follows that the myelin formation is also a function of age. A glance at the graphs in Chart 1, and at column (4) in Table 3, will show that the most active production of myelin, as indicated by the rapid loss in the percentage of water, occurs early, i.e., during the first twentieth of the life span in both the rat and man.

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DIFFERENTIAL MITOSES IN THE GERM-CELL CYCLE OF DINEUTES NIGRIOR

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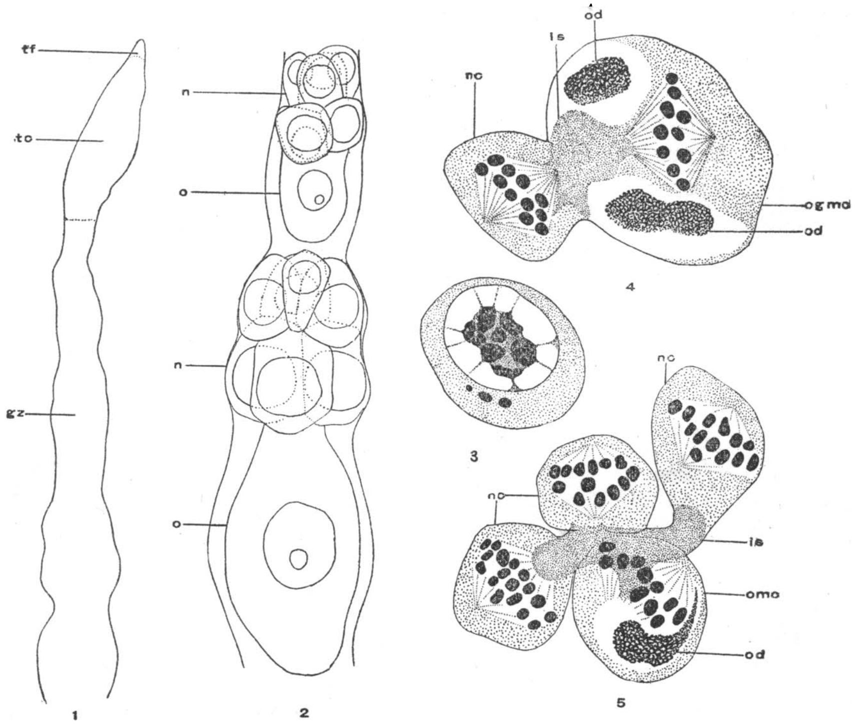
One of the most interesting and important periods in the germ-cell cycle of certain insects is that during which oögonia give rise to nurse cells and oöcytes. While such a period does not occur in certain insects, such as the paedogenetic fly, *Miastor*, in which the nurse cells are of mesodermal origin (Kahle, 1908; Hegner, 1914), perhaps in the majority of the members of this class, the growth of the egg is preceded by the formation of nurse cells from which the oöcyte derives most of its contents.

Many investigators have studied the origin and history of the cellular elements within the ovaries of insects, but in only one family, the Dytiscidae, have clearly defined visible differences been discovered between the nurse cells and the oöcytes at the time of their origin from the same mother cells. In the diving beetle, *Dytiscus marginalis*, Giardina (1901) discovered true differential mitoses which result in the derivation of one oöcyte and fifteen nurse cells from each ultimate oögonium. In this case there is a series of four mitoses during each of which one cell divides unequally; the larger daughter cell is characterized by the presence of an extra-nuclear 'chromatic ring' and leads to the formation of the oöcyte; the other gives rise only to nurse cells. Giardina supposes that this peculiar chromatic ring consists of part of the chromatin contained in the nucleus of the ultimate oögonium. He found that a chromatic network remains in the nucleus after the chromosomes are formed and that the ring results from the condensation of this network. Günthert (1909) repeated Giardina's work and confirmed it in almost every respect. Regarding the origin of the chromatic ring, he believes that it may consist of chromatin that has separated from the chromosomes. Debaiseaux (1909) also studied these differential mitoses in *Dytiscus marginalis* but added very little to Giardina's account. His most interesting conclusion is that the material of the chromatic ring may really be nucleolar in nature.

