

**NATIONAL UNIVERSITY**  
**OF PUBLIC SERVICE**  
Doctoral Council

**IMRE ELEK**

*Safeguarding equipment as trasological mark carriers*

doctorial (PHD) dissertation's authorial exposition and  
official criticism

Budapest

2015

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Supervisor:

Prof. Dr. Lajos Berek academic

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## Phrasing the scientific problem

Quasi about each field crime it is in order to clarify that how could the perpetrator get into the defended area, how and with what was able to crack the safeguarding equipment, or how connects the formed tool-mark on the safeguarding equipment to the examined incidence. However, that also can happen when the possibility of mark formation comes up in another context, though also a safeguarding equipment, such as several other solid consistency object might be the carrier of analysable forensic mark. Because of this it is not rare when the same mark carrier object carries different relevant mutation, eg. on a cracked strong box beside the tool-mark of the stretcher equipment or opener tool the dactyloscopic, biological, physics-chemical material residues are also mapped.

Principally, forensic mark expert examinations come after crimes. There are two phases can be separated in the investigational part of tool-mark inspection: one aims the identification of the forming mechanism and the other aims the identification of the committing tool. Both investigational results have important rule in the relevance of a mark on a given site. In case of decidable perpetration method during field-day the forensic expert cuts in the second phase, but when it is necessary to identify the perpetration method or forming mechanism, the professional work begins in the first phase. On the basis of my many decades of experience and observation a third inspecting method might have a key role during the investigation of the given case, which no other than the definition of mark formation time interval. Several mark inspection methods are executed in mark bare environments or performed in case of latent mark formations. Such inspection is not uncommon when the forensic expert instead of identifying tool or mark, refers latent or slight dimensional marks on the distressed equipment which is directly affected by unauthorised penetration or opening (eg. lock, lead, value sack).

Presently, tool inspection is an extremely labour-intensive part of the identification expert work and manual in it's every momentum. Probably, this is because in point of fact the shape characteristic of the tool-mark examination, the potential mark carriers and mark forming are extremely diversified and the key details of mark formations can't always be located by the field-day. As a scientific problem I ascribe main emphasis to the tool-mark forming mechanism and mark formation course.

## Theme objectives

During my research I was looking for the answer for three questions in connection with the previously mentioned theme, and all these are built around the unauthorized entering onto defended areas, or rather unauthorized opening, manipulating of safeguarding equipment, and the individual identification of tool-marks.

- The determination of tool-mark relevancies and mark formation time intervals.
- The borderline of perceptibility of tool-marks.
- The information content of tool-marks, the quest, systematization, examination and identification of formation mechanism specific specialities and tool recognition specific specialities.

I examine the potential trasological mark carriers in the in regard to which are the trasologically relevant mark formations, mark specialities those may be utilized during my daily routine work and can be taken into account as common mark source. In the light of forensic trasological examination (trasology, mechanoscopy) I introduce the most common types of mechanical locks, those dependability, resistance capability against different

aggression, hoping that I might give a more realistic aspect instead of the many spread false explanation.

The purpose of my research is that to produce such a justice professional investigational framework, which suits the special verification requirements of penal and civil law, furthermore provides sufficient evidence for exploring, proving several crimes against property and in jurisdiction.

My additional aim is to work out an effective criminal technique supporter conceptual and methodological framework on this special subdivision of tool-mark examination, which might be useful in education and in jurisdiction as well.

## **Formulating investigational assumptions**

One of the original idea writing my dissertation was that there hasn't been such a research in our country yet, which examines mark carrier features of safeguarding equipment on a trasological platform and formulates such principles which could be the basis for categorising tool-marks. Over the deductible consequences of group and individual specialities level conclusions of field marks, in my opinion it is necessary to analyse the character of the mark formation, because positive identification systems are already capable to identify tool-marks, however reached not so many success in tool-mark recognition so far. The known identifier systems in dactyloscopy and ballistic, which are the AFIS (Automated Fingerprint Identification System) and BIS (Ballistic Identification System), don't face complex mark formations, because at the prior solely defined mark specialities contained static mark formations can be translated (papillary trace-system), and at the latter in turn tool-marks by weapon parts (weapon functioning marks) come off along a precisely defined mark formation course (constraint course). In my opinion, in line with certain tool-marks similar identifier systems introduction will take place. After all, appropriate tool-marks and mark samples are needed for this. In favour of reaching the goals above it is important to define the mark formation course in case of tool-marks, and to protect the mark reproduction capability of the perpetrator tool. In case of those tool-marks at which the mark is formed along a constraint course or definable mark formation course, thereby a proof mark sampling is possible, the tool-mark may get into an identifier system's database.

