

## MODERN SYSTEMS USED IN THE PROCESS OF TURNING TO ACCOUNT TRACES IN THE CASE OF CRIMINAL OFFENCES IN THE BUSINESS FIELD

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### **Abstract:**

*In forensic investigation, traces are studied starting with the way they were formed, the aspects they take on, continuing with the methods and technical means of searching, recording and collecting them from the crime scene and finishing with their examination under laboratory conditions and with the conclusions of the forensic specialist.*

*The complexity and variety of criminal offences committed in the business field, the manner and means used by the perpetrator while carrying out a criminal activity determine the presence at the crime scene of various categories of traces.*

*Thus, biological traces, hand prints, foot prints, sometimes lip or teeth prints, or traces left by fire arms can be found at the crime scene.*

*In the article we have discussed the automatic system AFIS PRINTRAK BIS and the system IBIS.*

**Key words:** forensic investigation, hand prints, automatic systems.

*I. Introductory notions.* The interaction between man and his environment results in the most diverse traces that may be useful in determining the time or the succession of certain events, as well as determining the human behavior in the process.

In forensic investigation science and practice, traces are studied in all aspects, starting with their process of formation, the aspects they take on, continuing with the methods and technical means of searching, recording, collecting them from the crime scene, finishing with their examination under laboratory conditions and with the conclusions of the forensic specialist<sup>187</sup>.

From the point of view of forensics, the notion of trace is of a rather concrete nature, having two meanings.

In a broad sense, traces represent the very diverse changes that might occur in the environment, as a result of the action of persons who have crossed the area where the crime was committed. These changes include, for instance, the appearance or disappearance of certain objects, the appearance on the surface of

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<sup>187</sup> I. Mircea, *Forensics*, Lumina Lex Publishing House, Second Edition, Bucharest, 2001, page 56.

these objects of certain characteristics, the transformation of certain objects into others, of a different quality<sup>188</sup>.

Other authors define traces as: "all material elements whose form is determined by the committing of a criminal offence"<sup>189</sup> or "any change occurring in the conditions of committing a criminal offence, as there is a cause-effect relationship between the crime and its material reflection"<sup>190</sup>.

In a restricted sense, a trace represents the reproduction of the exterior structure of an object on the surface or in the volume of the object with which it came into direct contact<sup>191</sup>.

A definition of the notion of trace must take into account the variety of traces at the crime scene, but without being too abstract "a single, simple mention that a trace is any change occurring at the crime scene"<sup>192</sup>, or too complex, which would make it difficult to interpret. Therefore, in order to consider the changes as traces from the point of view of forensics, they must: be useful to the forensic investigation through at least one of their features or qualities, without other more concrete conditionings, and there must be a cause-effect relationship between the crime and the alteration produced<sup>193</sup>.

Throughout the years, specialty literature has operated several classifications of traces:

- by the factor generating the traces, they are: traces left by a human being, traces left by animals, vegetable traces, traces left by objects and traces created by certain phenomena;

- by the aspect of the traces, they are divided into form traces and material traces;

- by the plasticity of the recipient object, they are divided into surface traces and depth traces;

- by the action of the recipient object as reported to the object generating the trace, they are static traces and dynamic traces;

- by the way they are perceived, they are visible traces or not visible traces.

Other authors classify traces according to the way they are formed into three categories, as follows: traces of reproduction, traces represented by objects or various substances and traces produced through arson and explosions which may be sub classified according to various criteria.

*II. Automatic systems used in the field.* The complexity and variety of criminal offences committed in the business field, the manner and means used by

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<sup>188</sup> S. A. Golunski, *Forensics*, Scientific Publishing House, Bucharest, 1961, pages 82-83.

<sup>189</sup> C. Suciū, *Practical Treatise on Forensics*, Didactic and Pedagogical Publishing House, Bucharest, 1972, page 200.

<sup>190</sup> E. Stancu, *Treatise on Forensics*, Third Edition Revised and Enlarged, Universul Juridic Publishing House, Bucharest, 2004, page 99.

<sup>191</sup> I. Mircea, in the work cited, page 56.

<sup>192</sup> Idem page 56.

<sup>193</sup> Elena – Ana Mihuț, *Persons' Identification by the Traces of Their Papillary Landscape*, Lumina Lex Publishing House, Bucharest, 2004, pages 10-11.

the perpetrator while carrying out the criminal activity determine the presence at the crime scene of various categories of traces.

Thus, biological traces, hand prints, foot prints, sometimes lip or teeth prints or traces left by fire arms can be found at the crime scene.

#### *A. Traces left by the papillary pattern*

An accurate way of individualizing a person is to identify him/her by his/her papillary pattern. Dermal papilla form ridges and are separated by depressions<sup>194</sup>, which give very different shapes to the papillary pattern.

In order to identify a person according to a papillary pattern, it is necessary first of all to determine the area it belongs to: the palm or the finger, and then, taking into account the fact that the papillary pattern on the last phalanges is very diverse, a classification of these patterns should be operated.

