

**Information Bulletin  
for  
Shoepriint/Toolmark  
Examiners**

---

Vol.7, No.2, June 2001

The Information Bulletin for Shoeprint/Toolmark Examiners is published by the Marks Working Group of the European Network of Forensic Science Institutes (ENFSI).

<http://www.poliisi.fi/wgm/>

Editor:

Anja Ytti  
B.Sc., Forensic Examiner

National Bureau of Investigation  
P.O. Box 285  
01301 Vantaa  
Finland  
tel. +358-9-8388-6383  
fax +358-9-8388-6303  
e-mail: [anja.ytti@krp.poliisi.fi](mailto:anja.ytti@krp.poliisi.fi)

Co-editor:

Gerrit Volckeryck  
Laboratoriumcommissaris

Gerechtigde Politie  
Laboratorium voor Technische en Wetenschappelijke Politie  
WTC III  
Simon Bolivarlaan 30  
1000 Brussel - Belgie  
tel. +32 2 208 48 31  
fax. +32 2 208 48 50  
e-mail: [gerrit.volckeryck@village.uunet.be](mailto:gerrit.volckeryck@village.uunet.be)  
<http://gallery.uunet.be/gerrit.volckeryck/index.htm>

Printed in the National Bureau of Investigation, Finland

ISSN 1455-4194

# INDEX

<b>INDEX</b>	<b>3</b>
<b>FOREWORD</b>	<b>5</b>
<b>EUROPEAN MEETING FOR SHOEPRINT/TOOLMARK EXAMINERS (SPTM 2001)</b>	<b>6</b>
<b>General</b>	<b>6</b>
<b>ENFSI Marks Working Group - the Business meeting</b>	<b>11</b>
<b>Program</b>	<b>12</b>
<b>Posters</b>	<b>16</b>
<b>Workshops</b>	<b>16</b>
<b>Exhibition</b>	<b>16</b>
<b>Abstracts</b>	<b>17</b>
THE INVESTIGATION OF MANUFACTURING MARKS ON NEWSPAPERS	17
RESTORATION OF ERASED NUMBERS	17
MARK EXAMINATIONS ON DIES PRODUCED BY MILLING PROCESSES	18
EXTRUSION MARKS IN PLASTIC BAGS	18
EXAMINATION/COMPARISON OF PLASTIC, TRANSPARENT BAGS	18
3D MEASUREMENTS ON EXTRUSION MARKS IN PLASTIC BAGS	19
A PHYSICAL MODEL DESCRIBING THE PENETRATION OF CASTING MATERIAL INTO NARROW GROOVES	19
EVALUATION OF SEVERAL TOOLMARKS CASTING MATERIALS - PRELIMINARY RESULTS	20
MARKS EXAMINATIONS SUPPORT BOMBING INVESTIGATIONS	21
DEATH CAME AFTER THE HOCKEY GAME	21
IMAGE PROCESSING STRATEGY AND AUTOMATIC COMPARISON OF MARKS	22
COMPUTERISED COMPARISON OF TOOLMARKS BY THE PAMIR SYSTEM	22
TOOLMARK COMPARISON AND IDENTIFICATION WITH METHODS OF THE FUZZY SET THEORY AND THE IMAGE PROCESSING	23
TOOLMARK COMPARISON AND IDENTIFICATION WITH PATTERN RECOGNITION METHODS BASED ON 3D SURFACE MEASUREMENT	24
AUTOMATED ANALYSIS AND COMPARISON OF STRIATED TOOLMARKS	24
FAST 3D MEASUREMENT OF FORENSICS AND TRACE ANALYSIS	25
MARKS SCALE COMMITTEE AND THE RANGE OF CONCLUSIONS	26
A REPORT ON THE AFTE THEORY OF IDENTIFICATION AND RANGE OF CONCLUSIONS FOR TOOLMARK IDENTIFICATION AND RESULTING APPROACHES TO CASEWORK	26
HOW TO EXPRESS PROBABILITY IN FOOTWEAR COMPARISON	27
A BAYESIAN VIEW ON THE INTERPRETATION OF SHOEPRINT EVIDENCE	28
DAMAGES ON THE BRAKE HOSE OF A CAR - AN ATTEMPT ON A PERSONS LIFE OR FAULT IN PRODUCTION	28
ANALYSIS OF PATTERNED INJURIES AND INJURY-CAUSING INSTRUMENTS WITH FORENSIC 3D/CAD -SUPPORTED-PHOTOGRAMMETRY (FPHG)	29
INVESTIGATION ON THE FREQUENCY OF USE OF MECHANICALLY COPIED CAR KEYS, PART II	29
IDENTIFICATION OF SUSPECTS AND LOCATION FROM KEYS	30
PRACTICE OF SHOEPRINT EXAMINATION IN LITHUANIA: REALITY AND EXPECTATIONS	31
ENHANCING AND LIFTING TWO-DIMENSIONAL GREASY FOOTPRINTS	31
FLUORESCENIN: A MORE USER-FRIENDLY REPLACEMENT FOR LUMINOL ?	32
UPDATE ON THE CONTINUING RESEARCH IN BAREFOOT MORPHOLOGY	32

