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Case report

Guilty by his fibers: suspect confession versus textile fibers reconstructed simulation

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ABSTRACT

In one particular criminal case involving murder and theft, the arrested suspect admitted to the theft, but denied responsibility for the murder of the inhabitant of the crime scene. In his confession, the suspect stated that he found the victim's body when he broke into the crime scene to commit theft. For this report, the actual crime scene was reconstructed in accordance with the confession obtained during the interrogation of the suspect, and suspect behavior was simulated in accord to the suspect confession. The number of characteristic fibers retrieved from the simulated crime scene was compared with those of retrieved from the actual crime scene. By comparing the distribution and number of characteristic fibers collected in the simulation experiments and the actual investigation, the reliability of the suspect's confession was evaluated. The characteristic dark yellowish-green woolen fibers of the garment that the suspect wore when he entered the crime scene were selected as the target fiber in the reconstruction. The experimental simulations were conducted four times. The distributed target fibers were retrieved using the same type of adhesive tape and the same protocol by the same police officers who conducted the retrieval of the fibers at the actual crime scene. The fibers were identified both through morphological observation and by color comparisons of their ultaviolet–visible transmittance spectra measured with a microspectrophotometer. The fibers collected with the adhesive tape were counted for each area to compare with those collected in the actual crime scene investigation. The numbers of fibers found at each area of the body, mattress and blankets were compared between the simulated experiments and the actual investigation, and a significant difference was found. In particular, the numbers of fibers found near the victim's head were significantly different. As a result, the suspect's confession was not considered to be reliable, as a stronger contact with the victim was demonstrated by our simulations. During the control trial, traditional forensic traces like DNA or fingerprints were mute regarding the suspect's says. At the opposite, the fiber intelligence was highly significant to explain the suspect's behavior at the crime scene. The fiber results and simulations were presented at the court and the man was subsequently found guilty not only of theft and trespassing but also murder.

1. Introduction

Single fibers are one of the most important items of physical trace evidence in the field of forensic science. According to the exchange principle [1], with the cross transfer between suspect and victim, the identification of fibers retrieved from the suspect's garments and those retrieved from the victim and crime scene can be used to prove the relationship of the suspect to the crime scene. For this reason, there have been numerous reports regarding the examination of fibers, with aspects such as persistence and transference [2,3], several methods of color comparison using a microspectrophotometer (MSP) [4–6], high-performance liquid chromatography (HPLC) [7,8], the molecular analysis of dyestuffs using various mass spectroscopy systems [9,10] and as other sophisticated methods, Raman spectroscopy [11] and FT-IR microscopy [12]. Basically, the combination of the morphological examination, molecular composition and color parameters of the single fibers measured lead to discrimination or not between the different the different items.

In court trials in Japan, there has been an increasing rate of instances (now 80%) in which confessions obtained during interrogation by police officers and prosecutors are being retracted by defendants. In several cases, it has been determined that confessions obtained during investigations are not reliable. Recently, the National Police Agency of Japan has been emphasizing the importance of carrying out a "scientific investigation," which does not depend on the confession of the suspect. Under

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these circumstances, physical trace evidence plays an important role in investigating crimes. Many research papers have been reported in regards to newly developed and sophisticated study techniques for fiber identification as described in the reports [12].

In the present criminal case, when this report focuses on, when interrogated by a police officer and a prosecutor, the suspect admitted entering the victim's house and committing theft, but strongly denied responsibility for the murder. In order to verify the reliability of the suspect's story, the crime scene was reconstructed and the behavior of the suspect at the crime scene was simulated according to the details of the confession. For a reliable comparison with the number of characteristic fibers retrieved from the actual crime scene, the simulated reconstruction experiments were carried out four times. In these experiments, the characteristic fibers retrieved by the same officer who collected the fibers from the actual crime scene, using the same type of adhesive tape and the same protocol, were compared with those from the actual crime scene. The suspect's garments and the configuration of the room where the body of the victim was found were used in the reconstruction. All the collected fibers that showed morphological similarity to each other were further examined using an MSP to compare their color.

2. Experiments

2.1. Case report

The characteristic fibers of the garment seized from the suspect's house were of dark yellowish-green wool. The garment information was obtained from a witness who, near the time of crime, saw an unknown man near the victim's house.

2.2. Fibers retrieved from crime scene

The same fibers were retrieved from the scene of the crime by using adhesive tape.

The screening of morphological observation of these woolen fibers was conducted using binocular microscope (magnified 5 times) (Carl Zeiss, Japan Inc. Tokyo, Japan) for screening, the color and woolen characters were resembled to suspect garment fibers were selected. All selected fibers were identified by microscopic observation (magnified 400 times), and their similarities of color parameters were evaluated by ultraviolet–visible transmittance spectra measured by an MSP (M-800 ultraviolet–visible). The slide glass and cover glass used were made of quartz. The measurement range was from 240 nm to 780 nm, at 2.5-nm steps. Glycerin was used as the immersion solution.

