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Forensic examination of memory traces Part 1

What is a memory trace? An ideal trace, or just the opposite, a trace on which it is easiest to find some flaws? Does it exist in a material manner, and can it be examined in an objective way, or is it nonmaterial and ephemeral, with both its observation and assessment as subjective as human perception? We are not trying to answer these questions here; we are interested in the way in which the fact that everyone in our country has for many years agreed that the object of the polygraphic examination are memory traces practically influences or should influence the manner in which such examinations are conducted. The approach that we present diverges significantly from the majority of publications in this area of forensic studies, which is why we consider it important to provide it with its own name: forensic examination of memory traces.

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As has been mentioned before, we on purpose ignore here the question of memory traces themselves, moving immediately to the problem of disclosing them.

How is a memory trace disclosed in criminal acts? In most cases, this happens during interrogation. Testifying depends on the will of the suspect; he must neither be forced nor encouraged to do so. The suspect is not obliged to tell the truth. Yet if he feels unconnected with the subject of the investigation, it may be in his interest to disclose all the information that he possesses and that may be useful for investigation of the case. The obligations of a witness include testifying in accordance with their best knowledge and concealing no significant detail, even though we can of course not assume that that is what always happens. It may therefore be supposed that the person who has testified or given explanations in the matter in question has delivered a statement that he possesses or does not possess specific memory traces connected to the case (relevant for the case).

Article 192a of the Criminal Procedures Code envisages that – with the consent of the examinee – polygraph examinations may be conducted to define the value of the evidence of the disclosed traces (of a crime, event – authors' note). This also the case, therefore, with memory traces.

How can we examine a memory trace and register it?

Functional magnetic resonance imaging (fMRI) is a technique of imaging the brain introduced in the 1980s, with publications concerning it being available since the mid-1990s. Examinations make use of the fact that while the examined person performs thinking tasks, for instance, the activity of certain areas of the brain increases. Detection of these areas of the brain is possible thanks to the fact that the neuronal activity (e.g. thinking) causes topical changes of blood flow, blood volume, and oxygen consumption. During the examination, a magnetic field is run through the patient's head. Passing radio waves through the head of the examinee results in their reflection from hydrogen particles, which resonance is picked up by the scanner. It can be said that this examination is based on finding areas of increased uniformity of the magnetic field.

During over a decade of conducting examinations (using fMRI and PET, i.e. positron emission tomography), it was found which regions of the brain are responsible for storing information, thinking, emotions, etc. An activation map of the brain was developed, although research has not yet been completed.

The basic examination procedure is based on scanning the area in question (in layers) repeatedly/several times in the rest state, and later after the examined

has been subjected to a specific stimulus. It is important that the geometric centres of the selected layers lie in the axis of the magnet.

Neuropsychological examinations disclose whether the given person “tells the truth or lies” on the basis of the areas of the brain showing activity. When the area of the brain responsible for problem-solving is active, it may be concluded that the examinee is lying, and is making up the answer. If the active areas are those responsible for storing information (and emotions), this testifies that the examinee recollects the facts that were actually recorded in the brain earlier.

Experiments conducted during the research (with simultaneous observation of changes taking place in the brain and changes occurring on the surface of the body of the examined person) disclosed that activation of the area of the brain responsible for storing emotions is manifested by stimulation of the autonomous nervous system. In an indirect manner, using a polygraph to achieve this goal, we may observe when the area of the brain responsible for storing information and emotion becomes activated. It was on this that we based our concept of disclosing memory and emotional traces during examination.

During further research that we conducted, we used a stimulus on the patient (as in the case of fMRI), which results in the activation of specific structures in the brain (usually responsible for storing information and emotions, like in fMRI), and observed and registered the effect of the activity of these brain structures which manifests itself in physiological processes that can be measured in a non-invasive manner on the surface of the body of the examinee. To be more precise, if we are asked a question concerning an event during an examination, the content of the question will be compared to the content of our memory. The content of the question will reach the thalamus through the organ of hearing, with the initial assessment of the features of the stimulus performed from the thalamus and the content of the question passed to the higher parts of the brain, where precise analysis of the question is performed and its content is compared with the resources stored. From the many levels of processing the information, the result of the query is passed to the amygdale. If specific records are found in our memory, emotions accompanying this record are also found, which is manifested in stimulation of the autonomous nervous system.