Besides the shape particularities of papillary patterns, whose contribution in the process of identification is restricted to establishing the type or group to which a person's finger belongs, the fingerprint also contains a series of characteristic marks or details liable to allow the definite identification of the individual<sup>195</sup>.

In order to establish the identity of the perpetrator, crestoscopy and poroscopy<sup>196</sup> are also used, as well as the automatic systems AFIS PRINTRAK BIS.

AFIS (Automated Fingerprint Identification System) identifies the details of fingerprints, relates them to a classification and codifies the details (the identification points or elements) for the established purpose.

In order to automatically classify the traces and to codify the details, AFIS converts the information received into numerical or binary data.

Once an identification card has been scanned, the image processor automatically renders a letter or a symbol for every fingerprint. The respective letter or symbol represents a classification that uses symbols.

The image processor may easily classify the central areas of the fingerprints which are big and clear. When the central areas are very small, automatic classification is much more difficult.

For this reason, the image processor inserts a reference classification of symbols for the respective fingerprint. Another reason is that sometimes a fingerprint involves characteristics belonging to two types of symbols. If this is the case, the image processor provides a reference classification for the second type.

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<sup>194</sup> L. Ionescu, D. Sandu, *Forensic Identification*, Scientific Publishing House, Bucharest, 1990, page 23.

<sup>195</sup> E. Stancu, in the work cited, page 123.

<sup>196</sup> As a branch of dactyloscopy, crestoscopy is the recently developed science which includes methods of identifying persons on the basis of the individual features of the papillary ridges taken isolatedly, not as part of the papillary pattern, and poroscopy is another branch of dactyloscopy which studies the shape of the pores, of the orifices of sudoriparous glands present in the palms of the hands and in the sole, its practical efficiency consisting in the comparison of pores by shape, position and number, which results in making up groups in a configuration that does not change, see C. Suci, in the work cited, page 235.

After passing the descriptor filters and the Rule of the 16 items, the details of the fingerprints in the card index are sorted out once again in the database and sent for comparison.

The details of the fingerprint that is being searched are compared to the details of the fingerprint in the card index. The identification scores are consolidated and organized from the largest to the smallest and printed as an identification report.

Papillary traces examined in the AFIS system will be necessarily taken from the tangible proof for the evidence, the sheet, the negative film bearing the image of the trace by the metrical standard.

The papillary impressions are examined in the AFIS system necessarily in life-size, from the following supports: decadactylar fingerprint records, paper for those transmitted in electronic format). The processing of papillary impressions transmitted through fax is prohibited.

Among the new benefits provided by these automatic systems, I would like to mention the following:

1. The operating system Windows – with all the benefits it provides as reported to the old system UNIX (easy access, operating speed, etc.).

2. The implementation and comparison of palm impressions and traces.

3. More possibilities for collecting and processing impressions and traces (filter gamma, gab or etc.).

4. Much quicker connection with the Internet WEB on a national level (also, the possibility for international connection).

5. Through the software created, the expenses of beneficiaries are reduced, making it much more accessible and easy to operate with.

6. The details of the traces and impressions can be magnified on a much larger scale as reported to the old system.

7. More types of files, images (BMP, JPG, etc.) can be imported.

8. The trace can be visualized three-dimensionally.

9. The diagrams of several fingers can be produced.

10. A group of papillary traces can be searched for.

11. It automatically issues on demand comparative reports (comparative drawing boards of the trace and the impression).

12. Once the impressions have been implemented in the system, the data regarding the civil status of the persons are also inserted (the old system had only a data base containing the images of the respective traces and impressions, while the civil status data were stored in a different data base in another system).

#### *B. Forgery of documents.*

From a forensic point of view, keeping in mind the extent of the perpetrator's action, forgery can be classified into: total forgery and partial forgery.

With partial forgery, the perpetrator's activity does not aim at adulterating the entire content of the document, but the action aims at granting it effects that are totally different from those the initial document had.

Total forgery is also known as counterfeiting, consisting in the fact that the document is affected entirely.

As a rule, a forgery is achieved through: removing, covering, adding, cutting up and reconstituting a text, imitating writing or the signature, applying false seals or stamps.

*Forgery by removing a text* is done by resorting to mechanical and chemical means<sup>197</sup>.

Mechanically, the text is removed through an action of deletion, either by scraping it by means of sharp instruments or by erasing it with bread core or with a rubber.

Forensic examination of partial forgery performed by removing a text follows two stages: determining the place from where the text was removed and reconstituting the text removed.

*Forgery by adding a text* consists in adding certain marks or words to the existing text.

In this case, the perpetrator aims either at altering the content of the entire document or just at changing the meaning of certain sentences.

The forensic investigation of forgery committed by adding a text follows several stages:

- the examination of the graphic characteristics regarding the logical content of the writing, the distance between words and between lines, the text topography, general changes, the way the writing is placed on different supports when starting to write and when making the additions, the use of a different writing instrument or of a different writing position;

- the examination of the writing material by determining the physical and chemical properties of the writing material;

- establishing the chronological order of performing the intersecting routes.