2.3. Characteristic fibers

The image of the dark yellowish-green fiber and its ultraviolet–visible transmittance spectrum measured by MSP are shown in Fig. 1a and b.

The observed morphology (scales), diameter, absorption spectra of the fibers, as measured by MSP, were compared.

2.4. The reconstructed simulations

In the simulated experiments, the crime scene was reconstructed in accordance with the suspect's confession (Fig. 2a and b). The temperature of the simulation room was 25 °C, and humidity was 55%. The simulation of behavior of suspect's at simulated room of crime scene was conducted by our-coworker with seized suspect's garment and the victim was also our-coworker. Before the simulation, the materials in room and victim body were cleaned using wide adhesive tape (trace evidence collection tape, 0.2 mm thickness and medium adhering power, widely used in crime scene investigation at Japan, supplied by JP instrument Co. Ltd., Tokyo, Japan) and confirmed the absence of target fiber. The configuration of the victim's body and the fibers were collected using adhesive tape of zonal taping method, the locations where the fibers were retrieved are shown in Fig. 3a and b (numbers were target fiber retrieved position). The simulated figures of the victim as reconstructed to match the suspect's confession are shown in Fig. 4a and b. The suspect's behaviors at the crime scene, according to the confession, are summarized as below

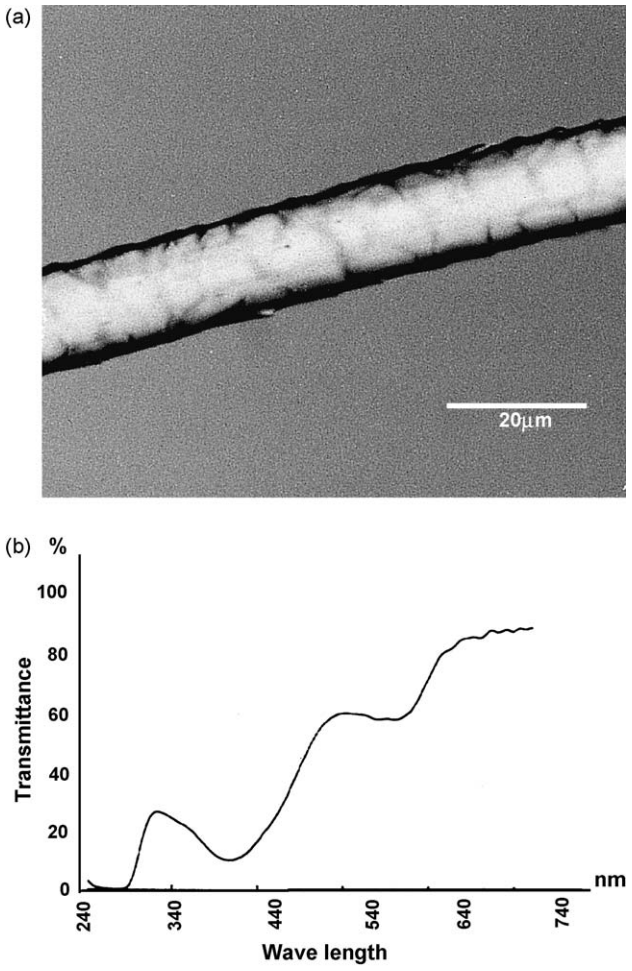

Fig. 1. (a) Characteristic yellowish dark green single fiber (magnified 400, transmittance figure). (b) Transmittance spectrum of characteristic yellowish dark green single fiber in ultra violet- visible region measured by microspectrophotometer.

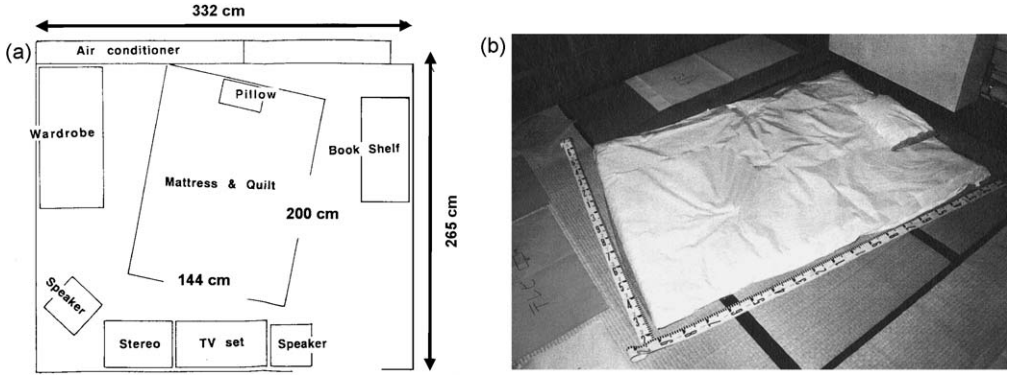

Fig. 2. (a) The configuration of reconstructed crime scene and (b) photo.