

# CHANCES AND LIMITATIONS OPERATING WITH POTENTIALLY CRIME-RELEVANT TEXTILE FIBRE TRACES

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**ABSTRACT:** In forensic fibre laboratories, the elaboration of tapings may provide investigators with useful hints for finding evidence about potentially crime-relevant items such as clothes worn by the perpetrator. In the past years there have been some casuistic examples depicting the fibre examination of so-called “Leitspuren” with successful outcomes.

The present paper likewise deals with this approach showing a possible systematic procedure of working. Keeping within these boundaries, limitations respectively sources of error and misinterpretations which may result from laboratory and police work with potentially crime-relevant textile fibre traces, will be pointed out. Finally, the balance between chances and risks of this kind of examination will be stricken on the basis of the experience of a routine case work laboratory.

**KEY WORDS:** Fibres; Police procedure; Laboratory procedure.

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## INTRODUCTION

The present paper deals with the chances and limitations of operating with potentially crime-relevant textile fibre traces. In the past years there have been some casuistic examples even in the course of the last two EFG-meetings depicting fibre examinations with successful outcomes under the conceptual category “Leitspur” (noticeable here are the papers of [1, 2, 3, 4, 6, 7, 8]). The conceptions and, in my opinion, rather sophisticated paper *Das Leitspurenkonzept* [9] recently appearing in the German journal *Kriminalistik* is an exception to above mentioned papers and I myself cannot agree with its substance.

This presentation is based on considerable experience gained in our routine-casework laboratory, and deals with our approach when searching for potentially crime-relevant fibres showing the possibility of a systematic work procedure, instead of using descriptions of single cases or philosophical essays. Keeping within these boundaries, the limitations, sources of error and misinterpretations which may result from laboratory and police investi-

gational work with potentially crime-relevant textile fibre traces, will be pointed out.

In our laboratory, the LA Nordrhein-Westfalen, we also have had numerous positive experiences with this form of examination. It is almost exclusively limited to homicides since the most suitable assumptions are available here. An examination of this type is often used at the beginning of police investigations if no reference material is available from suspect persons in the normal way.

We understand the search for so-called “Leitspuren” to be an alternative, economical approach to examination, unlike the classical direct comparison of incriminating items. In the case of capital offences, it was quickly observed that police investigators would send the entire contents of a suspects wardrobe into the lab for examination. This situation led to a heavy work load and/or overload of our lab and to many superfluous and time-consuming examinations. We were able to create relief by making potentially crime-relevant fibres available to the police investigators and therefore defining a selective search for the original textile item.

#### DEFINITION

Let us start with a definition of “Leitspuren” from the point of view of the case examiner or the expert witness, which is borrowed from the glossary of the excellent textbook “Forensic examination of fibres” [5]: “A fibre collective (or group of collectives) recovered from a crime scene or victim where the number; the distribution and as a supplement, the material of the fibres, suggests deposition by the perpetrator”. Thus in fact, they are only potentially crime-relevant transferred fibre traces that may have been transmitted by the perpetrator (i.e. from his/her clothes or used items) onto the victim or the scene of crime. These fibres may provide police investigators with useful hints for finding evidence about crime-related items (not persons), that are connected with the incident or the perpetrator, such as information about the material characteristics of the fibre traces or about as the clothes worn by the perpetrator.

The actual crime relevancy of a trace is scientific, which means objective, and is not verifiable. In my opinion, the police investigators or other customers should know clearly that potentially crime-relevant fibres have no scientific fact but depend on an evaluation or an interpretation of fibre evidence by the expert witness.

The examinational approach can be subdivided into two stages. Both stages can be afflicted with significant faults. These steps are called: a) Stage of elaboration, b) Stage of validation.

## Stage of elaboration

### *Process of realisation/Detection method*

In this stage the items and/or the tapings related to the victim or to the crime scene that are sampled by the police are sent for fibre examination and are scrutinised for possible foreign fibres which can be taken as an indication of the last contact with a crime-related textile item belonging to/used by the offender. As a practical procedure you may look for extraneous fibres that attract attention because of their number, distribution and/or material. This procedure should take place in areas in which the offender might have had crime-related contact according to information given for example by the police or by forensic medical personnel. These are compared to areas in which no contact may have occurred (as a neutral control) e.g., the clothing of the victim outside versus inside. In the case of homicide it may be useful to recover fibres from locations of naked skin such as the face or flat of the hands where fibre persistence is usually low.

Please note that in the stage of elaboration the selection of potentially crime-relevant fibres using the above mentioned criteria (the number, the distribution and/or the material) is already a subjective judgement from the point of view of the case examiner.

### *Requirements*

#### Requirements for the police/other customers (such as the prosecution or the court)

- Reasonable background information should be available to the expert witness as a starting point for the examination in areas with which the perpetrator might have had contact.