USING GELATIN LIFTERS IN A HYDRAULIC PRESS FOR LIFTING SHOEPRINTS	33
IDENTIFICATION OF CHARACTERS USED TO EMBOSS LICENSE PLATES USED BY ROBBERS - THE HELP OF TRACABILITY IN THE MATTER OF LICENSE PLATES	34
WORKSHOP EARPRINT EVIDENCE: SCENE OF CRIME MARKS AND TAKING STANDARDS	35
METHODS FOR PHOTOGRAPHING SHOEPRINTS AND OTHER MARKS	35
<b>GENERAL COMMENTS ON THE SCALE OF CONCLUSIONS IN SHOEMARKS – THE NEED FOR A LOGICAL FRAMEWORK</b>	<b>37</b>
<b>MARKS WORKING GROUP E-MAIL DISCUSSION LIST</b>	<b>42</b>
<b>SEMINAR FOR EAR PRINT EXPERTS</b>	<b>43</b>

## FOREWORD

Dear readers,

The 4<sup>th</sup> European Meeting for Shoeprint and Toolmark Examiners took place on the 15<sup>th</sup> -18<sup>th</sup> of May in Berlin in Germany. Even though the meeting gathered together about 120 shoeprint and toolmark examiners from Europe and also outside Europe there are lots of readers of the IBSTE who did not participate the Berlin meeting. You will find the program and the abstracts of the presentations in this issue. Because the SPTM meeting is also the meeting for Marks Working Group (MWG) of the European Network of Forensic Science Institutes (ENFSI), the contents of the MWG Business meeting is also included.

The aim of the scale committee of the MWG to harmonise the conclusion scales has arisen a lot of discussions among mark examiners about the principles of interpreting the forensic science evidence. As the editor of the IBSTE, I am glad to offer you one add to the discussions. You will find a comment of Ph.D Franco Taroni and Professor Pierre Margot on the use of verbal scales in shoeprint evaluation in this issue.

In February 2001, the Institute for Criminal Investigation and Crime Science arranged a meeting for the earprint examiners in Zutphen in the Netherlands. The examiners having been on the two earprint courses arranged in 1998 and 1999 in Zutphen congregated for discussions and exchanging experiences on this rather new field of forensics. The report of that meeting is part of the contents of this issue.

Please find also the information about the new E-mail Discussion List for the members of the Marks Working Group.

Let me wish you nice, relaxing summertime.

Sincerely,  
Anja Ytti

## **EUROPEAN MEETING FOR SHOEPRINT/TOOLMARK EXAMINERS (SPTM 2001)**

### **GENERAL**

Anja Ytti

The 4th European Meeting for Shoeprint and Toolmark Examiners was arranged on the 15th - 18th of May in Berlin in Germany. The meeting took place about 20 km from the centre of Berlin in Kleinmachnow in the hotel Astron - in a very beautiful park like surroundings. The meeting was very successful and important in bringing together about 120 examiners from Europe and also outside Europe to listen to scientific presentations and to exchange experiences. Many thanks to Dr. Horst Katterwe and Dr. Torsten Ahlhorn and to the whole organising committee of the meeting for all the work they had done. All the arrangements worked very well.

The program of the Meeting and the abstracts of the presentations will be included in this issue. We hope to be able to publish at least some of the presentations as a whole in the IBSTE issues later this year.

The meeting began on Tuesday with the interesting presentation about manufacturing marks on a tabloid newspaper. It was a case presentation but the information the examiner had found out to solve that case is very useful for the same type of cases mark examiners can have in the future. Another presentation about manufacturing marks concerned dies produced by a computer-controlled milling process. The result of the comparisons made with the seven test-dies was that although there might be some differences on the dies milled directly one after another also other unique marks from sandblasting, damages etc. are needed for definite identification. One presentation was given about restoration of erased numbers on metallic objects.

There seems to be growing interest to plastic bag examinations among mark examiners. Three presentations were given about the manufacturing marks in plastic bags and about different kind of methods to compare single plastic bags to a known plastic bag roll. The polarisation method and the projection method was introduced and the newest method taken in use is the method of using non-contact laser profilometry with the 3D structure of several manufacturing defects. An interesting case presentation was given about bloody barefoot marks in a flat where a young woman had been murdered. By viewing the presentations on Tuesday, it was easy to realise that

the forensic field of the mark examiners is very large.

Before the official opening of the meeting on Tuesday morning the IAI (International Association for Identification) Footwear Certification Test was arranged. Sandy Wiersema from the FBI laboratory, Washington, was controlling the test. This was the second time when it was possible for European shoeprint examiners to take the test. The first chance was in the EAFS Meeting (European Academy of Forensic Science Meeting) in Cracow in Poland last September. One examiner from Sweden took the test in Cracow. Now in Berlin there were five applicants; one from Norway, three from Belgium and one from Finland. All applicants passed the theory part of the test and the practical cases will be sent to the applicants later in this summer. The applicants will be certified after passing the theory and the practical parts of the test.

Wednesday was mainly reserved for toolmark examiners. The program consisted mostly of presentations of image processing and automated toolmark comparisons -for example the PAMIR system (Pattern based Toolmark Identification and Recognition) developed by the Inbitec of the Fraunhofer Institute (Ingenieurburo fur intelligente Technologien GmpH). A system prototype has been realised and installed at the Landeskriminalamt in Berlin to conduct field tests with real samples and to get experience with system application.