Several writers had noted peculiarities in the ovarian cells of beetles before Giardina published the results of his investigation but did not work out their history. Thus Will (1886) described and figured the origin of the nurse cells in the beetle, *Colymbetes fuscus*, but his work is lacking in detail, and Korschelt (1886) actually observed the chromatic ring is *Dytiscus marginalis* but failed to determine its real significance. Since Giardina's investigations were published many attempts have been made to find differential mitosis of a similar sort in other insects, but thus far without any success. Kern (1912) found a group of granules in the oögonia of the ground beetle, *Carabus nemoralis*, and a similar group in the oöcyte of *C. glabratus* but none of the intervening stages were seen and the connection between these granules and differential mitoses is therefore doubtful.

It seems particularly fortunate, considering these many failures, that a species belonging to another family of insects has at last been found in which visible substances can be observed during the differential mitoses. The material on which the following report is based consists of over thirty ovaries from the whirl-i-gig beetle, *Dineutes nigrior*.[1] These were obtained by the senior author[2] at Woods Hole, Massachusetts, on August 28, 1915. Some of them were fixed in Meves' modification of Fleming's solution, some in Bouin's picro-formol solution, and some in Carnoy's acetic-alcohol-chloroform-sublimate mixture. Longitudinal sections were cut 5 microns thick and stained with Heidenhain's iron-haemotoxylin. The general relations of the nurse cells and oöcytes were obtained from *in toto* preparations.

One of the ovarioles from an ovary of *Dineutes nigrior* is shown in longitudinal section in figure 1. It consists of three general zones, the terminal filament (*tf*), the terminal chamber (*tc*) and the growth zone (*gz*). The anterior end of each ovariole is attached to the dorsal body wall by a long terminal filament made up of epithelial cells. The oögonia multiply and differentiate into nurse cells and oöcytes within the terminal chamber. After differentiation has occurred, the oöcytes and their accompanying nurse cells lie at the anterior end of the zone of growth. Each oöcyte is nourished by seven nurse cells which lie in a nurse chamber anterior to it. The arrangement of these nurse cells is shown in figure 2, *n*.



1. Outline of an ovariole. *tf* = terminal filament, *tc* = terminal chamber containing undifferentiated oögonia; *gz* = zone of growth. (× 140)

2. A portion of growth zone, drawn from in toto preparation, showing eight cell stages. *n* = 7 nurse cells arranged in nurse chamber; *o* = oöcyte connected with nurse chamber. (× 225)

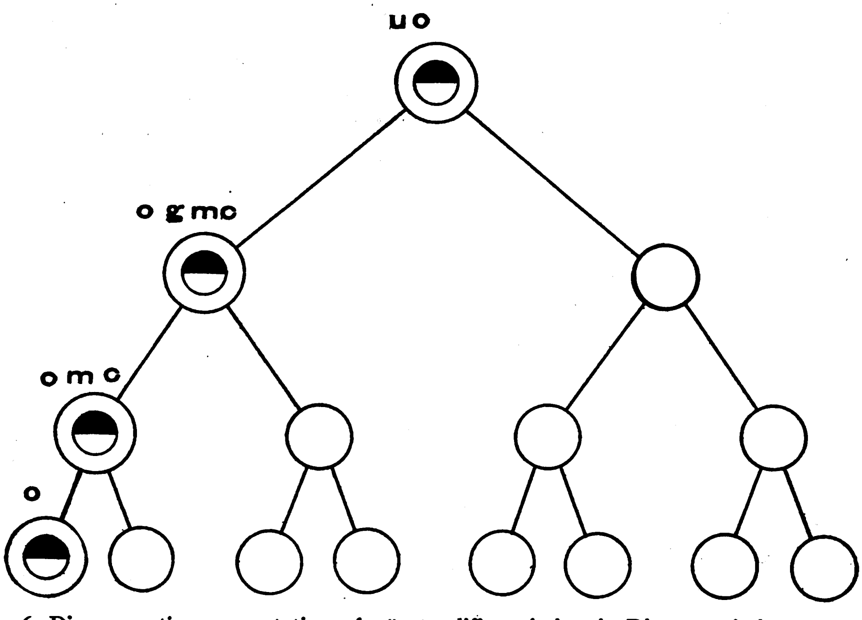
3. A single ultimate oögonium from anterior end of terminal chamber. (× 2000)

