

193 in the extremities of the arteries parts with  
some of its more fluid portion; there is a  
quantity exhaled and secreted, and a quanti-  
ty that fills the vasa minorum generum.  
The portion that goes off by the last is re-  
turned to the veins but exhaled: In the veins  
there is not the same impulse; nor is it per-  
fectly mixed till it has gone thro' the lungs,  
and passed the right ventricle of the heart. I  
would conclude that several phenomena might  
here be explained; that in the arteries, the over-  
val parts of the common roads are more  
perfectly diffused, and the spontaneous expe-  
ration is much less; but taking blood from  
large arteries has been too seldom practised,  
to throw much light on the subject. The dif-

ference of the saline matters in the blood tends  
to conform this. The alkaline and neutral  
salts give the blood a more florid state, &  
those matters that give coagulation more  
quickly give the blood always a darker colour.  
No doubt then that the difference of colour  
depends upon the quantity in which the red  
globules are gathered together. The blood is  
sumingly applied in the lungs to give the  
blood its red colour; but it appears in the chick  
in ovo before any blood air is applied to the  
lungs. The experiments have ~~been~~ been made  
in vacuo and with the same change of colour  
since, a member of the academy of Turin has  
experiments showing very plainly that the air

131 has some effects upon the blood: but they do not render it doubtful that the greater or lesser accumulation of red globules has this effect. It is enough to say that the air operates upon the blood in these circumstances. He covers the one portion of the blood drawn, with oil, and leaves the other uncovered; and the covered portion is always of a lighter colour than the other we have shewn that a halitus escapes. It consists probably of an aerial part. Its separation depends much upon the application of air. The respiration, then, resolves the blood and brings up the halitus to the surface. We may allow that the air has some effect out of the body, with the other circumstances

already taken notice of; but they do not shew that it takes place in the vessels. Next as to the colour. That they are colourless in the minute parts of our body is improbable. Senac supposes the colourless particles of a lenticular figure, but he is probably mistaken. He had also associated in this opinion; but microscopical observations are fallacious, & vary as you view them thro their diameter or thro one edge, or even the same parts in different shades of light. Haller and his associates have constantly found the figures spherical. I must say that the action of diffusion must be to produce the spherical figure only. Haller, in the smallest size of globules, and after many trials, always contends that colour does appear. The red globules diffused in water, and divided to a

143 greater degree than happens in the human body, still retain their colour. I therefore am against Senac's Doctrine, supposing the smallest particles not red coloured.

Lect: LXVII. Feb. 25<sup>th</sup> —

As we can not account for the colour some can hardly explain any other quality of the red globules. We can not say how its particles are formed. When abstracted in hemorrhages, they are soon restored. They are very much in proportion as the assimilating power. Whether or no they are pretty strictly in proportion to the strength of aliment, we shall afterwards enquire. They are formed from our aliment, and at last lose their distinguishing qualities and are carried off by the various secre-

tions. Experiments shew us that they are the subjected to putrefaction; If we could say of what use they are in the oeconomy it would be servicable, but we can not. Gaultierus and Haller say, they generate heat. But heat is not to be supposed to exist in one matter of the blood and not in the rest. That must depend upon a matter which may be peculiar, but must be common to all. Haller advances a bold proposition. "Rubor

est". That the heat of the blood is always in proportion to the red globules, and these to it. I know not how he says that a person after a hemorrhagy has, the same way, a greater heat than



180 he had the day before. It is not constantly  
as he says. Except  $\frac{1}{2}$  lb. which often dimin-  
ishes heat, and which may be supposed  
to happen from diminishing motions.  
If birds have more heat than quadrupeds  
and these more than men, I don't believe  
that can be said to be owing to the propor-  
tion of red globules. The heat is less in the  
amphibia but nobody will say that that  
is in proportion to the red globules. We  
shall meet with this again in Gaubius.  
What other means do the red globules use?  
They are manifestly of the greatest specifi-  
fic gravity of any of the particles of the  
blood, and therefore they preserve the diffu-  
sion more steady. It is probable that some

such means was in a great measure ne- 186  
cessary in our blood. If a portion of the  
lymph is not dissolved, but only diffused  
it is probable that the red globules have  
more attraction to it than <sup>the</sup> serosity, &  
keeps what serosity is necessary, and allows  
the rest to pass off into the smaller vessels.  
Otherwise in a thousand instances we should  
see obstructions formed. Some have imagined  
their solidity is a counterpoise to the action of  
the vessels, and their gravity an impulse to  
them; as to that we can not say. Concerning  
their solidity, a question has been put whether  
they are solid or fluid. I take them to be  
fluid, as all the phenomena can be ex-  
plained upon that supposition. That they

167 are incapable of a further subdivision, & therefore solid. is not true, as we can diffuse them to any degree we please in water, till they intirely disappear, and are as manifestly minutely dispersed in water, as salt. —

Coagulable Lymph. is the chief part of animal fluids either in quantity or quality. It is difficult to separate it or to have it exactly in the state in which it was in the living body. We can prove it is exactly the same with the albumen vi, which we may take for the subject of our examination. <sup>That</sup> It is the same, appears from its coagulating, with heat, acids, alcohol, which qualities it has in com-

mon with no other body which we know, 168 and also from its being insipid. Further it exactly resembles it in its manner of hardning upon evaporation, and the appearances it puts on. There is only one quality in which they seem to differ viz. that the albumen does not, without the means of evaporation, seem to conrete in the cold, which the lymph seems to do. But the coagulable lymph, while fluid in the body, if it is infused in water it will afterwards remain fluid in the cold without separating or conreting. The same albumen being deposited in a fine cellular membrane and having less water in it, accounts for that difference. When com-

