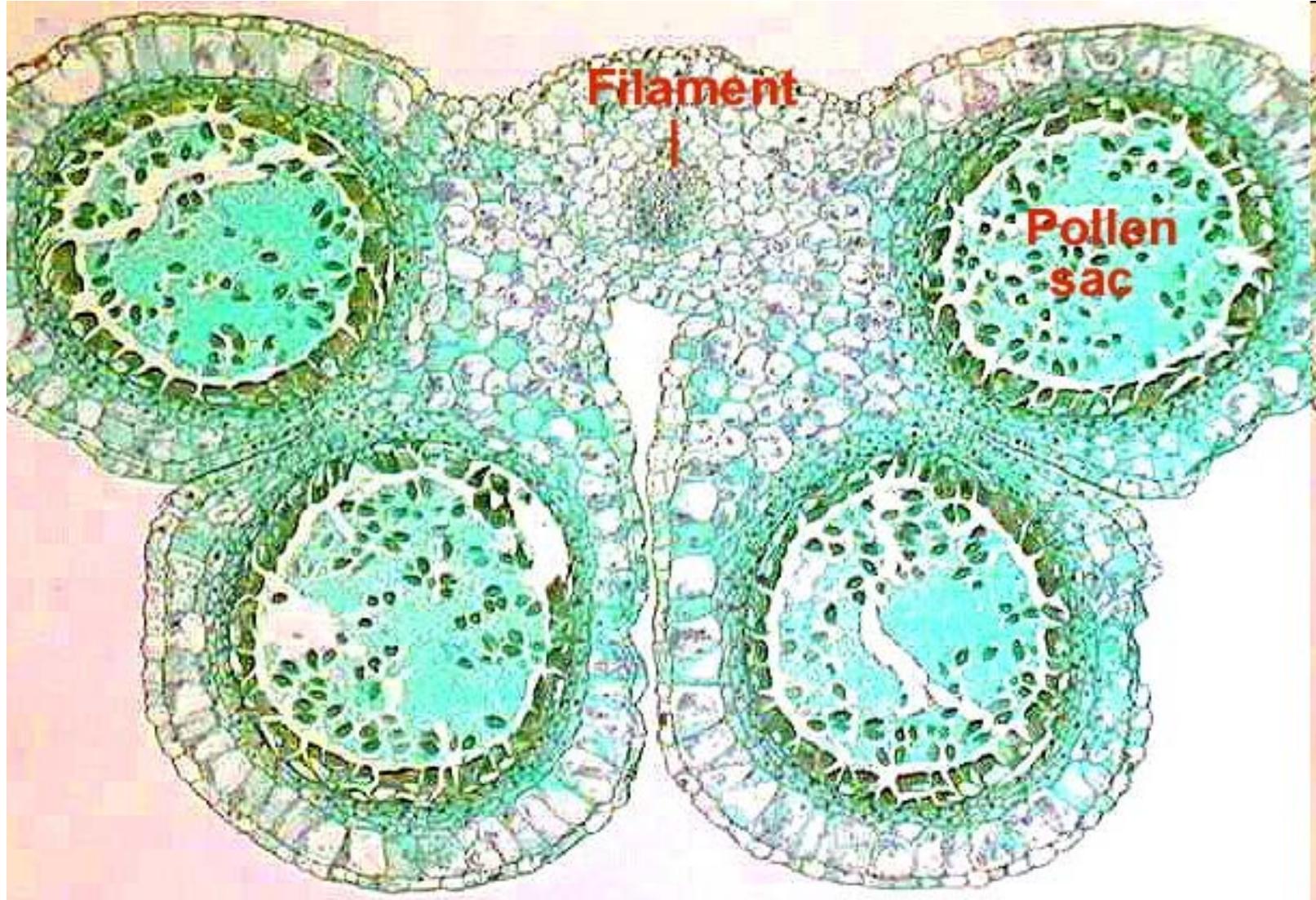
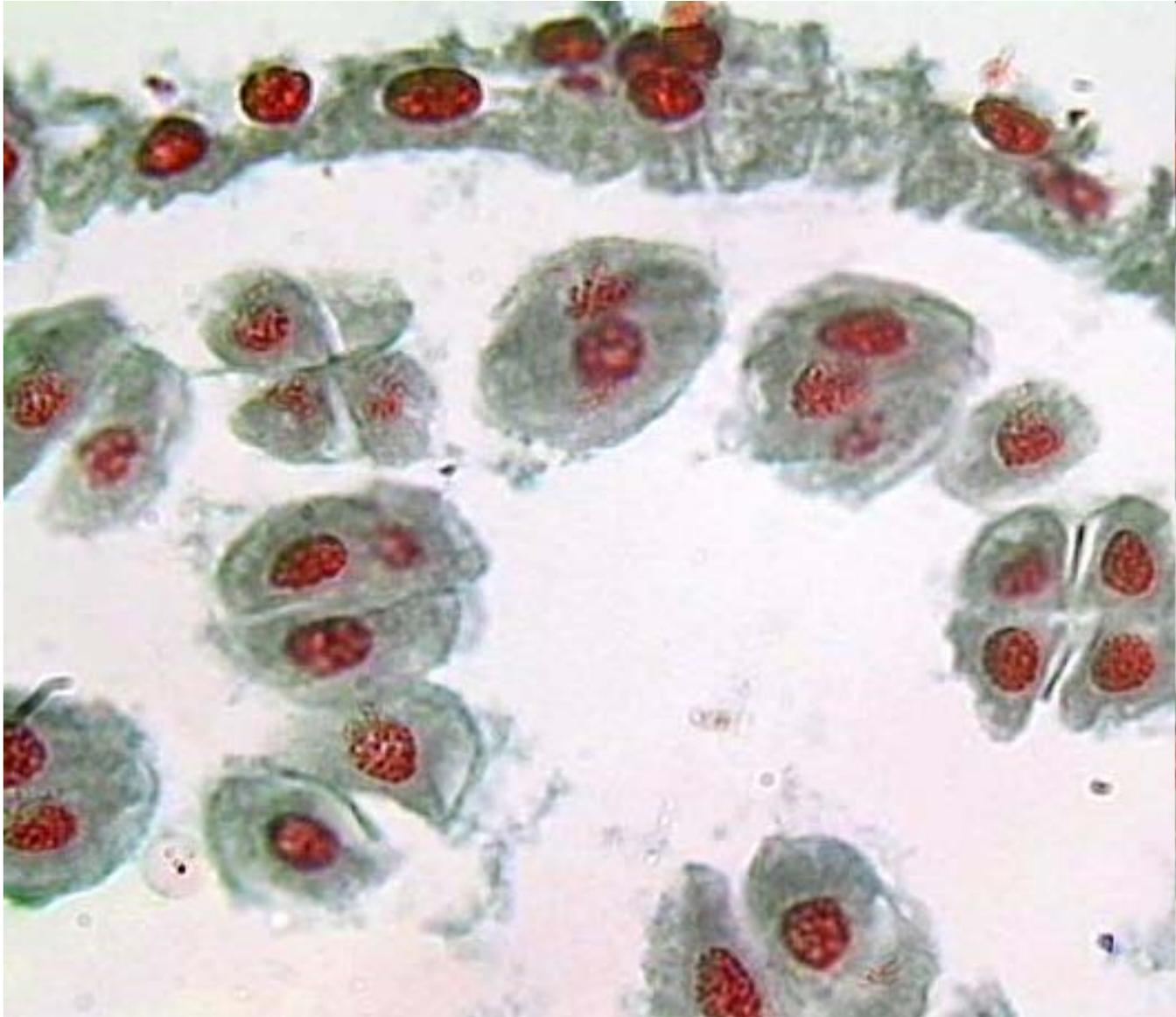


