delivered on Tuesday 2
Thursday 4 — & Saturday 6 of May
1815. S10. Con fanch 15.

1st. Flowers.

2d. Sol. n Conrad.

Having given a concise history of Botany by means of the biography of those who has distinguished themselves in the Science. We shall now commence with examination of the Anatomy & Phisiology of Plants. The Sc. of Botany may be compared to a ~~wheel~~ circle, begin where you will, and if pursued will bring you to the point from which you set out. Linneus has commenced the subject with the delineation of the P. supposing it to be already grown, but we propose investigating first the seed. We will unfold its structure & economy, plant it ~~in the ground~~ and watch its swelling, its protrusion from the ground and its gradual growth into a perfect plant, and then we will pull it up and describe its root, its branches and every part in succession, untill we come to the seed again or the same point at which we set out.

In the first place what is that body we called a seed. It possesses all the qualities of matter but it is very different from a pebble, which if we break seems thro'out alike, or throw it upon the ground and it there remain motionless, excepting when moved by external force, but break open the bean and you observe its cotes (its lobes filled with oil

filled with vessels, we find an internal adjustment of the particles so corresponding with each other as to become a little system, perfect in itself. Throw this into the ground and by the aid of heat and moisture, it will swell and evolve itself into the perfect plant, capable of producing "seed" "after its kind". The organization, which gives it this power, must then be curious & it is this we cannot never attempt to unfold.

Of the Seed

Few know what a seed is. but reflect upon it and your reflection may rise to astonishment. It's a living being. Throw it into the earth & it swells & from being a mere point by a power, inherent in a wonderfull conformation, it will soon flourish a luxuriant plant, which will be capable of producing "seed after its kind"

I had rather become acquainted with the structure of a single seed, than all the barbarous terms of the whole host of Botanists. The one trammels the understanding & burthens to little purpose; The other brings home to the mind the pleasing & sublime idea that it did not make itself

We begin with the external parts of the Seed. and shall describe the Hilum & the Arillus Integuments or Tunics. 1st. Examine a Pea in its pericarpium or Pod and you find it connected to the sutures by a little stalk which is the medium of nutriment to the growing seed. Break of the Pea and you will a scar or excavation which is called the Hilum or eye. which is of no use to the perfected seed, altho' it has been when growing — Forms — Colour

Near the Hilum is a part called Calyxa which in the bean is shaped like the heart on the playing card. In some seed the C is opposite the Hi:

Near the Hilum is a foramen or hole called the Foramina Hili, not distinguishable in all seeds but perhaps present in all. Was first observed by Grew who supposed it to be the point where the moisture was absorbed, which opinion was received, entertained by his successors and confirmed by their experiments particularly Mr Curtis Botanist of London who took 6 beans & carefully weighed them and also 6 other beans and varnish the foramina Hili. He then placed them all in the same situation where they operated upon by the same causes, and he found that the 6 unvarnish beans had swelled most, but we do not think this conclusive because inasmuch as the end of the radicle, soon to be mentioned, is directly under the Foramina Hili, the varnish might have prevented the action of the air and consequently the period of the swelling of the seed the action might only have been delayed longer in the varnished than in the unvarnish

