

On the Resemblances existing between the "Plimmer's Bodies" of Malignant Growths, and Certain Normal Constituents of Reproductive Cells of Animals.

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It is proposed in the present communication to present the results of investigations bearing on the nature of those remarkable structures known as "Plimmer's Bodies."* As is well known, these are found in many cancerous growths, and are most commonly encountered in the younger or growing regions of the tumour. They appear in the form of vesicles, and they consist essentially of a fairly well-defined wall containing a clear space in which is suspended

FIG. 3.

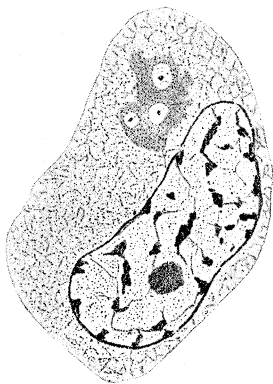
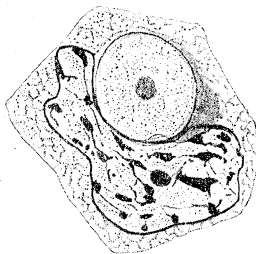


FIG. 1.

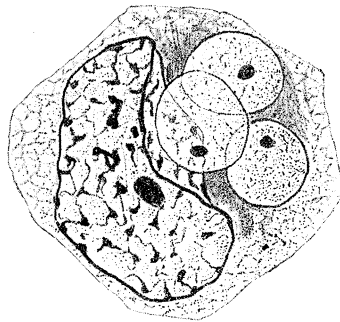


FIG. 2.

Figs. 1, 2, 3. Examples of Plimmer's Bodies from carcinoma. 1. Three small "Bodies" in an archoplasm. 2 and 3. Later stages in the development of the "Bodies."

a small darkly staining granule (figs. 1, 2, and 3). They are most commonly to be met with in tumours of a glandular or glandular-epithelial origin.†

* Plimmer, 'Practitioner,' vol. 62.

† Greenough, '3rd Rep. Caroline Brewer Croft Cancer Com.,' Harvard Med. School, 1905.

They lie in the cytoplasm of the cancer cell, and usually in close proximity to the nucleus. In size, they vary from excessive minuteness to that of the nucleus itself.

The special interest attaching to them depends on the fact that they have commonly been regarded as peculiar to cancerous cells, although Honda* believes he has occasionally also encountered them in inflammatory tissues. They have been variously interpreted. Some investigators have regarded them as parasitic organisms, more or less intimately connected with the etiology of the disease, whilst others have seen in them a differentiation of the cytoplasm of the cancerous cell itself. It has been suggested also that they might be derived from the centrosomes within the archoplasm,† but the observations of Benda‡ that centrosomes coexisted independently of them in the cell, has rightly been held to disprove this hypothesis.

Our own investigations indicate, however, that there are good grounds for reconsidering the whole position, and a comparison of the processes that normally obtain during the final stages of development of the reproductive elements in man and the other mammalia, appear to us strongly to suggest that a parallel between the Plimmer Bodies of cancer and certain vesicular structures occurring regularly in the gametogenic, but not in the ordinary somatic, cells, may be found to hold good.

It was shown by one of us,§ in 1895, that during the prophase of the heterotype (first maiotic) mitosis of the spermatogenetic cells, the archoplasm undergoes a highly characteristic and peculiar metamorphosis. In normal somatic, or premaiotic, cells the archoplasm is seen to lie beside the nucleus as a dusky mass of protoplasm in which are contained the centrosomes. That is, the attraction sphere consists of the archoplasm *plus* the centrosomes.

But during the prophase of the heterotype mitosis these constituents become separated. The centrosomes are found to lie *outside of* and detached from the archoplasm (fig. 4). At the same time the archoplasm itself undergoes a change. It becomes vesiculated, and finally, at the close of this cell generation, it is lost in the general cytoplasm of the daughter cells.

In the prophase of the second maiotic division (homotype) the same phenomena recur. When the homotype mitosis is over, the constituents of

* Honda, 'Virchow's Archiv,' vol. 174.

† Borrel, 'An. Inst. Past.,' vol. 15. This author was on the right track in attributing importance to the archoplasm, but the erroneous interpretation placed on the centrosomes precluded his arriving at a satisfactory conclusion as to the nature of the bodies under discussion.

‡ Benda, 'Verh. deutsch. Gesellsch. f. Chir.,' 1902.

§ Moore, 'Internat. Monatschr. f. Anat. v. Physiologie,' vol. 11.

the sphere, or at least some of them, enter into direct relation with parts of the spermatozoon which arises by further differentiation of the cell. As regards the archoplasm, with which we are more directly concerned, it is again seen to contain a number of minute vesicles which continue as before to grow in size, whilst each contains a single refractive and stainable granule (figs. 4, 5). Subsequently, several of these vesicles fuse together, so that at a later stage in the metamorphosis of the cell into a spermatozoon there only

FIG. 4.