Peak of tension tests are used to define the evidential value of memory traces. It is significant that – unlike the functioning practice and theory of conducting polygraph examinations, and, moreover, unlike the approach that assumes the sole use of “guilty knowledge tests” – “our” concept assumes the necessity of using three types of peak of tension tests, depending on the needs and capacity of their implementation, without excluding the use of control question tests. It is obviously not by coincidence that peak of tension tests play such an impor-

tant role in this concept. It is only thanks to their application that we can claim unambiguously that the goal of the examination is disclosure and registration of memory traces of the event in question.

Presenting forensic concepts of examining memory traces, it seems important to emphasise the differences that led us to discuss here a new approach to conducting polygraph examinations. First, whether the person examined conceals the knowledge of the event is a matter of secondary, if not tertiary importance. Yet we do not pass entirely over this matter, as we realise that, in most people, lying is also a source of emotions. Secondly, in the approaches to these examinations, the primary role has so far been attributed to control question tests, and peak of tension tests were given an ancillary role. It is otherwise in forensic examination of memory traces: peak of tension tests play a primary role, while control question tests have a supportive character, as they are used mainly for selecting people and the directions of the examination using peak of tension tests. Last but not least, this concept requires greater care and precision in preparing and conducting the examination, and at the stage of interpreting the registered emotional changes.

As we mentioned before, there are three types of peak of tension tests, each of them having a different reason for using it as well as diagnostic value. Below, we will present both a brief description of each of these tests and examples of their use. We shall put special emphasis on the discussion and illustration of confirmation tests.

The guilty knowledge test is constructed in such a manner that a single critical question concerning a significant detail of the crime is hidden among other, similar questions. It is assumed that only a participant in the event in question knows which of the questions is the critical one. For the person who did not participate in the event, all of them should be equally critical. The objective of such a test is to check whether the examinee knows the details of the event, which are highly improbable to be known to anyone else but the perpetrator.

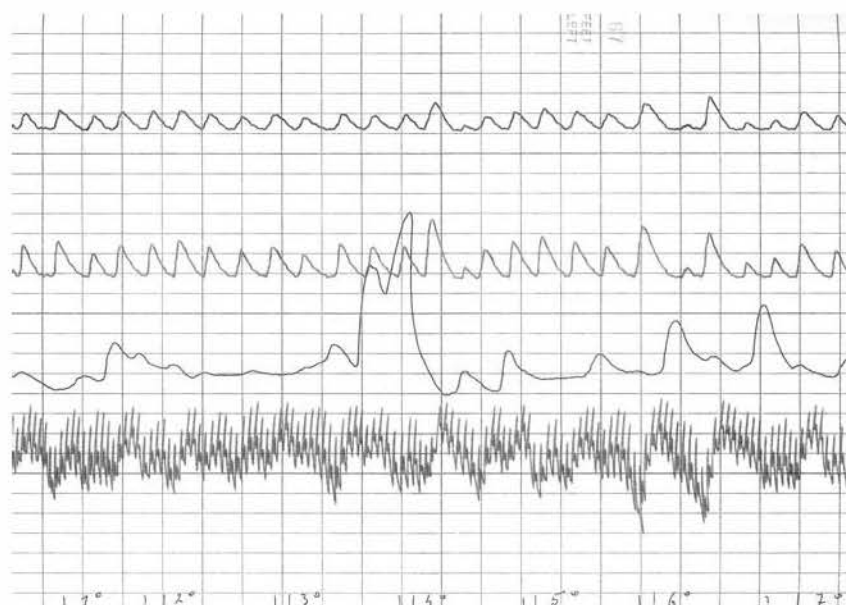
The test with a solution that is unknown and sought makes it possible to define significant details of the event that were not previously known to the investigators. These details should, on the other hand, be known to the person who committed the action that is the object of the investigation or to the person who acquired such knowledge from other sources, e.g. from the perpetrator or witness. To give an example, using this test, one may try to identify the perpetrator or accomplice in a crime, the place where the objects coming from the crime or used to commit it are kept, the place where the body was deposited, or the place where a kidnapped person is being held.