4. Two-cell stage. Metaphase of second division. *nc* = nurse cell; *ogmc* = oöcyte grandmother cell containing oöcyte determinant *od*; *is* = intercellular strand. (× 2000)

5. Four-cell stage. Metaphase of third division. *nc* = nurse cells, *omc* = oöcyte mother cell, containing oöcyte determinant *od*; *is* = intercellular strand. (× 2000)

The large terminal chamber contains at its distal end many oögonia ready to undergo differentiation. These ultimate oögonia (fig. 3) are characterized by a nucleus containing a deeply staining central mass of chromatin from which many fine strands radiate to the nuclear membrane. A few small darkly staining bodies are sometimes present in the cytoplasm. The two daughter cells of such an ultimate oögonium are shown in figure 4 preparing for division. One of these cells (*nc*) is smaller than the other and gives rise to nurse cells only. The other, the oöcyte grandmother cell (*ogmc*) is larger and contains within its cytoplasm portions of a deeply staining body that we do not hesitate to homologize with the 'anello cromatico' of Giardina and which we may call the 'oöcyte determinant.' Between the two cells is an intercellular strand (*is*) which represents the remains of the spindle fibres of the previous mitotic division.

A four-cell stage such as is illustrated in figure 5 proves that the division of the oöcyte grandmother cell (fig. 4, *ogmc*) is differential since one cell, the oöcyte mother cell (fig. 5, *omc*) has received all of the



6. **Diagrammatic representation of oöcyte differentiation in Dineutes nigrior.** ***uo*** **= ultimate oögonium, containing oöcyte determinant within its nucleus;** ***ogmc*** **= oöcyte grand-mother cell having similar nuclear characteristics;** ***omc*** **= oöcyte mother cell,** ***o*** **= oöcyte. Plain circles indicate nurse cells.**

oöcyte determinant (*od*), whereas the other three (*nc*) are smaller and lack this body, and are destined to become nurse cells. The intercellular strands are quite conspicuous here and leave no doubt in the mind of the observer as to the origin of the four cells from a single cell, the ultimate oögonium. Each of these four cells undergoes a single mitotic division resulting in the formation of seven nurse cells and one oöcyte, the latter containing the oöcyte determinant.

The most conspicuous difference that we have discovered between the origin of the oöcyte in *Dineutes nigrior* and in *Dytiscus* is in the number of differential mitoses; in *Dineutes nigrior* there are only three (fig. 6) whereas in *Dytiscus* there are four.

As a result the oöcyte of *Dineutes nigrior* is accompanied by only seven nurse cells, that of *Dytiscus* by fifteen. The origin and history of the oöcyte determinant are of considerable interest and importance because of their bearing on the subject of the physical basis of heredity. A more detailed study of our material is now being made and the ovaries of *Dineutes nigrior* and of several other species promise to furnish a means of clearing up the details of differential mitoses in these insects.

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[1] We are indebted to Mr. A. W. Andrews for the identification of this species.

[2] Mr. R. W. Hegner is indebted to the Bache Fund for assistance in preparing the material on which this report is based.

SOME MINERALS FROM THE FLUORITE-BARITE VEIN NEAR WAGON WHEEL GAP, COLORADO

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In the summer of 1912 Messrs. W. H. Emmons and E. S. Larsen[1] made a hasty examination of the fluorite-barite vein which passes through the hot springs near Wagon Wheel Gap, Colorado. Since that time this vein has been extensively prospected and a considerable amount of fluorite has been produced. In the summer of 1915, in the course of the reconnaissance geologic study of this region under the direction of Dr. Whitman Cross, Mr. Larsen made another brief visit to the deposit and collected two specimens of material not before recognized in the deposit.