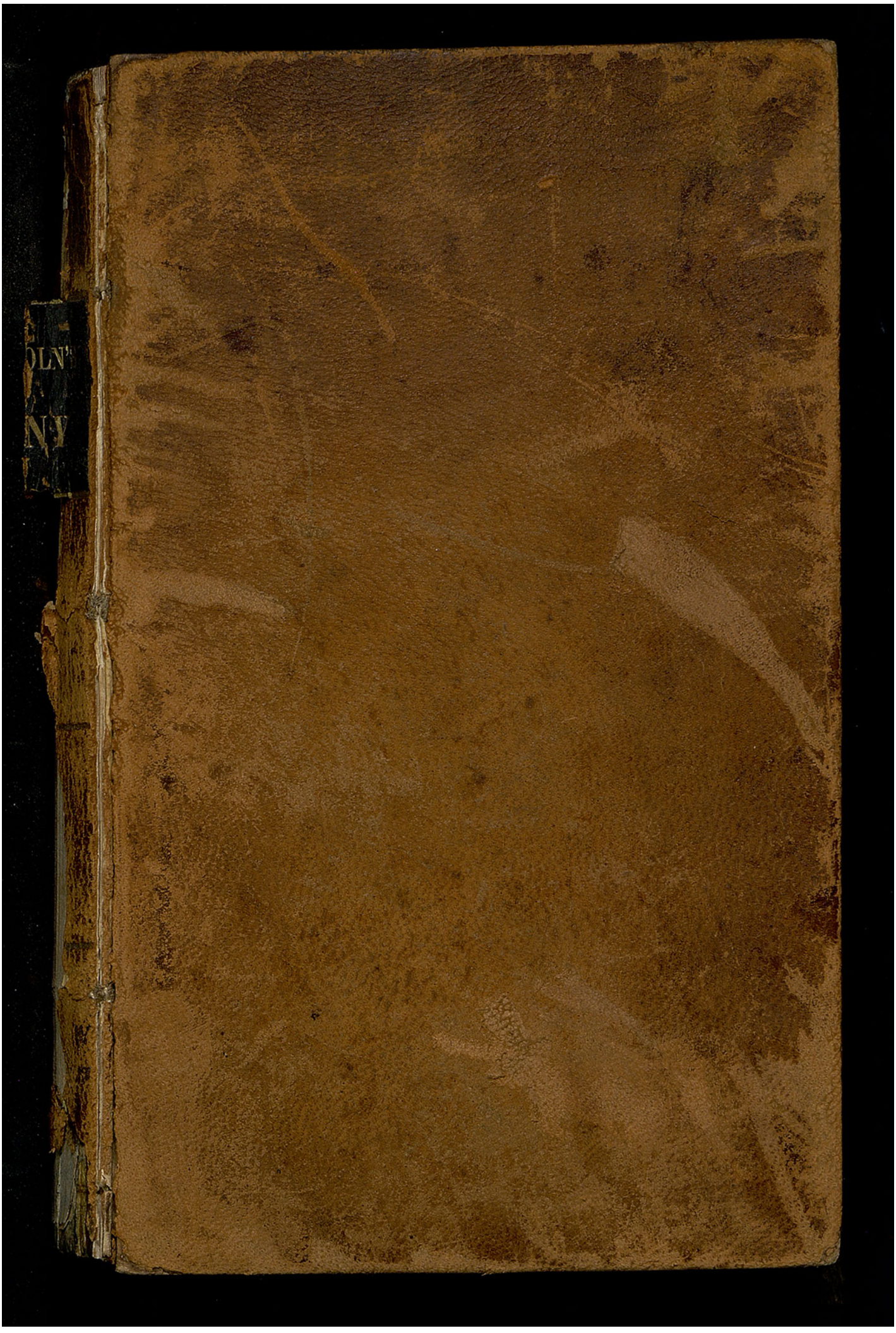


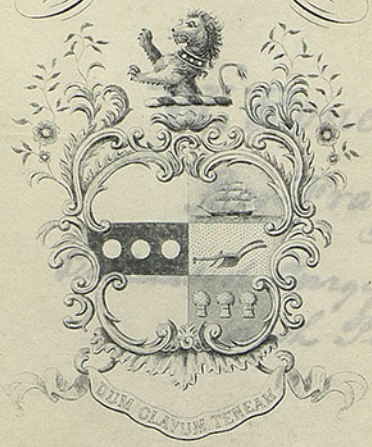
12968-Dj9562_0001.tif

