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HOW POLLEN IS A SILENT WITNESS IN CRIME

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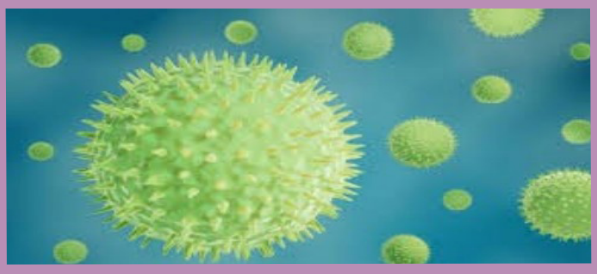
The pollen grain is not frequently encountered at a crime scene, but if encountered, it can lead to an investigation.
Palynology is the study of pollen grains, spores, etc., while forensic palynology refers to the application of palynology to investigate civil and criminal cases.



https://gapp.org/how-does-the-pollen-grain-develop/

Pollen is a fine powder discharged from the male reproductive organ of a flower. The size of a pollen grain ranges from 10 to 150 micrometres (i.e., it cannot be seen with the naked eye) that is protected by a cell wall consisting of cellulose, pectin, and sporopollenin, making it resistant to decomposition. Pollen grains are transferred by wind, water, insects, butterflies, etc., for better propagation.
They get attached to most surfaces and are deeply embedded in clothing. Hence, even washing clothes with detergents cannot remove all pollen grains attached. The first case where the pollen was used to solve the case was in Austria in 1959. In this case, a man had gone missing, and the police arrested a suspect who had a motive to kill the man, but they

had no evidence to prove so. On searching the suspect's belongings, they found a pair of muddy boots. The mud sample was given to palynologist Wilhelm Klaus for analysis.
The result showed that it contains a variety of species of pollen grain which can be found only near a small area around Vienna. When these findings were briefed to the suspect, he willingly confessed all about the murder and led authorities to the site of both murder and body, which were exactly in the area pinpointed by Dr. Klaus.
Pollen collected from a person can match the scene of the crime, which suggests that the person might have visited that particular area recently, but it doesn't mean they have committed the crime.
Images of pollen grains can be obtained by three methods, namely:
1. Transmitted-light microscopy (TLM),
2. Widefield fluorescent method, and
3. Structured illumination (Apotome) method.
These methods are semi-automated traditional methods that are used to detect pollen grains.

APPLICATIONS OF PALYNOLOGY
Pollen grain provides a link between the victim, suspect, and crime scene. Pollen grains can help in reconstructing the crime, understanding the modus operandi, and identifying the molecular level using DNA (Deoxyribonucleic acid) typing. It can determine primary and secondary crime scenes. It will determine the movement history of materials, including drugs. It will give information on the geographic condition of the pollen grain.

COLLECTION

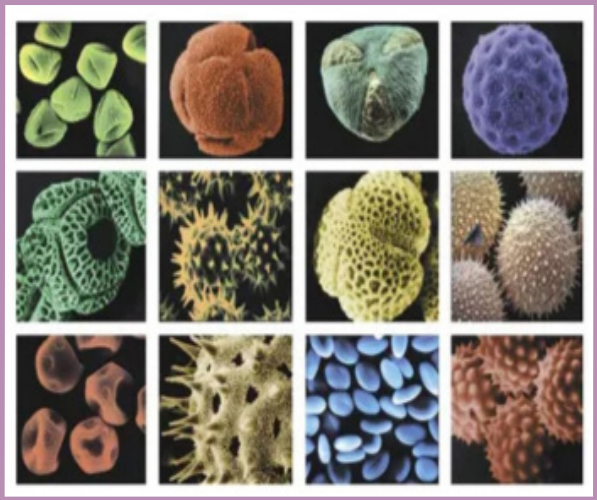
It is important to follow a simple method to collect pollen grains from clothes. The adhesive tape method is most suitable for recovering pollen from clothes. It is simpler, faster, and less expensive than other methods.

A pollen fingerprint is the number and type of pollen grains found in a geographic area at a specific time of the year.

Low temperature decreases the rate of cell growth. Hence, pollen grains are preserved in liquid nitrogen at -196^{o}C. This is known as cryopreservation.

EXAMINATION

Structures of exine, the polar and equatorial shape, size, dispersal form, and other morphology of pollen are examined, and conclusions are made.



https://www.vcbio.science.ru.nl/en/virtuallessons/pollenmorphology/

POLLEN PRESERVED AS FOSSILS

The exine of a pollen grain is constituted by sporopollenin, which is found to be one of the most resistant organic materials. Organic compounds such as long-chain fatty acids, phenylpropanoids, phenolics, and traces of carotenoids are

chemically cross-linked to give sporopollenin its rigid structure. This rigid structure can withstand high temperatures and strong alkalis and protect the pollen grain under harsh conditions. This leads to resistance against microbial and chemical decomposition, which is why pollen grains are well preserved during fossilisation.

With time, some pollen grains fall into lakes, where it gets accumulated with other sediments forming layers with each passing year. Due to a lack of oxygen (which is required for decomposition) in the lake sediments, the pollen grain remains as is. If the land remains wet, the pollen grains will perdure for millions of years.

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