Art. V.—The Fibrin of the Blood—its constitution and functions as explained by Dr. Charles Girard of Paris. By A. Ross, Esq.,

(*Read March* 9, 1874.)

According to our text books of Anatomy and Physiology, the fibrin of the blood is a "proximate principle," structureless and held in solution by the serum; its uses and real nature not definitely known.

I desire to call attention to its true structure and functions as explained by Dr. Charles Girard of Paris.*

When blood is drawn and allowed to cool rapidly, it forms a clot, the fibrin separating from the serum, and forming a semi-fluid, having no definite structure, but seeming somewhat thready (hence its name), and enclosing the red and the white corpuscles. Dr. Girard suspecting the true nature of fibrin, made an experiment for the purpose of determining it with very remarkable and valuable results. I give a free translation of his own words.

"I took a full grown deer, in perfect health, and opened a vein and artery so as to effect a gradual extinction of life from loss of blood. The heart in these circumstances lives longer than the other organs; its movements, in losing their intensity, permit a small quantity of blood to remain in its cavities under the gradually decreasing influence of life. The result is that the fibrin there continues distended with serum, and when placed under the microscope, without having lost its warmth, the cellular nature of the fibrin becomes as distinct as that of the vitellus. The cells are seen to be little transparent globules, having opaque points or nuclei in their centres."

I now proceed to give a resumè of his views of the origin and morphological relationships of fibrin.

Every organic tissue is composed of cells variously modified.

The lowest form of mature organic life, and the earliest form of each individual organism is equally a single cell, and the further

* "La Vie au point du vue phisique," and "Principes de Biologie appliques a la Medicine."

development of any organism consists in the multiplication and addition of cells and their modification into the several tissues, while nutrition consists simply in the replacing the worn out cells by new ones, and the assimulation of these with the tissue into which they have been incorporated. Cells are of two kinds—primordial and derived—the primordial being the result of the union of oil & albumen combining according to their reciprocal affinities, and the derived resulting from the development of the nucleus which appear soon after their formation.

The experiments* of Ascherson shew that the simple contact of oil and albumen at the ordinary temperature of the blood of animals, immediately results in the formation of cells, of which the albumen forms the envelope, and the oil the contents. Cells so formed, artificially, resemble so closely, as to seem identical with, the primordial cells produced within the animal, but pass through none of those phases of development which characterize the latter.

Researches on the formation of the egg in the various classes of the animal kingdom, have shewn that there is a time in its history when it cannot be distinguished from the ordinary cells constituting the organic tissues. It however undergoes a special development. Nuclei appear in its interior, and are developed into true cells which similarly develop within them new cells. When the third generation of cells has appeared, the first cell envelope disappears, setting free its contents. And this process goes on until the mass of cells which constitutes the vitellus or yolk of the egg is produced. It is well known that the white of the egg with which we are familiar in the eggs of fowl is merely a supply of albumen provided for the nourishment of the chick, and like the calcareous covering which in such eggs constitutes the final envelope, is not a necessary adjunct to an egg. In the white of the egg, when it exists, "floating cells" are found, which have become detached from the vitellus, and consequently undergo an abnormal development. Similar "floating cells" are found in the vitellus during the progress of segmentation.

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* Archives of Anatomy, Physiology, and Medicines, edited by J. Muler, Berlin, 1840, p. 44.

The pulp resulting from the digestion of food is *chyme*. That portion of the chyme which is taken up by the lacteals is called *chyle*—a fatty liquid. It meets the lymph—an albumenous liquid collected from all parts of the body by the lymphatic system before they are together carried into the venous system; and it is at this first contact of the two liquids that the primordial cells are formed; but such cells may also be found in the chyle alone, inasmuch as it also contains albumenoid substances.

Passing through the lungs the cells assume the red color which is characteristic of arterial blood, and their nuclei are rapidly developed into new cells, which in turn give birth to other cells, which becoming freed constitute the fibrin of the blood, or protein cells, the common basis of all organic structures. Such of these cells as are not incorporated into the tissues within a certain period, undergo an abnormal development and then constitute the white corpuscles of the blood, which are morphologically identical with the various epithelial cells, as also with the "floating cells" of the egg and embryo. The cells composing the vitellus are true protein cells like those constituting the fibrin of the blood, and similarly derived from a primordial or parent cell.

In polyps, and the inferior orders of radiates, mollusks and crustaceans, the nourishing fluid circulates in the form of *chyme;* in the higher orders of these sub-kingdoms in the form of *chyle;* and it is only in the vertebrates that blood properly so called is found. Blood consists of a liquor composed of albumen and water, containing various salts in solution, and in this liquid, floating as free cells, the protein or fibrin cells so minute as to require to be magnified 900 diameters, in order to be distinctly visible; the red cells or corpuscles, much larger in size and so numerous as to give color to the mass, and the white corpuscles less in size than the red, and comparatively very few in number. When the blood gives up its protein cells to the tissues, the albumen and water remain, and this last with its salts being eliminated by the perspiratory and other glands, the albumen is taken up by the lymphatic glands and carried back in the form of lymph to the general circulation for further service.