169 creted to a certain degree we know no  
means of diffusing it in water again, the  
the division of it depends upon water alone.  
The albumen, hardened by evaporation  
is difficultly diffusible in water

Therefore this lymph  
is the proper animal fluid, and out of  
which the others are formed, and the body  
nourished, as the albumen answers these  
purposes in the chick in ovo. Again  
on the other hand we presume this lymph  
is formed by saliva, & gastric liquor, joined  
with vegetable acid, or vegetable matter  
in some other state. This liquor is the  
intermediate state between animal and  
vegetable matter, but is never vegetable

and putrid at the same time. Putrefaction 169  
is the spontaneous change to which it is  
liable: and it is constant by proceeding  
to that change by degrees; it loses its  
firmness of cohesion, in union with alco-  
hol or acids, and evolves saline matters  
which I shall not here explain. I have  
now to add that it is the saline matter  
generating ~~towards~~ in its progress towards  
putrefaction, that joining with water  
forms the serosity. This saline part pro-  
duced by change in the lymph is what  
especially distinguishes the serosity. We  
may speak of the attenuation and exhalation  
of oils but to be sure, without meaning;

181 and tho' it be here we can not say, in what state it exists; probably, the saline matters are of different kinds; but experiments to ascertain them are difficult, and Margraaf has not been able to speak of them with any clearness. We perceive most distinctly an ammoniacal salt, of the same volatile alkali as in other bodies, but with a peculiar acid, the so much talked of acid of urine. see Margraaf who has taught that with regard to its effects combined with oily matters, it does not go so far as to explain any of the peculiar properties, or even its own production. Further a principal pur-

pose seems to be to dissolve a portion 182 of coagulable lymph, even in the cold to hold it suspended and to form the serum of the blood. Probably in the human heat it holds the most part of the coagulable lymph, I dare not be certain; for there is probably a portion of the coagulable lymph only fluid in consequence of the means of diffusion shown of --

Proportion of the Parts of the Blood. Most Physiologists have formed bold judgements of this, from spontaneous separation. I need not say how difficult, nay how almost impossible it is, in any particular case to judge from the circumstances



153 mentioned above. It is plain that Haller had no Idea of crur, which he constantly takes for the united mass of crur and lymph, without attending to the greater or lesser quantity of serum in their pores. What the proportion of the red globules is to the other parts of the blood, whether a tenth or twentieth is difficult to determine. The lymph, considering how much of the crur it makes, and how much of it is dissolved in the crur, makes the largest part of our fluids. It is diminished on the one hand, by its tendency to putrefaction, and increased on the other by the assimilatory power. The serum de-

pends upon the proportion of liquid aliment, the foundation of which viz. water, is in large proportion in our aliment. I stop here because these things are unavoidably a subject of the Pathology.

As to other parts of the blood, it is alleged that the chyle prepared in the stomach and intestines, in the lacteals or their passages, goes to the lungs so far unchanged, as to appear in its proper form, as is observed in U. S. . We must not think it a constituent part of the blood.

If we examine the blood daily, we will find this a rare case and ought to



186 to conclude it a morbid appearance.

Further many of the particulars quoted, are by authors of no credit in point of discernment; and with regard to some of them it comes out that they mistook the inflammatory crust for chyle. Consider how slowly the chyle is taken in, by the subclavian vein; secondly, consider its division in a coloured fluid, and you will say it is next to impossible that it can appear in blood taken from a vein. I can imagine it may form milk; but I deny that chyle can be found in eight or ten ounces of blood.

However it <sup>is</sup> probable that the assimila<sup>186</sup>tion may not be finished in the lungs, and therefore a further process may be necessary. —

— Lect. LXVIII. Feb. 4. 26<sup>th</sup>. —

I said yesterday that the chyle was thought, after passing the lungs, to remain in a mass, and that facts are quoted to that purpose; it is however, difficult to believe them. If we consider how large a portion of coloured matter it must be diffused in, and add the diffusion from the venous blood, and the powers of the lungs, in giving an accurate diffusion, we will say it is impossible that it should ever be in a

158 separate maps. The assimilation of our  
element may not be performed from  
one application of the Lungs; and there  
may be a portion of our maps in an in-  
termediate state, between chyle and lymph  
and this portion may have a tendency to  
viscidility. The like external appearance  
of milk and chyle has been a strong con-  
firmation of the opinion I at first set out  
with examining. But few experiments  
have shown that milk and chyle are the  
same; however there may be a portion  
of the common maps not assimilated.  
I add that it is lymph deviating from  
its more perfect nature, towards putre-

faction and forming serosity, and our ex-159  
crementitious fluids as in the urine. There  
may be several intermediate steps between  
perfect lymph, and the saline state in  
which it is thrown out of the body, and  
therefore there will be another portion of  
our common maps. But these two still  
are portions of the same matter, rather  
varying in degree than species. But are  
these not matters quite different from lymph,  
crea or serosity. A writer of the greatest  
industry, & I had almost said ingenuity, on  
this subject, speaks of two other substan-  
ces, the gelatinous and the mucous part, &  
and has been followed by Haller and Gou-