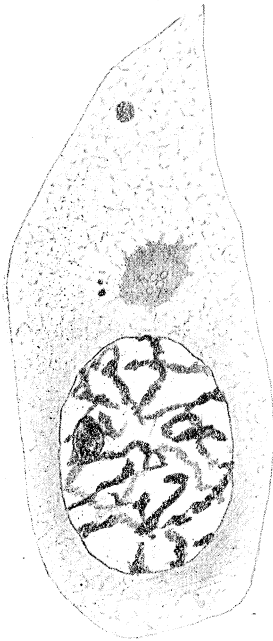


FIG. 5.

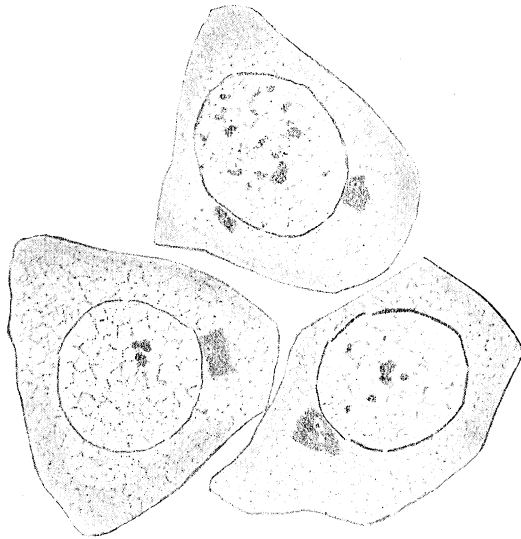


Fig. 4. Archoplasm with centrosomes lying outside it in prophase of the first meiotic division in testis of mouse.

Fig. 5. Spermatid of mouse, showing origin of vesicles in the archoplasm.

remains a single large clear body, bounded by a distinct membrane, containing in the centre one or more darkly staining granules (figs. 6, 7, 8).

This body, originally described by one of us in 1895 as the archoplasmic vesicle, is a very conspicuous and apparently constant feature peculiar to the spermatogenic cells of, at any rate, the vertebrata, and it has since been encountered beyond that group by other observers.

When fully developed it often assumes a size approximating to that of the nucleus. Indeed, the latter is often deformed and made to assume a crescentic or cuplike shape owing to the enlargement of the adjacent archo-

plasmic vesicle. The vesicle and its contents ultimately forms the so-called "cephalic cap" of the spermatozoon.

The remarkable similarity between the structure just described and those known as Plimmer's Bodies will have become obvious. It is not, perhaps,

FIG. 6.

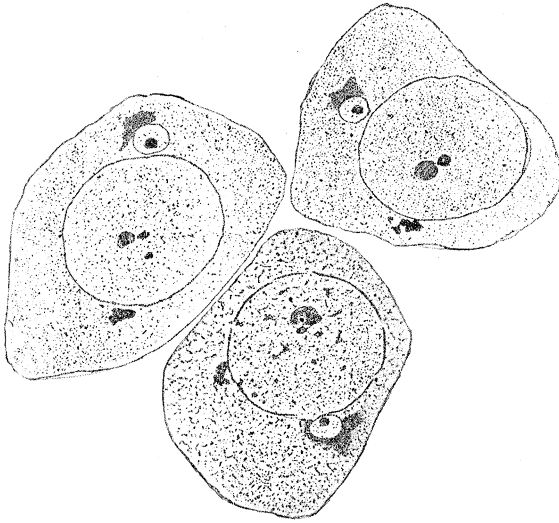


FIG. 7.

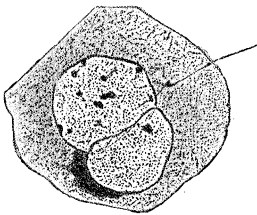
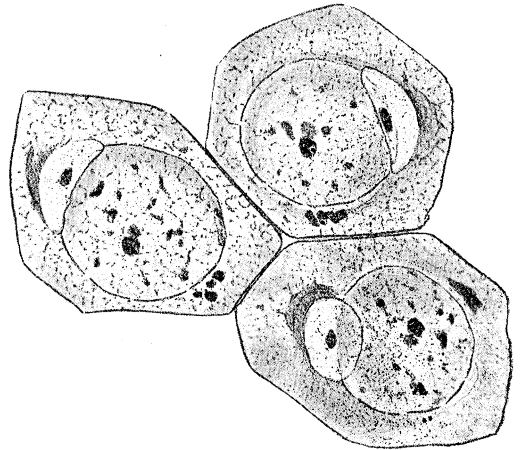
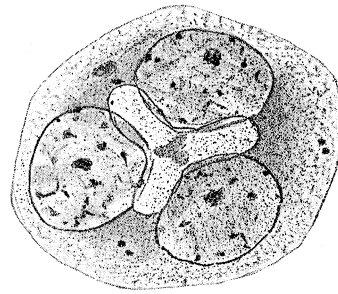


FIG. 8.

