A119 On the Random Presence and Discrimination of Purple Textile Fibers Collected From Movie Theater Seats

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After attending this presentation, attendees will realize how unlikely it is to randomly observe a large number of matching fibers within a given surface and also between different surfaces.

This presentation will impact the forensic science community by providing information, not only related to the ability of microscopical examinations to detect and discriminate microscopic features of textile fibers, but also about the value of the recovery of a large number of matching fibers. This study will benefit trace evidence examiners in cases where a defense strategy would raise an argument such as "the recovered fibers are common and ubiquitous; therefore, this recovery is valueless to this case."

Adhesive tapes have been applied to 150 seats of a movie theater. These public surfaces were targeted for fiber collection because they were considered to be representative of the general population where the study was conducted. The focus of this study was purple fibers: this color was chosen to deviate from the traditional colors like black, blue, or red which are already abundantly reported in the literature. Single purple fibers were searched for using a stereomicroscope and isolated from the tape. To date, 20 seats were searched for fibers: 7,000-8,000 fibers were present on the searched tapes. A total of 62 purple fibers were observed. The single fibers were mounted permanently for conducting microscopical examinations. Methods based on light microscopy are crucial for gathering data about fiber characterization as well as for performing comparisons. The study of the morphology of the fibers is first carried out; this may include the study of the cross-sectional shape. Fibers can thus be classified as natural or man-made. Their thickness can be measured, the presence of delusterant particles can be recorded for man-made fibers, and double polarization techniques are applied to study their optical properties. Fluorescence microscopy is useful to detect luminescence due to the dye content. Plane-polarized light can also be used to study potential dichroic properties of the dyes. The comparison microscope is used to perform intra-source and inter-sources comparisons: the color, thickness, presence and concentration of delusterant particles, surface appearance, and fluorescence properties are compared.

During this study, fibers were initially categorized according to their general class: about 50% of the collected fibers were natural, the most part being cotton. Few wool fibers were observed. About 25% of the fiber samples were of man-made regenerated origin and the other 25% were man-made synthetic types (the most part being nylons and polyesters). The various fiber samples belonging to a given subclass were pair-wise compared using the comparison microscope. The results indicate that this population of purple fibers is highly variable, especially considering the different color shades, their thickness, and their overall morphology. Color resulted to be the highest factor of discrimination. Indeed, a further step of this study will be the application of microspectrophotometry.

After comparison microscopy, a group of eight cotton fibers resulted to be indistinguishable and this was the largest group. Four fibers were recovered from the same seat, while the remaining four were collected from four individual seats. The group of four was confirmed after fluorescence microscopy along with another fiber of the group of eight, while the three other fibers exhibited different fluorescence effects. For cotton fibers, two groups of three indistinguishable fibers were observed: one group had two matching fibers recovered from the same seat. For the other group, the three fibers were collected from three different seats. On the other hand, all the regenerated fibers could be differentiated after comparison microscopy. With regard to the synthetic fibers, three pairs were observed. However, the most useful way to gather information about the recovery of these fibers is to consider the number of groups of purple fibers recovered on a given seat and their size. Most of the purple fibers occurred as individual fibers on the seats. Only one seat had more than two groups of purple fibers (two pairs of cottons and synthetic fibers, respectively). Globally, seven pairs of matching fibers were observed on six seats. Finally, the largest group observed from one seat was only four fibers.

Fibers, Evidential Value, Trace Evidence

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