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<http://www.lima.ohio-state.edu/biology/archive/flowers.html>



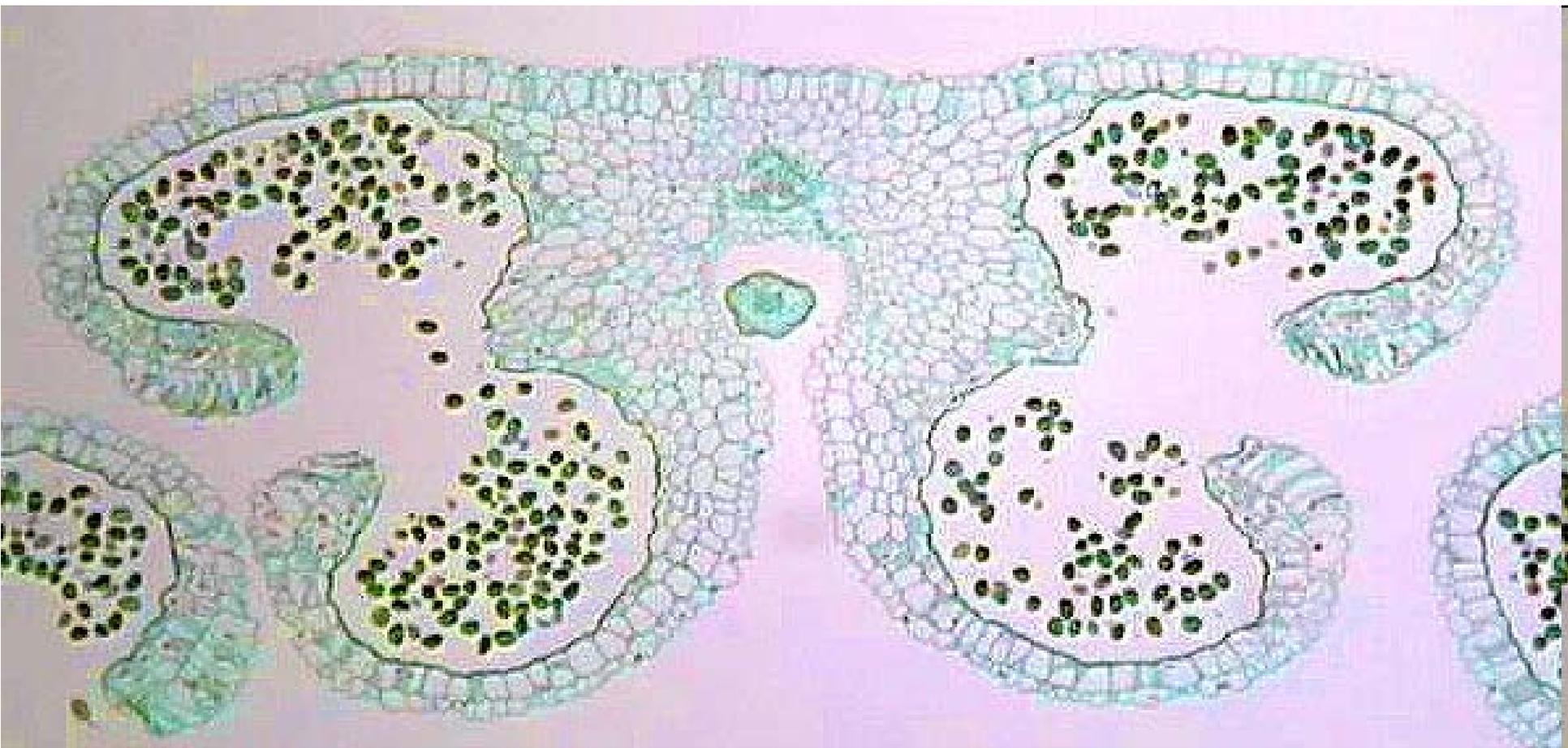
Young Lily anther x40. Four pollen sacs and a cross section of the fillament are visible. Diploid ($2N$ chromosomes) microspore mother cells in the middle of the pollen sacs undergo meiosis to make microspores which later become pollen grains. The large green cells lining the pollen sacs provide nourishment for the developing pollen grains.



