364. Fig. 62, *a*, represents a *legume*: *b*, the same cut transversely in order to show the two cells.

365. 4th. FOLLICLE, is a one-valved pericarp, which opens longitudinally on one side, having its seed loose within it, that is not bound to the suture.

Fig. 63.

366. Fig. 63, shows a fruit of this kind, which is composed of three pods or follicles; *a* shows the valve opening; *b*, a seed cut lengthwise. This is a compound fruit, of the Monk's-hood, (Aconitum.)

367. 5th. DRUPE, a stone fruit, is a kind of pericarp which has no valve, and contains a nut or stone, within which there is a kernel. The Drupe is mostly a moist, juicy fruit; as in the plum, cherry, and the peach. The nut or stone in the drupe, is a kind of woody cup commonly containing a single kernel called the *Nucleus:* this hard shell thus enveloping the kernel, is called the *Putamen;* it may be seen in the stone of a cherry or peach.

368. 6th. NUT, is a seed covered with a shell, resembling the capsule in some respects, and the drupe in others; this you may see in the walnut, chestnut, &c.

369. 7th. POME, is a pulpy pericarp without valves, but having a membranous capsule, with a number of cells, which contain the seeds. This species of pericarp has no external opening or valve. The apple, pear, quince, gourd, cucumber, and melon, furnish us with examples of this kind of pericarp. With respect to form, the *Pome* is oblong, ovate, globular, &c. the form of fruits being much varied by climate and soil. You know that apples are not uniform in their size or figure. With respect to the number of cells also, the apple is variable.

370. 8th. BERRY, is a succulent, pulpy pericarp, without valves, and containing naked seeds, or seeds with no other covering than the pulp which surrounds it, as in the gooseberry and currant; the seeds in the berry are sometimes dispersed

364. What does Fig. 62 represent?
365. What is a folicle?
366. What is represented by Fig. 63?
367. Describe the drupe.
368. What is a nut?
369. What is a pome?
370. Describe the berry

promiscuously through the pulpy substance, but are more generally placed upon receptacles within the pulp. A compound berry consists of several single berries, each containing a seed, united together; as in the blackberry and raspberry. Each of the separate parts is called an *acinus*, or grain. The orange and lemon are berries with a thick coat.

371. There are some kinds of berries, usually so called, that seem scarcely entitled to the name; in these the pulp is not properly a part of the fruit, but originates from some other organ; thus in the mulberry and strawberry the calyx becomes coloured and very juicy, surrounded by seeds like a real berry. Some botanists in describing the strawberry, say that what is commonly called the berry, is but a pulpy receptacle, studded with naked seeds. In the fig, the whole fruit is a juicy calyx, or common receptacle, containing in its cavity innumerable florets, each of which has a proper calyx of its own, which becomes pulpy, and invests the seed, as in the mulberry.

372. 9th. STROBILUM, a cone; is a Catkin or Ament hardened and enlarged into a seed vessel, as in the pine; this is called an aggregate, or compound pericarp. In the most perfect examples of this kind of fruit the seeds are closely enveloped by the scales as by a capsule. The Strobilum is oblong in the pine, round in the cypress, very small in the alder and birch.

When you eat fruit, as almonds, walnuts, apples, peaches, currants, &c., you will no doubt be pleased to be able to give them their proper place in the classes you have just been considering.

CHAPTER XV.

The Seed.

We have now traced the plant from the root through all its various organs, until we have arrived at that part, which is a link in the chain of vegetable existence between the old and new plant; if this were destroyed, if the seeds of plants were no longer perfected, what changes would the whole face of nature present!

373. The earth would in one year be stripped of the whole

371. What is said of the blackberry, strawberry, mulberry, and fig?
372. Describe the strobilum.
373. What appearances would nature present if seeds were no longe. perfected?

tribe of *annual* plants; in another the *biennial* plants would vanish; the *perennial* would, year after year, disappear, until (if we could suppose our own lives to be prolonged to the usual age of man,) we should behold the earth one vast scene of vegetable ruin; occasionally here and there a venerable oak or an ancient pine would stand in solitary grandeur, the mournful remnants of the once beautiful and fertile vegetable kingdom.

374. But such a sad spectacle the earth will never present, for we have the promise of God himself, that "while the earth remaineth, seed time and harvest shall not cease."