*Forgery by imitating writing, disguising writing and by copying*

The imitation of writing consists in the reproduction of graphic characteristics specific to the writing of another person. Forgery committed by free imitation and by servile imitation has several common elements. Among these, there are the appearances in the imitated writing of certain characteristics specific to the writing of the imitator, the ignorance of the way of putting down diacritical and punctuation marks.

In the case of servile imitation, there is a lack of naturalness and spontaneity in the writing, a low writing speed, increased pressure, retouch of certain letters, interruptions and route resumption.

If it is a free imitation, the writing displays a certain spontaneity, a uniform handwriting, trembling, interruptions, retouching.

Disguise is a deliberate alteration of handwriting done for the purpose of subsequently contesting it. The action of the forger aims at altering the graphic

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<sup>197</sup> I. Mircea, in the work cited, page 188.

elements of the writing, altering the dimensions of the writing, imitating the printing or left-handed writing.

*Forgery performed by copying the writing or the signature*

It can be achieved by:

a) copying through pressing, achieved by means of a sharp instrument, the forger following the outline of the authentic writing;

b) copying through transparency, which consists in superposing a sheet of paper on the writing used as a model, followed by the drawing of graphic marks;

c) copying by means of copying paper. For this purpose, between the authentic writing and the sheet of paper on which the copying is done a copying paper is interposed, the route of the original writing being followed by means of a writing instrument with a sharp point.

Among the elements that prove the forgery there are: discontinuities in tracing graphic marks, lack of connection between certain graphic marks, variations in the thickness of hachure or existence in the mass of the paper of certain micro-traces of the copying paper.

*Forgery committed by covering a text, forgery committed by cutting up and reconstituting a text, as well as other categories of forgery*

The forgery by covering a text is achieved by hachuring with the same substance as in the writing, or by creating ink spots or spots of other substances on the writing. The covered writing is highlighted by infrared radiation examination, by investigating traces of pressure and by roentgenography. The highlighting of the covered writing by means of these radiations can only take place if the substance used in order to cover the text responds to infrared radiations and the writing material is opaque.

*Forgery achieved by means of copiers and of the computing technique*

Photocopiers are devices that reproduce the image of the writings, functioning on the basis of the electrostatic phenomenon and of the phenomenon of photo-conductibility<sup>198</sup>.

The main ways of achieving partial forgery are by altering the validity term of writing, by partial or total replacement of the text in the authentic writing, by transferring the impressions of a stamp or of a signature from the authentic writing on the forged one.

Types of polychromic copiers include in their competence three toner cartridges, each of them containing different colors<sup>199</sup>, through the mixing of which any color in the visible light spectrum is obtained.

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<sup>198</sup> Any photocopier has the following main components: a light source, usually a laser radiation; a barrel with electro static properties; one or several toner deposits, V. Bercheşan, in the work cited, page 143.

<sup>199</sup> Any copier uses, in order to obtain the positive copy of a polychromic image, two procedures: the additive procedure, using the fundamental colours, blue, green, red, while the subtractive procedure uses composite colours, azure, yellow, and magenta, Idem page 143.

The reproduction of a writing with the help of the computing technique is achieved by means of a scanner, a computer and a printer. The graphic features of the writing that is reproduced are rendered by dots, the number of dots depending on the scanning resolution. Thus, in a microscope examination, one will notice both the dotted aspect and the indented content of the images.

Printers are of several types:

- inkjet printers use as a writing material warmed ink, projected on paper in the form of drops;

- with laser printers, the printing of graphic marks is achieved by applying on the paper microscopic toner particles;

- thermal transfer printers are based on the impact between a ribbon film and a warmed body. The reproduction achieved by a thermal transfer printer renders colors either in the shape of horizontal or oblique lines or as colored dots<sup>200</sup>.

### *C. Traces left as a consequence of using fire arms*

In judiciary ballistics, there is the IBIS system (Integrated Ballistics Identification System), interconnected with other similar systems in Europe, allowing us to determine certain circumstances in which the crime was committed, thus facilitating the quick solving of cross-border criminal offences committed with fire arms.

The system is composed of the correlation server and the data concentrator, the autonomous station capturing images (2D), the cartridge cases shot which are transmitted to the system – Brass TRAX, the computer with a specialized software – Match Point+ - which allows the interrogation of the data bases in the central server and the performance of comparisons for the purpose of identification.

The records and the central IBIS data base within the judiciary ballistics laboratory have as an object:

- ammunition elements resulted from experimental shootings with lethal fire arms legally owned by natural persons and legal entities in Romania;

- ammunition elements resulted from experimental shootings with lethal fire arms, used in crimes committed with unidentified fire arms;

- ammunition elements resulted from experimental shootings with lethal fire arms illegally owned or found/abandoned on the Romanian territory.

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<sup>200</sup> Idem pages 146-148.