An interesting presentation was given about a new image processing system that enables an automated extraction and matching of striations. To provide a high image quality, several images of the same surface area are recorded with systematically varying object distances and lightning constellations. The system is using a kind of parabola reflector to lighten for example firearm bullets or striated toolmarks to get one good image of the target.

For Wednesday afternoon the organisers had arranged a visit to the Fraunhofer Institute where the participants had a chance to take a closer look to the PAMIR system. We also got an overview of the different kind of scientific research and development work of the Fraunhofer Institute. They have developed systems for monitoring and control of road traffic for example to detect individuals and vehicles when approaching certain positions or determining the movement behaviour of individuals. They have developed also an automated analysis system that may be used for comparing signatures to be verified and the Finger-ID system. Fingerprint matching is the most widely used biometric technique in personal automatic identification. New applications

based on fingerprint matching include access control for high security installations and credit card usage verification.

Thursday - the third day of the meeting - was reserved for a panel discussion about the range of conclusions.

As a member of the scale committee of the ENFSI Marks Working Group I would like to use here an opportunity to give a little bit background information of the reasons to actual discussions about the scales of conclusions. It was decided in the 3rd SPTM meeting in Sweden to establish a scale committee of the ENFSI Marks Working Group. The aim of the scale committee is to harmonise the amount of different levels of conclusions and to define the basic principles for each conclusion level for the mark examiners. The idea to establish the scale committee was based on the two surveys arranged for the 1st European SPTM meeting in 1995 in Finland and for the 2nd SPTM meeting in 1997 in the Netherlands. Based on the results of those surveys, it was found out that there were variations in the conclusions of the same cases given by different laboratories. The scale committee members represent seven countries; Germany, the Netherlands, Belgium, England, Finland, Switzerland and Israel.

The scale committee members had their first meeting in Wiesbaden in Germany and it was decided to suggest the scale of six levels. The first proposal included levels of Identification, Highly Probable, Probable, Inconclusive, Probably not and Elimination. Soon afterwards the chair of the scale committee received a letter with comments to the suggested scale from Mr. Ian Evett, Mr. Christophe Champod, Mr. Graham Jackson and Mr. John Birkett from the Forensic Science Service, UK. They suggested in their letter that instead of using probability scale the Bayesian approach should be taken in use as the basis of giving conclusions: *"The crucial issue is whether or not forensic experts should draw conclusions about the probability (or certainty) of the hypothesis. ... Conclusion scales that use terms such as probable, very probable or exclusion, invoke clearly statements of the likelihood of the issue. We will show that such a statement is only logically possible when more than the scientific evidence is considered. Then the statement follows from the combined effect of the scientific observation and an assessment of the prior probability that encapsulates all the other evidence available to the court." ...*

*"Three principles of the Bayesian approach are: 1) Interpretation of scientific evidence is*

*carried out within the framework of circumstances. 2) Interpretation is only meaningful when two or more competing propositions are addressed. 3) The role of the forensic scientist is to consider the probability of the evidence given the propositions that are addressed."... "The concept of evidence is therefore relative and highly case-specific. It leads naturally to a verbal scale referring correctly to the strength of the evidence in favour of one proposition versus an alternative and not the probability of the issue."*

The letter has been published as a whole in the IBSTE issue Vol 6, No 3, October 2000.

The arranging committee of the 4<sup>th</sup> SPTM meeting had invited some statisticians in the panel discussion to give information about the Bayesian approach and to deliver information how to use the Bayesian approach to the interpretation of forensic science evidence. On the other hand, they had invited some representatives of mark examiners as non-Bayesians in the panel. They expressed their doubts about the use of the Bayesian approach in the interpretation and gave their comments why the Bayesian approach is not so suitable for mark examinations and thus shouldn't be taken into use.

There arose some good questions about the Bayesian approach like "Who is able to give the relevant information about the case the examiner needs?" and "Is for example the information of the collected shoeprint database in a certain country/city such an information that the shoeprint examiner can use when giving a conclusion about the case?" etc. Even though nearly the whole day was reserved for this topic we did not have a chance to hear the answers to those important questions. The introductions of the panel members revealed quite clearly the principles of the Bayesian approach and the doubts of the non-Bayesian representatives. The discussions after the introductions could have been the most interesting and informative part of the day but due to the tight schedule there unfortunately was no time for that. Anyway informal discussions about the conclusion scales and the Bayesian approach versus "the Classical approach" continued in the evening in the Banquet.

The Banquet for Thursday evening was arranged at the castle of Cecilienhof. After an hour boat trip in a sunny warm weather we came to the Havel where the castle was situated. The castle of Cecilienhof is famous because the Potsdam Conference was held there in the summer 1945. There the Allied heads of state, Truman (USA), Attlee (Great Britain) and Stalin (USSR) determined Germany's future under the Potsdam Agreement.

On Friday the ENFSI Marks Working Group business meeting was held first in the morning and then we continued the program scheduled for the fourth day of the meeting. There was not any special topic for Friday as it had been for the two previous days. There was, for example, an interesting presentation about the analysis of patterned injuries and injury-causing instruments with forensic 3D/CAD supported photogrammetry (FPHG). In tests and also in real cases it has been shown that even very small objects can be evaluated with great accuracy using FPHG. According to the presenter photogrammetry is routinely used by the traffic police in order to provide thorough accident reports and the photogrammetrically treated objects are normally as big as vehicles, rooms and bodies.

