



The spatial and temporal distribution of pollen in a room: Forensic implications



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ABSTRACT

This paper presents two experimental studies that deal with the spatial and temporal distribution of pollen grains within a room of a domestic dwelling. The findings concur with the preliminary work of Morgan et al. [1] and provide greater detail as to the behaviour of pollen grains within indoor locations that are pertinent for forensic investigations. The spatial distribution of pollen in a room exhibits strong distance decay trends, with the majority of pollen recovered within 0.8 m of its source. The pollen was found to persist in increasing quantities during the time the flowers were in the room. This study also shows that 20 days after the flowers were removed, 25–32% of the original pollen was still present within the room. The influence of disturbance was investigated and whilst areas of high disturbance were found to retain less pollen than undisturbed locations, the influence of the proximity to source was a more dominant factor.

These findings have significant implications for forensic investigation protocols, particularly the collection and interpretation phases of trace evidence analysis. The distribution of pollen around a room ensures that viable sources of trace pollen are available for transfer if contact is made between a location in the room and a suspect. The persistence of pollen many days after the flowers have been removed from a room indicates that many rooms in domestic dwellings will have distinctive assemblages that reflect the history of the flowers that have been displayed within that room in the past, and that these assemblages will persist and therefore be available for transfer. These preliminary findings indicate that investigation by forensic palynology in indoor domestic settings may well be an underutilised technique that has the potential to provide accurate and valuable intelligence and evidence for forensic enquiry.

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1. Introduction

It has been well established that trace evidence can provide important intelligence and evidence in forensic investigations [2–7] and that pollen evidence in particular can provide highly valuable spatial and temporal information [8–12]. The majority of cases where pollen evidence has been successfully utilised have been either in the identification of a crime scene based on the pollen assemblages present on a suspect or victim [13] or refuting an alibi by identifying assemblages at a crime scene and on a suspect that could not be excluded from having a common source [14]. To date, it has rarely been used as a means of characterising a particular indoor location. Emberlin et al. [15] is the only study in this broad area (with a primary focus on occupational health issues), yet it but it has been recognized that ‘...searches for forensic pollen need not be restricted to the outdoors’ ([9]:169). This study therefore

aims to investigate whether indoor settings in domestic dwellings are likely to have specific pollen assemblages contained within them that may be useful for forensic investigation. Moreover, it is important to gain a better understanding of the nature of such pollen assemblages if pollen evidence is to be interpreted meaningfully in a criminal investigation where an indoor setting is being investigated.

Cut flowers are often displayed in rooms in domestic dwellings and in a forensic context it needs to be considered whether an offender who had broken into the house could have contact with surfaces or materials within a room such that transfer of pollen grains may occur onto the clothing of the perpetrator and even secondary and tertiary transfer [16]. This is contingent upon the underlying tenet in forensic geoscience, first introduced by Locard [17], that ‘every contact leaves a trace’ and that contact can initiate a two-way transfer (in this case from an object in the room to the perpetrator and from the perpetrator into the room). Since there have been no experimental studies undertaken to investigate whether the very specific pollen assemblages which can be found in a room (perhaps as a result of a cut flower display), it is presently difficult to provide acceptable evidence for a court implying that pollen grains found on a suspect could indeed have come from a

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contact made in a particular room. This study aims to go some way to providing an insight, under controlled experimental conditions, as to the efficacy of such pollen transfers and their interpretation in a forensic context.

Preliminary experimental work has demonstrated that pollen from cut flowers is dispersed around a room onto all types of surface, with most pollen found closest to its source (in this case the vase of flowers) [1]. This is, however, one preliminary study and these patterns have not yet been established as the general rule in different domestic dwellings. We present here further and fuller studies in different settings to those reported in Morgan et al. [1] in order to establish whether it is possible to identify general trends that can be applied more universally in the field of forensic science. These experimental studies aim firstly to establish the reproducibility of pollen grain dispersal throughout a room in a domestic dwelling; and secondly the longevity/persistence of the pollen grains in a domestic setting.