375. We have seen in the progress of our inquiries, that while the present plant is diffusing around it beauty and fragrance and administering to the necessities and luxuries of man, the watchful care of that Being, who never slumbers nor sleeps, is by a slow but certain progress perfecting that part which is destined to continue the various species of plants until time shall be no more.

376. The *seed* is that internal part of the fruit which contains the complete rudiment of a new plant, similar to that from which it received its existence.

377. The seed consists of three principal parts, viz. the *eye*, *husk*, and *kernel*.

378. 1st. The *Eye*, or *hilum*, is the scar formed by the separation of the membrane or thread which connected the seed with the pericarp, and conveyed to the former the necessary nourishment. You can see the eye plainly in a bean or kernel of corn.

379. 2d. The *Husk*, is the outer coat of the seed, which, on boiling, becomes separate; as in peas, beans, Indian corn, &c. The husk surrounds the kernel; it is essential, as the kernel, which is originally a fluid, could not be formed without its presence.

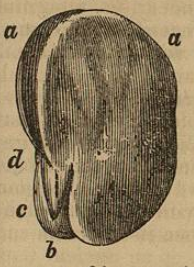
380. 3d. The *Kernel*, includes all that is contained within the husk; it is also called the *nucleus* or almond of the seed. The kernel is usually composed of the *albumen*, *cotyledon*, and *embryo*.

381. Albumen makes up the chief part of some seeds, as the

374. Will the earth ever present such a spectacle?
375. What have we seen in the progress of our inquiries?
376. What does the seed contain?
377. Of how many parts does the seed consist?
378. Describe the eye.
379. What is the husk?
380. What is the kernel, and into how many parts is it divided?
381. What is said of the albumen?

grasses, corn, &c.; in the nutmeg, which has very small cotyledons, it is remarkable for its variegated appearance and aromatic quality. It chiefly abounds in plants which have but one cotyledon.

Fig. 64.



382. Fig. 64 represents the garden bean *a* shows the cotyledons; *b* and *c*, the embryo; *d* shows the petioles or stems of the cotyledons.

383. *Cotyledons* (from a Greek word, *kotule*, a cavity,) are the thick fleshy lobes of seeds, which encircle the embryo. In beans they grow out of the ground in the form of two large leaves. Cotyledons are the first visible leaves in all seeds, almost always fleshy and spongy, of a succulent and nourishing substance, which serves for the food of the embryo at the moment of its germinating. Nature seems to have provided the cotyledons to nourish the plant in its tender infancy. After seeing their young charge sufficiently vigorous to sustain life without their assistance, they, in most plants, wither and die. The number of cotyledons varies in different plants; there are some plants which have none.

384. *Acotyledons*, are those plants which have no cotyledons in their seeds; such as the *cryptogamous* plants, *mosses*, &c.

385. *Mono-cotyledons*, such as have but one cotyledon, or lobe, in the seed; as the *grasses*, *liliaceous* plants, &c.

386. *Di-cotyledons*, such plants, as have two cotyledons; they include the greatest proportion of vegetables: as the *leguminous*, the *syngenesious*, &c.

387. *Poly-cotyledons*, those plants, the seeds of which have more than two lobes: the number of these is small; the *hemlock* and the *pine* are examples.

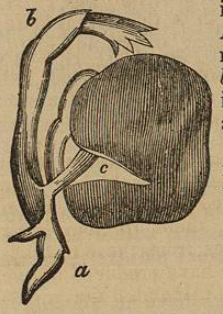
388. The *Embryo*, is the most important part of the seed, as it produces the new plant; all other parts seem but subservient to this, which is the point from whence the life and organization of the future plant originate. In most dicotyledonous seeds, as the bean, orange, and apple, the embryo may be plainly discovered. Its internal structure, before it begins to vegetate, is

382. What does Fig. 64 represent?
383. What are cotyledons?
384. What plants are called Acotyledons?
385. What are Monocotyledons?
386. What are Dicotyledons?
387. What are Polycotyledons?
388. Give an account of the embryo.

very simple, consisting of a uniform substance enclosed in its appropriate bark or skin. When the vital principle is excited to action, vessels are formed, and parts developed, which seemed not previously to have existed. The embryo is usually central, and enclosed by the cotyledons; sometimes it is no more than a mere point or dot, and in some cases, altogether invisible to the naked eye. The embryo consists of two parts.

389. 1st. The *Plume*, is the ascending part, which unfolds itself into herbage.

Fig. 65.