In the program, there was also a case presentation about the damages on a brake hose of a car and one presentation of copied car keys. Always interesting topics for the mark examiners are new enhancement methods. A developed method for enhancing and lifting two-dimensional greasy footprints was presented. The examiner had found that applying SPR reagent followed by the gelatin lifting had been the most effective method. Also a promising method for enhancing weak bloody prints with fluorescein was introduced. Fluorescein has some advantages compared to luminol which until this has been kept as the most sensitive reagent for invisible bloody marks. The advantage of fluorescein is its easier documenting compared to luminol. The examiner does not have to work in total darkness, photographing is easier and the reaction is longer than with luminol.

One presentation concerned Shoeprints and Forensic Intelligence - how to use databases as a help for serial crimes analysis with shoeprints. Before the closing remarks, an update on the continuing research in barefoot morphology was presented. Collecting of barefoot impressions is still going on and the research is hoped to be ready by the end of the year 2002. Then in the database there should be data about the barefoot impressions of approximately 20,000 volunteers.

The program of the 4<sup>th</sup> SPTM meeting included also three workshops and poster presentations and an exhibition where there were for example comparison microscopes of Projectina AG and Leica Mikrosysteme Vertrieb GmbH.

## ENFSI MARKS WORKING GROUP - THE BUSINESS MEETING

The business meeting for the ENFSI Marks Working Group took place on Friday morning. The chairman Dr. Horst Katterwe reported shortly about the business meeting in Cracow in September 2000 and the board meeting in Brussels in November 2000. He also gave information about the board meeting that was held on Thursday in Berlin.

In a board meeting in Berlin it was decided that Dr. Horst Katterwe will continue as a chairman of the board of the Marks Working Group. It was also decided to ask new board members from the ENFSI laboratories of Austria and Sweden. There are currently four board members of MWG since Gerrit Volckeryck from Belgium informed the board that he is not able to continue anymore as a member of the board.

In April 2001 John Birkett, FSS, sent a draft Statute to the ENFSI laboratories for approval. Voting slips were sent out to 36 ENFSI Institutes and 31 replies were received. 30 of these were in favour of acceptance. So the Statute had been approved by an overwhelming majority. The only institute to vote against gave reasons for its decision. Essentially they were unhappy about our policy on "guest members". The feeling was that the ENFSI Institute in the relevant country should have the right to say whether someone from another institute could join. The Statute recognises the differences between the full members (those from ENFSI Institutes) and the guest members. Although we welcome input and discussion from all members, any decisions taken will be by a vote involving only the full members.

Later this year the board will collect a list of the nominated representatives of each ENFSI organisation to be the primary contact person when any votes are to be taken.

The NBI Crime Laboratory in Finland will continue publishing of the Information Bulletin for Shoeprint/Toolmark Examiners (IBSTE). The editor of the IBSTE is Anja Ytti and Gerrit Volckeryck will continue as the co-editor. The "Wanted"-page is updated in the NBI in Finland by Sirkka Mikkonen and Anja Ytti.

According to the Statute for the Marks Working Group the regular scientific meetings will be organised for mark examiners, usually at two yearly intervals. Anyway the arrangements will take into account the triennial EAFS meetings (European Academy of Forensic Science). In a case the EAFS meeting and the SPTM meeting will be on a same year the EAFS meeting will

replace any Marks Working Group meetings that would otherwise have been organised in that year. So the next SPTM meeting will be arranged together with the EAFS meeting in 2003. The organising institute of the EAFS meeting is not yet known by the board members of the Marks Working Group. The board also left open the question about the date of the next SPTM meeting - will it be 2004 or 2005. Until this, two countries have informed the board to be volunteers to arrange the 5<sup>th</sup> SPTM meeting.

## PROGRAM

Tuesday the 15th of May

<b>Presentations</b>			<b>Author(s)</b>
8:30	11:00	Registration /IAI test	
11:00	11:30	Word of welcome	G. Vordermaier
		Marks Working Group	H. Katterwe
		Organising Committee	T. Ahlhorn
11:30	11:45	Certification IAI test	S. Wiersema
11:45	12:15	The investigation of manufacturing marks on newspapers	B. Craythorne
12:15	12:45	Restoration of erased numbers	<u>M. Feyer</u> M. Pohl H.Katterwe
13:45	14:00	Mark examinations on dies produced by milling process	<u>A.Körschgen</u> A.Koch B. Radke
14:00	14:30	Extrusion marks in plastic bags	K. Carlsson
14:30	15:00	Examination/comparison of plastic, transparent bags	<u>M. van Beest</u> I. Keereweer
15:00	15:30	3D measurements on extrusion marks in plastic bags	<u>V. Berx</u> J. De Kinder

15:45	16:25	A physical model describing the penetration of casting material into narrow grooves	H. Hardy D.Zaal I. Keereweer
16:25	16:45	Evaluation of several toolmarks casting materials - preliminary results	N. Sester <u>A. Jacquat</u> J.-C.Martin
16:55	17:15	Marks examinations support bombing investigations	R. S. Voorhees
17.15	17:40	Death came after the hockey game	<u>Ch. F. Belser</u> M. Wermuth

