

The Dust of Life

Pollen in Close-up

Reg Adams

Photographs by the author

Pollen grains are the male cells produced within the anther of a flower. Their primary function is to fertilize the ovules of a flower of the same species so that it can produce seed. The pollen of different families, genera, and species varies in size, shape, and ornamentation. Under some conditions pollen walls are almost indestructible. When buried in bog or lake mud, these pollen walls fossilize and remain recognizable for many thousands or even millions of years.

Palynologists (scientists who study pollen) are able to take a core of mud from the bottom of a bog or lake, take small samples at regular intervals from the top to the bottom of the core, and treat the samples to dissolve sand, clay, and organic matter. This treatment yields concentrations of almost pure pollen. The concentrate is then suspended in silicon oil and smeared on a microscope slide. The slide is scanned through the light microscope at 400 times magnification, and the pollen grains are identified and counted. The changes in percentages of different pollen types enable the palynologist to reconstruct the plant cover through time for the area around the coring site, as it existed when the pollen was deposited in the accumulating mud.

The study of pollen reveals information useful to many scientific disciplines. Not only can it help estab-

lish the taxonomic relationships among plants, but it can also aid in dating the age of rocks. From fossil pollen archaeologists can discover what crops were cultivated by prehistoric man, how he modified the vegetation, and even what foods he ate.

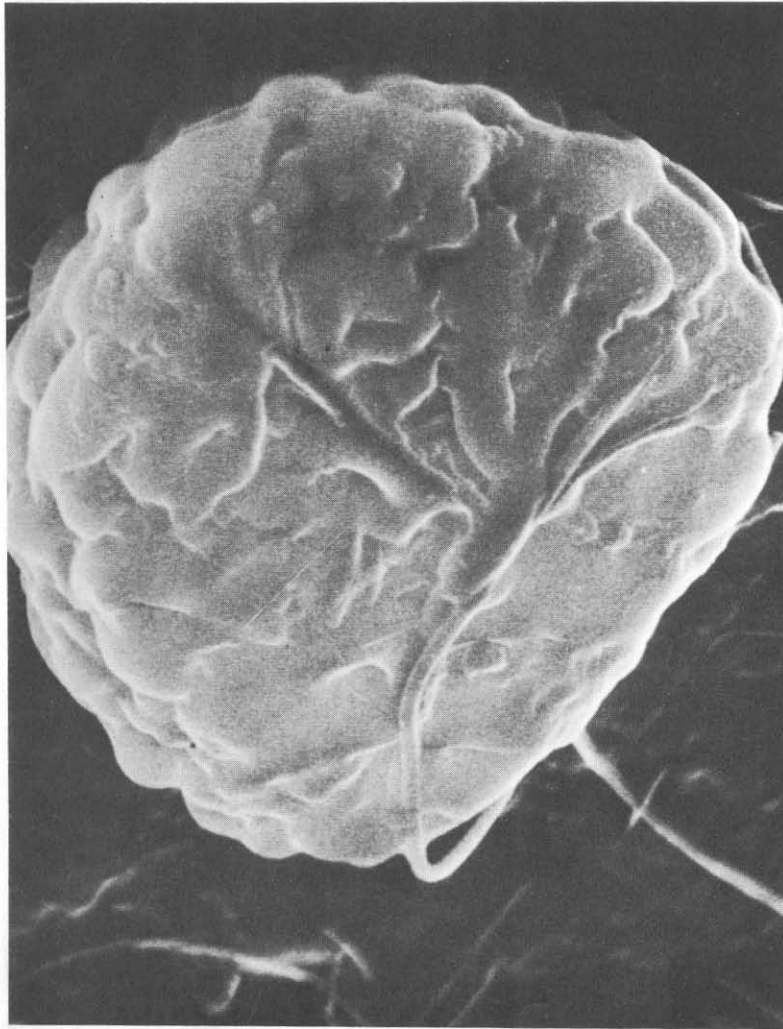
Palynology can also identify those plants that cause the miseries of hay fever. If you are among this band of sufferers, now is your opportunity to take a close look at your tormentor.