390. 2d. The *Radicle* is the descending part, which unfolds itself into roots. At Fig. 65 appears the embryo in a germinating state; *a* represents the radicle, *b* the plume, *c* the cord by which the plant is still connected with the cotyledons, and receives from them its nourishment.

To use the words of an ancient botanist, "the embryo continues imprisoned within its seed, and remains in a profound sleep, until awakened by germination; it meets the light and air to grow into a plant, similar to its parent."

There are various *appendages* which may, or may not, be present without injury to the structure of the seed.

391. *Aigrette*, or *egret*, sometimes called *pappus*, is a kind of feathery crown with which many of the compound flowers are furnished, evidently for the purpose of disseminating the seed to a considerable distance by means of winds; as the dandelion. The egret includes all that remains on the top of the seed after the corolla is removed.

392. *Stipe* is a thread connecting the egret with the seed. The egret is said to be *sessile* when it has no stipe, *simple* when it consists of a bundle of hairs without branches, *plumose* when each hair has other little hairs arranged along its sides, like the beards on a feather.

389. Describe the plume.
390. Describe the radicle.
391. What is the egret?
392. What is the stype?

Fig. 66.

393. In Fig. 66, *a* represents the *capillary*, or hair-like egret, *b* the *plumose*, or feathery egret; *c* and *d* show the style remaining, and forming a *train*, as in the Virgin's bower and Geum; *e* represents a wing, as may be seen in the fir and maple; and *f* a sessile egret.

General Remarks upon Seeds.

394. The number of seeds in different plants is variable; some have but one; some, like the umbelliferous plants, have two; some have four, as in the rough-leaved plants; in the order Gymnospermia, of the class Didynamia, there are four lying naked in each calyx. The number varies from these to thousands. A stalk of Indian corn is said to have produced in one season, two thousand seeds. It has been calculated that a single Thistle seed will produce, at the first crop, twenty-four thousand, and at the second crop, at this rate, five hundred and seventy-six millions.

395. Seeds are of various sizes, from that of the cocoa-nut, to a fine dust, as in the mosses.

396. The period at which seeds arrive at maturity, marks the decay of annual plants, and the suspension of vegetation in woody and perennial plants. Nature, in favouring by various means, the dispersion of these seeds, presents phenomena worthy of our admiration, and those means are as varied as the species of seeds which are spread upon the surface of the earth.

397. The air, winds, rivers, seas, and animals, transport seeds and disperse them in every direction. Seeds provided with feathery crowns, (*egrets*,) as the Dandelion and Thistle, or with wings, as the Maple and Ash, are raised into the air, and even carried across seas. Linnæus asserted that a certain

393. What is represented by Fig. 66?
394. What is remarked respecting the variation in the number of seeds?
395. What is said of the different sizes of seeds?
396. What marks the decay of annual plants?
397. How are seeds transported in various directions?

plant of the compound family was introduced into Europe from America, by seeds wafted across the Atlantic Ocean. "Seeds," says Linnæus, "embark upon the rivers which descend from the highest mountains of Lapland, and arrive at the middle of the plains, and the coasts of the seas. The ocean has thrown even upon the coasts of Norway, the nuts of the Mahogany, and the fruit of the cocoa nut tree, borne on its waves from the far distant tropical regions; and this wonderful voyage has been performed without injury to the vital energy of the seeds."

398. Animals also perform their part in the diffusion of seeds. Squirrels and other animals carry seeds and nuts into holes in the earth. The Indians believed that the squirrels planted all the timber in the country: there is no doubt but that they do much towards diffusing different kinds of nuts and seeds; as Chestnut, Oak, Walnut, &c. Animals contribute also to the distribution of seeds by conveying them in their wool, fur, or feathers.

399. The diffusion of seeds completes the circle of vegetation, and closes the scene of vegetable life. The shrubs and trees lose their foliage—the withered herbs decompose, and restore to the earth the element which they have drawn from its bosom. The earth, stripped of its beauty, seems sinking into old age; but although unseen by us, and unmarked the processes of nature by too many among men, innumerable germs have been formed, which wait but the favourable warmth, to decorate with new brilliancy this terrestrial scene.

400. So fruitful is nature, that a surface a thousand times more extended than that of our globe, would not be sufficient for the vegetables which the seeds of one single year would produce, if all should be developed;—but the destruction of seeds is very great, great quantities being eaten by man and beast; or left to perish in unfavourable situations. Those which are preserved, constitute but a small proportion of the whole; they are either carried into the clefts of rocks, or buried beneath the ruins of vegetables; protected from the cold, they remain inactive during winter, and germinate as soon as the early warmth of spring is felt.