Wednesday the 16th of May

8:30	8:40	Image processing: strategy and automatic comparison of marks	H. Katterwe
8:40	9:10	Computerized comparison of toolmarks by the PAMIR system	G. Schreck
9:10	9:40	Toolmark comparison and identification with methods of the fuzzy set theory and the image processing	F. Drews
9:40	10:10	Toolmark comparison and identification with pattern recognition methods on 3D surface measurement	A. Lisounkin
10:20	11:00	Automated analysis and comparison of striated toolmarks	<u>M. Heizmann</u> F. Puente Leon
11:00	11:15	Fast 3d measurement of forensics and trace analysis	M. Liedmann <u>G. Frankowski</u>
11:15	12:45	Workshop	
11:15	12:45	Exhibition	
13:45	-	Bus transfer to the Fraunhofer Institute -Introduction to the Fraunhofer Institute -Presentation of the PAMIR system	

Thursday the 17th of May

8:30	10:00	MWG Board - Meeting	
8:30	10:00	Workshop	
8:30	10:00	Exhibition	
<b>Panel Session "Range of Conclusions"</b>			
10:00	10:15	Marks scale committee and the range of conclusions	H. Katterwe
10:15	10:45	Introduction to probability	M. Sjerps
10:45	11:15	Principles of evidence interpretation	G. Jackson
11:30	12:00	Alternative hypotheses and Bayesian theory	K. Nissen
12:00	12:30	Examination results and report conclusions of the FBI	<u>W. Bodziak</u> <u>S. Wiersema</u>
13:30	14:00	A report of the AFTE theory of identification and range of conclusions for toolmark identification and resulting approaches to casework	B. Moran
14:00	14:30	How to express probability in footwear comparison	R. B. Kennedy
14:45	15:15	Report conclusions in Northern Ireland	W. M. McDowell
15:15	15:45	A Bayesian view on the interpretation of shoeprint evidence	<u>M. Sjerps</u> I. Keereweer
16:00	17:00	ENFSI Marks WG-Business-Meeting (postponed to be on Friday morning)	

Friday the 18th of May

9:00	9:15	Damages on a brake hose of a car	Ch.Dlugos
9:15	9:45	Analysis of patterned injuries and injury-causing instruments with forensic 3D/CAD -supported photogrammetry (FPHG)	<u>W. Bruschweiler</u> M. Braun
9:45	10:00	Database for recognition and identification of shoeprint evidence	J. O'Brien
10:00	10:15	Investigations on the frequency of use of mechanically copied car keys, part II	<u>M. Braune</u> A. Körschgen M. Barten
10:15	10:45	Identification of suspects and location from keys	M.W. Tobias
11:00	11:15	Practice of shoeprint examination in Lithuania: reality and expectations	J.Juskeviciute
11:15	11:35	Enhancing and lifting two-dimensional greasy footprints	<u>Y. Shor</u> B.Glattstein S. Weisner
11:35	12:05	Fluorescein: a more user-friendly replacement for luminol?	R. Develtere B.Van Dijck <u>S. Lambrecht</u> <u>K.Van Dijck</u> K.Meyfroodt <u>G. Volckeryck</u>
12:05	12:25	Serial crimes analyses with shoeprints	A. Girod
12:25	12:45	Update on the continuing research in barefoot morphology	R. B. Kennedy
12:45	12:55	Closing remarks	H. Katterwe T. Alhlhorn

## POSTERS

- Photo-comparison of thumbs (upperside) O.Brockmann  
F.Gabelgaard  
P.Krat
- Using Gelatin Lifters in a Hydraulic Press  
for Lifting Shoeprints Y.Shor  
B.Glattstein  
T.Tsach  
A.Vinokurov
- Investigations on the frequency of use of  
mechanically copied car keys, part II M.Braune  
A.Körschgen  
M.Barten
- Shoeprint impression archieval and retrieval systems (SHARS) Ch.Feist,  
R.Knöfel  
G. Stanke
- Identification of characters, used to emboss  
license plates used by robbers - the help of tracability  
in the matter of license plates A.Desmarais
- Robust concept concerning shoeprint data exchange between different  
services including fast and error-tolerant search to combine crimes T.Ebding

## WORKSHOPS

- Workshop of earprint evidence: scene of crime marks and taking standards G.Volckeryck  
M.Moes
- Methods for photographing shoeprints and other marks K.Carlsson  
U.Lorentzi
- A new image processing system for  
automated analysis and comparison of striated toolmarks M.Heizmann  
F.Puente Leon

## EXHIBITION

GF Messtechnik GmbH  
Leica Microsysteme Vertrieb GmbH  
Projectina AG

## ABSTRACTS

### THE INVESTIGATION OF MANUFACTURING MARKS ON NEWSPAPERS

Brian W. Craythorne  
Forensic Science Northern Ireland  
Co Antrim BT 38 8 PL

Casework necessitated the investigation into how pages within a tabloid newspaper could be linked conclusively to each other. An investigation was made into marks left on newspapers by the manufacturing process and the uniqueness and significance of these marks in respect of connecting pages to each other. It was determined that printing presses can leave identifying features on the paper but that this was dependent on the efficiency and maintenance of the machine. Concerning the original problem, it was established that it is possible to connect conclusively a page of newspaper, by means of a physical fit, back to the tabloid it originated from. Each page of such a newspaper will have been separated from another page within the same newspaper during the manufacturing process. Other marks left by the manufacturing process are of benefit to a greater or lesser degree.