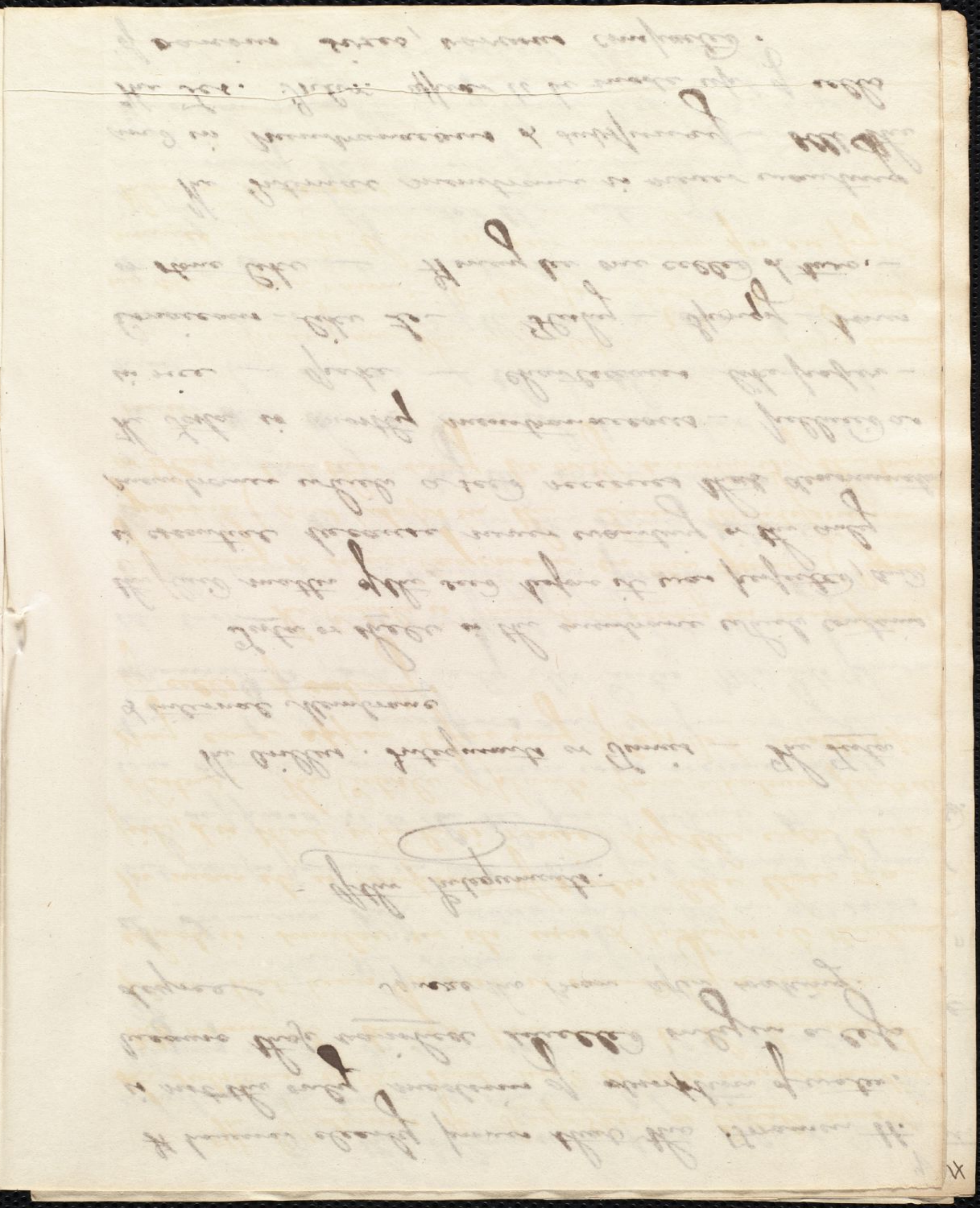
It however clearly proves that the Foramen H. is not the only medium of absorption of water, because those varished swelled only in a less degree — Squeze the Bean after soaking.

Of the Integuments.

The Arillus. Integuments or Tunics — The Testa & internal Membrane

Testa or shell is the membrane which contains the fluid matter of the seed before it was perfected, and is essential because never wanting or the only membranes which a seed receives that denomination. The Testa is mostly membranaceous — pellucid as in rice — Opake — Chartaceous like paper — Coriaceous — like L. — Fleshy — Spongy — bones or stone like — It may be one celled & two. —

The Internal membrane is never wanting and is membranaceous & subspongy — All the The Tes. Inter. appear to be made up of cells of various sizes, variously compacted.



The Epidermis or Scarf Skin or Cuticle invest the substance of the seed and is also never wanting. All animated beings from man to the humblest plant that bears a seed is covered by a cuticle which is similar in its uses & perhaps its structure. In man it is composed of scales, like those of a fish, & is that which is raised by the water in a blister. The Cuticle of plants from whatever part it may come appear before my glass to be made up of cells of extently.

The Cuticle is membranaceous in most plants by gummy or mucilaginous in the quince (Pyrus Cydonia) and perhaps in the Linum usitatissimum or Flax, but this may be only investures of the true cuticle

Excuse from the imputation of pedantry because we think you cannot be too familiarized to the hard names respecting them in our memory for we forget them in a season

The Nut or Seed properly so called is composed of 4 parts. 1st Albumen — 2d Vitellus. 3 Cotyledons & 4th Embryone.

1st Albumen — —

Here we may remark that the eggs of birds & the seed of vegetables are essentially the same in their structure & oeconomy. After breaking the shell of an egg we find a strong membrane investing the other contents of the shell. Immediately within this membrane is the white, consisting of two in their own proper membranes. The Yolk is known to you all and it likewise has its membranes which uniting with the other membranes forms at the pole of the egg what are called Calyza — This Union serves to steady all the parts and keep them in their relative position & to bring the punctum vitae or cicatriculae always uppermost. Upon the yolk is a small circular body, whitish, which is the Punctum vitae, point of Life, the point, whereby incubation, life is first perceived. In the blunt end of the egg is a cavity for air. By heat the punctum vitae begins to pulsate & the other parts.

other parts contained in the shell became in time ar=
ranged into a chicken. The vessels of the cicatricula
extend themselves thro' the other parts & go to the little
sack of air in the large end of the egg. This sack con=
tains oxygen & as the chick grows the sack enlarges,
the shell being pervious to the air. We shall soon
see how well these parts aggree with the seed of plants.