Beside these, my belief is that it is necessary to work out a mark-taxonomy within a mark carrier conglomeration that is considered special, which corresponds with the theses of forensic trasology. This mostly needed because it could provide sufficient methodical background for the members of jurisdiction, and beside this a definable terminology could come true simultaneously for safety engineering and law.

During justice expert work such special expertise claimer questions are so frequent, which challenges the cooperation of several professional field. The professional mark examination also belongs into this circle, which based on the connections between many disciplines, thus the forensic professional mark examination is an interdisciplinary zone. My hypothesis is that it is possible to create a such framework on this subdivision of forensic trasology, which might be capable to form an integrated aspect and to define the competence borders.

## **Investigational methods**

My dissertation searches the connections of trasology to safety engineering in the viewpoint of professional mark examiner or rather the overlapping between competence borders. During my work I inspect the mechanical safeguarding equipment as carriers of trasological marks. I introduce the typically occurrent mark carriers in forensic expert

practise, and I particularly describe those mark types which were recognised as a new mark during my career so far. I systematize the new marks collectively with the already known tool-mark types and I work out new probative methods. I define more mark formation mechanism on the basis of imaged and reflected shape or individual specialities. In my dissertation within the justice mark examination I specified by stressing the examination of tool-marks as trasological mark carriers.

The acquired almost 25 years of practical experience in the Hungarian Institute for Forensic Sciences (HIFS) is an integral part of my researches. During this period I practised a comprehensive national and international literature research, so as to be able to unravel the key forensic, safety engineering, legal and other common specialities in terms of the theme. I continuously tested my knowledge that I acquired through my research, in penal and civil procedures as a practising forensic mark examiner expert. As an active member of the European Network Forensic Sciences (ENFSI) I was following continuously the professional events and research results. On many national and international conferences those were related to my research theme, I attended as presenter or attendee. As a forensic expert member of the Hungarian Institute for Forensic Sciences (HIFS) I performed many modelling experiment in many cases in context of my daily routine work, and latched on to national and transborder qualifying trial of safeguarding tools in many cases, and as a PhD student I had the possibility to perform tests in the laboratory of the NUPS.

In total, during my research work I applied several common and unique research methods in consort with the methodology of scientific research. I used historical overview and comparing method as a common method, as an individual technique the empirical research had an emphatic function, in regard to that the safeguarding equipment regarded mark examinations are part of my daily routine work for decades. Of course, beside these the theoretical and logical research methods were also implemented during the elaboration of my research theme. Accordingly, I collected many specialized literature, which I selected then according to different viewpoints, but mainly I took into account the specialities and actualities of the national forensic tool-mark examination. After systematization I prepared by synthesising the evolved relevant specialized literature.

During the adaptation of the specialized literature I prioritized the methods and modes those aim the quality and effectiveness of the forensic mark examining work, in the case of which I applied the induction and deduction method as well. During the examination of informations gathered from tool-marks and related technologies, completing the previous, I also performed analysis. Every momentum of my research was consorted with the usage of the global internet. Purposeful searches in the highest degree made efficient and contributed to collect theme related informations and to quest sources.

## Conclusions

In my dissertation I analysed the specialities of trasological and mechano-scopical marks in a special mark carrier conglomeration. On the basis of and proceeding from forensic trasology I crossed the competence borders of law and safety engineering. In the focus of my project about the mechanical safeguarding equipment as forensic tool-mark carriers was **the relevance of tool-marks, the possibility of defining the time interval of mark formation, the perceptibility borderline of tool-marks, the information content of tool-marks, the quest, systematization, examination and identification of formation mechanism specific specialities and tool recognition specific specialities.**

In many momentum of my research I revealed the connecting points between law and safety engineering. **I attempted to search new mark sources according to the already known types, and defined mark specialities in a wider range.** I drafted the mechanical

tools of safeguarding related major forensic mark examiner and safety engineering correlations. About the mechanical safeguarding equipment **I defined** from my point of view the primal pillar of safety. In trasological and safety engineering environment I compared the mechanical safeguarding tools' resistance value, defensive level, sensitivity against unauthorized actions and operation safety related criteria.