### RESTORATION OF ERASED NUMBERS

Dr. Manfred Feyer (1), Prof. Dr. Michael Pohl (2), Dr. Horst Katterwe (3)  
(1) Germanischer Lloyd Pruflabor, D-45478 Mulheim/Ruhr  
(2) Ruhr-Universität Bochum. Institut für Werkstoffe, D-44780 Bochum  
(3) Bundeskriminalamt, Kriminaltechnisches Institut, D-65173 Wiesbaden

Different kinds of objects are marked by the manufacturer or owner with numbers, letters or other marks for several reasons. On metallic objects this is achieved by hammering with the help of die stamps. In the case of theft or loss the new owner will usually try to erase the marks by filing or grinding. An overview is presented of techniques for restoration of marks in steel and light metals using chemical and thermal methods as well as cavitation impact and magnetic particle inspection.

## MARK EXAMINATIONS ON DIES PRODUCED BY MILLING PROCESSES

Aline Korschgen, Alfons Koch, Bernhard Radke  
Bundeskriminalamt Kriminaltechnisches Institut  
D-65173 Wiesbaden

Recently cases of Ecstasy-Tablets, jewellery etc, concerning stamped marks incl. dies were examined. Some of the dies were produced by milling processes. Therefore information about manufacturing marks (class and identifying characteristics) especially when using computer-controlled milling machines were gathered. Results of these examinations as well as examples from actual cases will be presented.

## EXTRUSION MARKS IN PLASTIC BAGS

Kjell Carlsson  
Stockholm Police Department  
S-10226 Stockholm

Plastic bags and garbage bags are - from our experience - very frequent evidence in different types of crime. Smaller plastic bags are very commonly used as packing material in drug crimes. In some murder cases we have found black garbage bags containing parts of human bodies. A common question is: "Does this plastic bag come from this roll of bags?".

The plastic bag shows very often a lot of marks from manufacturing. One example - maybe the most interesting - is marks from the extrusion tool. Some of these marks are near invisible, but we have found methods to make them visible and very useful for the comparison.

We will present these methods and show some interesting cases we have had in this topic. We will also discuss the level of our conclusions in these type of comparison.

## EXAMINATION/COMPARISON OF PLASTIC, TRANSPARENT BAGS

Marcel van Beest and Isaac Keereweer  
Netherlands Forensic Institute  
2280 GC Rijswijk, The Netherlands

In this presentation the emphasis will be on the examination methods of transparent bags. Some of the presented methods can also be used for other bags. Items to be discussed are:

- characteristics of a PTFE (Teflon) heating element
- comparison by means of the sealed edge of a bag

- the use of digital photography;
- comparison by means of the (sometimes visible) line-patterns in a bag.

The obtained knowledge and experiences with this way of examination has led to satisfactory results.

### 3D MEASUREMENTS ON EXTRUSION MARKS IN PLASTIC BAGS

Veerle Berx and Jan De Kinder  
National Institute of Criminalistics and Criminology  
B-1120 Brussels, Belgium

To investigate the surface of plastic bags, non-contact laser profilometry was used with a vertical resolution of 0,1 micron. Attention was paid to the 3D structure of several manufacturing defects, known from optical observation, such as the so-called 'arrow heads', 'fish eyes', pigment lines and extrusion marks. Measurements made from both sides of the bag show that the fish eyes and extrusion marks are due to a local variation of its thickness. The latter show up in the profiles as lines which are slightly inclined towards one of the axes of the bag. The translational symmetry was used to extract feature vectors (one-dimensional data) of which the characteristic value was analysed within a single scan area (30 by 2 cm). A single bag and within subsequently manufactured bags on a roll. The goal is to determine whether plastic garbage bags are part of the same roll which can be achieved by correlating these feature vectors. Different kinds of garbage bags were investigated made out of both low and high density polyethylene.

### A PHYSICAL MODEL DESCRIBING THE PENETRATION OF CASTING MATERIAL INTO NARROW GROOVES

Huub Hardy, D. Zaal, Isaac Keereweer  
Netherlands Forensic Institute  
2288GD Rijswijk, the Netherlands

In toolmark examination, castings of traces are frequently used for examination purposes. Yet, the technical literature only sparsely provides quantitative information on the accuracy by which the cast reflects the original trace. And the physical processes and substance properties involved in casting are hardly explored. Data available are from a qualitative nature, as experiments presented in a study by Katterwe<sup>1</sup>, showing no large differences between original and cast for the

---

<sup>1</sup> Katterwe H., Modern Approaches for the Examination of Toolmarks and Other Surface Marks, Forensic Science Review, Volume Eight, Number One, June 1996.

particular traces examined. From the same qualitative nature are the attempts of examiners to avoid the enclosure of air during cast making. They realize that air enclosure will affect the final result, but we were not able to find quantitative data on how air enclosure, once it has unnoticeably happened, influences the cast.

We came across the problem when developing three dimensional measurement techniques for toolmark traces down to the micron domain. In order to avoid disturbing light reflections, castings of the traces were used. This forced us to tackle the problem of the accuracy by which the cast reflects the original.

