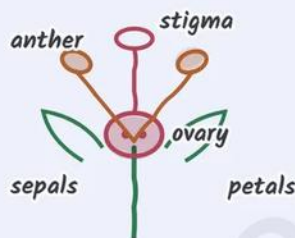


Sexual Reproduction in Flowering Plants

pollen to seed, and the two fusions that make it work

The flower, as the reproductive organ it is

- the **androecium** is the whorl of stamens, each a filament with an **anther** at its tip; the **gynoecium** is the whorl of carpels, each with **stigma**, **style** and **ovary**
- a typical anther is **dithecal**, four sided and **tetrasporangiate**, so it carries four pollen sacs
- the anther wall has four layers: **epidermis**, **endothecium**, middle layers and **tapetum**, and the outer three protect while the **tapetum** **NOURISHES** the developing pollen
- tapetal cells are dense, often with more than one nucleus, and they supply the material that later builds the pollen wall



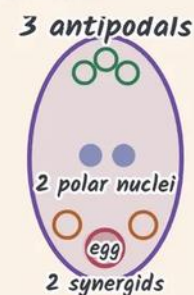
stigma, style and the ovary make the pistil, with a stamen either side of it and sepals and petals outside

Microsporogenesis, and the pollen grain

- cells of the sporogenous tissue undergo **meiosis** to give a **microspore tetrad**, and each microspore matures into a pollen grain
- the wall has two layers: the outer **exine** of **sporopollenin**, the most resistant organic material known, and the inner **intine** of cellulose and pectin
- sporopollenin resists high temperature and strong acid and alkali, which is why pollen survives as fossils
- the exine is interrupted at **germ pores**, where the pollen tube emerges, and the intine is continuous
- at shedding a pollen grain is usually **two celled**, a large **vegetative cell** and a small **generative cell**; in about 40 per cent of species the generative cell has already divided, so it is shed **three celled**

The ovule and the embryo sac

- the **ovule** is attached by a **funicle**, its body is the **nucellus**, and one or two **integuments** enclose it leaving a small opening, the **micropyle**
- the **chalaza** is the base, opposite the micropyle, and the **hilum** is where the funicle joins the body
- one nucellar cell becomes the **megaspore mother cell**, divides by **meiosis** to give four megaspores, and typically **only one** stays functional
- that megaspore divides **mitotically** three times to give **eight nuclei**, which organise into **seven cells**: the egg apparatus of one egg and two synergids at the micropylar end, three antipodals at the chalazal end, and one large central cell with two polar nuclei
- the synergids carry **filiform apparatus**, thickenings that guide the pollen tube in



the mature embryo sac: the egg apparatus at the micropylar end, the antipodals opposite, and the two polar nuclei in the central cell