12/—

Dj

9562

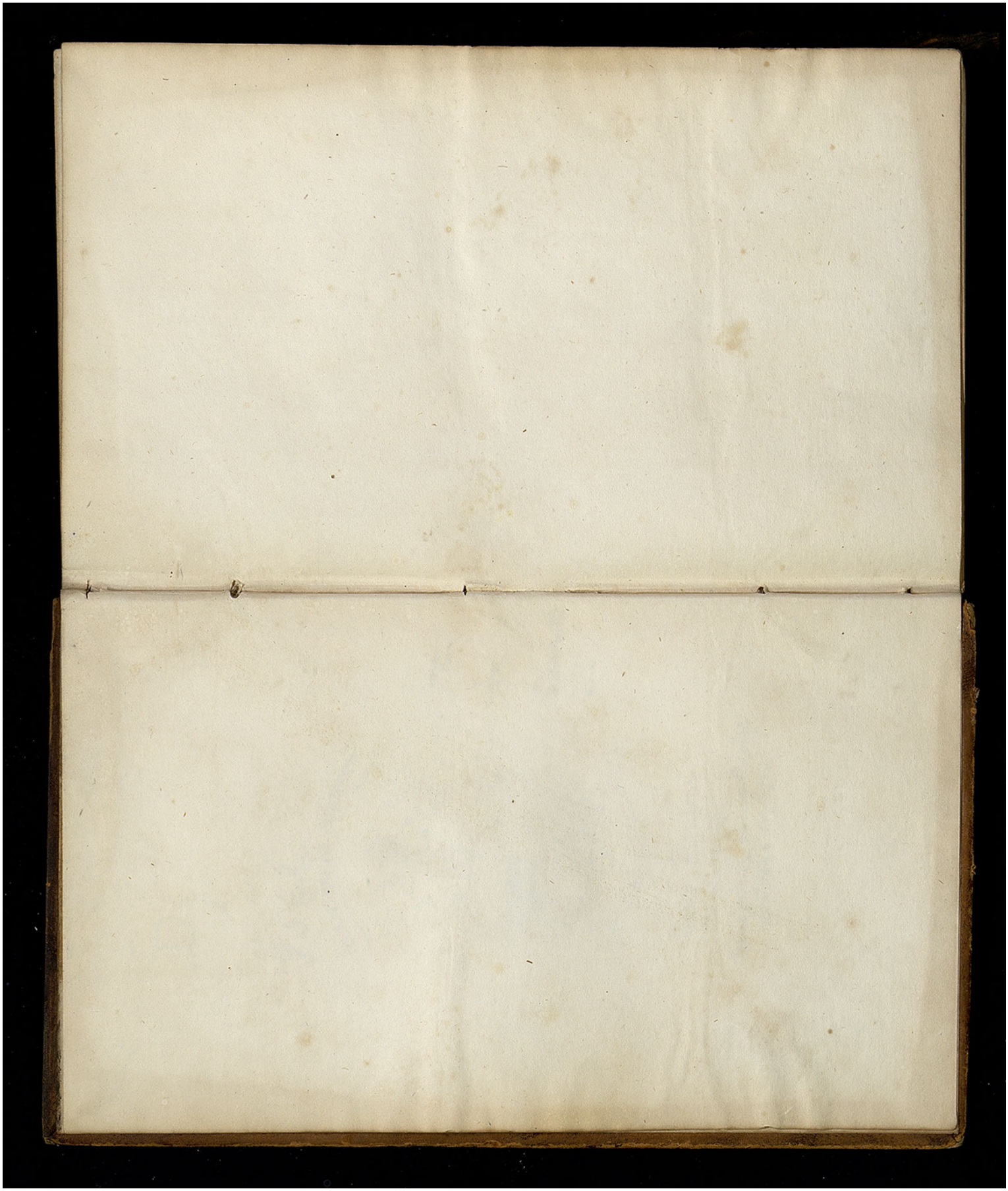
THE
HISTORICAL SOCIETY



OF
PENNSYLVANIA.