Major problems to be superseded concerned the acquisition of viscosity data of hardening material and the development of a model system to gain experimental data for the penetration of a substance into a groove. A special purpose design made in a computer chip laboratory enabled us to gain experimental data for grooves or slits within the 2-20  $\mu\text{m}$  domain. Also, a theoretical model was developed describing the casting material as a hardening, high viscosity fluid, penetrating into a narrow slit. When compared, experimental data and theoretical predictions turned out to be in fair agreement.

The theoretical model was then used to explore the influence of substance properties and of air enclosure. It turned out that air, once trapped, causes serious differences between cast and original. The theoretical model also offers some semi quantitative data for a procedure to avoid air enclosure.

## EVALUATION OF SEVERAL TOOLMARKS CASTING MATERIALS - PRELIMINARY RESULTS

N. Sester, A. Jacquat and J. -C. Martin  
Institut de Police Scientifique et de Criminologie  
Universite de Lausanne  
CH- 1015 Lausanne

Casting materials used for toolmarks in the Swiss police departments mainly come from dental medicine (StaSeal®). They produce quality impressions. However, there are other materials with different application and mixing methods which are sometimes easier to use. The aim of this project is to compare the StaSeal® with different casting materials. The choice of the comparison products was made among these used in dental medicine, archaeology, restoration and do-it-yourself. Five materials - two silicones and three polyethers - were tested on different supports and under several conditions. The comparisons were performed according to certain

---

parameters which are: ease of application, setting time, cast precision, (time) stability, cost and toxicity.

## MARKS EXAMINATIONS SUPPORT BOMBING INVESTIGATIONS

Raymond S. Voorhees  
United States Postal Inspection Service  
Dulles, VA 20104-1000, USA

The identification and association of components of Improvised Explosive Devices (IEDs) with items of evidence recovered from the suspect's home, workshop, or place of business often provide the most significant links between the bomber builder and the device. Many of these associations are effected using comparison microscopy and physical match techniques. The identification of tools used during the construction of such devices also plays an important role in the resolution of such investigations. This paper represents an overview discussion of how the United States Postal Inspection Service Crime Laboratory employs these classic marks identification analytical procedures to support its investigation of mail bombs.

## DEATH CAME AFTER THE HOCKEY GAME

Charles F. Belser and Martin Wermuth  
Forensic Dept. of the Kantonspolizei Zurich  
CH-8021 Zurich

After she visited an Ice-hockey game, starring her favourite team, a 31 year old bachelor was accompanied home by her ex-boyfriend and bid farewell shortly after midnight at her address. The following day the girl didn't show up at work and the local police was notified by concerned coworkers. Soon after entering the unlocked flat of the „missing" lady, the police found her murdered, lying in the kitchen of her apartment. Bloody footprints were found on the carpet and bed in the living room and after using chemical enhancement in the bathroom as well. All those detected prints were partial and lacking papillary lines, which didn't make the task of finding the culprit any easier.

Soon the investigators came up with several possible suspects and the question was asked, if according to the evidence, we could tell if only one person was involved in the crime, or one had to deal with more than one.

This presentation shows what problems faced in the examination process and what kind of information we could supply the investigating authorities with.

## IMAGE PROCESSING STRATEGY AND AUTOMATIC COMPARISON OF MARKS

Dr. Horst Katterwe (1), Michael Braune (1)

Dr. Torsten Ahlhorn (2), Wolfgang Grimmer (2)

(1) Bundeskriminalamt Kriminaltechnisches Institut, D-65173 Wiesbaden

(2) Landeskriminalamt PTU Berlin, D-12101 Berlin

The automatic comparison of marks is still a problem which must be solved to effectively support the toolmark examiners work. Nowadays powerful tools in the field of image processing and pattern recognition in combination with increasing performance of the computer technology are available to achieve this aim.

At request of the Forensic Science Institute of the Bundeskriminalamt (BKA) the Fraunhofer Institute for Production Systems and Design Technology (Fraunhofer IPK) in Berlin in cooperation with the Engineer's Office of Intelligence Technologies (INBITEC) in Strausberg carried out a feasibility study to test suitable analytical methods for computerized comparison of toolmarks.

For this purpose, toolmarks were produced under different conditions at the Forensic Science Institute Berlin. The surface profiles of the marks were measured with a laser surface scanner, with a 'MicroCad system' (threedimensional imaging device based on the principle of structured light), and attained as gray value images by light microscopy photography, respectively.

In addition to these methods the BKA asked Prof. Dr. Mesch (Institut für Mess- und Regelungstechnik, University Karlsruhe) for cooperation in the field of image processing strategy. The Institute in Karlsruhe / Germany developed a new image processing method (enhanced image obtained by fusion methods) and a new image processing strategy that enables an automatic extraction of signatures from striation patterns.

So, we are very proud getting the possibility to discuss with scientists of all the institute mentioned above during this "Workshop of Automatic Comparison of Marks".

## COMPUTERISED COMPARISON OF TOOLMARKS BY THE PAMIR SYSTEM

Gerhard Schreck

Fraunhofer Institut für Produktionsanlagen und Konstruktionstechnik

D-10587 Berlin

This paper presents a computer aided system for the comparison of toolmarks, called PAMIR (Pattern based Toolmark Identification and Recognition). The main objective of PAMIR is to

support a forensic examiner with an automated pre-comparison of toolmarks samples. The digital representation of samples are stored in a data base system, which enables a flexible management of toolmark attributes and comparison procedures. A set of data processing and comparison methods can be configured and adjusted to specific toolmark types.