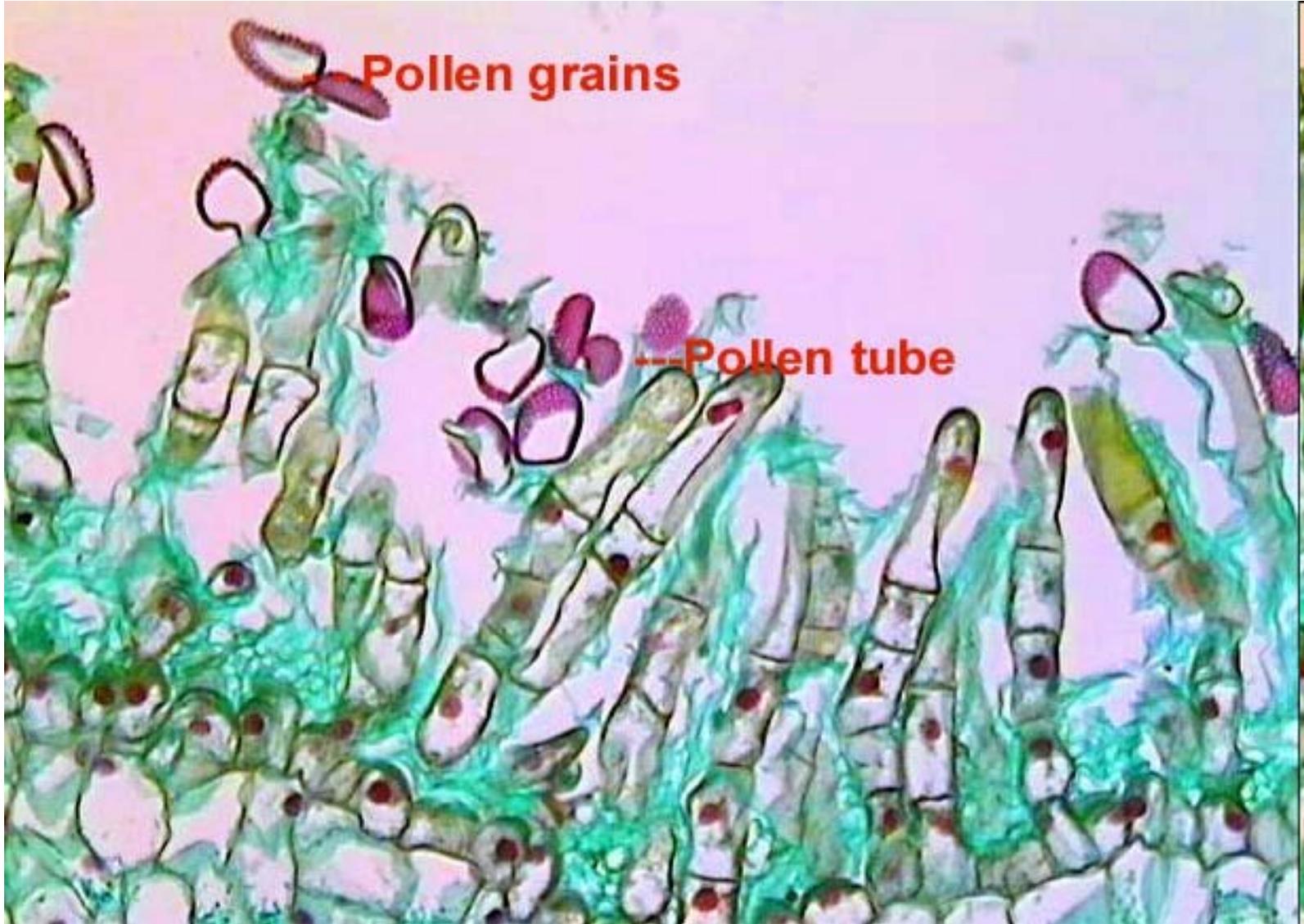
Megaspore tetrads x400. Meiosis produces groups of four haploid (N chromosomes) megaspores which are initially attached to each other as shown here. In some of the illustrated megaspore groups you can't see all four megaspores because some are out of the plain of section.



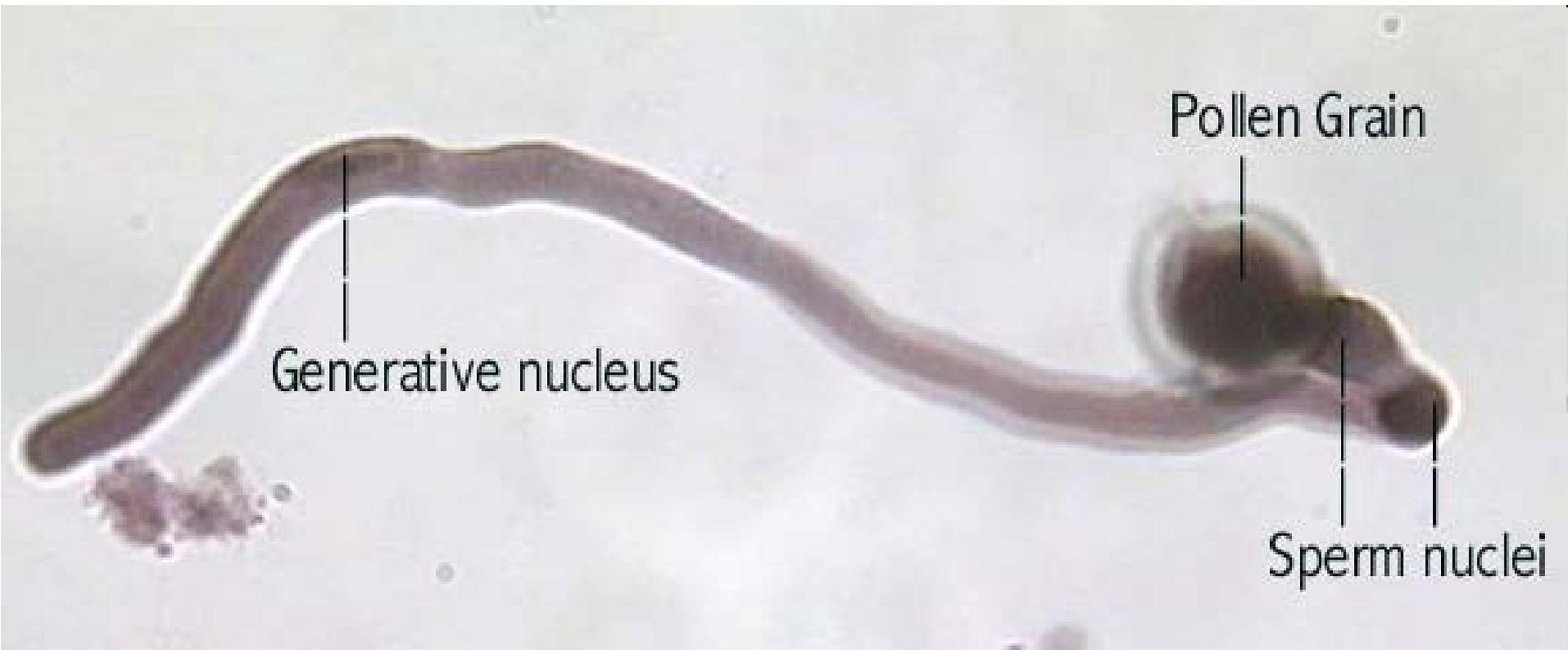
One celled microspores x400 which will soon divide by mitosis to form two nucleate pollen grains. One of the illustrated spores has just finishing this division. An elaborate pollen wall is forming at this stage of development.