All of these pictures were taken on the scanning electron microscope (SEM), which allows us to see the various kinds of pollen in much greater detail than is possible on the light microscope. All but the last two pictures appear in *An Atlas of Pollen of the Trees and Shrubs of Eastern Canada and the Adjacent United States* by R. J. Adams and J. K. Morton, published in the University of Waterloo biology series.

Magic Formula to Make an Enemy Peaceful

Put your feet down with pollen.
Put your hands down with pollen.
Put your head down with pollen.
Then your feet are pollen;
Your hands are pollen;
Your body is pollen;
Your mind is pollen;
Your voice is pollen.
The trail is beautiful.
Be still.

Navajo

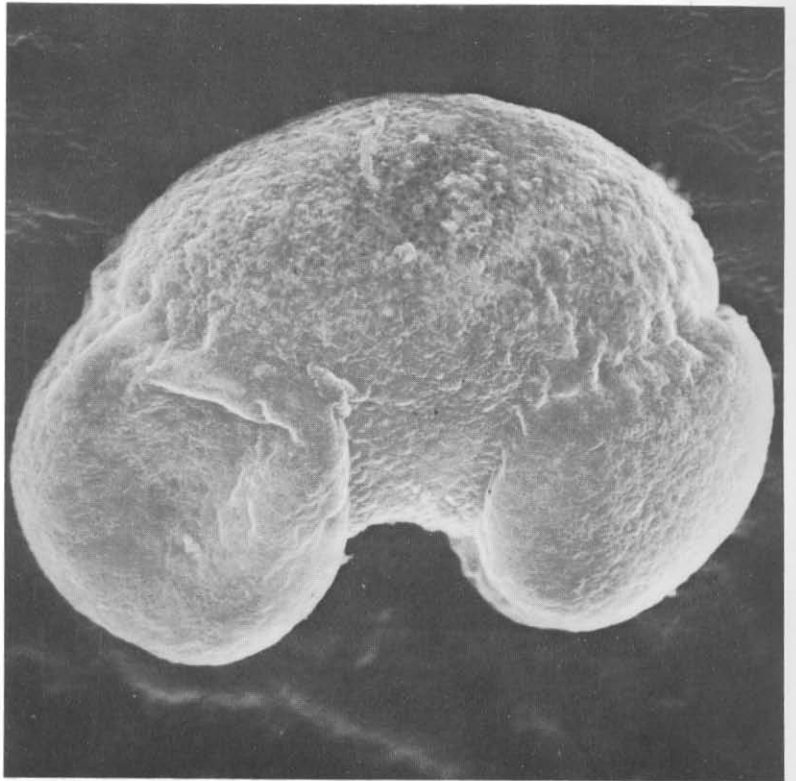


Rattlesnake Fern (*Botrychium virginianum*) x 5500

To begin an article about pollen with a picture of a fern spore may seem strange, but the functions of the two are quite similar. The spore is a primitive sort of seed, while the pollen carries the male function (sperm) to fertilize the ovule, from which the seed of a higher plant is produced. The outer wall or exine of both spores and pollen is made up of an almost indestructible waxy material called sporopollenin. Both pollen and spores are found in bog and lake sediments, still perfectly recognizable after some millions of years. Unlike pollen, some fern spores have an outside sac called a perine, and many of them have a trilete scar, the large inverted T you see here.