401. At this season the botanist who considers with a curious eye the vegetable species with which the earth begins to be clothed, seeing successively all the types or representations of past generations of plants, admires the power of the Author of nature, and the immutability of His laws.

398. Do animals assist in dispersing seeds?

399. What is remarked of the appearance of vegetation at the time of the diffusion of seeds?

400. Would the earth afford sufficient space for all the seeds which one year produces to vegetate?

401. What are the reflections of the botanist on beholding the plants which appear on the return of Spring?

CHAPTER XVI.

Germination of the Seed.

402. We have now considered the various organs of plants; we have traced them through their successive stages of development, from the root to the bud, leaf, and flower, and from the flower to the fruit and seed. We have seen in imagination, the vegetable world fading under a change of temperature, the "sear and yellow leaf," a prey to the autumnal blasts; and even the fruits themselves, exhibiting a mass of decayed matter. Were this appearance of decay and death, now presented to us for the first time, how gloomy would be the prospect! How little should we expect the return of life, and beauty, and fragrance! No power short of Omnipotence, can effect this miracle.

403. But we are now so accustomed to these changes, that "seeing, we perceive not;" we think not of the mighty Being, who produces them: we call them the *operations of nature*, and what is *nature*, or what are the *laws of nature*, but manifestations of Almighty power?

404. The word *nature*, in its original sense, signifies *born* or *produced*; let us then look on nature as a created thing, and beware of yielding that homage to the creature which is due to the Creator. The sceptic, with seeming rapture, may talk of the beauties of nature, but cold and insensible must be that heart, which from the contemplation of the earth around, and the heavens above, soars not,

"To him, the mighty Power from whom these wonders are."

405. How beautifully is the re-animation of the vegetable world, used by St. Paul, as an illustration of our *resurrection from the dead!* The same power, which from a small, dry,

403. Why are mankind so forgetful of the Great Being who produces the wonderful changes which nature presents?

404. What is the meaning of the word nature, and how should we regard it?

405. What should remind us of the resurrection from the dead?

and apparently dead seed, can bring forth a fresh and beautiful plant, can also from the ruins of our mortal bodies produce a new and glorious body, and unite it to the immortal spirit by ties never to be separated.

Germination.

406. The process of the shooting forth of the young plant from the seed is termed *Germination.*

407. The principal of life contained in the seed does not usually become active, until the seed is placed in circumstances favourable to vegetation.

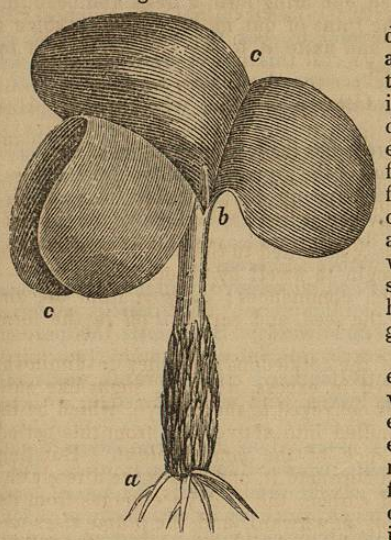
408. When a seed is committed to the bosom of the earth, its various parts soon begin to swell by absorbing moisture.—A chymical action then commences; *oxygen* from the air unites to the *carbon* of the seed, and carries it off in the form of *carbonic acid gas.*

409. As the carbon of the cotyledons continues to diminish, and oxygen is produced in excess, a sweet, sugar-like substance is formed; this is conveyed to the embryo, which by its new nourishment is kindled into active life; from this period we may date the existence of the *young plant.* Bursting through the coats which surround it, and which are already enfeebled by their loss of carbon, the embryo emerges from its prison, the *radicle* shoots downward, and the *plume* rises upwards. We say then that the seed has come up or sprouted.

410. Fig. 67 represents a young dicotyledonous plant, with its radicle, *a*, developed; its plume, *b*, is yet scarcely perceptible; its cotyledons, *c*, appear in the form of large, succulent seed-leaves.

406. What is germination?
407. What is necessary for the vegetation of the seed?
408. What changes occur when the seed is placed in the earth?
409. What kindles the embryo into active life?
410. What does Fig. 67 represent?