Mature anther x40. When the pollen is fully formed the pollen sacs break open and pollen is released.



Stigma and pollen x100. When pollen is carried by the wind or an animal to the hairy stigma of a flower the pollen germinates and makes a pollen tube. Several purple staining pollen grains are visible with green staining pollen tubes emerging from them.



Pollen grain with pollen tube x400. This grain has been germinated in sugar water. When a pollen grain germinates, one of its two nuclei divides by mitosis to produce two sperm nuclei. The generative nucleus and then the two sperm nuclei follow the tip of the pollen tube as it grows toward the ovary and the ovules inside. A germinated pollen grain with pollen tube and three haploid nuclei is the mature male gametophyte in flowering plants.

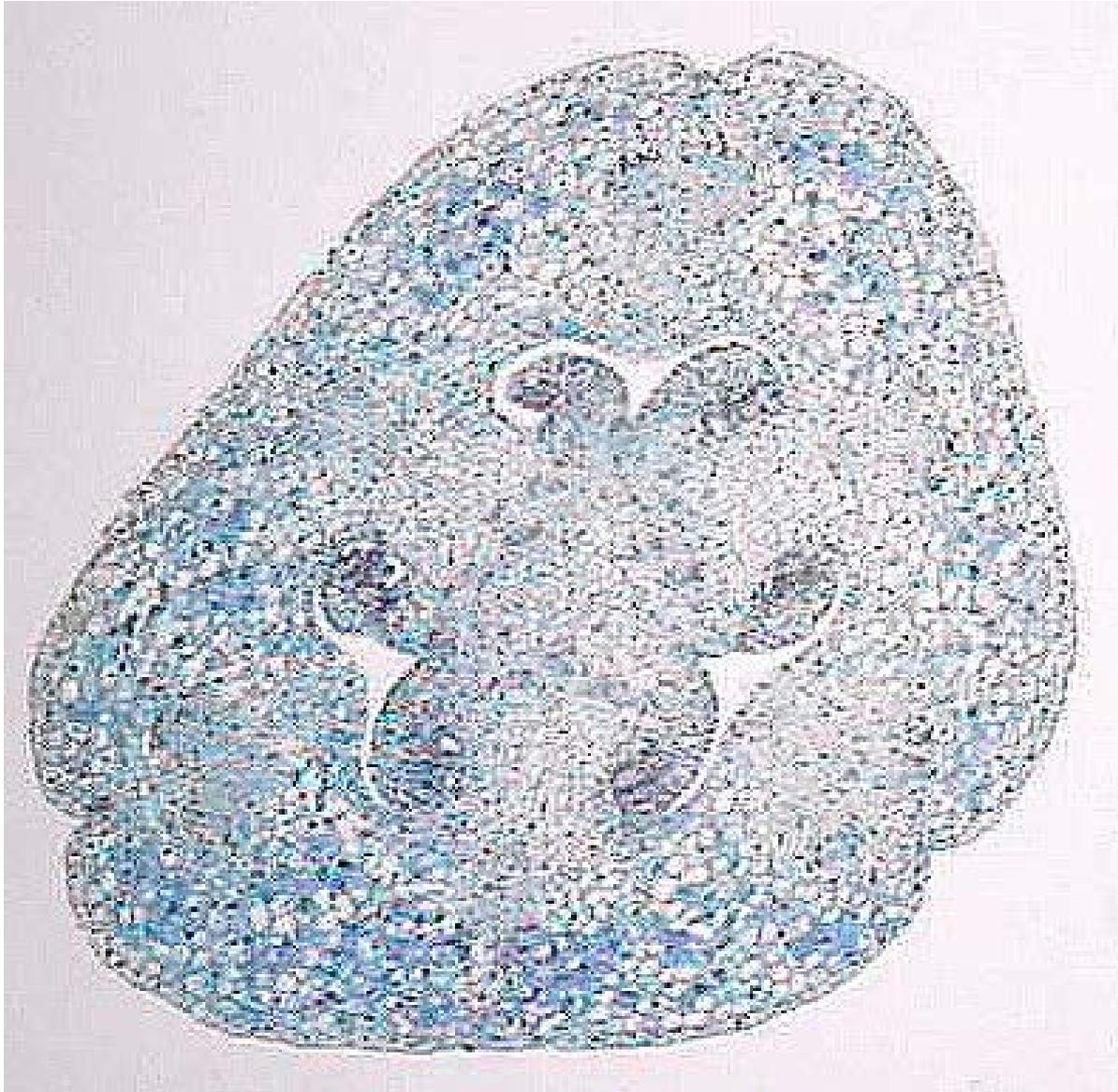


**Hollow
center
of Style**

---Pollen tubes

**Wall
of
Style**

Pollen tubes grow down the hollow center of the style as they head toward the ovary.

