MICROSCOPE POWER

A compound microscope of 100 times overall magnification is needed to see pollen grains.

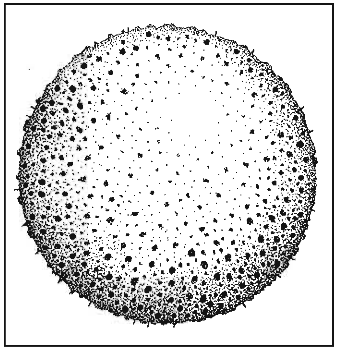
With a x100 microscope you will be able to just see the grains of pollen. Using x400 you will be able to see some identifying features. You will need x1000 to see the level of detail shown here.

POLLEN STUDY

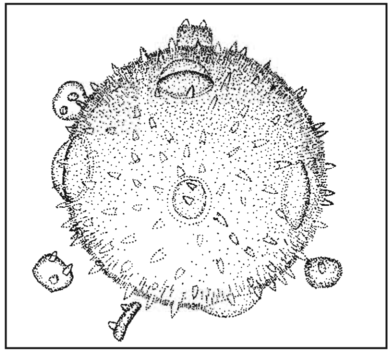
There should be plants in flower, with pollen available, in the UK at most times of the year.

The easiest grains to collect are those on the clumps (anthers) which are held aloft on flower stalks (filaments). Examples, together with the approximate week of flowering, include:

Winter aconite ~ week 1
Blackthorn ~ week 11
Philadelphus (mock orange) ~ week 25
Bramble ~ week 25
Hollyhock ~ week 33



A pollen grain from Spring Crocus 115 μm in diameter



One of the largest pollen grains, from marrow Curcurbita Pepo ovifera, 168 μm in diameter

Other easy pollens to collect are:
Catkin bearing plants (eg hazel, willow, alder, birch, oak, walnut) ~ week 9 onwards
Yew ~ week 9
Ivy (late flowering) ~ week 39

Some common pollens with interesting or unusual forms to look at include:

Dandelion	Borage
Heathers	Rosemary
Yellow corydalis	Chickweed
Umbellifers eg cow parsley	

Drawings in this leaflet are mostly examples of the larger, more interesting pollen grains, which you should be able to find easily, and look at yourselves.

Things to look at with microscopes: Pollen

A Guide to Pollen

All flowering plants produce pollen (Latin for powder) grains, an essential function for plant species survival. Pollen contributes half the genetic material enabling seeds to be formed. Two main methods have evolved to carry pollen grains from one plant to another.

WIND POLLINATION is used by all grasses and many large plants eg catkin bearing trees, yew, walnut, oak and many others. The quantity of pollen required is far greater for this method of pollination than other more direct methods.

Pollen grains carried by the wind fall earthwards when the wind abates. The sizes of these are largely contained within the range 20 to 40 μm (micrometers) to give a suitable rate of descent in still air, and to be drawn to the receptive flowers when close by electrostatic attraction.

A huge quantity of these grains falls everywhere, and this together with their hard outer 'exine' coat mean they persist in the environment, giving dating information from earth deposits.

INSECT POLLINATION is used by many plants. It is more efficient, needing far smaller quantities of pollen. These pollen grains tend to be lots more varied in size than the grains from plants relying on wind pollination. Bees perform the majority of this transportation.

Bees, all species world wide, have co-evolved with the flowering plants for over 100 million years to mutual benefit and survival.

Extensive devices can be seen in the plants to encourage bees thus to ensure pollination. For instance, flowers produced by the plants provide nectar to attract the insects, as well as pollen. Both are essential foods for the bees.

Honeybee dusted with willow pollen. She has pockets on her back legs to collect pollen for the hive but grains sticking to hairs on her body pollinate the next flowers she visits.

Bees are adapted in form and in habit for the reciprocal service of inadvertent carrying of grains between the plants. The service to the plant by honey bees is particularly useful as bees have the habit of constancy *ie* visiting the same flower species sequentially, thus giving maximum effectiveness in cross pollination.