FIG. 9.



Figs. 6 and 7. Later stages of fig. 5.

Fig. 8. Slightly later stage in the spermatid of man, with centrosomes and tail.

Fig. 9. Three spermatid nuclei in a single cytoplasmic mass, showing three archoplasmic vesicles in the centre, with two pairs of centrosomes, and a third, less defined, to the left hand.

accidental that just as in the case of nuclear divisions, so also in the cellular inclusions, a parallelism between the cells of reproductive tissues and of cancer cells should be found to exist. But we do not on this account regard the cells of cancer as *identical* with those of the sexual cells, as we were careful to point out in our first communication in 1903.

But the resemblances between what we have termed gametoid, and the true gametogenic cells now seem to be even more significant than they appeared to be at that time. Both classes of cells are autonomous to a very high degree, and both possess the faculty of continuous or intermittent multiplication independently of the tissue requirements of the organism. And finally both exhibit cellular and nuclear metamorphoses which not only, *mutatis mutandis*, resemble one another, but differ materially from those pertaining to the normal somatic cells.

It is possible that the malignant elements are the outcome of a phylogenetic reversion, as was suggested by Sir William Collins, but the matter is obscured by the disturbing influences that have been operative during the actual ontogeny of the cells and tissues from which these elements have sprung. If this be so, the connection apparent between gametoid and the true reproductive cells will acquire a still deeper significance. But we propose to reserve the discussion of this question for another occasion.

In thanking those who have helped us with material we would mention especially Dr. Plimmer himself, who has most kindly placed preparations at our disposal.

We would further record our indebtedness to the Imperial Cancer Research Fund for a grant in aid of our investigations.

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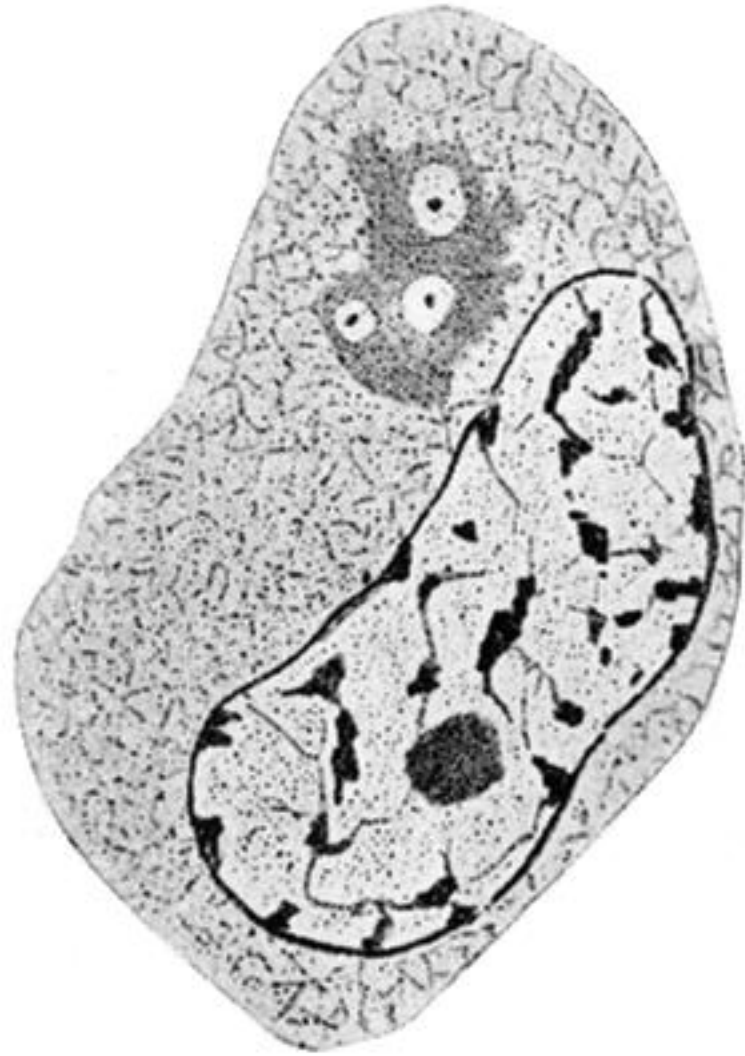
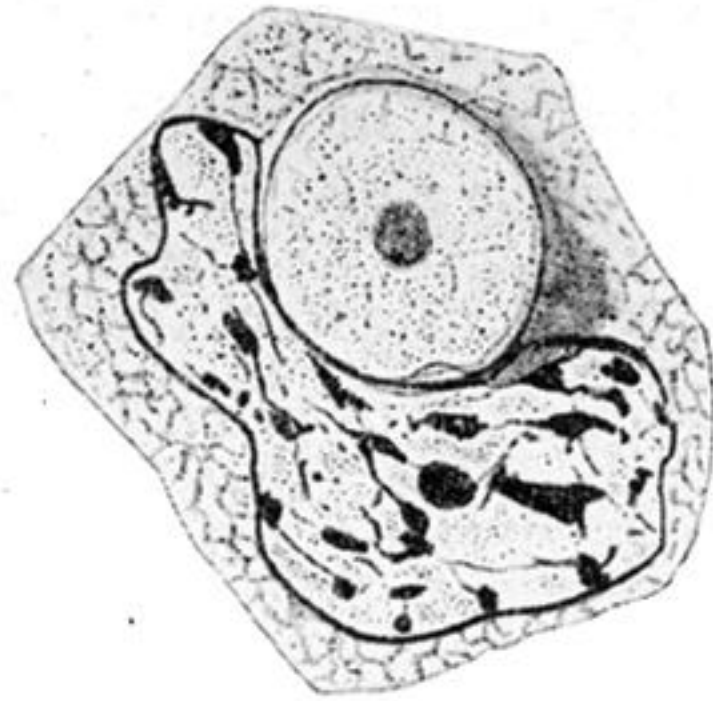