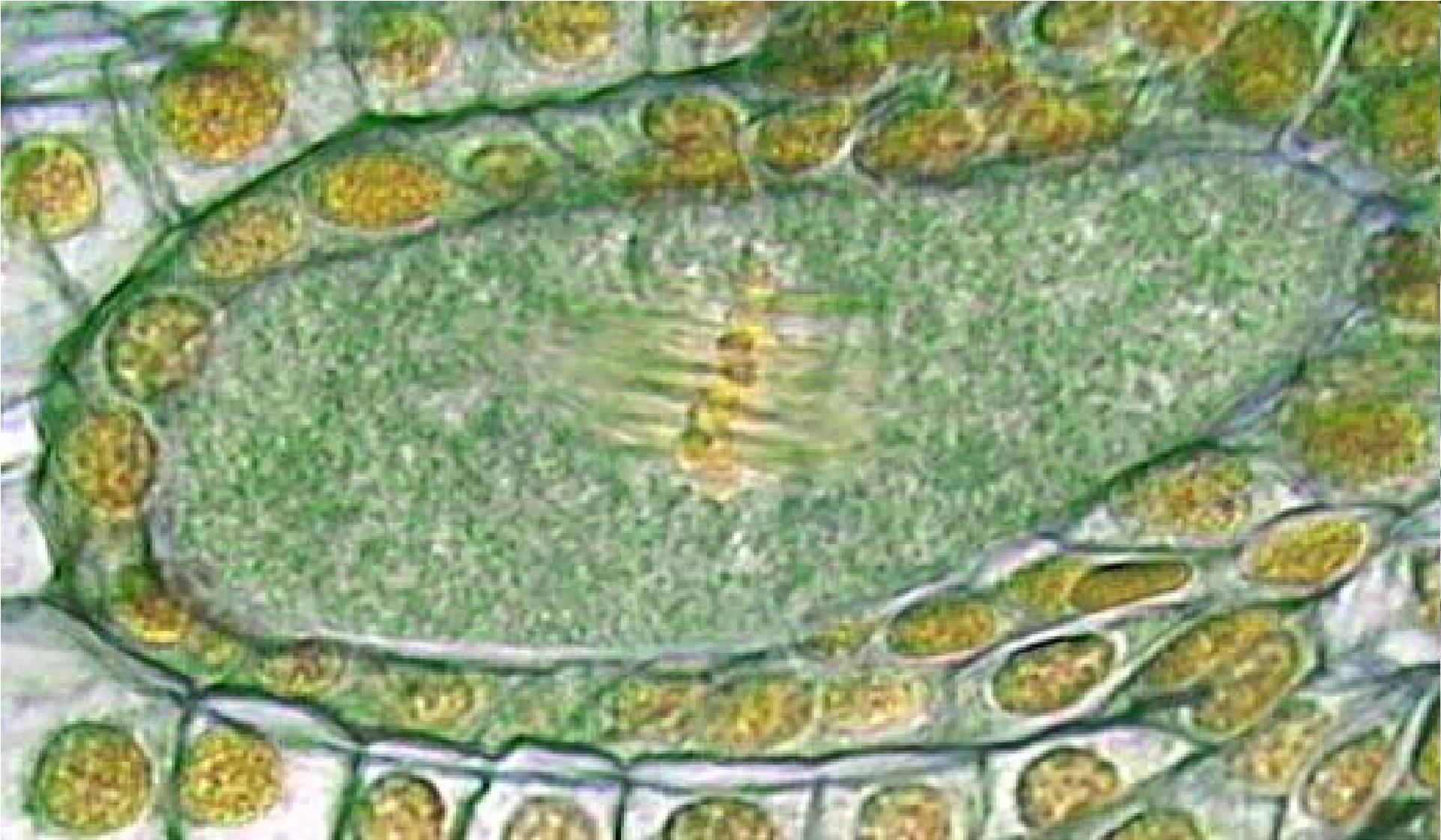


Lily ovary xs x20 has three chambers that result from the fusion of the three modified leaves (carpels) that formed the ovary. Each of the three chambers has two rows of ovules (unfertilized seeds). Thus, in an ovary cross section like the one illustrated you can see six ovules in various stages of development.

