NOTES AND MEMORANDA.

The Origin of the Red Corpuscles of Mammalian blood.—A step forward in our knowledge of this subject has been made by Professor Rindfleisch, of Würzburg. As he justly remarks ('Archiv. f. mikrosk. Anatomie,' vol. xvii, August, 1879), in the introduction to his memoir, "not a word is needed as to the usefulness, in fact the necessity, of continually renewed researches as to the site of the formation of the blood and its mode of formation. Who among us does not feel it as a wound, a painful raw in his scientific manhood that we still are unable to say '*Here* and *thus* do the red blood-corpuscles take their origin!'" Neumann and Bizzozero deserve the amplest recognition for their discovery that in the red marrow of bones, cells occur with reddish-yellow homogeneous protoplasm and well-marked nucleus, cells which accordingly are identical with the red blood-corpuscles of the earliest period of life. These observations are easy to repeat and are fully accepted by all histologists. From these observations we know clearly *where* besides in the spleen, we have to look for the great factory of the red blood-corpuscles.

Hæmatogenesis is either a temporary or permanent function of certain regions of the connective-substance apparatus of the body, which for this purpose and during this period enters into an open communication with the lumen of blood-vessels either by the loss of their proper walls on the part of the capillaries and veins, as happens in the bone-marrow or by the thinning of their walls to such a degree, as in the spleen, that the unrestricted in-and-out wandering of cells becomes possible. The hæmatogenous connective-tissue becomes a sort of accessory cavity for the lumen of the blood-vascular system. In this cavity hæmoglobin-containing cells are produced by the conversion of colourless cells. Professor Rindfleisch compares the process of formation of hæmoglobin in these cells to that of fat in fat-forming connective-tissue.

Professor Rindfleisch's special contribution to this subject consists in: 1st, a description of the vascular plexus of the marrow of mammalian bones which he has succeeded in injecting (using the rib of a young guinea-pig) and of the wall-less character of its smaller vessels. 2nd, and of greatest import-

ance, an answer to the question "How do the nucleated red corpuscles of the red bone-marrow give rise to the non-nucleated red corpuscles of the blood?"

It is well known that this question has always been answered by hypothesis based on very slender foundation.

The old view, as to the origin of the red blood-corpuscles, was that the nucleus of certain colourless corpuscles became red and escaped as a free nucleus, the homogeneous red blood-corpuscle.

Later knowledge as to the red coloration of the whole of the mother-cell of the red corpuscle led to the assumption that the nucleus became atrophied and the whole cell converted into the non-nucleated red corpuscle. The attempts which have been made from time to time during the past few years to detect a nucleus in some form or other in the red mammalian corpuscle, point to a foregone conclusion in favour of this total conversion.

Professor Rindfleisch has, however, seen, both in embryos and more advanced individuals, the steps in the transformation of the red-coloured cell of the marrow into the non-nucleated red corpuscle which demonstrate that *the nucleus of the red coloured cell escapes and atrophies whilst the body of the cell contracts and becomes the red corpuscle.*

He gives figures of the red cells with their nuclei in the act of escaping, lying just on the limit of the cell-body or protruding from or even hanging by a mere thread to the latter. Then beside these he has seen and figures the freed nucleus and the irregular collapsed coloured body of the cell, which will soon be shaped by pressure and rolling into the disc-form of the circulating red corpuscle.

Professor Rindfleisch has endeavoured, but unsuccessfully, to witness under his own eyes the actual extrusion of a nucleus from a red cell. At the same time the intermediate series of forms observed by him are very strong evidence in favour of the view which he takes.

It seems also that Professor Rindfleisch's view is supported by certain facts of comparative anatomy which he has not himself adduced in its favour. In the Chætopodous and some other worms the *nuclei* of the vascular walls are often loosened and float in the blood as corpuscles. They are not impregnated by hæmoglobin but the plasma, in which they float, is. Whence comes the hæmoglobin of the plasma? Clearly the cells forming the walls of the vascular system in certain regions are in the Chætopoda as in Vertebrata, hæmatogenous; in them as in Vertebrata, the body of the cell forms the hæmoglobin which in this case becomes liquid instead of retaining the form of a corpuscle,

and at the same time the nucleus is separated from the hæmoglobin-bearing body just as it is in the Mammalia, but here, as it does not there, enters into the blood stream.

Any discussion of the mode and significance of the formation of hæmoglobin in the mammalian blood, ought to take cognizance of the fact that hæmoglobin is formed in the blood of the worms above noted, in Insect larvæ, Crustacea, and even Molluscs, and further that whilst it usually occurs diffused in the plasma of the blood it does occasionally, as in the Chætopods Glycera and Capitella, the Molluscs, Solen legumen and Arca, sp., &c., take the form of special nucleated corpuscles differing from and accompanied by the usual amœboid colourless corpuscles: also it is to be noted that just as fat occurs in other cells than specialised fat-cells so do we find the muscular tissue of many Vertebrates and of some Molluscs (buccal mass) impregnated with hæmoglobin. And even in one Annelid (the sea-mouse Aphrodite) we have the cells of the nervous tissue so rich in it, that the nerve-cord is of a deep crimson colour (see 'Proc. Roy. Soc.,' No. 140, 1873).—E. Ray Lankester.

I. On the Mode in which Hydra swallows its Prey. By M. M. Hartog, M.A., B.Sc., F.L.S., of the Owens College, Manchester. The current idea is that Hydra swallows by taking its prey in its tentacles and turning tentacles and all into its stomach. However, the part played by the tentacles ceases as soon as the mouth comes in contact with the food. The hydra then slowly stretches itself over the food in a way that recalls to some extent the manner in which a serpent "gets outside" its prey, or in which an automatic stocking might stretch itself on to the foot and leg. No care seems to be taken, however, to present the easiest point for deglutition, and an Entomostracan may be swallowed sideways, for instance. So far are the tentacles from co-operating in the act, that they are usually reflexed away from the food; occasionally, however, they are swung forward for a moment around the mass as if to ascertain how much remains to be swallowed.

If the prey be at all bulky, immediately after the whole act is completed the body cavity is everywhere filled and on the stretch, but after a short lapse of time the body contracts forcibly along the long axis, so that the part containing the food is globular, supported on a slender foot and with a slender apical process bearing the tentacles around the hypostome.

II. Additional Note on Hydra. By the Same. Since my last note I think I have found the clue to the false idea referred to. A Hydra that had swallowed a morsel larger than itself disgorged, as frequently observed, on my attempting to take it up for examination. On finding it half an hour after, three of its tentacles were