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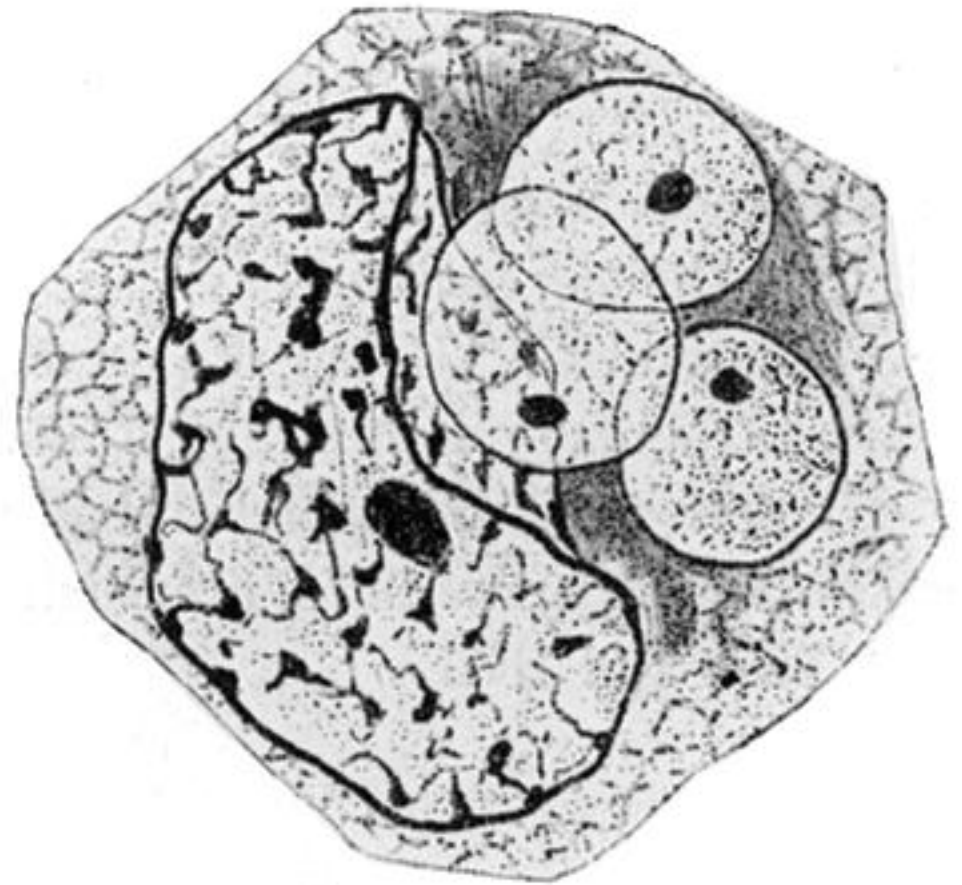