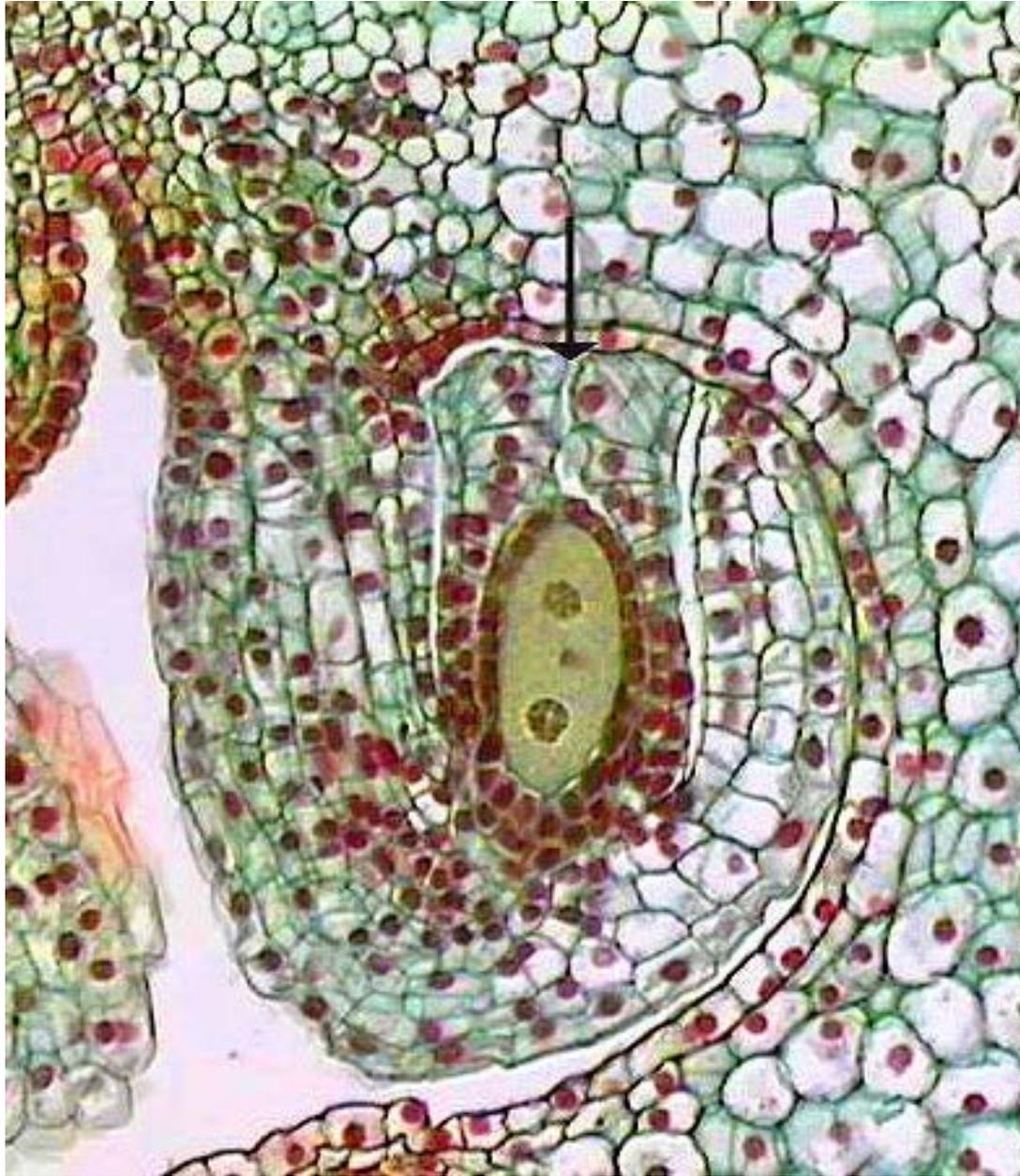


Megaspore mother cell

Megaspore mother cell x100. This large diploid ($2N$) cell will undergo meiosis to form four nuclei, each a haploid (N) megaspore. The flaps of tissue on either side of the megaspore mother cell are seed coats. They will grow around (growing toward the upper left in this illustration) the mother cell almost but not quite completely surrounding it.



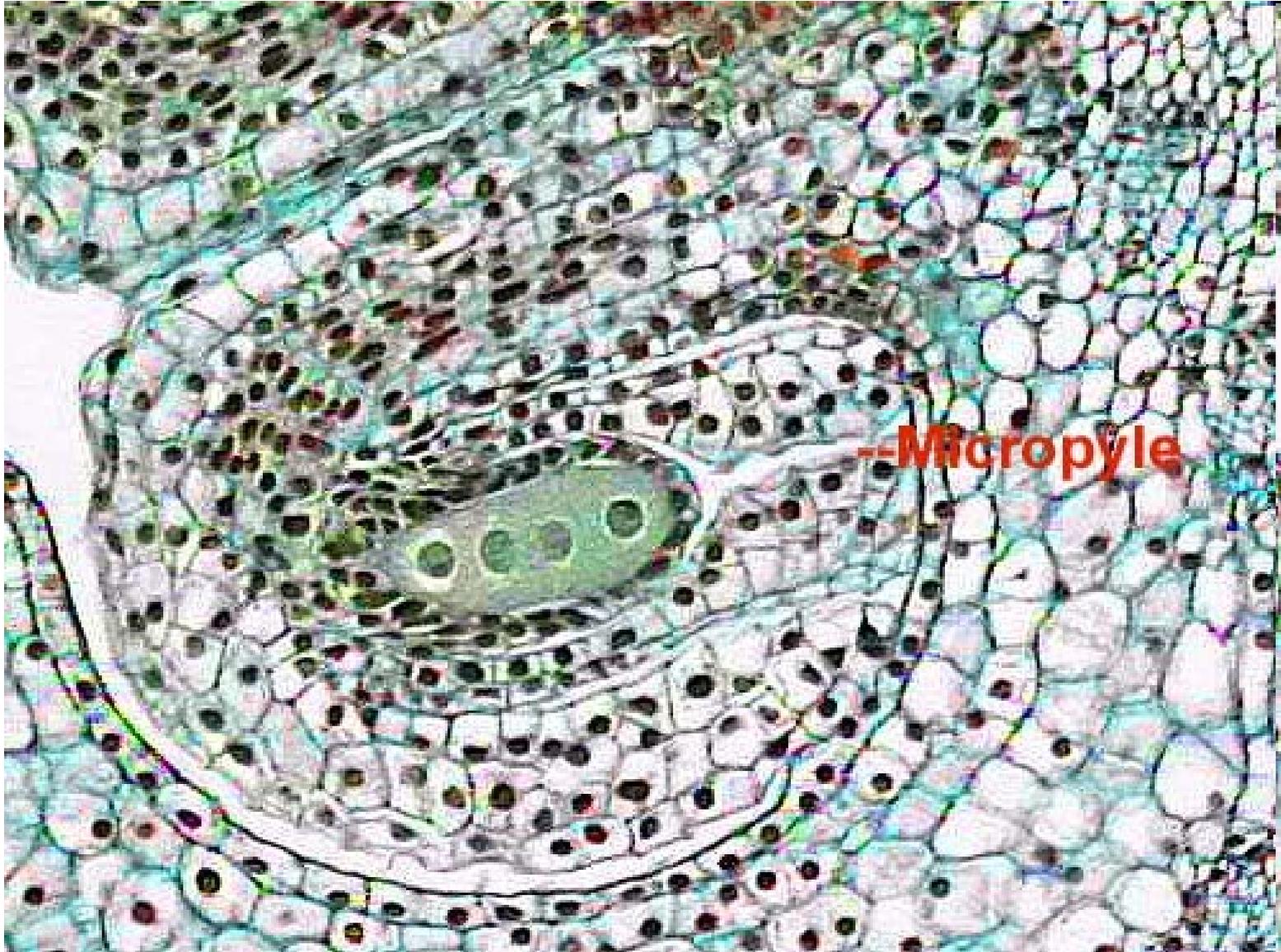
Metaphase I x400. Meiosis of the megaspore mother cell.