The confirmation test makes it possible to establish significant details of an event that raised doubts that may result among others from the mutually ex-

clusive testimonies of persons connected to the investigation. In such a test, the examined person reacts emotionally to the question concerning a fact that actually took place or its date, according to the person's knowledge, independent of the fact or date stated during the interrogation. In this type of test, both the version that assumes the participation of the examinee in the given event and the one that excludes it are taken into account. For example, this may be the fact of having been at the place of the event, as opposed to the place stated by the examinee during the interrogation, with the assumption that neither of these options has strong support from other evidence. Without resorting to the theory of probability, we assume that the likelihood is minimal that a given person 1a) reacts weakly or does not react emotionally to the fact connected to the question being investigated that at the same time places that person at the scene of the event, and 1b) also reacts in a strong and legible manner to the question considering the place that the person stated, with the 2) fact of that person's brain having registered a memory trace of being in the place where the crime was committed on the given day and at the given time. Significant is the fact that the registered trace is lasting, and it is possible (where necessary) to repeat its "examination".

Case study No. 1.

The following are registered (top to bottom of the recording): changes in the thoracic breathing cycle, in the abdominal breathing cycle, galvanic skin re-

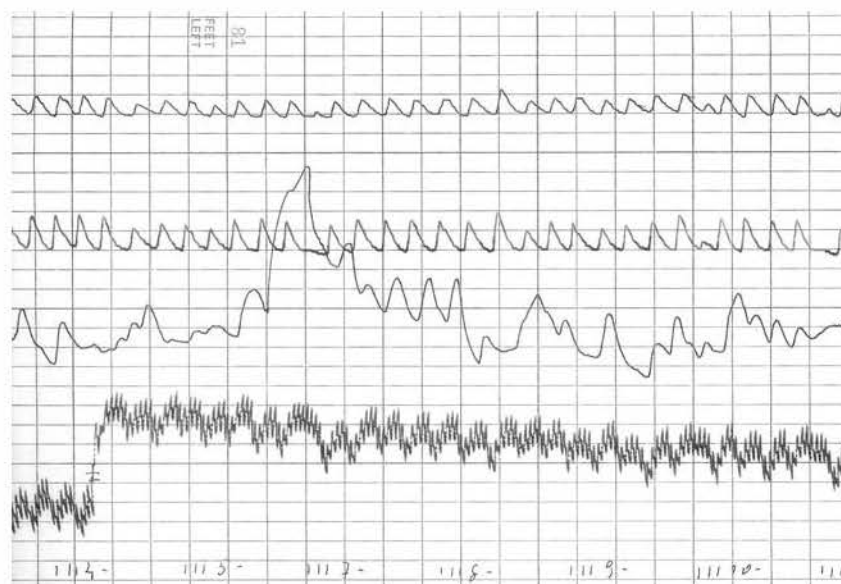


sponse (in the conventional, i.e. traditional, polygraph, the recording of changes in the galvanic skin response "outruns" the point at which a question is asked by a few seconds, which results from the fact that the galvanic skin response pen is longer than the others by $3/4$ "), changes in pulse and blood pressure. The distance between two vertical lines is $1/2$ ", and the speed of paper transmission is 1 " per 10 seconds.

The examination used the guilty knowledge test. The questions concerned the amount of money stolen from a day safe in a hotel. Question No. 4 concerns the amount that was actually stolen. Visible are marked emotional changes in the skin galvanic response and in breathing after question No. 4 was asked. Earlier, the examinee declared that he had no knowledge concerning the amount stolen. This gives grounds to assume that the examinee knows what amount of money was stolen from the safe.

Case study No. 2.

The examination makes use of the test with an unknown result. In this test, the names of four different people known to the examinee were mentioned, with an accompanying question whether he knew that any of the people mentioned performed the action that was the object of the investigation. Visible emotional changes in skin galvanic response and in breathing followed the asking of question No. 7. This gives grounds to assume that the examinee knows or suspects that the person mentioned in question No. 7 is connected to the theft being investigated.