PRESENTED BY
Miss A. R. Dougherty
October 10-1912.

P150



FAMILIAR

LECTURES ON BOTANY,

PRACTICAL, ELEMENTARY, AND PHYSIOLOGICAL,

WITH

A NEW AND FULL DESCRIPTION

OF

THE PLANTS OF THE UNITED STATES,

AND CULTIVATED EXOTICS, &c.

FOR THE USE OF

SEMINARIES, PRIVATE STUDENTS, AND PRACTICAL BOTANISTS.

BY MRS. ALMIRA H. LINCOLN—NOW MRS. LINCOLN PHELPS,
PRINCIPAL OF THE PATAPSCO FEMALE INSTITUTE OF MARYLAND.
Author of The Fireside Friend, A Series of works on Botany, Chemistry, and Natural Philosophy, &c.

NEW EDITION, REVISED AND ENLARGED;
ILLUSTRATED BY MANY ADDITIONAL ENGRAVINGS.

NEW YORK:
PUBLISHED BY HUNTINGTON AND SAVAGE,
216 PEARL STREET.

1848.

PREFACE.

THIS work was prepared, originally, with the view of being used as a text book in the class-room, and by private students, teaching in a simple and inductive manner the Science of Analytical Botany, as also Vegetable Physiology. It did not profess to contain a sufficient number of descriptions of genera and species to furnish a complete manual for the Botanist in collecting and labelling plants; those which were described were chiefly the more common, such as the student would be most likely to meet with in his botanical excursions, or could readily be collected for illustrations before classes, and for teaching the mode of analysing and classifying.

The extensive circulation of this work has encouraged the Author and publishers to incur new labor and expense to adapt it more fully to the demands of the public. These demands, according to the testimony of teachers in various sections of the country, are for a greater number of generic and specific descriptions of plants. We have, therefore, added extensively to the catalogue of *Southern* and *Western* plants, as also to that of more northern latitudes. So that the book will now contain descriptions of most of the plants of the United States, and cultivated exotics. We except such of the Cryptogamia and Grasses as are too obscure in their characteristics for the attention of the general student; as also some *new Species*, which appear to have been separated from their proper and established relations, in order to gratify the vanity of imaginary discoverers, or to enable them to compliment their friends by giving their names to the *supposed* new Species.

With the *Flora* of *Northern*, *Southern*, and *Western* plants now presented to the public, in connexion with the Familiar Lectures on Botany, we hope to have rendered our work such as will fully answer public expectation.

PATAPSCO FEMALE INSTITUTE,
(Ellicott's, near Baltimore, Maryland,)
March 1, 1845.

TO TEACHERS.

The author indulges the hope that this book will not only afford assistance but gratification to Teachers, in the pursuance of the severe and often *ennuyant* duties of their profession. It is hoped that it may serve to interest and quicken the dull intellects of some pupils, to arrest the fugitive attention of others, and to relax the minds of the over-studious, by leading them all into paths strewed with flowers, and teaching them that these beautiful creations of Almighty Power are designed, not merely to delight by their fragrance, color, and form, but to illustrate the most logical divisions of Science, the deepest principles of Physiology, and the goodness of God.

The best time for commencing botanical studies seems to be that of the opening of flowers in the spring; though, where circumstances render it convenient to begin in winter, assistance is offered by engravings. The arrangement of subjects might be altered, in pursuing the study *without the aid of natural flowers*. The *Second* part, which treats of the various organs of plants, the formation of buds, and other subjects connected with vegetable physiology; the *Fourth* part, which gives the history of the science, with the distinctions in the kingdoms of nature, might be studied to advantage, before attending much to the principles of classification, which are mostly illustrated in the First and Third parts.