Sources of detailed information that have to be taken into account include any reliable documentation such as the police scene reports or forensic medicine reports.

#### Requirements for the recovery and collecting of trace evidence at the crime scene

- The recovery of fibre traces should if possible occur in an unchanged situation as far as retrieval of the victim (the corpse) is concerned to preserve an undisturbed reflection of the crime-relevant distribution of fibre evidence.
- The recovery should as soon after the incident as possible in order to avoid any non-legitimate contamination through unauthorised persons and to prevent post-incident movement of fibre evidence.

- 1:1-tapings or other suitable areal tapings (in the case of a homicide) from the corpse or from other defined crime-related areas enable the case examiner to perceive a particular fibre distribution. In this case, in my opinion, individual fibres do not play a decisive role (as they may also have resulted by unknown contamination), but rather the recognition of fibre clusters (Figure 1).

### ***Limitations / Faults***

#### Limitations and faults by the police (investigating officers/officers of the forensic squad)

- The background information is incomplete or unreliable.
- On account of an indistinct or vague and complex course of events at the crime scene, no specific contact areas can be named.
- The topical collection of fibre evidence was, among other examples, not possible because of corpses found outdoors with wet clothes, or in water, or because immediate recovery may have been prevented for the sake of necessary rescue action.

#### Limitations and faults by the expert witness/case examiner

As well as the limitations for fibre examination in general, faults can be essentially due to wrong considerations or interpretations by the case examiner.

- During the examination of areas that are declared as not having been contacted by the perpetrator (the neutral control), fibres matching the potentially crime-relevant fibres were found and/or not found and the case examiner could draw the wrong conclusions from this.
- The assumption that potentially crime-relevant fibres must be present.
- Considering Locard's axiom the case examiner acts under duress to name potentially crime-relevant fibre traces even if none are readily apparent. But, in order to do this, information about the strength of contact between the incriminating items, about the textile construction or about the shedding potential would be necessary. This is of course impossible because the textile source is unknown at the beginning of the examination.
- As is not possible to determine the exact moment of fibre transfer it is not known whether potentially crime-relevant fibres do not result from the crime-related contact, but rather from legitimate contacts before or after the incident or whether the offender wore, for example, clothes that do not shed fibres.

### Closure of the stage

This stage ends with the announcement of the results of elaboration to the police or other customers. There are two possible outcomes.

Negative case: If no potentially crime-relevant fibres were found, the examination ends at this point. In this case the direct comparison of suspects' textile items that are believed to be crime-related by the police investigators is still possible and desirable.

Affirmative case: If potentially crime-relevant fibres were found, the case examiner informs the police or the customer about those potentially crime-relevant fibres as well as about the evidential value of the recovered material. This is an essential point as it makes a difference whether it is a question of unspecific black cotton fibres<sup>1</sup> or red, delustred polyester fibres for example.

In the affirmative case we would proceed to the stage of validation.

### STAGE OF VALIDATION

Validation means the integration of the results of the search for crime relevant fibres into the police investigation by looking for possible textile source items. This stage only confirms the relevancy and evidential value of the results so far, if a possible textile source with matching fibres is found.

### Two step-process of realisation

#### *Step 1*

The first step is to look for possible sources in the victim's own environment as well as to carry out comparisons with clothes from legitimate contacts. Combined with this it is the task of the police (or the customer) to determine who the legitimate contact persons might be. If a possible source textile is found, the investigational approach ends here. If not, it may be resumed with the search for another potentially crime-relevant fibre (e.g. if the victim was smothered (according to the obduction protocol) with a soft object and fibres were found on the victim's face that could be assigned to a pillow from the victim's own environment, a plausible source would then be found).

If no further possible crime-relevant fibre traces can be developed, the direct comparison of suspects textile items, which are believed to be crime-related by the police investigators, remains possible.

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<sup>1</sup> See: M. Grieve, The evidential value of black cotton fibres, *Problems of Forensic Sciences*, vol. XLVI, pp. 196–200.

In case no obvious legitimate textiles were found, procedures for the second step are followed.

## **Step 2**

In the second step, the search for possible textile sources is extended to suspected persons where, either purposeful examinations of textiles themselves are possible, or informational tapings taken from the suspects' household can be scanned for suitable fibres which may provide evidence of a secondary transfer. Combined with this, it is again the task of the police or the customers to decide which group of persons is regarded as non-legitimate.

## **Limitations / Faults**

### ***Limitations and faults (by the expert witness/case examiner)***

- The expert witness is involving himself in investigational activity (under German law he may then become prejudiced).
- If the case examiner provides inadequate or inaccurate information and/or descriptions about the recovered fibres to the police, it may result in them searching for the wrong item(s) in their efforts to find a possible textile source.