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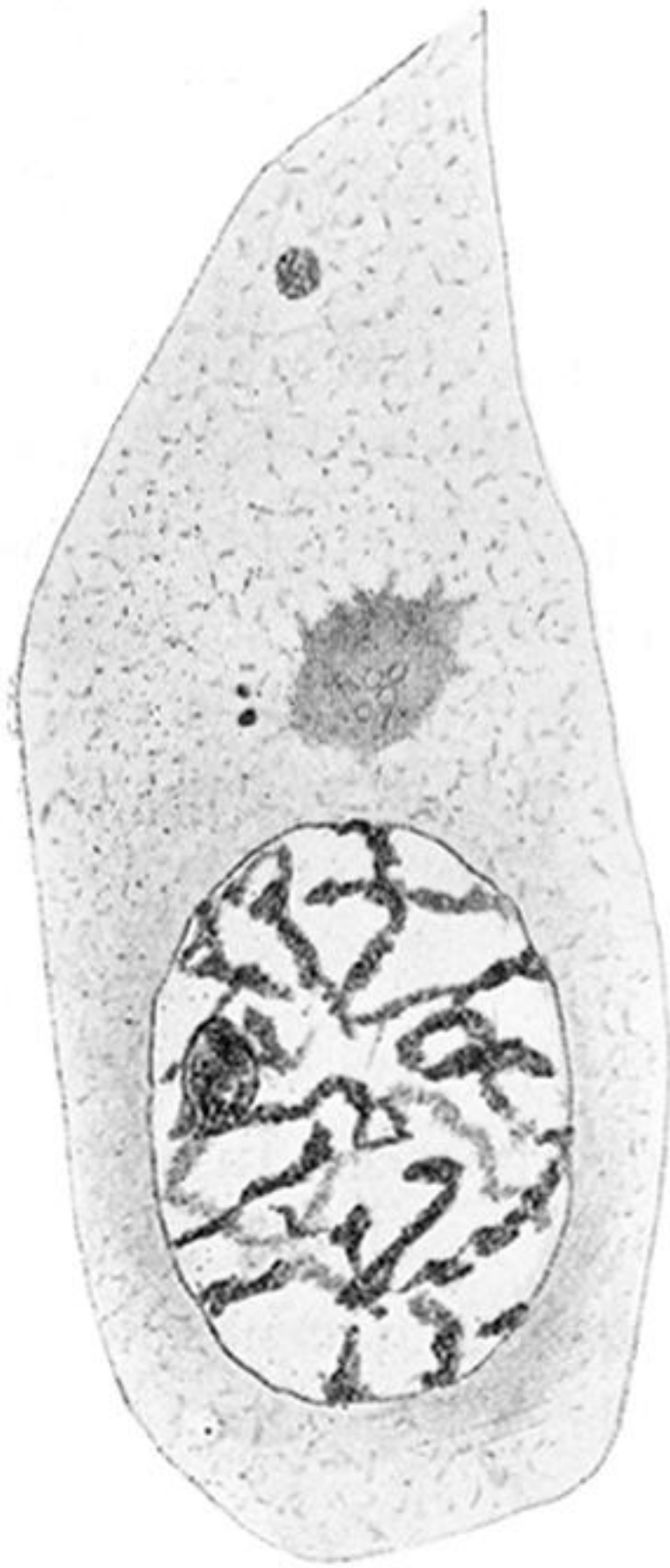


FIG. 5.