On the first meeting of a botanical class, after some explanation as to the nature of the study they are about to commence, each member should be presented with a flower for analysis. The flower selected should be a simple one, exhibiting in a conspicuous manner the different organs of fructification; the lily and tulip are both very proper for this purpose. The names of the different parts of the flower should then be explained, and each pupil directed to dissect and examine the flower. After noticing the parts of fructification, the pupils will be prepared to understand the principles on which the artificial classes are founded, and to trace the plant to its proper class, order, &c. At each step, they should be required to examine their flowers, and to answer simultaneously the questions proposed; as, how many stamens has your flower? Suppose it to be a lily, they answer *six*. They are then told it is of the sixth class. How many pistils? They answer *one*—they are told it is of the first order. They should then be directed to take their books and turn to the sixth class, first order, to find the genus. In each step in the comparison they should be questioned as above described, until, having seen in what respects their plant agrees with each general division, and differs from each genus under the section in which it is found, they ascertain its generic name. They should

be taught in the same manner to trace out its species: they will perceive at each step some new circumstance of resemblance or difference, until they come to a species, the description of which answers to the plant under consideration.

Technical terms should be explained as the pupil proceeds. The advantage in this kind of explanation, over that of any abstract idea, is, that it is manifested to the senses of the pupils by the object before them. If a teacher attempt to define the words *reason*, *will*, &c., or any other abstract terms, there is danger that the pupil may, from misunderstanding the language used in the explanation, obtain but a very confused and imperfect idea of the definition; and, indeed, what two authors or philosophers give to abstract terms the same definition? Though mankind do not, in the purely mental operations, exhibit an entire uniformity, yet, in their external senses, they seldom disagree. A flower which appears to one person to be composed of six petals, with corolla bell-form, and of a yellow color, is seen to be so by another. Pupils who find it difficult to understand their other studies (which in early youth are often too abstract), are usually delighted with this method of analyzing plants; they feel that they understand the whole process by which they have brought out the result, and perhaps, for the first time, enjoy the pleasure of clear ideas upon a scientific subject.

It is necessary, before the meeting of the class, to have a suitable number of plants collected, so that all may have specimens. In examining the pupils as they proceed in their study, each one, besides reciting a lesson, should be required to give an analysis of one or more plants; sometimes the whole class having similar flowers; sometimes giving to each pupil permission to bring any plant she chooses. This, also, at public examinations, is a satisfactory method of testing their knowledge of the subject. With respect to those portions of the work to which their attention should most particularly be paid, it must be left to the judgment of the teacher. Whatever relates to modes of classification, and makes part of a system, should be noted: many remarks, illustrations, and quotations, are designed merely for reading, without being considered as important matter for recitation.

The name of the Natural Order is connected with the name of each genus under the head of Descriptions of Species; indeed, the subject of the *natural affinities* of plants is kept in view through the whole work, although the artificial system is considered as the groundwork of botanical knowledge. The origin of the generic name is also given, as far as this could be ascertained with any degree of certainty.

The analysis at the bottom of each page, is designed rather to suggest the leading subjects, than as a form of questions; for every experienced teacher must perceive the importance of varying his mode of questioning.

Fig. 10.

The name of the 21st class is a compound of two Greek words, CRYPTO and GAMIA, signifying a concealed union.

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

Fig. 11.

Lichens. Mushrooms. Ferns. Mosses.

The number of classes as arranged by Linnæus, was twenty-four. Two of them, Poly-adelphia, (many brotherhoods,) which was the eighteenth class; and Poly-gamia, (many unions,) the twenty-third class, are now, by many botanists,* rejected as unnecessary. The eleventh class, Dodecandria, which included plants whose flowers contain from twelve to twenty stamens, has been more recently omitted. The plants which were included in these three classes have been distributed among the other classes.

The Orders of Linnæus.

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

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

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

The classes vary as to the number of orders which they contain. The orders of the 13th class, Didynamia, are but two.

1. GYMNOSPERMIA. From GYMNOS, signifying naked, and SPERMIA, signifying seed, implying that the seeds are not covered by a seed vessel.
Seeds usually four, lying in the calyx.

2. ANGIOSPERMIA. From ANGIO, signifying bag or sack, added to SPERMIA, implying that the seeds are covered.
Seeds numerous in a capsule.

* A few writers still retain the 24 classes of Linnæus;—but in the works of Eaton, Torrey, Beck, and Nuttall, only 21 are adopted.

What does Cryptogamia signify?—Classes omitted—Orders of the first twelve classes, on what founded?—How are the orders named?—Orders of the class Didynamia.

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.

The orders of the 15th class, Monadelphia, and of the 16th class, Diadelphia, 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.

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.*
2. SUPERFLUA. Florets of the disk perfect, 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.