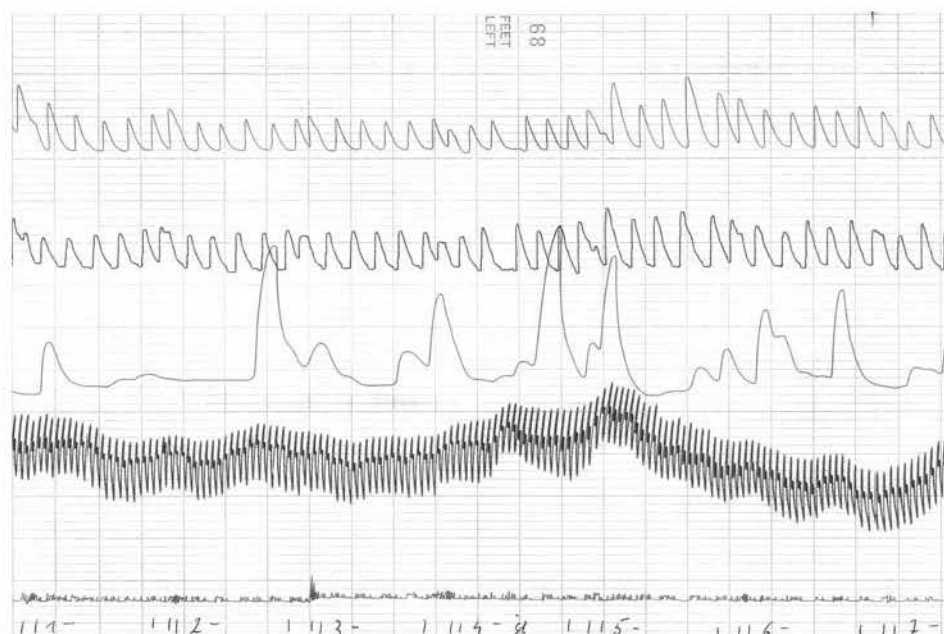


Case study No. 3.

The examination made use of the confirmation test. A few months after the crime, while browsing photographs in the police register, the injured party recognised the examinee as the perpetrator of a robbery. He recognised him, among other reasons, thanks to his characteristic moustache. In the courtroom, the accused stated that he had shaved off the moustache two years before the robbery he was charged with was committed. He remembered this very well, as the reason for removing the facial hair was the issue of an arrest warrant in which he was identified as having the moustache. He shaved the moustache off to make recognition more difficult. Question No. 5 concerns the period when the accused (according to his statement) did not have a moustache. Question No. 7 concerns the period when the robbery which the examined was accused of was committed.

The largest emotional changes in the arterial blood pressure and the skin galvanic response followed the asking of question No. 5, which is to be interpreted as meaning that the examinee – according to his knowledge – did not have a moustache during the period listed in question No. 5.

This examination establishes what memory and emotional trace concerning the time when the examinee did not have a moustache is registered in his nervous system. This trace is lasting, and may be disclosed in successive examinations, should the need to repeat them arise.



Case study No. 4.

Adverse circumstances, such as a lengthy passage of time and repeated participation in legal proceedings, do not rule out the possibility of conducting forensic examination of memory traces. It should nevertheless be remembered that repeated interrogations and questionings concerning the actions the examinee was charged with, presentation of the charges, bringing the case to court, participation in the trial, and sentencing at the court of first instance also result in the creation of memory and emotional traces connected to the event in question. For these reasons, it may not be ruled out that in examination of certain people, sudden emotional changes present after asking critical questions may be caused by the experiences listed above and not because of perpetrating the action they are charged with.

This example concerns the brutal killing of an elderly married couple. The examination was conducted more than 13 years after the crime had been committed. Polygraph examination was proposed to the people who had the keys to the house or who could have been let inside at any time. This was suggested by the way that the crime was committed. During the investigation, the time of the killing was defined fairly precisely. All those examined were interrogated as witnesses within several hours of the discovery of the crime. Among others, they described where they were and what they were doing at the time of the crime.



One of the tests used concerned the place where the people examined stated they were when the crime was committed. Question No. 4 concerned being in the house of the parents while they were killed. Question No. 5 concerned the place where the examinee was – according to the testimony – when the parents were killed.