2. Pollen in a room of a domestic dwelling: implications for palynological investigations in domestic crimes

2.1. Rationale

In order to address these questions, additional experiments were undertaken to develop the work presented by Morgan et al. [1]. In this original work, two vases of flowers were placed in a living room as shown in Fig. 1 (each vase contained a different type of flower and for the three experimental runs, lily, freesia, campanula and lisianthus flowers were used). The room was sampled at 23 different locations

(see Fig. 1) every 24 h for 9 days during which the flowers were present in the room (after control samples were taken to establish no background pollen was present). Additional sampling was also undertaken up to 40 days after the flowers were removed. This preliminary study identified that in terms of pollen distribution there was a strong spatial pattern of distance-decay from the vases of flowers placed within the room. Further, no statistically significant difference was found between the amount of pollen collected on hard (wooden) furnishings in comparison to soft (material) furnishings and pollen was found to persist within the room up to 40 days after the flowers were removed from the room.

Further experiments were designed for this present study utilising the same methodology as the preliminary study as outlined in Table 1. The experiment was undertaken in a different house in a different location whilst keeping as many of the variables in the original experiment as similar as possible. The experiment was repeated six times with two of the same flower types (in this case lily and freesia) in vases at either end of the room as shown in Fig. 2. For the first four runs of the experiment, the 22 sampling locations (which comprised a mixture of hard and soft furnishings and aimed to cover a broad spatial area) were sampled using double sided tape on an electron microscope stub (1.27 mm diameter) every 24 h for 9 days as was carried out in the preliminary experiment (reported by Morgan et al. [1]). This was undertaken in order to establish whether or not similar trends could be identified in the different rooms. For the final two runs the sampling time frame was extended so that the 22 sites were sampled every 48 h for 17 days. The flowers were then removed (after 9 days for runs 1–4 and after 17 days for runs 5–6) and the sites within the room were

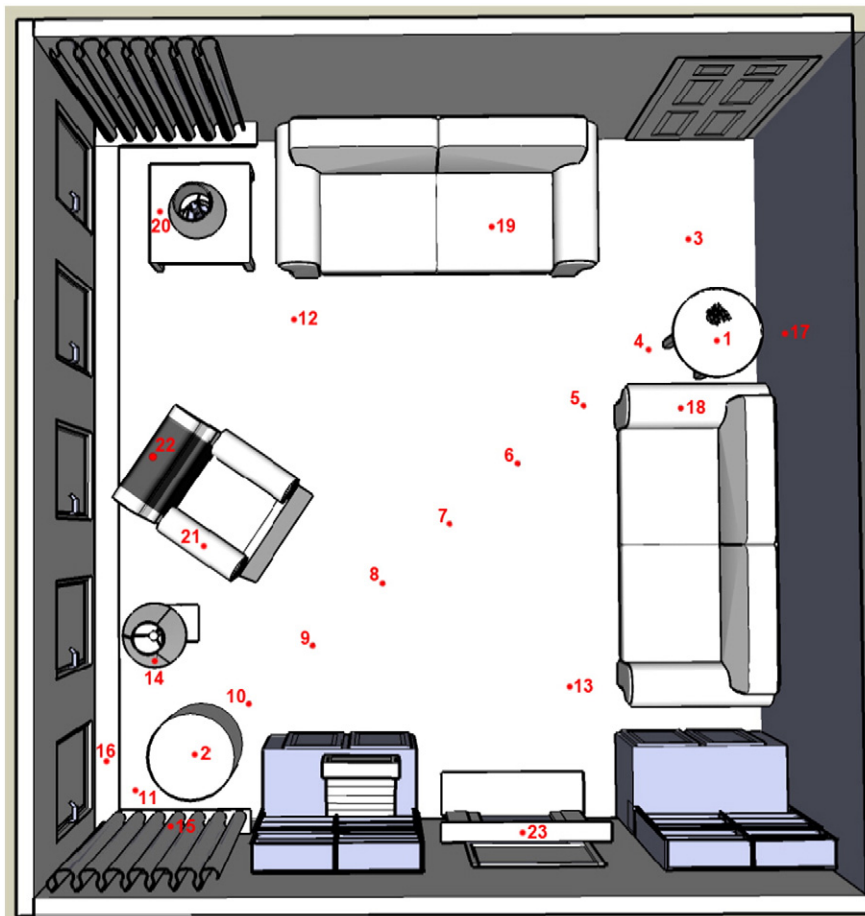


Fig. 1. Flower and sampling locations within the living room during the preliminary experiment outlined by Morgan et al. [1]. Vases of flowers were located at sampling points 1 and 2.

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