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

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. HEPATICAE,—Liverworts, or succulent mosses.
4. ALGAE,—Sea-weeds, and frog spittle.
5. LICHENES,—Lichens, found growing on the bark of old trees, old wood, &c.
6. FUNGI,—Mushrooms, mould, blight, &c.

Note.—No confusion is produced in taking the character of some classes, for orders in other classes; 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.

LECTURE V.

METHOD OF ANALYZING PLANTS BY A SERIES OF COMPARISONS—GENERAL REMARKS UPON PLANTS—METHOD OF PRESERVING PLANTS FOR AN HERBARIUM—POISONOUS PLANTS, AND THOSE WHICH ARE NOT POISONOUS.

THE dissection of a plant is, properly, analysis; the meaning of the term being a separation: but when we speak of analyzing plants, we mean something more than examining each part of the flower; this is, indeed, the first step in the process; but by analysis, we learn the Class, Order, Genus, and Species of the plant. A person engaged in ascertaining the name of a plant, may be said to be upon a *Botan-*

Of Tetradynamia—Of the classes Monadelphia and Diadelphia—Of the class Syngenesia—Of the classes Gynandria, Monœcia, and Diœcia—Of the class Cryptogamia—Meaning of the word analysis—How used in Botany.

ical Journey, and the plant being his Directory; if he can read the botanical characters impressed on it by the hand of Nature, he will, by following system, soon arrive at his journey's end.*

Let us suppose, then, we have before us a plant in blossom, of whose *name* and *properties* we are ignorant.—The *name* must be first ascertained, and this can only be done with certainty by the Linnæan system.

In the first place we have *two comparisons* to make.

1st. Whether the *Stamens* and *Pistils* are VISIBLE.

2d. Whether they are INVISIBLE.

If the Stamens and Pistils are not visible, we have already arrived at the class, which is CRYPTOGAMIA.

If, however, the *Stamens* and *Pistils* are *visible*, we have now two *comparisons* to make.

1st. Whether the flowers have *stamens and pistils* on the same corolla.

2d. Whether the *Stamens and Pistils* are placed *on different corollas*.

If the Stamens and Pistils are on different flowers, we then shall find our plant either in the class *Diœcia* or *Monœcia*; according as the Stamens and Pistils are on different flowers, proceeding from the same root, or from different roots.

But if our plant has the Stamens and Pistils both enclosed in the *same corolla*, we must next examine,

1st. Whether the *Anthers* are *separate*, or,

2d. Whether the *Anthers* are *united*.

If we find *five anthers united* around the *pistil*, we have found the class of our plant; it is SYNGENESIA.

If the *Anthers* are separate, we must proceed to a *fourth stage*, and see,

1st. Whether the *filaments* are *separate*, or,

2d. Whether the *filaments* are *united* with each *other*, or,

3d. Whether the *filaments* are *united* to the *pistil*.

If the latter circumstance is ascertained, we need search no farther; our plant is in the class GYNANDRIA.

If the flower has not the filaments united to the pistil, we must ascertain if the filaments are united with each other; if they are so, and in two parcels or sets, the flower is in the class DIADELPHIA, but, If in *one* parcel or *set*, it is in the class MONADELPHIA.

But if the *filaments* are *separate*, we must next examine,

1st. Whether these are *similar* in length, or,

2d. Whether they are of different lengths.

(Of different *lengths*, those only which have *four* or *six stamens* are to be regarded.)

If we find our flower has *six stamens*, *four long* and *two short*, we need go no farther, this is the class TETRADYNAMIA.

If the flower has four stamens, two long, and *two short*, it is in the class DYDYNAMIA.

If our flower comes under none of the foregoing heads, we must then count the number of stamens; if these amount to *more* than ten, we must then consider their *insertion*, as,

* Thornton.

What two comparisons to be first made in analyzing a plant—When the stamens and pistils are enclosed in the same corolla, what is next to be considered?—When the anthers are separate, what must be done?—If the filaments are separate, what must be observed?—If the flower has not stamens of unequal length, what is to be observed?

1st. Whether inserted *on the calyx or corolla*, or,

2d. Whether inserted *on the Receptacle*.

If we find the Stamens inserted on the *Receptacle*, the flower is in the class POLYANDRIA; but if on the *Calyx* or *Corolla*, it is in ICOSANDRIA.