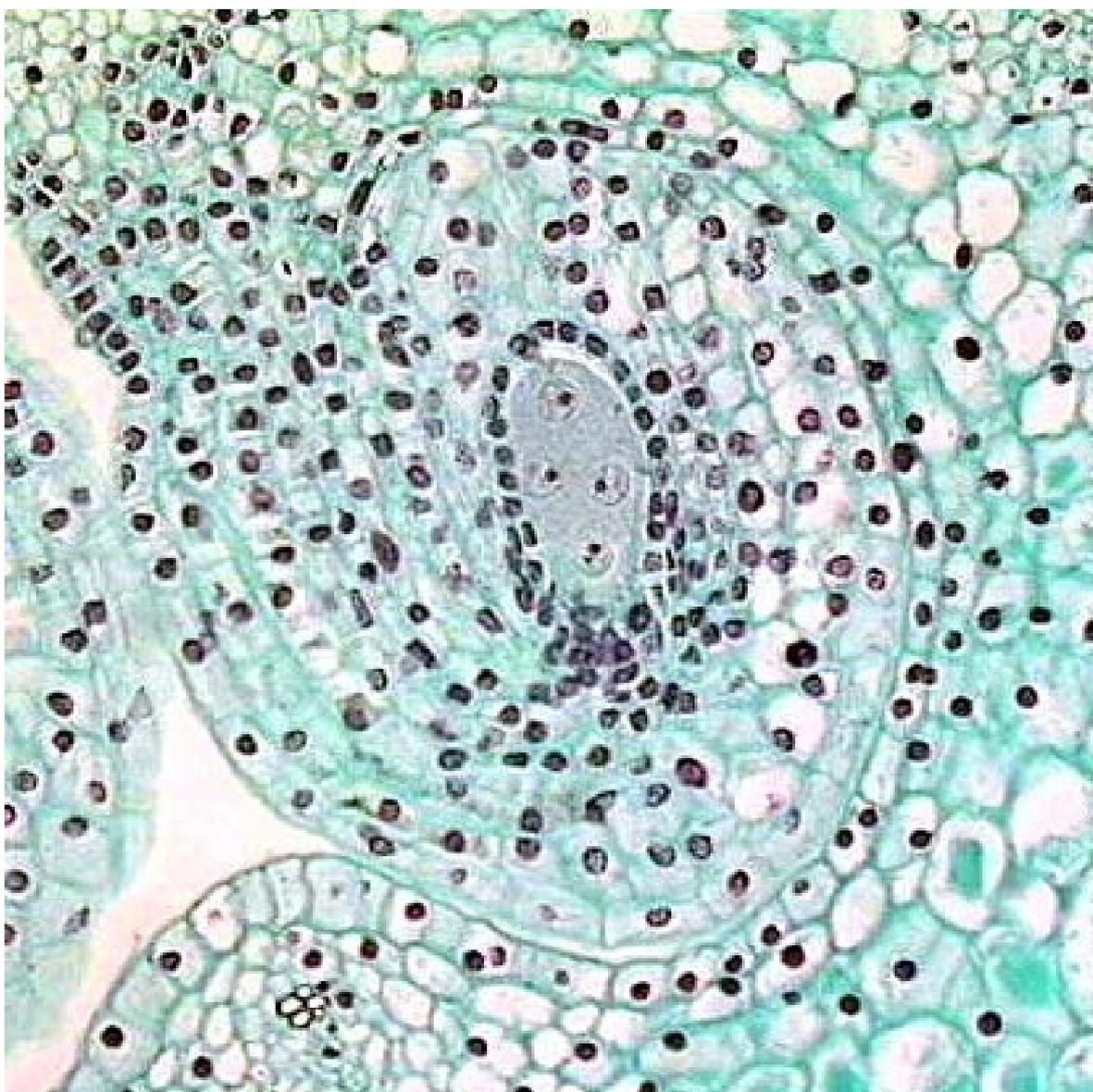
Two nucleate stage x100. The first two nuclei formed by meiosis. The micropyle is the slit immediately above the old megaspore mother cell with the two nuclei.



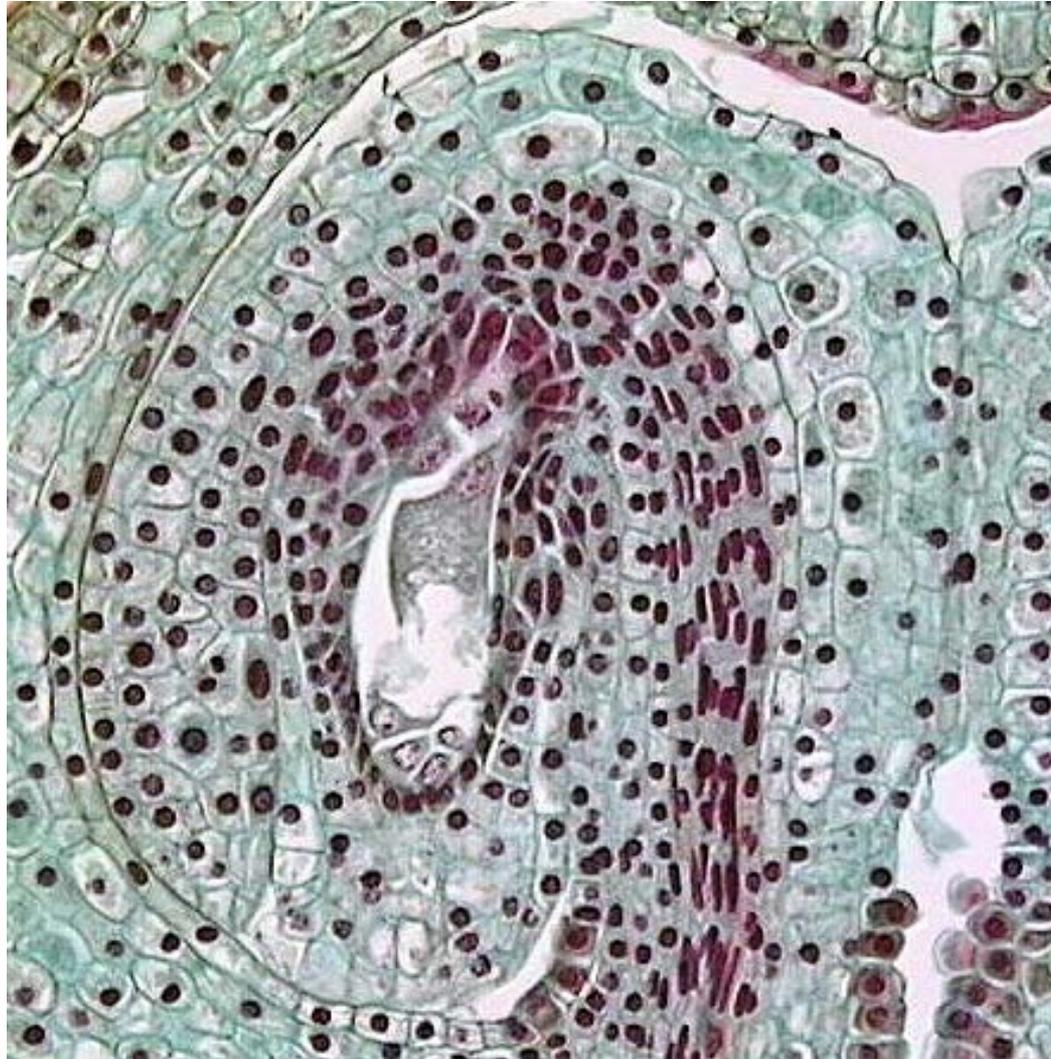
Metaphase II x400. Meiosis of the megaspore mother cell. You can see two groups of chromosomes, each at metaphase II, and spindle fibers.



