

Autumn 1798.

Reap<sup>n</sup> of y.<sup>e</sup> extension of Arterial System, & prefatory to  
Digestion

In our last Lecture we traced (as far as we were able) the fetus from y.<sup>e</sup> small particle, or egg in the womb until it issued into Life. It is found that the hum. ovum is very like y.<sup>e</sup> egg of a Bird. As we cannot easily bring the first under the cognizance of our senses, and the latter can be examined by them in every stage of incubation, we have chosen the hen:egg by way of example for the human. In the hen:egg the first parts that were formed were the head, back bone, and heart; next the abdominal viscera, and lastly the limbs. The same took place in the rabbit, and what is more to our purpose the same order was observed in the human embryo —

We told you that the fetus adhered to ~~the~~ its mother's womb, by the umbilical vessels or funis in the same manner as the pear adhered by its stalk to the Tree. The umbilical chord or stalk, w.<sup>e</sup> consisted of y.<sup>e</sup> two umbilical arteries, one vein, & we might have added the Urachus, all covered over w.<sup>th</sup> a thickish membrane, w.<sup>ch</sup> is a production of that membrane called the Amnion. The two umbilical arteries, arise from the internal iliacs of the fetus; they ramify all over the Placenta & their branches inosculate together in its substance, and the smallest extremities are lost in that part of the membrane called chorion w.<sup>ch</sup> is in  
terposed



interposed between the placenta & the uterus. —

The origin of the Umbilical vein, is from small venous tubes arising from the Chorion, where the the smallest twigs of the arteries are lost, w.<sup>c</sup> uniting & forming larger & larger branches, at length run all into one large trunk, bigger w.<sup>c</sup> both the arteries put together; w.<sup>c</sup> trunk entering the umbilicus of y.<sup>e</sup> foetus, goes to the Liver, and opens into the sinus of the Vena portarum; from w.<sup>c</sup> sinus there arises in the foetus a particular large trunk, called the venous duct, opening directly into the Vena cava, w.<sup>c</sup> transmits the blood to the Heart. This venous duct is wholly obliterated after the animal <sup>has once</sup> breathed —

From this history you will perceive, that y.<sup>e</sup> arteries of the uterus bring the blood to the Placenta; w.<sup>c</sup> being taken up by the beginnings of y.<sup>e</sup> veins of the Placenta, is transmitted to the foetus through the umbilical vein, into the Vena portarum; from thence into the Vena cava, & so into the Heart.

On the other hand, the two umbilical arteries in the foetus being continued from the Aorta, carry the blood to the placenta; w.<sup>c</sup> blood, at the adhesion of the placenta to the uterus, is taken up by y.<sup>e</sup> beginnings of the uterine veins, and transmitted to the Cava & Heart of the Mother. — and thus, the blood flows from the mother to the foetus, and from y.<sup>e</sup> foetus to the mother again; and what was arterial b. in the one, becomes venous in y.<sup>e</sup> other alternately. —



From the whole, then, that has been said, it appears, that the  
h. body from being at first very small, grows gradually  
to a considerable size. This increase of bulk, in a great  
measure consists in the increase of the quantity of the  
fluids & a proportional enlargement of the containing  
vessels. The growth of an animal body depends on the  
extension of the arterial system; and this extension de-  
pends upon the quantity of fluids accumulated in it,  
& upon the force of the heart impelling the fluids, being  
~~such~~ such, as to keep the Arteries, constantly in a state  
of tension & ∴ always w<sup>th</sup> a tendency to be extended  
in every dimension. This extension of the Arteries is ap-  
plied to every red fibre of the body, & by their extension, it  
gives an opportunity for the application & accretion of  
the nutritious m<sup>r</sup> w<sup>c</sup> contributes to the growth of the fibre  
itself, & to the cellular texture on its surface. ~~The same~~  
extension of the arterial system, <sup>contracts</sup> is in some degree <sup>the</sup> ~~owing~~  
secretion of the Fluids.

By this gradual extension of the arterial system, the  
several parts of the body are unfolded, some sooner &  
others later, according to the constitution, or original  
stamina of the body.

As the growth of the animal advances, the solids become  
more rigid, by the increased force of the heart. This increased  
force



force compacts the elementary particles of the fibres & makes  
their cohesion stronger; & the larger arteries by their strong  
dilations, obliterate intermediate small vessels, changing  
them from hollow-tubes into solid fibres. In process of time by  
the incessantly repeated action of the heart & arteries, (as  
denoted by the pulse) more & more vessels will be ob-  
-literated; & the coats of those that remain open, will be  
more indurated; sometimes so as to become ossified in  
particular parts: the ligaments, cartilages & bones become  
drier & harder; the muscles & amongst them the heart  
more tendinous, & consequently weaker. At length the  
membranes, acquire some degree of rigidity; and as the  
heart grows weaker, more vessels will be obliterated,  
and the circulation is consequently performed through  
fewer vessels. As the finest canals are first affected  
(says D. Fleming) the fine organs of the senses, will be  
the first impaired, especially the eye sight. Then the  
memory & the imagination suffer, for we have already  
observed that perfection of organization and function are in-  
-separably connected, and the old man becomes a second  
time a child, and he gradually withers, like a plant, and  
dies, and this is called natural death. (Fleming.)