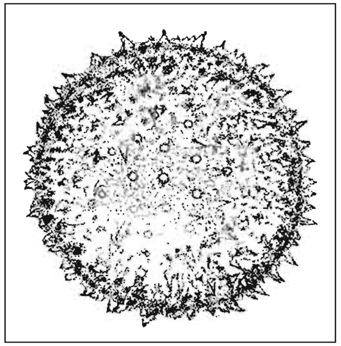
It has been estimated that an average hive of honeybees will collect 44 kilograms of pollen in a season, dusting recipient flowers and cross pollinating the plants in the process.

POLLEN MORPHOLOGY

Pollen grains vary considerably in colour, size and form. The more so in pollen from insect pollinated plants.

Size

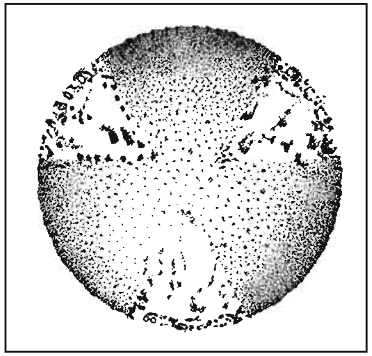
Individual grains of pollen are too small to be seen. Most pollen grains are near the average of 30μm (micrometers) diameter and are spherical. The thickness of newspaper is about 50μm, a human hair 50 to 80μm.



A Mallow pollen grain 109μm in diameter

Measurements of typical pollen grains gave the following results though the precise sizes can vary:

Forget-me-not 7μm
Green alkanet 12μm
Mock orange 14μm
Great evening primrose 167μm
Marrow 182μm
Mallow 191μm



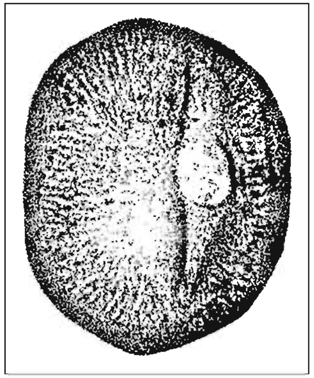
A pollen grain from Helleborus 25 μm in diameter

Form

Pollen grains commonly enclose the male genetic contents with two skins, the 'intine' (inner), a relatively thin, flexible film, and the 'exine', a far less flexible outer cover. The exine often bears slits, called furrows and some have pores. Others have both and in these, the pores are found in the centres of the furrows.

Furrows can open a little to allow expansion when the grain absorbs moisture.

The pollen tube carrying genetic material to the female ovary emerges from one of the pores of the pollen grain.



A cornflower pollen grain 36μm in diameter showing a typical arrangement. It has three furrows, with an aperture in each.

A significant proportion of known grains, particularly the smaller grains relying on insect pollination, have three apertures. Minor differences in these furrows and pores help with identification. Many other arrangements are to be seen through the microscope, particularly among the larger pollen grains.

Surface structure will be better revealed if grains are stained before mounting.

Of the popular mountants glycerine jelly is recommended for a five to eight year project. Canada balsam provides much longer stability.

More information on stains and mountants is given in microscopy books and can also be found on the Internet.

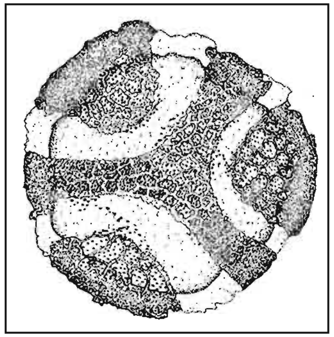
ALLERGY

Some pollens, always the large quantities of some wind borne pollens eg grass pollen, can cause allergic reactions known as hayfever.

POLLEN STUDIES

The exine can survive for many years long after the remainder of the pollen grain has dissolved and been lost. Pollen identification can give information of the plant origin, geographical, seasonal and historic source of the pollen, which is useful in forensic as well as archaeological study.

Because honey bee individuals forage on one species at a time, studying the pollen they have collected gives important information about where and when they visited the pollen source. Beekeepers can derive lots of information on the day to day foraging of their bees by studying colours of the pollen pellets collected in a pollen trap. Pollen analysis can also be used to identify the source of honey and wax.



A passion flower pollen grain 80 μm in diameter