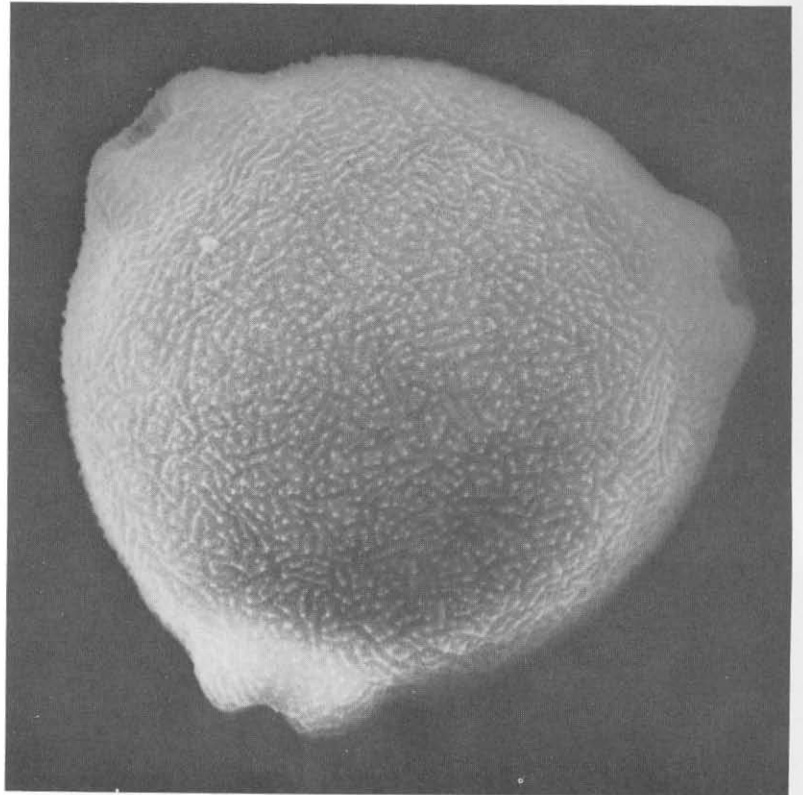
White Pine (*Pinus strobus*) x 1900

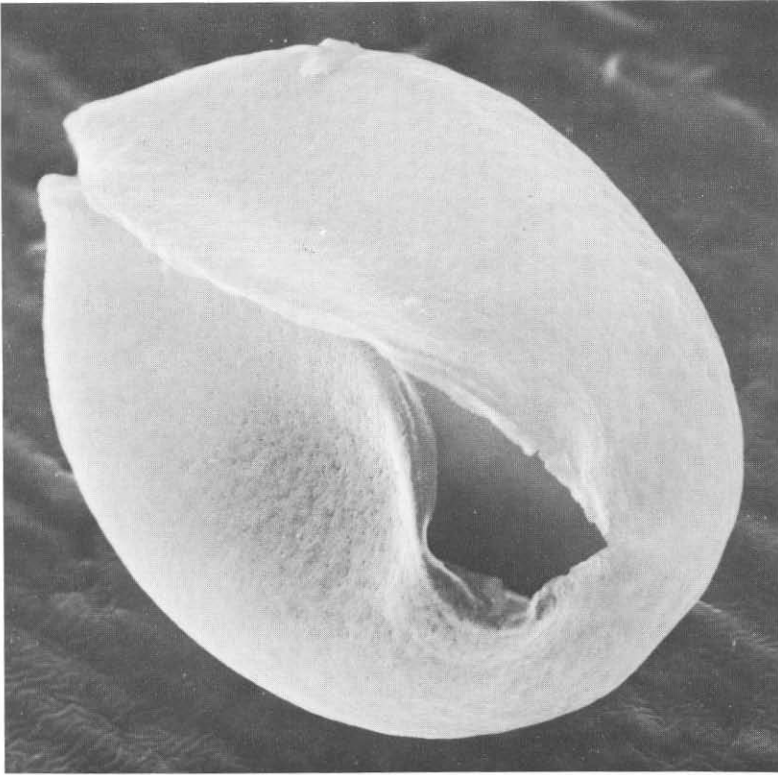
The pollen grain of the white pine, like that of the other pines, spruces, and firs, has a body and two bladders. These species are wind pollinated, and the bladders make the pollen grains more buoyant; they are sometimes carried by the wind for many hundreds of miles. You will notice that the underside of this pollen grain, between the bladders, is covered with small knobs or warts, often called "belly warts". These warts distinguish the white pine pollen from other species of pine pollen.