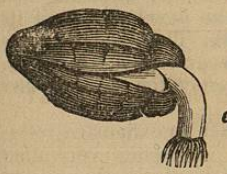
Fig. 67.



411. The radicle, or descending root, is usually first to break through the coats of the seeds, it commences its journey downward, to seek in the earth nourishment for the future plant, and to fix it firmly in the earth. This constitutes the root, and always takes a downward course, in whatever situation the seed may have been placed in the ground.

412. A botanist planted in a pot, six acorns, with the points of their embryos upwards. At the end of two months upon removing the earth, he found that all the radicles had made an *angle* in order to reach downwards. It is supposed that if the root met with no obstruction in going downwards, it would always be perfectly straight.

Fig. 68.



413. Fig. 68 is the representation of a germinating seed of the Four o'clock; it will be seen that the radicle, *a*, has made nearly a right angle in turning downwards; the plume is not developed.

414. If you put into a tumbler of water some cotton, and place upon it some seeds of rice or wheat, you will see all the fibres shooting from the seeds, in a perpendicular direction, downwards. It is a very simple and interesting experiment. Some ascribe this phenomenon to the laws of gravitation, by which the root is attracted towards the centre of the earth; others say that the radicle, stimulated by moisture, naturally extends itself in the direction from which

411. What direction does the radicle take?
412. What experiment did a botanist make with acorns?
413. What does Fig. 68 represent?
414. What experiment is mentioned, and what are some of the causes assigned for the downward course of the radicle?

the moisture proceeds; while some imagine that the plant is endowed with a kind of instinct, similar to that which appears in animals, leading the little duck to seek the water, and birds to attempt to fly; but let us call this power by what name we will, or refer it to whatever secondary laws, we must after all attribute it to the will and design of Him, who gave the plant a principle of life.

415. After the young root has made some progress, the cotyledons swell, and rising out of the ground, form two green leaves, called *seed leaves*. You have no doubt noticed their appearance in the garden bean, when it first appears above the ground.

416. When the plume develops its leaves, these seed-leaves, being no longer needed, wither and decay.

417. You will recollect that the embryo or germ is composed of two parts, the radicle and the plume. The radicle, we have just seen, extends itself downwards. Soon after this part of the germ has begun its downward course, the plume, (so called from its resembling a little feather,) rises upwards, and soon becomes a tuft of young leaves, with which the stem, if there is one, ascends.

418. Some moisture is essential to the germination of the seed, though different plants require different quantities. Water softens the envelopes of the seed, swells the kernel, and causes it to burst. Too much water produces a decay or rot in the seed so rapidly, that the living principle is destroyed rather than brought forward; hence it is better to sow seeds in dry rather than wet weather. *Earth*, though not absolutely essential, is useful, as affording to the vegetable egg a favourable situation, where it may receive the influence of the various agents, which are to perform their offices in the development of its parts. Some plants vegetate without earth. The parasite grows upon the barks of other plants; many seeds vegetate in water, and some, when moistened and placed on cotton, or any other supporting substance.

419. *Air* is essential to vegetation; under an exhausted receiver a seed will not germinate, although possessing every other requisite. Seeds that become imbedded deeply in the ground do not vegetate, unless accidentally ploughed up, or exposed to the atmosphere. Acorns, supposed to have lain for centuries, have germinated as soon as they were raised sufficiently near the surface to receive the influence of air. You will recollect,

415. When do the seed leaves appear?
416. When do the seed leaves decay?
417. What direction does the plume take?
418. What effect has water upon the vegetation of the seed?—Is earth essential to vegetation?
419. Is air necessary to vegetation?

that in the process of germination, *oxygen gas* unites with the carbon of the seed, and carries it off in the form of carbonic acid. Air furnishes that important agent, oxygen, which is the first moving principle of life.

420. Carbon constitutes the greater part of the substance of seed; and this principle being in its nature opposed to purtrefaction, prevent seeds from rotting, previous to their being sown. Some seeds having abundance of carbon, are capable of being preserved for ages: while others, in which this element exists but in small proportions, require to be sown almost as soon as ripe; and such as are still more deficient in carbon, lose their vital principle before separating from the pericarp.

421. Oxygen is important to germination, on account of its agency in removing the carbon which holds the living principle of the seed in bondage.

422. The *absence of light* is unfavourable to the germination of seeds; for light acts upon plants in such a manner as to take away oxygen by the decomposition of carbonic acid gas, and to deposite carbon; now this is just the reverse of the process required in germination, where the carbon must be thrown off and the oxygen in excess.