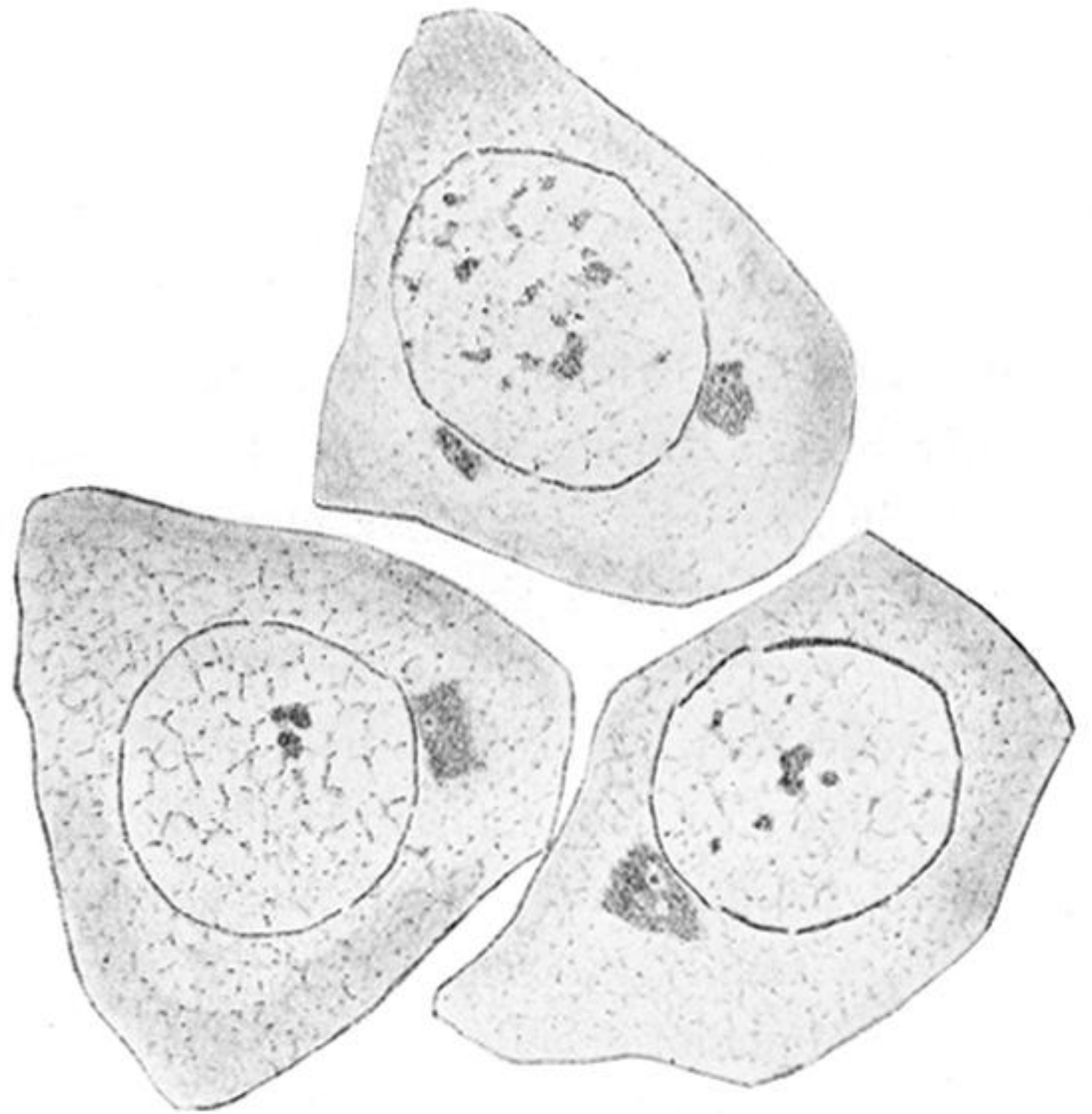


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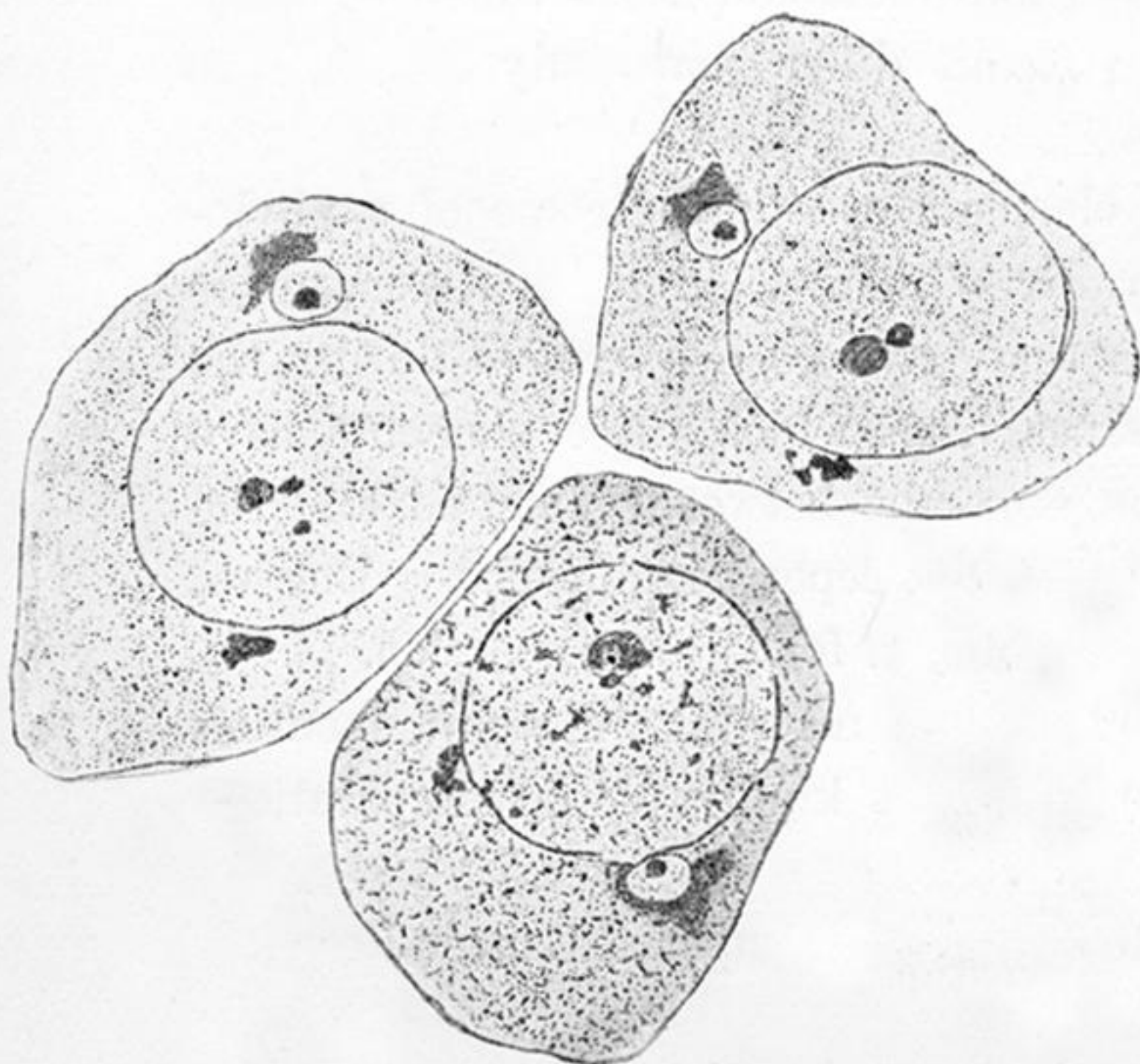


