as to where it can be placed short of the zero advocated by some supporters of panmixia, involves either a mortality due to periodic selection or a magnitude of the regression coefficient vastly greater than any which are in the least supported by such statistics as have hitherto been collected.

(*m.*) Natural selection is more rapid in its effects when unaccompanied, than when accompanied, by that form of sexual selection which has been termed assortative mating.

V. "On the Granular Leucocytes." By G. LOVELL GULLAND, M.A., B.Sc., M.D., F.R.C.P.E. Communicated by J. N. LANGLEY, F.R.S. Received August 27, 1895.

(Abstract.)

Leucocytes whose finer structure is to be examined must be fixed by reagents, of which the best is sublimate; drying is unreliable, as it does not preserve details of structure.

It is impossible to divide leucocytes into a hæmal variety and a cœlomic variety, for (1) lymphocytes are the precursors of all forms; (2) leucocytes are not present in the blood in early fœtal life; (3) they are constantly passing from blood to connective tissue and *vice versâ;* (4) the mitotic reproduction of leucocytes takes place almost entirely in adenoid tissue. It is only their size which prevents the largest hyaline, eosinophile, and basophile cells from appearing in the blood.

M. Heidenhain's observations on the relative positions of nucleus and centrosomes are correct, but his theory of the original equality of the "organic radii" will not hold. These main threads of the mitoma are connected at every microsome by subsidiary threads. The nucleus does not lie free in the interfilar spaces, but its linin network is connected with the cytomitoma, and the two are perhaps to a certain extent interchangeable. This would explain the variety of arrangement of the nuclear chromatin, and the co-ordination in movement of the cell-body and nucleus.

The shape of the nucleus has no relation to the presence or absence of granules in the cell-body, but depends on (1) the relative sizes of the cell-body and nucleus (according to M. Heidenhain's law); (2) the position of the centrosomes; (3) the condition of rest or movement of the cell.

All varieties of leucocytes are merely stages in the development of a tissue. They may be divided for convenience, and with regard to the presence or absence of granules, into three main groups, the Hyaline, Acidophile, and Basophile. These forms are all derived from the lymphocytes, which are the daughter-cells derived from the

mitosis of all leucocytes except the largest granular forms. The lymphocyte develops into the small hyaline forms, from which the three groups branch off.

I. The cells may remain *Hyaline*, and attain their maximum development in such cells as the large phagocytes of the alimentary canal or the giant-cells of bone marrow. In this case they remain sluggishly amœboid, their centrosomes are very evident, and the cytomitoma and microsomes, while visible, are not easily made out.

II. In the *Acidophile* group are included the so-called neutrophile and amphophile cells, which are really oxyphile, and the eosinophile or coarsely granular cells. In the transition forms from the small hyaline cells to the oxyphiles the mitoma of the cell-body becomes more visible, and it is this rather than the presence of granules which gives rise at first to the finely granular appearance. The granules are simply the microsomes of the mitoma. In the transition forms between the oxyphile and eosinophile cells some of the microsomes become larger and take up acid dyes and iron-hæmatoxylin better than others, and when the large eosinophiles are reached the threads of the mitoma have become thicker, and also take up iron-hæmatoxylin. The microsomes in the eosinophiles vary greatly in size; they are arranged subradially, with the largest microsomes usually at the periphery. In this group the centrosomes are well seen, better in the eosinophiles than in the oxyphiles.

III. The cells of the *Basophile* group vary immensely in size and shape. The nucleus is generally ellipsoidal, except when the cells are actively amœboid, probably because the cell-body is usually relatively large. As the cells increase in size the amount of basichromatin in the nucleus becomes increased out of proportion to the size of the nucleus. This has no relation to mitosis, which has only once been observed in these cells. The centrosomes can be seen fairly easily in the smaller rounded forms. In the larger forms they are difficult to make out, and it seems possible that there may be several subordinate centrosomes. These cells are derived from the small hyaline forms by an increased visibility of the mitoma, and an increase in size of the microsomes, which are at first usually very irregular in size, and do not exhibit metachromasia with methyl-blue. As the cells become larger, so generally do the granules; they become more uniform, but are never all quite of one size. Metachromasia becomes more constant, and the mitoma more evident, especially in those cells which are moving, or which are greatly branched. The staining of the microsomes is never quite the same as that of the nuclear chromatin.

The granules of leucocytes are therefore *not* products of the metabolic activity of the cell embedded in a structureless protoplasm, as was hitherto supposed, but represent an altered condition of the

microsomes. They always form part of the cytomitoma, and are therefore plasmatic, and not paraplastic. They are probably concerned with amœboid movement, and they and the rest of the mitoma are more visible the more active the cell. No definite conclusions as to their chemistry can yet be arrived at, but all the altered microsomes probably consist of nucleo-albumins, the basophiles being richer in phosphorus than the eosinophiles.

In diseased conditions it is probably impossible to say what organ is affected from the kind of leucocytes present in excess in the blood.

VI. "On the Development of *Lichenopora verrucaria*, Fabr." By SIDNEY F. HARMER, M.A., Fellow of King's College, Cambridge, Superintendent of the University Museum of Zoology. Communicated by A. SEDGWICK, F.R.S. Received October 15, 1895.

(Abstract.)

The principal results of my examination of the life-history of *Lichenopora* have already been communicated to the Royal Society.* I then showed that embryonic fission occurs as a normal process in the development of that genus, as of *Crisia*. The general growth of the colony and of the embryo was described, and attention was called to the remarkable fact that the embryonic processes which culminate in the production of the entire first brood of larvæ commence in the earliest stage of the formation of the colony itself.

The present paper contains a fuller account of the processes indicated above, with the addition of some new details. Statistics are given to show that the zoœcium which produces the primary embryo, from which the larvæ are developed by a process of embryonic fission, is, in the great majority of cases, one of the first two blastozoites of the colony. The position assumed by these two zoœcia depends on the direction in which the primary zoœcium has become curved; and "left-handed" and "right-handed" colonies are accordingly distinguished. The relation of the young ovicell to the fertile zoœcium has been observed for the first time. The formation of the ovicell commences with the occlusion of the orifice of the fertile zoœcium; and this takes place in such a way that the body-cavity of the zoœcium remains continuous, near the orifice, with the cavity of the ovicell. The polypide has previously degenerated, and the embryo, contained in an investment, the "embryophore," has passed up to the neighbourhood of the orifice, still attached to the

* 'Roy. Soc. Proc.,' vol. 57, p. 188.