423. A certain degree of *heat* is necessary to germination. Seeds planted in winter, will remain in a torpid state; but as soon as the warmth of spring is felt, the embryo emerges into life. By increasing heat, seeds may be hastened in their vegetating process; thus the same seed, which with a moderate degree of heat would germinate in nine hours, may be brought to this state in six hours, by an increase of temperature. Too great heat destroys the vital principle; thus corn which has been roasted can never be made to vegetate.

424. There is a great difference in plants as to their *time of germinating;* some seeds begin to vegetate before they are separated from the pericarp.* In the greater number of vegeta-

* In the month of January, on observing the seeds of a very fine juicy apple, which had been kept in a warm cellar, I saw that they were swollen, and the outward coat had burst; examining one seed by removing the tegument and separating the cotyledons, I saw by the help of a microscope the embryo, as if in a germinating state; the radicle was like a little beak; in the upper part or plume was plainly to be seen the tuft of leaves and the stem.

420. What constitutes the greater part of the substance of the seed?
421. Why is oxygen necessary to germination?
422. Is light favourable to vegetation?
423. Is heat necessary to vegetation?
424. What is said of the difference in plants with respect to the time of germination?

bles, however, there is no germination until after the opening of the pericarp and the fall of the seed. The time at which different species of seeds, after being committed to the earth, begin to vegetate, varies from one day, to some years. The seeds of grasses, and the grain-like plants, as rye, wheat, corn, &c. germinate within two days. Cruciform plants, such as the radish and mustard, the leguminous, as the pea and bean, require a little more time. The peach, walnut, and peony, remain in the earth a year before they vegetate.

425. All kinds of plants germinate sooner if they are sown immediately after being separated from the pericarps, than if kept some time.

426. The seeds of most vegetables preserve their living principle for years: some lose it as soon as they are detached from their pericarps. This is said to be the case in the coffee and tea. The seeds of some of the grasses, as wheat, &c. are said to retain their vital principle even for centuries. It is asserted that mosses, kept for two hundred years in the herbariums of botanists, have revived by being soaked in water.

427. An American writer† says that "seeds, if imbedded in stone or dry earth, and removed from the influence of air or moisture, might be made to retain their vegetative quality or principle of life for a thousand years." But he adds, "life is a property which we do not understand: yet life, however feeble and obscure, is always life, and between it and death there is a distance as great as existence and non-existence."

428. Before commencing the study of botany, when you looked at the trunk of a tree, a little herb, or a leaf, you probably considered it very simple in its structure; you saw it only as one mass; but you now perceive that plants, like animals, consist of collections of fibres; that they have parts which in some respects are like our skin, bones, flesh, and blood; that they are living organized beings, and like animals, are subject to life and death.

429. Plants differ from animals, in possessing none of the organs of sense. They can neither see, hear, taste, smell, nor

† B. Barton.

425. Is it better that seeds should be kept sometime before they are sown?

426. Are seeds alike with respect to retaining their living principle?

427. What is remarked by an American writer respecting the life of seeds?

428. Do you regard plants now in the same manner as before you began to study them?

429. How do plants differ from animals, and how do they resemble them?

touch. Some vegetables, however, seem to have a kind of sensibility like that derived from the organs of touch in animals, they tremble and shrink back upon coming in contact with other substances; some turn themselves round to the sun, as if enjoying its rays. There is a mystery in these circumstances which we cannot penetrate; and it is not yet fully known at what point in the scale of existence animal life ends, and vegetable life commences.

CHAPTER XVII.

General Principles of Classification—Natural Families of Plants.

420. Let us now imagine the whole vegetable kingdom, comprising innumerable millions of individual plants, to be spread out before a botanist. Could he, in the course of the longest life, number each blade of grass, each little moss, each shrub, or even each tree? If he could not even count them, much less could he give each one a separate *name* and *description*. But he does not need to name them separately, for he sees that nature has arranged them into *sorts* or *kinds*.

431. If you were sent into the fields to gather flowers of a similar kind, you would need no book to direct you to put into one parcel, all the *red clover* blossoms, and into another, the *white clover*; while the *dandelions* would form another group. These all constitute different *species*. Nature would also teach you that the red and white clover, although differing from each other in some particulars, yet bear a strong resemblance.