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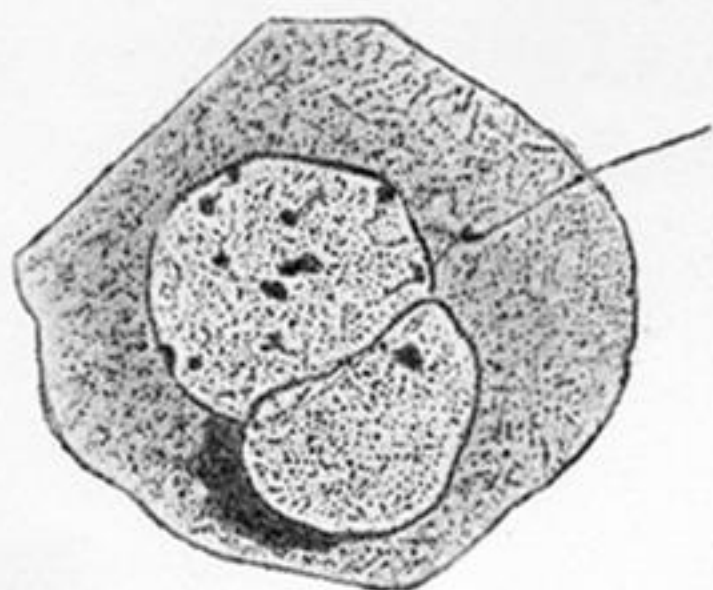
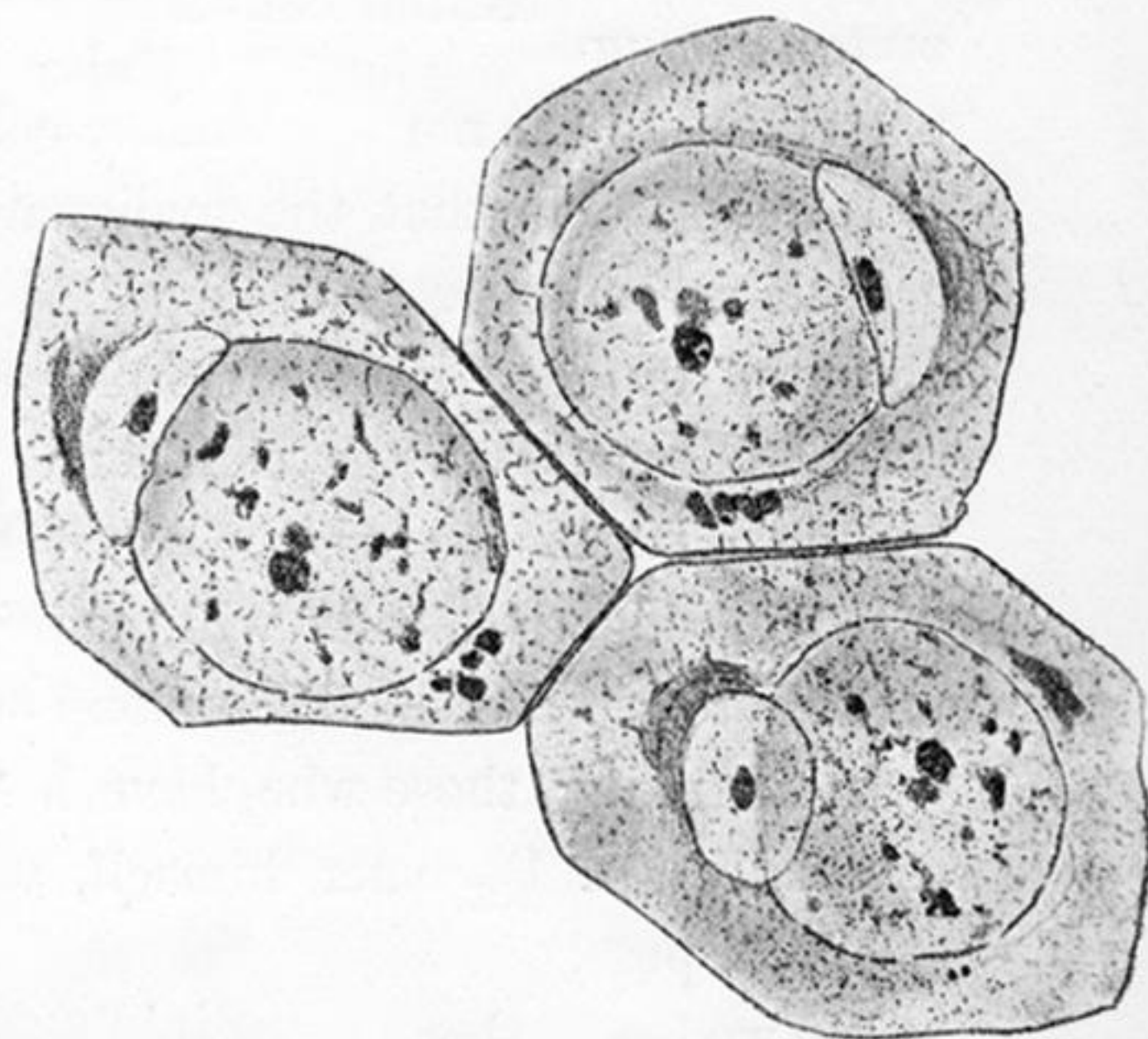