**I scrutinized** the safeguarding pyramid as a cascading system of safety engineering. Within this, in the aspect of trasology, **I evaluated** the relation of the residual risk to the mechanical defence and insurance. **I demonstrated** that trasology and safety engineering meet each other in many questions on the ground of mechanical defence. **I illustrated** the situation of forensic mark examination and safety engineering in the hierarchy of this methodology discipline.

**I interpreted** the forensic mark in both complex competence aspect and trasological correlation. Through the identification conception of trasological mark I was concerned with the relation of mark forming and carrying objects. **I construed** the group speciality level mark imaging and on this level I defined the possible mark specialities, which are taken into account in terms of mark formation and group recognition. **I construed** the individual speciality level and complex mark formations. **I defined** the criteria of trasological marks in virtue of the logical connection of mark speciality imaging.

In practical terms **I analysed** the domination of mark formation and **defined** the influential factors of tool-mark formation. **I systematized** the relevant mark formation interactions in the aspect of the development of tool-mark. **I examined** the rule, importance and possible manifestation of the mark forming transmissive material in forming tool-marks. **I inspected the direct and indirect manifestation of mark formations and the information content of indirect marks** and thereof the deductible professional conclusions.

During my tool-mark related researches **I demonstrated** that the criterion of identifying the mark forming object is the ability of determining the **mark reproduction capability and mark formation course**. **I inspected** the individual character of parallel mark structures and introduced the abrasive mark structure as a new terminological concept. **I described** significant dynamic mark formation related national and international tool-mark modelling results and my own research results. **I defined** those mark formation specialities and environmental capabilities, from which the mark formation course can be determined.

**I introduced** rolling granule as a **new terminological concept** in dynamic mark formation, which might have importance in the aspect of formation mechanism. **I selected** the usage related and through manufacturing process evolving surface deformations. To found on national and international results **I defined** those mark specialities which are taken into account in the aspect of individual specialities. **I studied** the detachment of material parts or rather mark parts as collateral mark formations. **I defined the** relevant mutations and mark specialities during **material- and mark-detachment** part-whole inspections, in the destination of typically occurrent mark carrier objects. Investigating standardized production related mark formations I defined several producing technologies or rather producer appliances in the viewpoint of mark reproduction ability.

**I believe that my researches were effectual, I reached my conceived intentions. The summarised results in my dissertation will be successfully utilized in my future forensic expert and research work and besides I believe that the work which was given into research was not autotelic. On the basis of the reached successes I will conceive new research goals and I keep going on this way.**

## **New scientific results**

On the grounds of my accomplished research I deem for new scientific results the following:

- 1) In relation to the mechanical safeguarding equipment, about tool-marks and mark formation mechanism those arose in context with unauthorised action I made an overall analysis, during which, I compared the accepted methods in international practise with the national practical experiences. I interpreted the informations gathered from trasological mark specialities, and expanded the so far available knowledge in this category.
- 2) I verified that in evaluating the mapped individual specialities in tool-marks have decisive role of the mark formation course's character. I defined the tool-marks related basic mark formation course types. Beside the known mark specialities in the phase of trasological dynamic mark formation, I defined a new speciality type that I labeled to „rolling granules”. This speciality type makes available to determine the direction of formation in case of severe dynamic mark formation.
- 3) I accomplished the sectioning of lock opening capable equipment and defined groups which are interpretable for each competence field and unified for safety engineering, forensic and law.

## **References, the practical use of dissertation**

I recommend my dissertation to be used in tertiary education in the tuition of criminal techniques, forensic, safety engineering, in specialist forensic jurisprudent training, in addition, in the professional forensic expert refresher course of the concerned competency sections, and not least in the aspect of safeguarding and crime prevention. My dissertation may be underlying of future tool-mark identifier system developments.