Under the integuments, of which we have spoken,
in the lillies, Grasses Palms &c. (Corn Tea Maize) is
a substance called Albumen, which is similar, in its
sensible as well as chemical properties, to the white of an
egg & so like is it that it is designated by the same
name (Albumen). In many plants it is wanting &
therefore cannot be so necessary as the white of the egg.
The. Vittellus or Yolk in the seed is placed between
the Albumen & the Embryon and it is entirely exhausted,
when the embryon grows, which proves its importance
where it exists, but is oftener wanted than seen, but it
is best observed in the imperfect seeds as the Maples.
Some dispute has arisen whether the vitellus be
distinct from the cotyledons. The Albumen & vitellus
never rise with the ~~germinating~~ with plant. never become
leaves, as we shall tell you another part does
which will be conformed with it.

Cotyledons. –

The next part is the cotyledons, which is a farinaceous substance ~~which~~ constitutes the nutritive part of the seed. Many plants have but one. Most have two and Linnaeus Gaertner & Jussieu that there are many which really have none as the mosses, which is disputed by others who say the the Vitellus of the mosses is a cotyledon, but the V. is always absorbed in germination & never becomes seminal leaves.

Jussieu has derived the primary divisions of his system from this circumstance.

Which are. 1st Acotyledonous. Plant
2. ~~Monocotyledonous~~. —
3. Dicotyledonous —

and some say Polycotyledonous. but Jussieu refers all such plants to the Dicotyledonous –

Colour – white. yellow in siliques & Legumes – Sonchus Scorzonera. livid or leaden – Purplish in Bidens – Amaranthus – blood red

Taste. almond – A. Communis – & Peach Persica sweetish – aromatic. many –

Vicia Faba.

As an example of the seed we shall take the English Bean or French Horse B. as one of the largest seeds which display clearly the different parts. On it we find the Testa which consists of three parts, as our glasses show. First the cuticle? 2d a membrane corresponding with the Cortex & 3d with the tegmen or inner bark of the trunk hereafter to be mentioned.

Under these are the cotyledons or seed lobes cut thro' the Funicle and the bean will seperate in to two part or two lobes, which are the cotyledons They are white in the Bean & most seeds, altho' there are some which are pale. I never saw any that were much coloured. The Col.s of the Bean are eaten by no insect. The lobes in different seeds are variously applied. In the Bean they are each concave & smooth & plain in; others waved irregular & often twisted.

Grew was probably much deceived by his glass when he says that the substance of the coty=ledon was radiated. and that these radiated lines runs from the centre to the circumference are were composed of cells. By looking at the Seed lobes with my glass I can see the radiated lines but I can make the centre in any part, so I can with my finger. any d.

Shave & Cut tuneously

(See the drawing.)

Shave away part of the lobe carefully from the end of the Bean which contains the radicle and you may discover small lines & by shaving very carefully with reference to these lines you will be enabled to trace them thro' out the lobe & you will find about 4 or 5 main branches with numerous smaller ones. They arise from the point of the union of the cotyledons & ramify thro' them variously and frequently uniting. Cut the lobe transversely and you find the line of seperation and the cut ends of the vessels in a curved line of dots. These vessels are called the Seminal Vessels from existing in the Semen or Seed. Other seed correspond with the Bean, and what we have said applies in a great measure to all

(Drawing. Almond & Bean.)

Between the Cotyledons is a small body called the Embryon, called by Linnaeus the Corculum or little heart. This composed most frequently of two parts. Always of the radicle or little root and the Plumula which is wanting in the Mosses When there is a neck it is called Scapus.

(Drawings of the Plume & scapus)—

The Plumula is that part of the Embryon or Corm which is to become the leaves & stem. Plumula means a feather, is the diminutive of Plume. Gertner calls it the first bud of the new plant. Grew who called it plume was followed by Linnaeus. (Plumula)

In some P. the Plume is so hidden that it can be scarcely seen: in other more or less flattened evident & usually much flattened or compressed. The P. of the Bean is composed of two leaves, of the almond the (Amygdalus communis) of many.

(Show the drawing, & point out all the parts and hand them)

This part of the Plant called the Plumula aspires after the air and in germinating pushes thro' the ground. When the seed germinates, moisture is introduced or imbibed by the little hole or foramen Hili which we said was directly over the end of the radicle.

The plume is most always wanting in the monocotyledonous seeds. — It may be simple linear. Cuneiformate — spiral. compound. digitate. &c. —

The Scapus is very frequently absent from the cotyledons. It is a mere neck, between the Plume and the Radicle. Linnaeus says nothing about it. —

The Radicle or Rostellum.