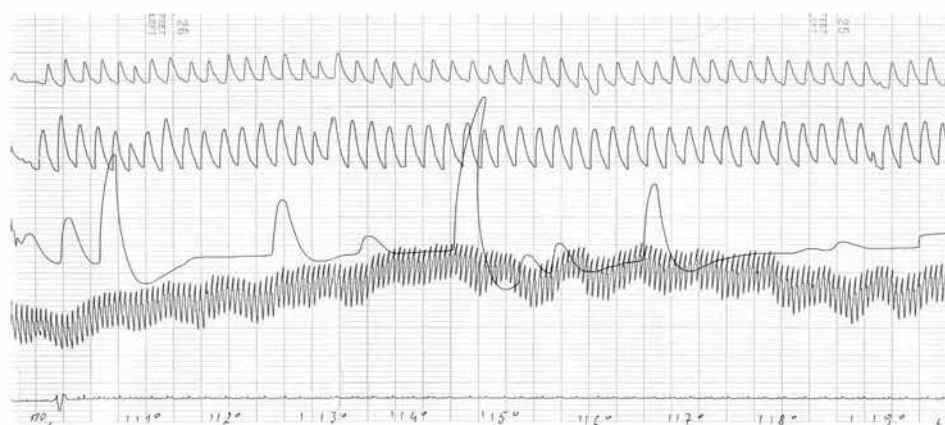
No significant emotional changes were registered after the asking of question No. 4 concerning being in the parents' house during the murder. Decidedly the strongest emotional changes were recorded after question No. 5 was asked, that is when the place named by the examinee as the one where he was at the critical moment was mentioned. Changes are visible both in skin galvanic response and in arterial blood pressure.

It is hard to imagine that memory and emotional traces were not registered in the nervous system of the examinee if he were a witness to or perpetrator of the murder of his parents. The remaining questions concerned other probable places where of examinee might have been.

This examination established what memory and emotional trace connected to the location of the examinee when the murder was performed is registered in the nervous system of the examinee. This trace is lasting, and may be disclosed in successive examinations, should the need to repeat them arise.

Case study No. 5.

This case refers to a suspicion of insurance fraud. The examinee notified the police on 6th January 2008 that somebody had stolen his car from the parking spaces by the house where he lived. At about 2 p.m. the day before, he had left the car in the parking spaces, and he had seen it for the last time at about 9 p.m. on 5th January. He was convinced that the car was stolen from him, and did not know who did it.



The police officer conducting the preliminary proceedings issued a decision to terminate the investigation concerning the theft of the car, due to the lack of data sufficiently substantiating the actual crime. One of the basic reasons for undertaking such a decision was an official note which claimed that the police had "operational evidence" to prove that W.T. submitted a false claim to obtain damages under false pretences, and actually sold or abandoned the car.

Question No. 3 was "Did you abandon your car?", question No. 5 was "Was your car stolen from you?", and question No. 7 was "Did you sell your car?"

By far the strongest emotional changes were present after question No. 5 was asked. Visible are clear emotional changes in the skin galvanic response and arterial blood pressure.

Established through this examination is what memory and emotional trace concerning the loss of the car is registered in his nervous system. This gives reasons to assume that the examinee notified the police about the theft of the car with the best of his knowledge, and the version accepted by the police is false. This trace is lasting, and may be disclosed in successive examinations, should the need to repeat them arise.

Case study No. 6.

This example concerns a case of a false accusation. The examinee was accused of claiming and receiving a financial gain amounting to several tens of thou-

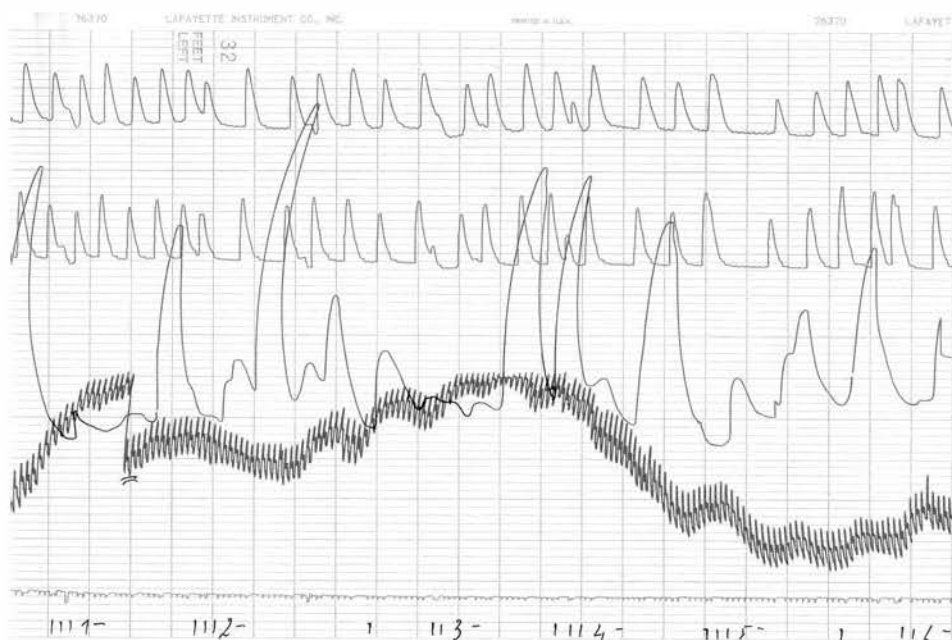


sand zloty. Due to the post he held, he could eliminate the corporation he worked for from competing for highly lucrative contracts. A criminal procedure against the examined was initiated. The examinee admitted that he had maintained professional contacts with the man falsely accusing him for a few months, and even received from him on two or three occasions small presents of a nominal value.