Having shown you



2/ Digestion. — Alimentary Canal  
Having shown you, that the growth of y.<sup>e</sup> Animal depends  
on y.<sup>e</sup> extension of the arterial system; it becomes now ne-  
cessary to show <sup>how</sup> the system of Arteries itself is supplied by  
a constant recruit of Aliment; w.<sup>c</sup> is drawn out of the food  
It is taken into the stomach and there digested into a  
soft mass called Chyle, further elaborated in the In-  
testines, taken up from thence by those fine pellucid  
vessels w.<sup>c</sup> arise in the Intestines called Lacteals, and  
conveyed by them to the receptacle of the chyle in  
the Loin, thence it ascends thro' the Thoracic-  
duct, from whence it drops into the left sub-  
clavian vein, thence into the Heart, then through  
the Lungs, and lastly from the Heart to each and  
every part of the body in order to maintain and  
recruit the whole, and this is effected by y.<sup>e</sup> process of Digestion.

Digestion is the conversion of food into chyle, and  
of chyle into blood. There is no function in the h. b. which  
requires your attention more y.<sup>e</sup> this, and there is no organ  
whose derangement you will be called so often to rectify  
as the stomach. There are two organs to w.<sup>c</sup> all our remedies are  
applied, and but two, and these are the skin & the stomach  
and their nature & properties demand our particular attention,  
especially the last. The skin as well as the lute mucosum is continued down through  
the alimentary Canal (See what food is)



No one w<sup>d</sup> suspect from the anatomical structure of the stomach, that it possessed those powers of solution and assimilation w<sup>ch</sup> we actually find it is endowed ~~with~~. Nay, who could believe that such ~~such~~ a simple bag as the stomach appears to be could possess that exquisite sensibility for which it is so remarkable; for the sensations of the stomach are so acute and so various that it ought to be ranked, <sup>I was going to say</sup> among the organs of the senses.

We presume that you are already acquainted with the form & general structure of the Alimentary canal, we w<sup>d</sup> therefore remind you that from the root of the tongue to the lower part of the intestines, there is one continued canal, w<sup>ch</sup> has different offices & denominations. The first part is called the Esophagus, or gullet. The masticated food, passes in the act of swallowing through this tube down into the stomach; w<sup>ch</sup> appears at first sight to be nothing more than the Esophagus enlarged, to several times its bulk; and assuming a shape not unlike that musical wind instrument called a Bag-pipe. The Alimentary canal then, contracts itself again, forming what is called the Intestines, w<sup>ch</sup> beginning at the bottom of the stomach is continued in various turnings & evolutions to the outlet of the body, or Rectum.

all the parts



all the parts of this canal are formed of various membranes, laid on each other, & w.<sup>c</sup> are themselves composed of fibres differently interwoven. The muscles wherewith one, or more parts of this canal is furnished, impress different motions on the organ; the principal of which is called the peristaltic motion; w.<sup>c</sup> motion serves to attenuate the aliment & force it into the Lacteals.

The Esophagus, receives the masticated food and transmits it to the stomach, where it is dissolved into a soft mass. It afterwards passes into the Intestines, and there undergoes a new preparation, or further elaboration. From thence it enters into the Lacteals (w.<sup>c</sup> are fine pellucid tubes w.<sup>c</sup> arise with open mouths in the upper portion of the Intestines, & pass on to the Receptaculum Chyli in the Loins) From thence I say it enters under the form of a milky fluid, into these fine vessels, that convey it into the circulation, where it assumes the name of blood.

The nutritive parts of the food thus enters the system of the blood-vessels, where the grosser & unnutritive part falls down as a sediment to the lower parts of the Intestines, and is thrown out of the body as an Excrement.

Digestion is



Digestion is the conversion of food in chyle, and afterwards into blood. As this is one of the most important functions in the An.<sup>d</sup> Economy, it requires our particular attention. Let us first see what the most celebrated Physiologists say on this subject.

If we look into Boerhaave & Haller. — w.<sup>c</sup> see —

Altho' heat & oxygen evolve the seed of a plant, and causes it to grow up to a large tree; and altho' the same agents unfolds the eggs, and causes it to grow up into a living animal, yet it is natural for some of you to enquire what the pabulum, matter or provender is, which encreases the size, and adds to the bulk of an animal. To say merely that it grows, is to talk like a child. To grow is to have some foreign matter added to us. In infancy this foreign matter is the mother's milk. In the adult state it is the various articles of our food reduced into a particular fluid called chyle. But how is grass turned into the flesh of a sheep? How is corn & fruit turned into the flesh of a man? You say by Digestion — good — but what is Digestion? You may answer that it is the conversion of food into chyle, and of chyle into blood, & of blood into flesh. But how is this performed? That is not so easily answered. Let us see what Boerhaave & Haller say on this subject —