in does this case differ from the other two?

May we not reasonably exercise some 'critical caution' before with Wheeler we conclude it probable 'that worker ants can really produce other workers or even queens parthenogenetically'? But suppose they can; wherein lies the 'ominous import' which such a possibility has for 'current views on sex determination'? For myself, I do not see that the case of the ant would then present any new problems not found either in the case of *Nematus,* or in the silk-moth, or in *Daphnia,* to any theory of sex determination ever conceived or conceivable. Should it be shown that the unfertilized eggs of the ant may develop either into males or into females (at present we have no evidence whatever that such is the case), then it would be in order to inquire whether all such eggs undergo two maturation divisions, as do the eggs of the bee, or whether, as in the Rotifera and Crustacea, male parthenogenetic eggs undergo *two* maturation divisions, whereas female parthenogenetic eggs undergo only one.

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January 25, 1904.

SPECIAL ARTICLES.

AMITOSIS IN THE EGG FOLLICLE CELLS OF INSECTS.

Professor Conklin's interesting account of the amitotically dividing egg follicle cells of the common crickets (*Gryllus pennsylvanicus, abbreviatus* and *domesticus*) in the *American Naturalist* for October, 1903, recalls attention to a condition and phenomenon in animal cytology all too little known. Despite the rarity of amitotic cell division elsewhere among animals, and the interest and significance of the phenomenon, the opportunity offered for its study in the egg follicle cells of insects has been taken little advantage of. We know simply that amitotic division occurs in some of these cells in certain insects. How consistently through the insect class; whether identical or varying in character among the different insect species in which it occurs; and finally and most importantly, how far back in the lineage (ancestry) of the cells themselves the phenomenon persists; in other words, at what time the amitotic division appears in the history of cells which must be derived from cells with mitosis; all these interesting questions remain to be answered. Professor Conklin finds that only in the follicle of the lowest egg-chamber of each ovarial tube of *Gryllus* are all the cells amitotically dividing. In the upper chambers or sections of the tubes the division of the cells is always (as far as observed) mitotic; in the lowest chamber, on the contrary, always amitotic.

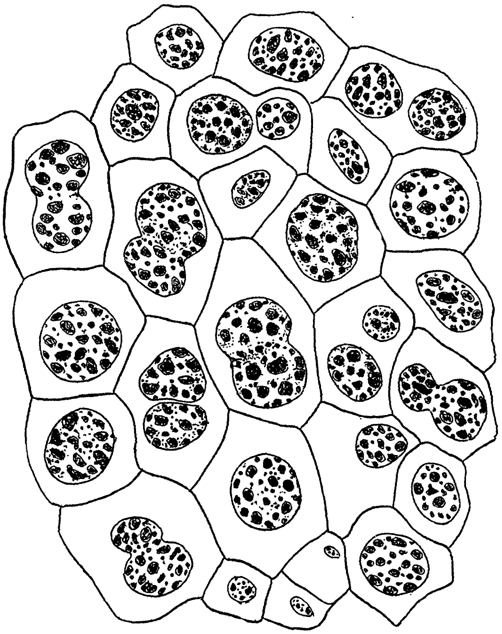

Fig. 1. Egg follicle cells of *Hydrophilus* sp.; showing amitotic division.

The obvious conclusion, in the light of our knowledge of the fate of the follicular cells of the lowest chamber—they secrete here the chorion of the egg and then give up the ghost —that the amitosis is a concomitant with senescence and decay, is probably indisputable. But it is a fact that in not all of the few insects in which this amitosis has been studied is it limited to the follicle cells of the last egg chamber.

Certain differences exist in the character of the amitosis of the egg follicle cells of *Gryllus* (as described by Professor Conklin) and this process in the follicle cells of *Hydrophilus* sp., the common large water-scavenger beetle of our ponds and stream pools, as I have observed it. In the first place, amitosis is not confined to the lowest egg-chamber; unfortunately I can not say from my present preparations how far up the tube, *i. e.,* toward its germinal chamber, amitosis may be found among the follicle cells, but it is found above the last (lowest) chamber. In the second place, there is no well-defined single nucleolus. So the phenomenon of such a nucleolus surounded by a clear zone and regularly dividing before the nucleus (described for *Gryllus*) is wholly wanting in the follicle cells of *Hydrophilus*. Each nucleus of these cells contains a large number of spherical, strongly staining (chromatin) masses or grains gradating in size from a point up to conspicuously large nucleolus-like balls. The larger of these structures might be looked on as nucleolar masses, if one wanted to use the name nucleolus at all; but if so, from half a dozen to a score of nucleoli would have to be accepted and their only distinction (from the many smaller masses) would be the arbitrary one of size. Fig. 1 shows this disposition and relative massing of the staining (chromatin) substance in the nuclei. No sign of chromatin thread (linin or skein) is apparent. There is absolutely no sign of a division of these nucleoli or chromatin balls accompanying the nuclear division. The nuclei simply seem to be senescent structures with their chromatin content segregated into many small globular masses which vary in size, with all intermediate gradations from small to large. About each of the larger masses a narrow clear zone is apparent.

Fig. 1 shows also the various stages in the simple division of the nucleus and the great size of the nucleus compared with the cytoplasm body containing it. In some cases a cell wall appears between the daughter nuclei after division, but in others the cytoplasm does not seem to effect a clean division, both nuclei then lying, it may be said, in one cell. The actual size of the nuclei averages .04 mm.

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VARIATIONS IN THE PROTECTIVE VALUE OF THE ODORIFEROUS SECRETIONS OF SOME HETEROPTERA.

WHEN on a collecting trip near College Station, Texas, early in October, I examined the stomach contents of a half-grown toad. In this mass I found two stink-bugs (*Euschistus fissilis*). This seemed very interesting on account of the great amount of apparently more palatable insects available here; and especially interesting in connection with the fact that the examinations of the contents of 152 toads' stomachs since the summer of 1901, made to determine what rôle the common squash bug played in the toad's diet during a season when these bugs were exceptionally abundant, revealed less than three per cent. hemipterous material. Mr. Kirkland, in Bull. 46, Mass. Agric. Coll., p. 16, estimated the percentage of hemipterous and dipterous food, after careful examinations of 149 toads stomachs, below two per cent of the whole.

There are variations in the protective efficiency of the secretions of some heteroptera, and this may be an important factor in governing the percentage of diet such insects form with some animals. Many experiments with the common black squash bug were made during the summer of 1901 while at the New Hampshire Experiment Station, and the results there obtained showed that with constant use for a short time the secretions become weaker, and after fifteen minutes are decidedly less effective. Although toads in confinement were witnessed to eat squash bugs, it was only after the secretions were partially exhausted or where the bug was snatched before discharging the liquid. The greatest number a hungry toad would eat was three. In no case was this done in the face of a discharge from the secretion glands.

After twenty-four hours' rest under natural conditions the glands apparently regained maximum strength. This does not apply to hibernating specimens of heteroptera.

On September 15, 1901, half-grown toads were repeatedly killed from the full effects of the fresh discharges from several specimens of squash bugs.