Question No. 5 pertained to receiving money from the slanderer, and questions Nos. 3 and 8 concerned receiving small presents in kind. It is visible that stronger emotional changes occurred after questions Nos. 3 and 8 were asked than after question No. 5. This provides grounds to assume that the examinee did not accept any money from the slanderer. Established through this examination is what memory and emotional trace concerning receiving a financial gain is registered in the nervous system of the examinee. This trace is lasting, and may be disclosed in successive examinations, should the need to repeat them arise.

Case study No. 7.

This case concerns a false accusation. The examined man was accused by an acquaintance of forcing her with violence and threats to have sexual intercourse. Question No. 4 was "Was the sexual intercourse the initiative of your acquaintance?"; and question No. 5 was "Was the sexual intercourse your ini-



tiative?”. Decisively stronger emotional changes were present after asking the question No. 4, which gives reasons to assume that the sexual intercourse of the examinee with the slandering woman occurred on her initiative. This excludes the element of threats and use of force to coerce her to sexual intercourse. This trace is lasting, and may be disclosed in successive examinations, should the need to repeat them arise.

As the cases above prove, polygraphic examination is vested with far greater capacity than just disclosing the connection of the person examined with the event in question. This is significant not only for the practice but also for the manner of perceiving this field of forensic studies by persons dealing with the broad field of evidence procedure (and law).

References

- Góraj B., Kordek P. (1999), *Czynnościowy Rezonans Magnetyczny w tworzeniu map aktywacyjnych mózgu człowieka*, *Polski Przegląd Radiologiczny* No. 64 [in Polish].
- Jaworski R. (1999), *Opinia z ekspertyzy poligraficznej, jako dowód odciążający*, Wydawnictwo Kolonia Limited, Wrocław.
- Kołecki H. (1977), *Pojęcie i klasyfikacje śladów kryminalistycznych*, *Zeszyty Naukowe ASW* No. 18, Warszawa [in Polish].
- Kulicki M. (1998), *Wariografia kryminalistyczna*, ed. by Mariusz Kulicki, Wydawnictwo Wyższej Szkoły Policji, Szczytno [in Polish].
- LeDoux J. (2000), *Mózg emocjonalny*, Media Rodzina, Poznań [in Polish].
- Lewandowski E. (2006), *Badania poligraficzne. Fakty i mity*, *Współczesne Problemy Kryminalistyki*, Vol. X, Warszawa [in Polish].
- Lewandowski E., Lewandowski Ł. (2008), *Alibi Testing Potential in Polygraphic Examination*, *European Polygraph*, No. 3, Kraków.
- Lewandowski E., Lewandowski Ł. (2008), *Teoria i praktyka testów potwierdzających wykorzystywanych w badaniach poligraficznych*, *Współczesne Problemy Kryminalistyki*, Vol. XII, Warszawa [in Polish].

Lewis M., Haviland-Jones J.M. (2005), *Psychologia emocji*, red. Lewis, M., Haviland-Jones, J.M., Gdańskie Wydawnictwo Psychologiczne, Gdańsk [in Polish].

Martin G.N. (2001), *Neuropsychologia*, Wydawnictwo Lekarskie PZWL, Warszawa [in Polish].

Sehn J. (1960), *Ślady kryminalistyczne, Z zagadnień kryminalistyki*, Vol. 1 Warszawa [in Polish].

Widacki J. (2002), *Kryminalistyka*, ed. by Jan Widacki, Wydawnictwo C.H. Beck, Warszawa [in Polish].

Wójcikiewicz J., Szumakowicz E. (1984), *Ślady pamięciowe*, Studia Kryminologiczne, Kryminalistyczne i Penitencjarne, Vol. 15, Warszawa [in Polish].