### ***Limitations and faults by the police (by investigating officers/ by officers of the forensic squad)***

- The police investigator has not been able to establish all persons who may have been legitimate contacts and/or has not been able to determine what they were wearing, i.e. the recovered fibres may have come from an unrecognised legitimate contact person or item (rescue services, from forensic medical officers or those persons who discovered the victim at the scene of the crime etc.).
- Possible useful textile sources in the victims own environment (which might transfer secondarily to the suspect) go unnoticed or fibres from them were not registered on the informational tapings from the victims household (this may result from incompetence of the forensic squad).
- Possible useful textile sources in the environment of suspect persons are not recognised or matching fibres from them were not registered on the informational tapings from the household of those persons.
- The fibre background in the suspects environment varied significantly from the fibres of interest or no matching fibres were left in the household because, for example, the textile involved as the donor had been specially obtained for the purpose of carrying out the crime.

- The textile source was destroyed by the perpetrator following the crime.
- Police investigation has been stopped completely while they are waiting for the results of the examiners' elaboration. Other possibilities may be thus neglected.

### **Completion of the stage**

The second step of the validation stage may end with the discovery of a possible textile item from the property of a suspect that matches the potentially crime-relevant fibres.

In further examinations it is useful to verify the result and to evaluate the evidence, which means for example to establish whether the number and distribution of the recovered fibres corresponds to the shedding potential of the textile source:

- or if the textile item in question bears cross-transferred fibre traces from the environment of the victim;
- or if further secondary fibres from the suspects environment may have been established on the victim or the victim's clothing.

On the other hand, if the origin of the recovered fibres remains "open" (with an undetermined source), again the direct comparison of the recovered fibre traces with suspects textile items that are believed by the police to be crime-related should still be possible.

### ***Advantages (of the Leitspur principle) for the police/other customers***

- It provides support for police officers for the faster selection of possible crime-related textile items from suspects.
- It allows the possibility of screening environments of suspects (clothes, household, cars) to cover the possibility that the recovered fibres may be secondary traces. (A necessary assumption is that the people involved are real suspects. A global inspection of some persons makes no sense).

### ***Advantages for the expert witness/case examiner***

- A more economic scrutiny of possible crime-relevant textile items is possible by enabling preselection of the textile items to be checked (the lab is not covered with miscellaneous textiles, those must be checked in a time-consuming manner).
- The discovery of potentially crime-relevant fibres directly influences the numerator of the likelihood ratio in Bayes theorem if you want to use this theorem to evaluate fibre evidence (which means it may increase the numerator).

***Disadvantages for the police/other customers***

- This approach requires great experience and knowledge of possible sources of error.
- Police investigational approaches are occasionally unreliable and not verifiable.
- The approach depends on honest communication between police or the customer and the lab.
- Furthermore, it depends on the informative value of the background information.
- Critical conditions must be fulfilled when recovering and collecting the fibre evidence.

***Disadvantages for the expert witness/case examiner***

- It requires great experience and the knowledge of possible sources of error.
- The approach depends on the individual and subjective boundaries of being able to recognise potentially crime-relevant fibre traces.
- The relevancy of the recovered fibres cannot be verified scientifically. It is the opinion of the case examiner, which are relevant and which are not.
- If a 1:1-taping is used, a great number of tapes must be examined. (The very considerable amount of time required is contrary to faster processing of forensic fibre evidence which is highly desirable).

One suggestion for a time saving alternative to the 1:1-taping, for example, would be a suitable but less comprehensive areal taping of textile items that still permits the identification of a specific distribution of fibre clusters (see Figure 1).

## CONCLUSION

At the end of the lecture let me now summarise with some personal annotations: The approach to examination referred to as “Elaborating potentially crime-relevant textile fibre traces” or “Looking for so-called Leitspuren” when seen from the point of view of the case examiner is based on an interplay of objective examination results, evaluations of experience with fibre traces and to a large extent subjective background information given from the police or other customers. Therefore, the approach is embossed and influenced to a great extent by the personality and the individual experience of the case examiner.



Fig. 1. A suggestion for complete areal taping of corpses.

In cases where corpses are discovered where there are clothed areas together with naked skin areas in any of the above regions, it is useful to split these into separate regions and to recover the traces separately.

Furthermore, this presentation should not leave the impression that the restrictions which apply in general when working with fibres, can be bypassed by application of this investigational approach. A negative result in the stage of elaboration does not mean that during the crime no traces were left by the perpetrator at the crime scene. Equally, a negative result during the stage of validation cannot be used to exclude a suspect.

In the hands of an expert witness, however, who uses the possibilities of this approach but at the same time knows, and above all, respects the limitations, the method certainly offers a way of carrying out precise and economi-

cal forensic fibre examinations. Furthermore, particularly at the beginning of police investigative work it may provide the police or other customers with useful information concerning fibre evidence which may be of evidential value.

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