## **My publications of this subject**

### **Book chapters**

1. I. Elek *Practical knowledge of trace expertise* In É. Tóth E. Belovics (Ed.) Auxiliary sciences of prosecution I. Chapter VI/2. Pázmány Péter Katolikus University, Budapest, Pázmánypress (2015) ISBN 978-963-227-0 pp. 404-428.
2. I. Elek Bases of forensic trasology In Gy. Szabó (Ed.) Documentation of work accident locations, ISBN 978-615-5460-16-6 (2014) Budapest, Óbuda University pp.39-50.
3. I. Elek *Main subdivisions of forensic mark examinations* In Gy. Szabó (Ed.) Documentation of work accident locations ISBN 978-615-5460-16-6 (2014) Budapest, Óbuda University pp. 51-77.

### **In foreign language journal in Hungary**

4. I. Elek *Forensic Mark Examination of Vehicle Keys AARMS* Academic and Applied Research in Military and Public Management Science Volume 14 Issue 3 2015 ISSN 2064-0021, pp.

### **In standard Hungarian journals**

5. I. Elek *Mechanical locks in safety engineering in the viewpoint of a forensic mark examiner expert* Hadmérnök V. year 1. fig. - march 2010 ISSN 1788-1919 pp. 24-32.
6. I. Elek *Key-questions of crimes against property* Bolyai Review 2010. year XIX. 2. fig. , ISSN: 1416-1443 pp. 127-139.
7. P. Bóna - I. Elek - Gy. Korek *Several questions of forensic mark expert investigations of crimes against property* Home Affair Review 50. Year 2002/5ISSN 1789-4689. Fig. pp. 19-25.

#### **Articles published in conference publications**

8. I. Elek *The sham key as a specially dangerous equipment on public security* National Engineer, mechanic and safety engineering symposium ISBN 978-6155018-10-7 10-11. November 2010. Óbuda University, Budapest pp. 11
9. I. Elek *50 years in forensic mark examinations* National Engineer, mechanic and safety engineering symposium, ISBN 978-615-5018-15-2 Budapest 15-16. November 2011. P.11.

#### **Presentment published in conference publication**

10. I. Elek *50 years in forensic mark examinations* presentment National Engineer, mechanic and safety engineering symposium, ISBN 978-615-5018-15-2 Budapest 15-16. November 2011.
11. I. Elek *Microscopic tool marks examination* (oral presentation) ISSN 1338-4619 10th International symposium on forensic science 27th-30th September 2011 Bratislava
12. I. Elek *Latent marks in safety engineering* ISBN 978-615-5018-11-4 presentment National Engineer, mechanic and safety engineering symposium, 14. April 2011. Óbuda University, Budapest
13. I. Elek *The skeleton key as a particularly dangerous device to public safety* VII<sup>th</sup> International conference „New challenges in the field of military sciences” 28-30 September 2010 Budapest, ZMNDU

### **Professional scientific autobiography**

#### **Professional academic biography of the doctoral candidate**

##### **Professional Experience**

Date	1989 –
Name of the Company	<b>Hungarian Institute for Forensic Science</b>
Post	Judicial staff
Main activities and	Forensic mark examination, teaching,

responsibilities	Member of ENFSI Mark Working Group
Date	2006 –
Name of the Company	<b>Pázmány Péter Catholic University</b>
Post	Contractual Lecturer
Main activities and responsibilities	Teaching activities in Forensic mark examination and Crime scene
Date	2014 –
Name of the Company	<b>Óbuda University &amp; Budapest University Of Technology And Economics</b>
Post	Contractual Lecturer
Main activities and responsibilities	Teaching activities in Forensic mark examination and Crime scene
<b>Studies</b>	
Date	2009 –
Name and type of the educational institution	<b>ZMNE (NKE HHK)</b>
Education	<b>Doctoral School of Military Engineering</b>
Level of education	
Date	2006 – 2008
Name and type of the educational institution	<b>ZMNE (NKE HHK) University</b>
Education	<b>Military Technical Faculty</b>
Level of education	Certified safety engineer University Degree MSC
Date	2001 – 2005
Name and type of the educational institution	<b>ZMNE (NKE HHK) University</b>
Education	<b>Military Technical Faculty</b>
Level of education	Safety engineer Bachelor's Degree BSC
Date	1985– 1988
Name and type of the educational institution	<b>MCCS MVD Moscow</b>
Education	<b>Training Institute of Forensic Expert</b>
Level of education	Forensic Expert of mark, handwriting, firearm, document, and fingerprint higher level VET, diploma
Personal competencies native language	Hungarian
Other spoken languages	
English	pre intermediate
Russian	advanced level

**Elek Imre**