If our flower has less than twenty stamens, with none of the peculiarities above mentioned, of *connexion*, *position*, or *length*, we have only to count the number of stamens, in order to be certain of the class; if there are *ten* stamens, it is in DECANDRIA; and so on through the nine remaining classes. This is the true analytical process; but when we put plants together to form a species, and species together to form a genus, and genera together to form an order, and orders together to form a class, we then proceed by Synthesis, which means putting together.

General Facts relating to Vegetables.

Plants are furnished with pores, by which they imbibe nourishment from surrounding bodies. The part which fixes the plant in the earth, and absorbs from it the juices necessary to vegetation, is the *root*; this organ is never wanting.

The *stem* proceeds from the root; sometimes it creeps upon the earth, or remains concealed in its bosom; but generally, the stem ascends either by its own strength, or, as in the case of vines, by supporting itself upon some other body. The divisions of the stem are its *branches*; the divisions of the branches are its *boughs*. When the vegetable has no stem, the flower and fruit grow from the tops of the root; but when the stem exists, that or its branches bear the leaves, flowers, and fruits. *Herbs* have generally soft, watery stems, of short duration, which bear flowers once, and then die.

Trees and *shrubs* have solid and woody stems; they live and bear flowers many years.

Small bodies of a round or conical form, consisting of thin scales, lying closely compacted together, appear every year upon the stems, the boughs, and the branches of trees. They contain the *germs* of the productions of the following years, and secure them from the severity of the seasons. These germs, and the scales which cover them, are called *buds*. The buds of the trees and shrubs of equinoctial countries, have few scales, as they are less needed for protection against inclemencies of weather.

Leaves, like flowers, proceed from buds; the former are the lungs of vegetables; they absorb water and carbonic acid from the atmosphere, decompose them by the action of rays of light, and exhale or give out oxygen gas.

Vegetables, like animals, produce others of their kind, and thus perpetuate the works of creation. The organs essential to the perfection of plants, are the stamens and pistils. Those plants in which the stamens and pistils are manifest, are called *Phenogamous*; where these are rather suspected than demonstrated to exist, they are called *Cryptogamous*. The presence of a stamen and pistil only constitutes a *perfect* flower; but in general, these organs are surrounded with an inner envelope, called the *corolla*, and an outer one, called the *calyx*. When there is but one envelope, as in the tulip, this is often called by the more general term of *perianth*, which signifies, surrounding the flower. Persons ignorant of botany, give exclusively

When is the flower in one of the first ten classes?—Difference between analysis and synthesis—Stem—Branches—Boughs—Herbs—Trees and Shrubs—Buds—Leaves—Phenogamous and Cryptogamous plants.

the name of *flower* to these envelopes, which are often remarkable for the brilliancy of their colours, the elegance of their forms and the fragrance of their perfumes.

Method of preserving Plants, and of preparing an Herbarium.

Plants collected for analysis, may be preserved fresh many days, in a close tin box, by occasionally sprinkling them with water; they may also be preserved by placing their stems in water, but not as well by the latter, as the former method. While attending to the science of Botany, you should keep specimens of all the plants you can procure. An herbarium neatly arranged is beautiful, and may be rendered highly useful, by affording an opportunity to compare many species together, and it likewise serves to fix in the mind the characters of plants. It is a good method in collecting plants for an herbarium, to have a port-folio, or a book in which they may be placed before the parts begin to wilt. Specimens should be placed between the leaves of paper, either newspaper or any other kind which is of a loose texture, and will easily absorb the moisture of the plants; a board with a weight upon it should then be placed upon the paper containing them; the plants should be taken out frequently at first; as often as once or twice a day, and the paper dried, or the plants placed between other dry sheets of paper. Small plants may be dried between the leaves of a book. Plants differ in the length of time required for drying as they are more or less juicy; some dry in a few days, others not sooner than two or three weeks. When the specimens are dry, and a sufficient number collected to commence an herbarium, a book should be procured, composed of blank paper, (white paper gives the plants a more showy appearance.) A quarto size is more convenient than a folio. Upon the first page of each leaf should be fastened one or more of the dried specimens, either with glue or by means of cutting through the paper, and raising up loops under which the stems may be placed. By the sides of the plants should be written the *class*, *order*, *generic*, and *specific name;* also the place where found, and the season of the year. The colours of plants frequently change in drying; the blue, pale red, and white, often turn black, or lose their colour; yellow, scarlet, violet, and green, are more durable. An herbarium should be carefully guarded against moisture and insects; as a security against the latter, the plants may be brushed over with corrosive-sublimate.