White Birch (*Betula papyrifera*) x 4000

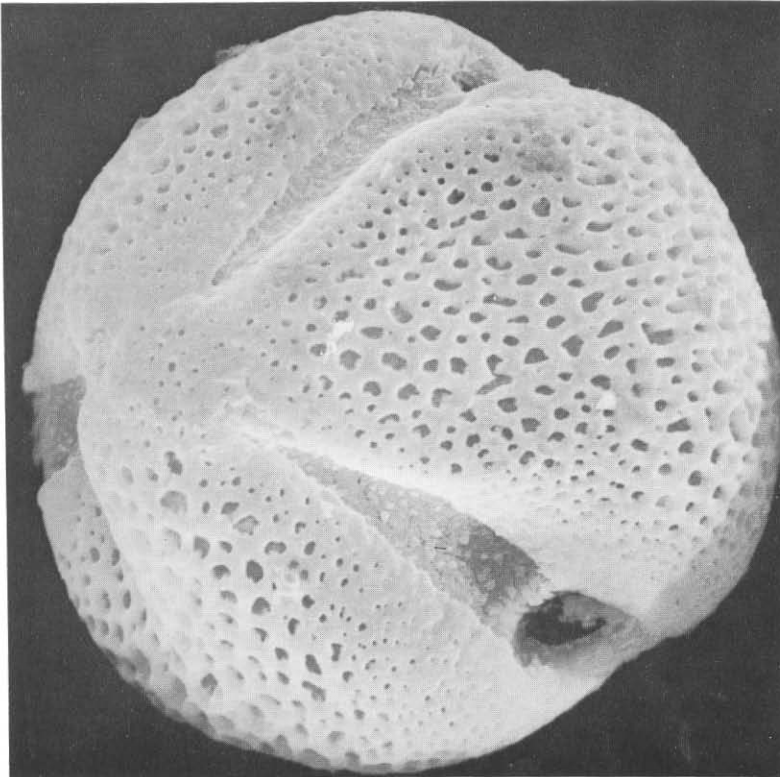
This picture and the ones that follow show the pollen of some of our broad-leaved trees, shrubs, and herbs. White birch pollen has three pores, through which the sperm passes on the way to fertilize the ovule. At a smaller magnification the surface would appear smooth, but at this magnification it is seen to be covered with tiny granules.





Magnolia (*Magnolia macrophylla*) x 2100

Magnolia pollen has one furrow that functions as a passage for sperm. Pollen with only one furrow is quite rare, but it is also found in the lily, waterlily, and fern families. The surface of this pollen grain is almost smooth, though a slight texture can be seen in this photomicrograph.



