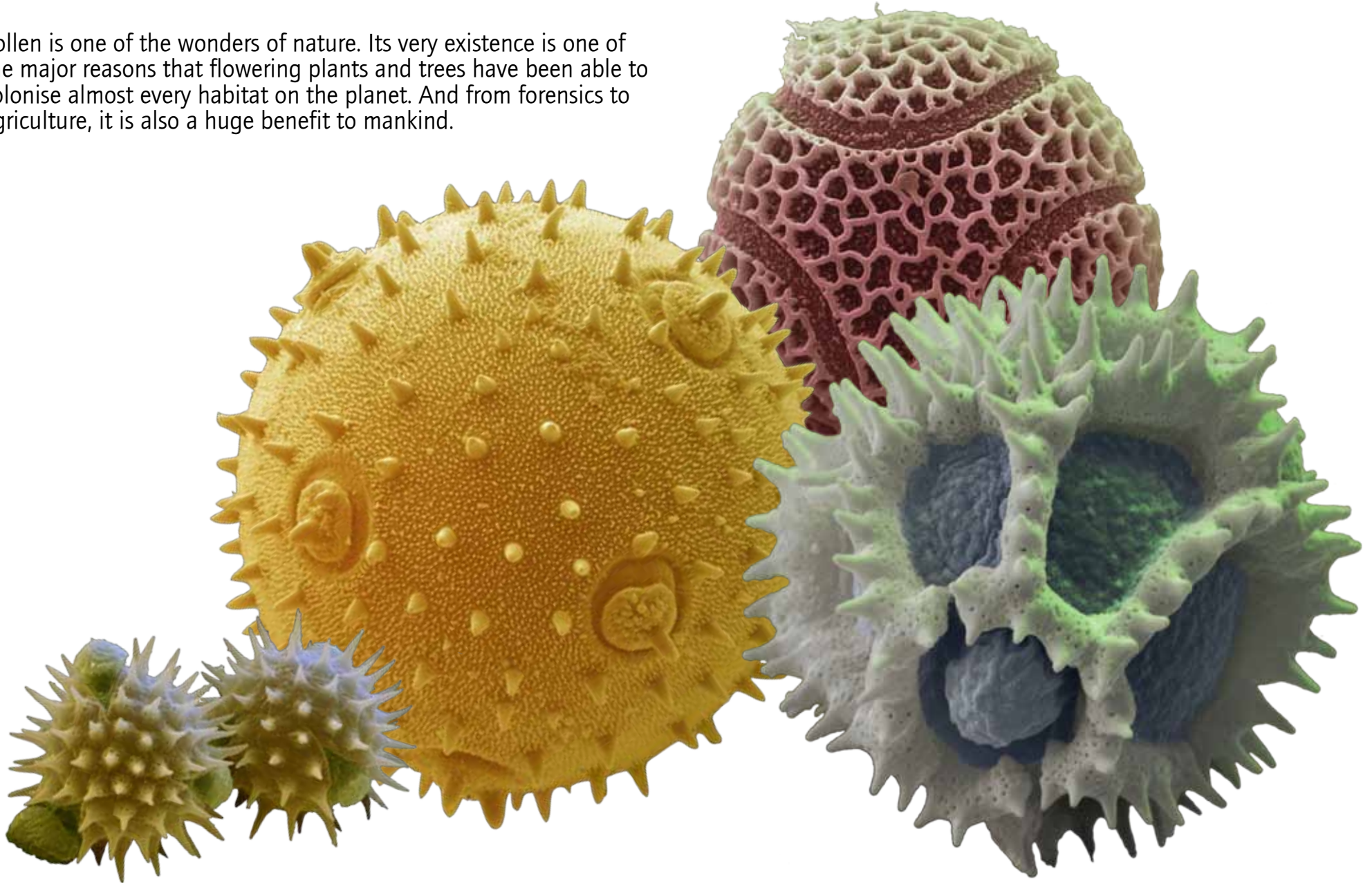
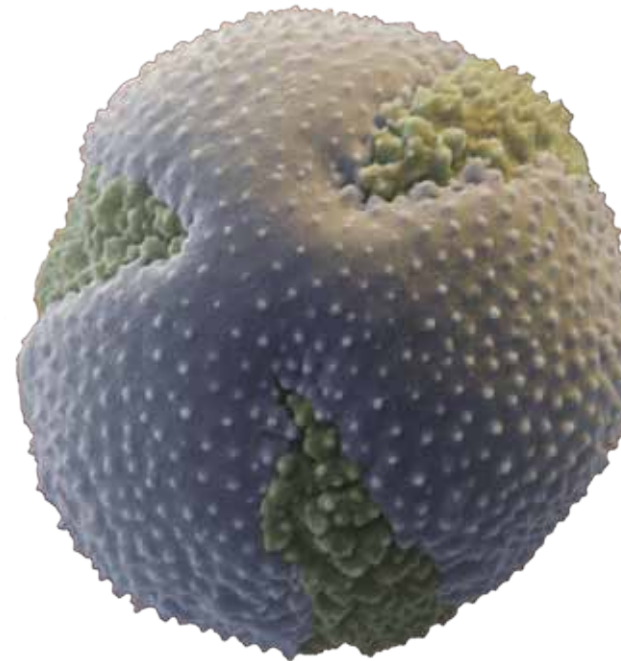


POLLEN UNDER THE MICROSCOPE

Pollen is one of the wonders of nature. Its very existence is one of the major reasons that flowering plants and trees have been able to colonise almost every habitat on the planet. And from forensics to agriculture, it is also a huge benefit to mankind.