Botanical Excursions.

As a healthful and agreeable exercise, we would recommend frequent botanical excursions; you will experience more pleasure from the science, by seeing the flowers in their own homes; a dry grove of woods, the borders of little streams, the meadows, the pastures, and even the waysides, will afford you constant subjects for botanical observations. To the hardier sex, who can climb mountains, and penetrate marshes, many strange and interesting plants will present themselves, which cannot be found except in their peculiar situations; of these you must be content to obtain specimens, without seeing them in their native wilds. You will, no doubt, easily obtain such specimens, for there is, usually, among the cultivators of natural science, a generosity in affording assistance, and imparting to others the treasures which nature lavishes upon those who have a taste to enjoy them.

Method of preserving plants, and of preparing an herbarium—Botanical *excursions.*

Poisonous Plants, and those which are not Poisonous.

In collecting flowers, you should be cautious with respect to *poisonous* plants. Such as have five stamens and *one pistil*, with a corolla of a dull, lurid colour, and a disagreeable smell, are usually poisonous; the Thorn apple (*stramonium*) and the Tobacco are examples. The Umbelliferous plants, which grow in *wet* places, have usually a nauseous smell: such plants *are poisonous*, as the water hemlock. Umbelliferous plants which grow in dry places, usually have an aromatic smell, and *are not poisonous*, as Caraway and Fennel.

Plants with *Labiate* corollas, and containing their seeds in capsules, are often poisonous, as the Foxglove; (Digitalis;) also, such as contain a *milky juice*, unless they are compound flowers. Such plants as have horned or hooded nectaries, as the Columbine and Monk's-hood, are mostly poisonous.

Among plants which are seldom poisonous, are the compound flowers, as the Dandelion and Boneset; such as have labiate corollas, with seeds lying naked in the calyx, are seldom or never poisonous; the Mint and Thyme are examples of such plants. The *Papilionaceous* flowers, as the pea and bean; the *Cruciform*, as the radish and mustard, are seldom found to be poisonous. Such plants as have their stamens standing on the calyx, as the rose and apple, are never poisonous; neither the grass-like plants with glume calyxes, as Wheat, Rye, and Orchard-grass, (Dactylis.)

Proper Flowers for Analysis.

In selecting flowers for analysis, you must never take double ones; the stamens (and in many cases the pistils also) change to petals by cultivation, therefore you cannot know by a double flower, how many stamens or pistils belong to it in its natural state. Botanists seem to view as a kind of sacrilege, the changes made by culture, in the natural characters of plants; they call double flowers, and variegated ones, produced by a mixture of different species, *monsters* and *deformities.* These are harsh expressions to be applied to Roses and Carnations, which our taste must lead us to admire, as intrinsically beautiful, although their relative beauty, as subservient to scientific illustration, is certainly destroyed by the labour of the florist. The love of native wild flowers is no doubt greatly heightened by the habit of seeking them out, and observing them in their peculiar situations. A Botanist, at the discovery of some lowly plant, growing by the side of a brook, or almost concealed in the cleft of a rock, will often experience more vivid delight than could be produced by a view of the most splendid exotic. Botanical pursuits render us interested in every vegetable production: even such as we before looked upon as useless, present attractions as objects of scientific investigation, and become associated with the pleasing recollections, arising from the gratification of our love of knowledge. A peculiar interest is given to conversation by an acquaintance with any of the natural sciences; and when females shall have more generally obtained access to these delightful sources of pure enjoyment, we may hope that scandal, which oftener proceeds from a want of better subjects, than from malevolence of disposition, shall cease to be regarded as a characteristic of the sex. It is important to the cause of science, that it should become *fashionable;* and as one means of effecting this, the

Poisonous plants—Compound flowers seldom poisonous—Double flowers not proper for analysis—Effect of Botanical pursuits—Of an acquaintance with any of the natural sciences.

parlours of those ladies, who have advantages for intellectual improvement, should more frequently exhibit specimens of their own scientific taste. The fashionable *et ceteras* of scrap books, engravings, and albums, do not reflect upon their possessors any great degree of credit. To paste pictures, or pieces of prose or poetry, into a book; or to collect in an album the wit and good sense of others, are not proofs of one's own acquirements; and the possession of elegant and curious engravings, indicates a full purse, rather than a well stored mind; but *herbariums* and books of *impressions of plants*,* drawings, &c. show the taste and knowledge of those who execute them.