The Radicle or little root is found even on those plants where embryon is entirely wanting. Gaertner found by examination of 1054 seeds I concludes that they all have a Radicle simplex (sim R.) only one but in the seeds of (Secale Cereale) Rye. Triticum Wheat & Hordeum Barley there are 3. 4 & Sema - C - It may be a mere point. tubercle - conic - tapering cylindrical. Fusiformed - Capitate, straight & curved — It is very long when longer than the cotyledons - aequalis - short or very in proportion to the Cotyl.

By examining the Plumula & Radicle we find it covered by a cuticle & two fine membranes corresponding with the barks - The Pores originate in the seed I and we shall see them perfect in the full grown seed

Thus you see how nearly the seed resembles the egg. The seeds according to Spallanzani exist in the pericarpium before the plant has flowered as he ascertained in the Spartium Junceum, Broom & it is sometimes after the flower has fallen ~~that~~ before the Corculum is distinct.

When the seed is perfected it falls to the ground & is buried by the rains. It is now a perfect system or whole like the egg and not a dead substance like a pebble or a crystal, but a body regularly organized & harmoniously arranged into a system of vessels glands & membranes, and in a state of fitness to be acted upon by certain external agents. It is a little machine capable and liable to be set in motion. What then are the agents, which turn the wheel of life or rouse the vegetable ens or being from its dormant state? The answer — These agents are Fire Air & Water.

Place a living seed or egg of a Plant in the ground, where there is a proper degree of moisture & not far from the air. By the influence of the Potent agent Fire or Heat upon the Corculum, the punctum vitæ or that point where life begins to show itself, will begin to swell. The vessels will permeate the co=tyledons (show drawing) will take on their proper functions, which are to nourish the little embryon. The cotyledons are a deposite or store house of farinaceous or mucilaginous matter, which the seminal vessels are enabled to absorb & carry to the corculum, first converting it into a milky fluid, which contains much sugar. The first fermentative process in the seed in this saccharine and it is this which is performed in the making of

making of malt. All animals are their first feed by the milk. The Milk is carried directly in the seminal vessels to the Corculum by ~~the seminal vessels~~ which unites with the lobes by them entirely, and the Radicle pushes forward directly ~~to the Corculum~~ until it bursts the integuments. The Foramen Hili is at the very end of the Radicle & the integuments of the Bean almost always first break there. The Foramen enlarges, in a manner analogous to the enlarging of the air sack in the blunter end of the egg. The radicle invariably pushes down into the ground in quest of its peculiar nutriment. The Root always will tend downwards and as in this case, if the bean is placed the wrong end up it will turn in a circle & push down. Linnaeus proved that the ~~roots~~ branches of trees placed in the ground would become root & the roots in the air would bear leaves & flowers — Bonnet has supposed that the Root would in this case become the plume & the plume the Root but here you see that they both have turned in order to assume their proper places. The Plume by the same power emerges from the ground in quest of its peculiar element, & we may say aliment, the air. Thus you see the use of the cotyledons, that of feeding the infantile plant with milk. But this is by no means to only one.

They continue adherent to the infantile plant until all the Farina store of Farinaceous or nutritive matter is exhausted, when it falls off and rots affording a manure. In some plants the cotyledons rise with the embryon as in the bean & serveas protection and support. They grow and become green & serve the as lungs to the little plant, before it can use its own. The vegetable juices are brought up thro' the Root and are carried by the seminal vessels, which you have seen, & exposed upon the upper surface of the leaf, where they undergo a change by exposure to the atmosphere & then return by the lower side of the leaf to the Plumula for its growth and increase. When the cotyledons are thus grown they are called seminal leaves & they are various in different vegetable, but constant in the species of plants.

As soon as the proper leaves of the plant are suited to their office, the seminal leaves become exhausted, shrivel up and fall off. Then the little plant is weaned and can go alone

The colour of the corculum is nearly white in almost all plants, until it is exposed to the air when it takes the livery of the herbage of which covers the fields. The Plume of the

(Read in S.S. May 30 1875)

The plume of the Nelumbium is green; which a curious anomoly, as we find few exceptions to the general rule that part of animals & particularly plants are colour less excepting when exposed to the air & light.

(Recapitulate the parts again and take leave of them for this season).

Plumula is the embryon plant & it has been supposed that each embryon contains the flower & the seed and that these seed, altho' scarcely distinguishable even with glass, contain also others rolled up in them and that the high tree is sketched out in miniature in the minutest seed. Darwin alluding to it says.

Lo! in each seed within the tender rind,
Life's golden thread in endless circles wind;
Maze within maze the lucid coils are rolled,
And as they burst, the living flame unfold,
The pulpy acorn ere it swells contains,
The oaks past branches in its milky veins:
Each ravel'd bud fine film & fibre line,
Traced with nice pencil on the small design.

Again he says

Grain within grain, successive harvest dwell,
And boundless ~~forests~~ slumber in a shell.