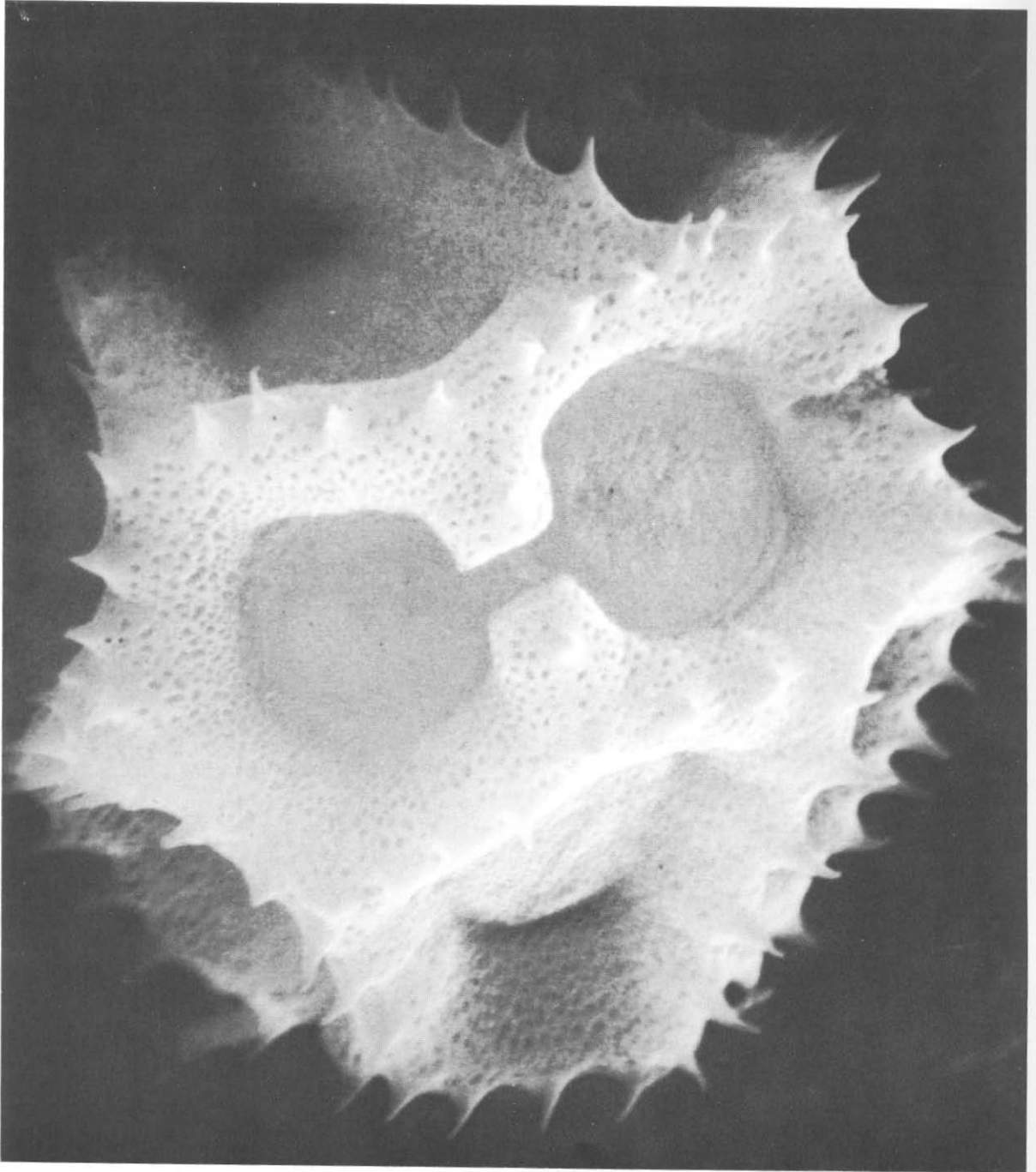
Virginia Creeper (*Parthenocissus vitaceae*) x 3900

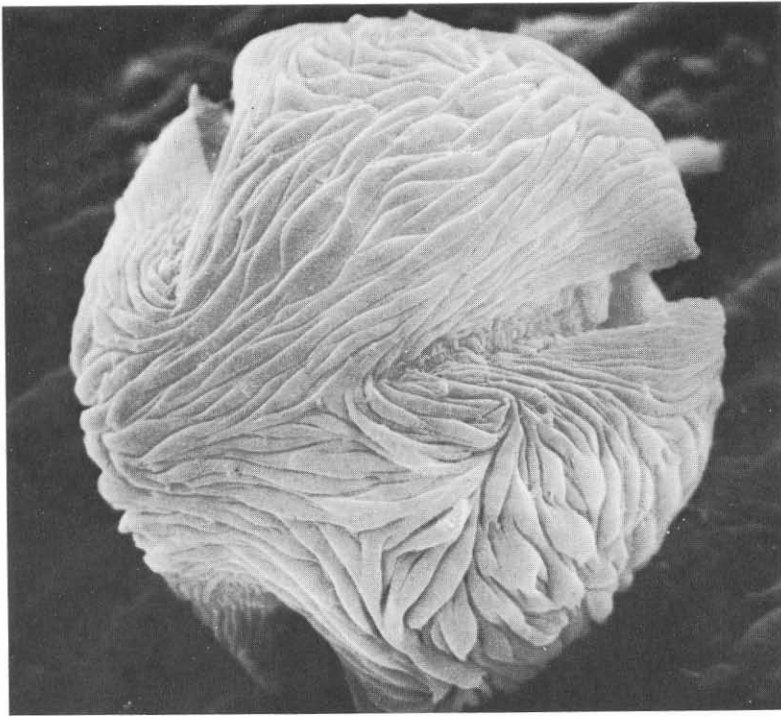
Virginia creeper belongs to the grape family. Its pollen has three furrows, with a pore in the centre of each furrow. Three-furrowed pollen is probably the most common type of pollen in the plant kingdom. In this picture you can see that the pits dotting the pollen grain become smaller as they approach the furrows and the ends of the grain, called the poles.