Four Megaspores x100 within the old megaspore mother cell. The slit-like micropyle is to the right of the megaspores. This tube like opening, where the seed coats failed to fuse as they grow around the megaspore mother cell, is where a pollen tube will penetrate the ovule.



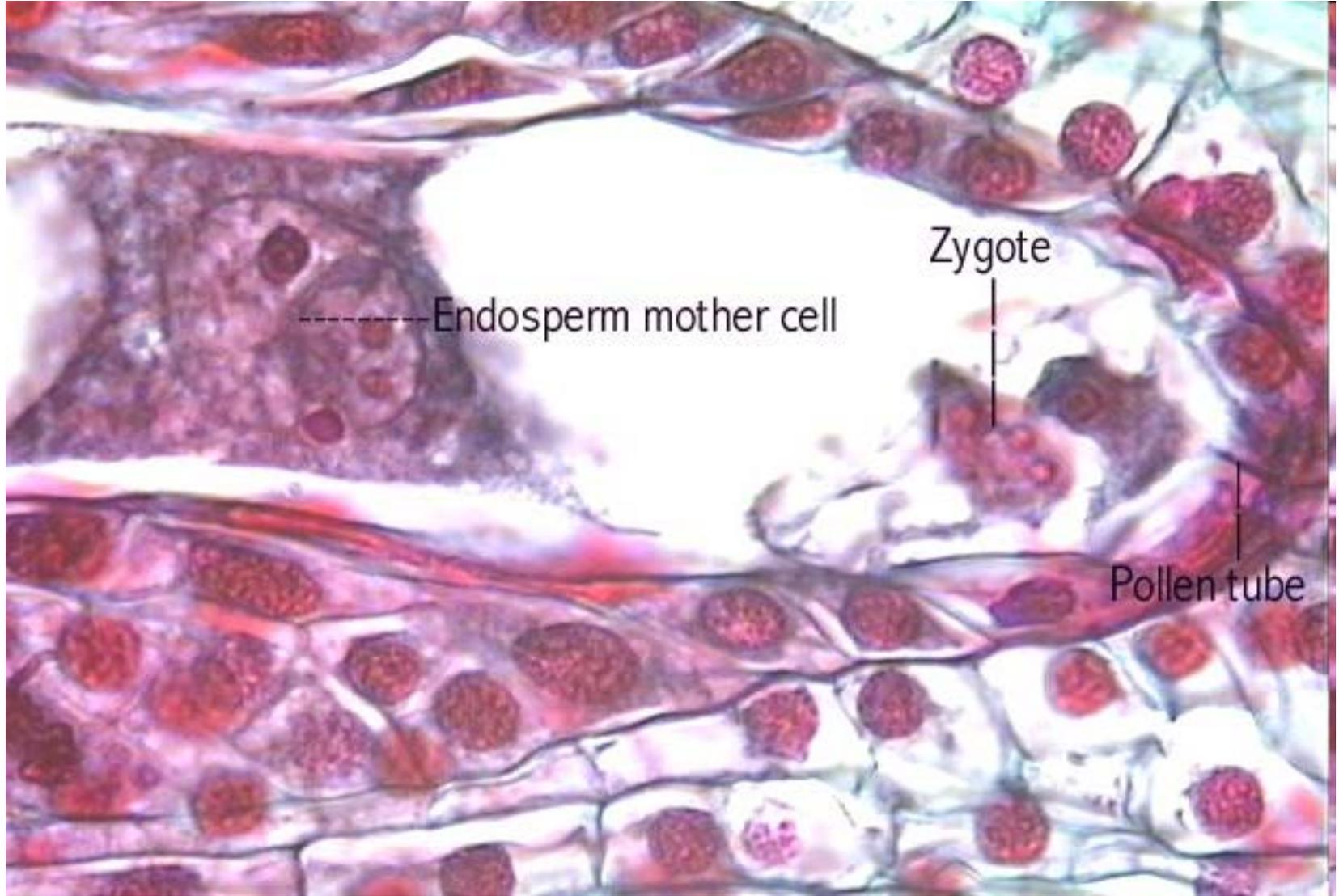
Immature female gametophyte x100. In most species of flowering plants three of the four megaspore nuclei die. The remaining megaspore, the one closest to the micropyle, divides several times by mitosis to form the female gametophyte. Illustrated is the 4 nucleate state of this gametophyte



8 nucleate Embryo Sac x40. This is the Lily mature female gametophyte consisting of 7 cells and 8 haploid nuclei. Such a flowering plant female gametophyte is usually called the "embryo sac". The egg and two flanking synergid cells are at the lower right. The large central cell contains two large "polar nuclei", one at the lower left and one at the upper right. The three antipodal cells are at the upper left.



Embryo Sac x400. The polar nuclei and egg are labeled. The two "synergid" cells flank the egg. The three "antipodal" cells are above and to the right of the upper polar nucleus.



Double Fertilization x400. Lily caught "doing it"! Two sperm nuclei exit the pollen tube. In most species of flowering plants one sperm nucleus (N) fuses with the two polar nuclei (each N) to form the 3N nucleus of the endosperm mother cell. The other sperm nucleus (N) fuses with the nucleus of the egg (N) to form the zygote (2N).