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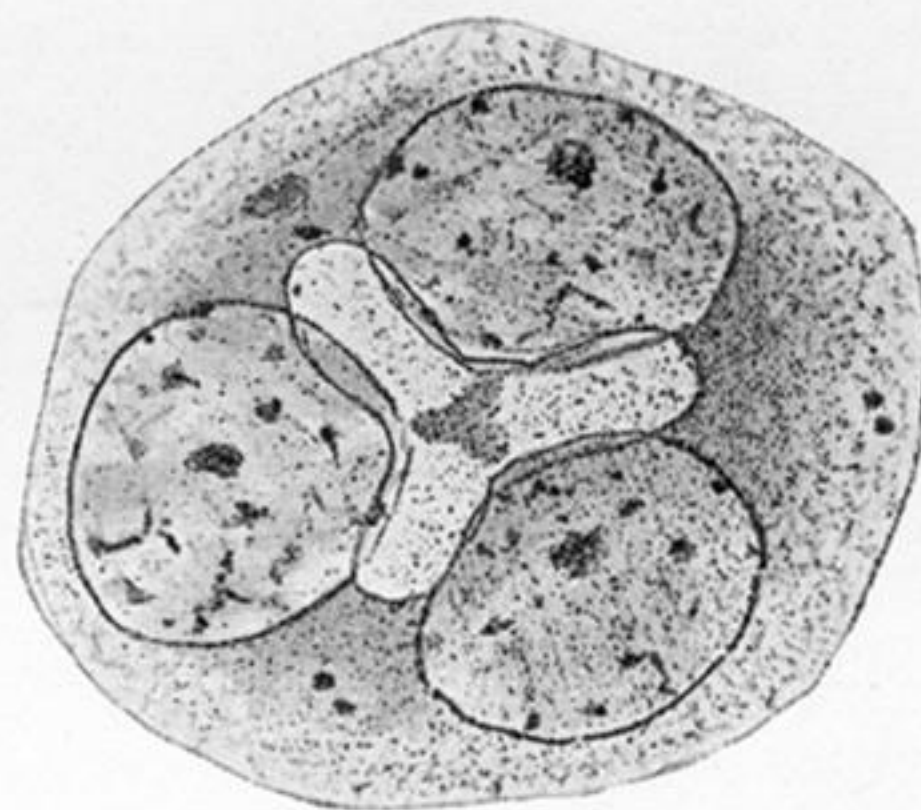


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