Dwarf Dandelion (*Krigia oppositifolia*) x 6900

This is truly a pollen grain, not the masked bandit that it appears to be. It belongs in the aster or sunflower family, the Compositae. This is by far the largest family in the plant kingdom, containing more than

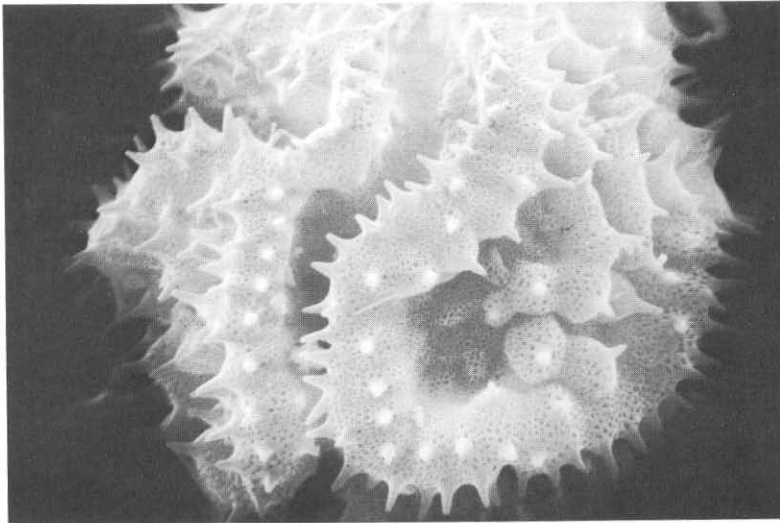
15,000 species. Some of the more famous members of this family are the ragweed, dandelion, and thistle. The pollen of this family all have spines arranged in a variety of patterns. Here, then, is the villain that makes your nose run and your eyes water.





Beach Plum (*Prunus maritima*) x 3400

The beach plum, another three-furrowed pollen grain, belongs to the rose family. This very large family contains many of our fruits—apples, pears, cherries, raspberries, and strawberries—as well as roses. Most pollen grains of this family are similar to beach plum, whose surface is covered with parallel ridges called striae.



Dandelion (*Taraxicum officinale*) x 2500

The dandelion belongs in a relatively small group of plants, quite unrelated to one another, that produce seed without fertilization by pollen. And so, although some dandelion pollen grains are fertile, most are not. The production of seeds without fertilization is called apomixis. Other apomictic plants in-

clude some of the hawthorns and at least one species of coffee, *Coffea arabica*. The pollen of these species is also atypical; instead of having three furrows it may have four, five, or more. As you can see, the dandelion pollen is irregular and is quite different from the dwarf dandelion pollen. So I give you the dandelion pollen, beautiful but not quite reliable.

Reg Adams is a Field Associate of the ROM's Mineralogy and Geology Department. He has had careers as a farmer, nurseryman, and commercial photographer, and has been an enthusiastic botanist all his life. In 1975 he won first and third prizes for photomicrography given by the Canadian Botanical Association. He and Dr. Jock McAndrews of the ROM are currently collaborating on a study of the fossil pollen and vegetation history of Ontario.

The photographs for this article were made at the Biology Department of the University of Waterloo, where the author worked with Dr. J. K. Morton.