It is unfortunately too much the case, that female ingenuity, (especially in the case of young ladies after leaving school,) is in a great degree directed to trivial objects, which have no reference either to utility, or to moral and intellectual improvement. But a taste for scientific pursuits once acquired, a lady will feel that she has no time for engagements, which neither tend to the good of others, nor to make herself wiser or better.

* *Manner of taking impressions of leaves.*—Hold oiled paper over the smoke of a lamp until it becomes darkened; to this paper, apply the leaf, having previously warmed it between the hands, that it may be pliant. Place the lower surface of the leaf upon the blackened paper, that the numerous veins which run through its extent, and which are so prominent on this side, may receive from the paper a portion of the smoke. Press the leaf upon the paper, by placing upon it some thin paper, and rubbing the fingers gently over it, so that every part of the leaf may come in contact with the sooted oil-paper. Then remove the leaf, and place the sooted side upon clean white paper, pressing it gently as before; upon removing the leaf, the paper will present a delicate and perfect outline, together with an accurate exhibition of the veins which extend in every direction through it, more correct and beautiful than the finest drawing.

Female ingenuity too often directed to trivial objects.

PART II.

LECTURE VI

IMPORTANCE OF OBSERVING EXTERNAL OBJECTS—VEGETABLES CONSIST OF TWO SETS OF ORGANS—OF THE ROOT.

The exercises which constitute the principal part of our previous course of lectures, are chiefly designed to assist you in practical botany. It is not expected that you are to be the passive receivers of instruction, but that you are to compare with real objects, the descriptions which are presented; by doing this faithfully, you will find your minds gradually strengthened, and more competent to compare and judge in abstract studies, where the subjects of investigation are in the mind only, and cannot, like the plants, be looked at with the eyes, and handled with the hands.

All our thoughts, by means of the senses, are originally derived from external objects. Suppose an infant to exist, who could neither hear, see, taste, smell, nor feel; all the embryos of thought and emotion might exist within it; it might have a soul capable of as high attainments as are within the reach of any created beings; but this soul, while thus imprisoned, could gather no ideas; the beauty of reflected light, constituting all the variety of colouring; the harmony of sounds, the fragrant odours of flowers, the various flavours, which are derived from our sense of taste, the ideas of soft, smooth, or hard; all must for ever remain unknown to the soul confined to a body having no means of communication with the world around it. The soul, in its relation to external objects, may be compared to the embryo plant, which, imprisoned within the seed, would for ever remain inert, were no means provided for its escape from this confinement, and no communication opened between it and the air, the light, and vivifying influence of the earth.

Since our first ideas are derived from external nature, is it not a rational conclusion that we should add to this original stock of knowledge, by a continued observation of objects addressed to our senses? After the years of infancy are past, and we begin to study *books*, should we, neglecting sensible objects, seek only to gain ideas from the learned; or, in other words, should we, in the pursuit of human sciences, overlook the works of God?

Having now enabled you to understand the method of analyzing plants, we shall proceed to consider more fully the different organs of plants, with the uses of each, in the vegetable economy.

In plants, as well as animals, each part or organ is intimately connected with the whole; and the vegetable, as well as the animal being, depends for its existence on certain laws of organization.

We shall consider the vegetable organs under two classes; the first, including such organs as *promote the growth* of the plant, as the root, leaves, &c.; the second, such as *perfect the seed*, and thus provide for the reproduction of the species, called organs of fructification.

Study of external objects strengthens the mind—Abstract studies facilitated by acquaintance with the natural sciences—Our first ideas gained by the senses—Analogy between the soul and the embryo plant—We should not confine our attention exclusively to books—Vegetable, as well as animal existence, depends on certain laws of organization—Two kinds of organs of vegetables