It's a hot day in summer and you are having a miserable time outdoors, with a running nose, constant sneezing and itchy, puffy eyes. You are suffering from the typical symptoms of hay fever, an allergic reaction to plant pollen. But before you curse the annual recurrence of another high pollen season, consider the fact that pollen is one of the wonders of nature. Pollen's very existence is one of the major reasons that flowering plants and trees have been able to colonise almost every habitat on the planet. And from forensics to agriculture, it is also a huge benefit to mankind.

All flowering plants comprise male and female organs. The female organs, known as the ovaries, are usually hidden from view deep inside the flower. The male organs, known as anthers, are responsible for producing the microscopic cells we know as pollen. Anthers are usually more visible as they must be exposed to help aid pollination. Each pollen grain contains sex cells, called gametes, which are the equivalent of sperm cells of animals and contain one complete set of chromosomes. Surrounding the gametes are cell tissue and a tough outer coating.

Under the eye of the scanning electron microscope and coloured by the artist, it is clear that pollen species come in all shapes and sizes. The squash (*Cucurbita* sp) produces the largest of all pollen grains: at 200 microns, it is just big enough to see with the naked eye. In contrast, the forget-me-not (*Myosotis* sp.) produces the smallest grains at just 5 microns in size.

The size and shape of most pollen species can be related to their method of dispersal. This generally falls into one of two categories: small, smooth grains for wind assisted dispersal; or

larger grains with hooks, barbs and other structures that aid animal assisted dispersal.

The uncertainties of wind dispersal mean that plant species using this method must produce huge quantities of pollen to ensure a successful pollination. Typical wind-pollinated plants include grasses and many trees. Some tree species, such as hazel (*Corylus avellana*), grow distinctive tail-like floral groups known as catkins which are able to catch the wind more effectively and help spread the pollen. To people who suffer from hay fever, it is wind-dispersed pollen grains that

spark their allergic reactions.

The relationship between flowering plants and animal pollinators is one of the most fascinating in nature. The large majority of animal pollinators are insects: notably bees, butterflies, moths, beetles and flies. But birds and bats are also important pollinators.

To attract the attentions of pollinating animals, plants such as tiger lilies (*Lilium tigrinum*), poppies (*Papaver* sp.)



and ox-eye daisies (*Chrysanthemum leucanthemum*) have large brightly coloured flowers, often with strong scents that attract many species of flying insects. For the animal pollinator, the main attraction is the bountiful food supply in the form of nectar and pollen itself. For the plant, insects and other animals that are able to fly from one plant to another allows pollen to transfer from one plant individual to another, thus avoiding inbreeding. Such is the success of this relationship that flowering plants, which botanists



refer to as angiosperms, are without doubt the most dominant and successful group of plants on the planet.

Whether by wind or animal pollination, once a pollen grain lands on the receptive surface, or stigma, of a compatible plant it begins the process of transferring its

genetic cargo to the ovaries. It does this by developing a pollen tube that grows through the stigma towards the ovaries. Here, the two gametes fuse during fertilisation and an embryo eventually develops into a seed.

Man has a long association with pollen. In some cultures pollen is considered a delicacy or curative, often sold as bee pollen. Traditional plant breeders are expert at creating new varieties or hybrids of ornamental and agricultural plant species using manual pollen transfer techniques. As most species of flowering plants produce a uniquely shaped pollen grain, forensic scientists who find traces of pollen on a suspect or murder victim are able to trace both location and timing once they have identified the species.

But pollen has a dark side. Opponents to genetically modified (GM) food ar-

gue that GM plants release pollen into the wild, upsetting the ecosystem and causing unknown problems.

If plants did not have the ability to produce pollen, there would be limited, if any, sexual reproduction and flowering plants – which include hugely important food crops - would not exist today. So the next time you go outdoors and complain about the symptoms of hay fever, spare a thought for the marvel of nature that is pollen.

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Written by Seymour Yang

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FULL PICTURE SET

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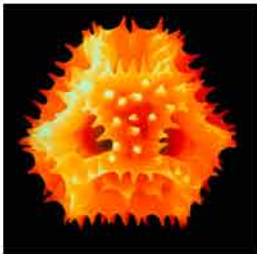
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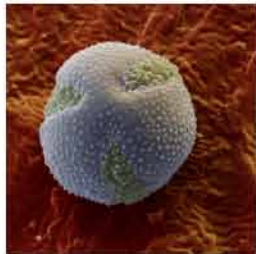
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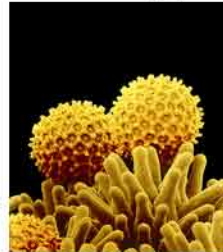
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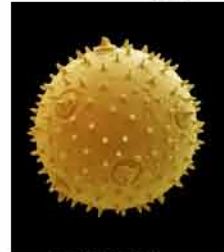
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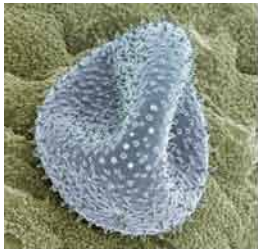
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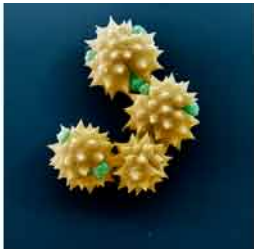
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