432. By placing species together you form a *genus*, and to this *genus* you refer all the different kinds of clover. When you see red, damask, and cinnamon roses, you perceive they all have such strong marks of resemblance as to entitle them to be placed together in one genus.

433. But yet you know that the seed of a damask rose would never produce a red rose. One species of plants can never produce another species, however near may be their resemblance.

434. The whole number of *species* of plants which have

430. Is it necessary for the botanist to give a particular name to every plant?

431. Do you need a book to teach you to put flowers of the same sort together?

432. How is a genus formed?

433. Does one species ever produce plants of another species?

434. What number of species have been discovered?

been named and described, including many which have been recently discovered in New Holland and about the Cape of Good Hope, is said to be 56,000.

435. If species of plants were described without any regular order, we could derive no pleasure, and very little advantage, from the study of practical botany. If we wished to find out the name of a plant, we should be obliged to turn over the leaves of a large volume, without any rule to guide us in our search.

436. The necessity of some kind of system was so apparent, that many attempts for the methodical arrangement of plants, were made, before the time of Linnæus; but his system was so superior to all others, that it was no sooner published to the world, than it was adopted by the universal consent of all men of science.

437. This system not only includes within it all known plants, but is founded on such principles as must comprehend within it whatever plants may yet be discovered. Its author believed that no plant was destitute of stamens and pistils: but at the same time, that there were species in which these organs were so small, so obscure, or of such a singular formation, as to render it difficult, and sometimes impossible, to be certain of their existence, except by the principle of analogy.

438. Linnæus made two grand divisions of plants, *Phenogamous*, such as have stamens and pistils *visible*, and *Cryptogamous*, stamens and pistils *invisible*.

439. The following comparison has been very properly made, in illustration of the divisions in the system of Linnæus

Classes are compared	to States.
Orders,	to Towns.
Genera,	to Families.
Species,	to Individuals.

440. You must not forget, while you are studying botany that plants themselves are the only real substances; species, genus, order, and class, are mere abstract terms, denoting certain distinctions which would equally have existed, although we had never observed them, or given them names.

435. What would be the consequence if species were described without regularity?

436. Were any attempts at a methodical arrangement of plants made before the time of Linnæus?

437. Does the system of Linnæus provide for the arrangement of plants not yet discovered?

438. What two grand divisions of plants did Linnæus make? QL

439. How may the divisions in botany be illustrated?

440. Which are the only real substances that are considered in botany?

441. An *Individual* is an organized being, complete in its parts, distinct and separate from all other beings. An oak, a rose, and a moss, are each of them individuals of the vegetable kingdom.

442. A *Species* includes such individuals as agree in certain circumstances of the roots, stems, leaves, and inflorescence. We have no reason to suppose that any new species, either of animals or vegetables, have been produced since the creation. We sometimes see *varieties* in plants made by cultivation; the stamens and pistils, from excess of nourishment, expanding into petals. Varieties are also occasioned by strewing the pollen from one species, upon the stigma of another; but these varieties do not produce perfect seed, and therefore cannot reproduce themselves by their seed. Colour, taste, and size, are not considered as marks of specific difference.

443. A *Genus* comprehends one or more species, grouped together on account of some resemblance in situation, proportion, and connexion of the organs which constitute the flower. Any one species of a genus may be regarded as a type or example of the others; we may easily refer species which we have not studied to their proper genus, by a knowledge of any one species of that genus. Some genera appear to be distinctly marked by nature; the various species of the rose, form a beautiful genus which is known to all, although every one might not be able to describe it to others, in such a manner as to be understood; it is chiefly distinguished by its urn-shaped, fringed calyx.

444. The generic names of plants are derived from various circumstances; in some cases from a peculiarity of form, or colour of the corolla or some property of the plant. Some genera are named from distinguished persons. Iris, (Flag,) is named from Iris the rain-bow, on account of its various shades of colour. Digitalis, (Fox-glove,) is named from *digitus* a finger, on account of the shape of its corolla, like the finger of a glove. Convallaria, (Lily of the valley,) is named from the Latin *convallis*, signifying valley. The name of the great Linnæus is commemorated in a beautiful but modest and humble flower called the *Linnæa borealis*.*

* *Borealis*, signifying *northern*, has reference to the situation of Sweden, the country which gave birth to Linnæus. The Linnæa borealis is not uncommon in New England, and has been found on an island near Troy, in the State of New-York.

441. What is an individual?

442. What is a species?

443. What is a genus?

444. How are the generic names derived?