The PAMIR system is a co-operative development of the Fraunhofer Institute for Production System and Design Technology (Fraunhofer IPK), Berlin and the company INBITEC GmbH, Berlin. It is requested by the Kriminaltechnisches Institut of the Bundeskriminalamt (BKA), Wiesbaden.

A system prototyp has been realised and installed at the Institut Polizeitechnische Untersuchungen of the Landeskriminalamt in Berlin to conduct field tests with real samples and gain experience with system application.

System architecture, main modules and application results are presented in this paper.

#### TOOLMARK COMPARISON AND IDENTIFICATION WITH METHODS OF THE FUZZY SET THEORY AND THE IMAGE PROCESSING

Frank Drews  
INBITEC GmbH  
Berlin

This paper gives a view of special methods used in the system PAMIR (Pattern based Toolmark-Identification and Recognition). These methods can be used to build a complete procedure for the identification of toolmarks or they can be combined with other components of the PAMIR system.

The problem of the pre-processing of data and/or pictures is very important for a succesful recognition. Special methods, for the filtering and straightening of toolmarks, were first tested and then added to PAMIR.

Fuzzy Classification methods were also applied to data pre-processing. The results of the Fuzzy Classification are filtered data without loss of precision.

With the data obtained by pre-processing, it is possible to recognise and identify toolmarks by applying special fuzzy matching operators and modified statistical methods.

The problem of toolmark recognition is characterised by many inaccuracies (i.e. the toolmark itself and measurement systems), so that the adding methods for "fuzzy" data is useful.

Such methods are able to analyse data obtained by laser measurement systems as well as by microscope photos.

## TOOLMARK COMPARISON AND IDENTIFICATION WITH PATTERN RECOGNITION METHODS BASED ON 3D SURFACE MEASUREMENT

Dr. Alexei Lisounkin  
Fraunhofer Institut für Produktionsanlagen und Konstruktionstechnik  
D-10587 Berlin

This paper focused on an automatic procedure for toolmark comparison and recognition based on the measurement of the toolmark surface micro-structure. The procedure is optimised for recognition of toolmarks with homogeneous one-dimensional pattern structure (toolmarks from leverage tools -screwdrivers, crowbars, etc.).

The procedure possesses three main steps: pre-processing / filtering of the surface measurement, toolmark information coding, and code comparison. The first step involves a multi-resolution. Wavelet analysis of the raw data which provides a toolmark profile that is stable, independent from background material as well as having stochastic errors smoothed out. The second step transposes the toolmark profile into a toolmark code. The last step performs a pattern-recognition-based comparison of toolmark codes and provides an expert with a "hit-list" of possible toolmark conformities in a storage (data base).

The procedure has been designed and implemented at Fraunhofer Institute for Production System and Design Technology (Fraunhofer IPK), Berlin, in the scope of the co-operation project with INBITEC GmbH, Berlin, the Institut Polizeitechnische Untersuchungen of the Landeskriminalamt in Berlin (PTU LKA), and the Kriminaltechnisches Institut of the Bundeskriminalamt (BKA), Wiesbaden. The prototype of the system has been installed at PTU LKA for testing and optimisation of the procedure.

## AUTOMATED ANALYSIS AND COMPARISON OF STRIATED TOOLMARKS

Michael Heizmann and Dr. Fernando Puente León  
Institut für Mess- und Regelungstechnik, Universität Karlsruhe (TH)  
D-76128 Karlsruhe

Current matching methods for striated toolmarks are often unable to provide the turnaround times and success rates that law enforcement demands. To approach this challenge, we present in this paper a new image processing system that enables an automated extraction and matching of such patterns. For this purpose, a signal model is proposed that allows a suitable description of the interesting characteristics of striated toolmarks. To provide for a high image quality, several images of the same surface area are recorded with systematically varying object distances

and lighting constellations. The images obtained are then combined to an improved result by means of appropriate sensor fusion techniques.

Based upon the signal model, the signal of interest is concentrated, and a compact representation of the grooves is obtained. To enable an efficient description of the relevant features even in the cases of deformed surfaces or curved striation marks, a straightening of the grooves is performed before. Following, a meaningful signature describing the information of interest is extracted using the whole length of the grooves. Finally, by comparing the extracted signature to another one, a metric measure is obtained. Thus, an objective evaluation of similarity, of the toolmarks is enabled.

The performance of the proposed strategy is demonstrated with a database of real striation patterns. After having achieved successful matching results with firearm bullets, we present promising results for the more complicated task of comparing curved toolmarks.

#### FAST 3D MEASUREMENT OF FORENSICS AND TRACE ANALYSIS

Matthias Liedmann, Dr. Gottfried Frankowski  
GFMesstechnik GmbH  
D-14513 Teltow

We will introduce the method of digital stripe projection using micro mirrors from Texas Instruments. With the method it is possible to acquire up to 100.000 3d-points in 1 second from your measurement object. The measurement field can be adapted to the size of your measurement sample. The system handling is very easy and can be used for a large amount of measurements in a short time.

With the right resolution you will get very detailed measurement results of scratches from different tools. The results can be used for the automatically classification of scratch patterns, comparison and role analysis. The measurement method can be used for different tasks. To demonstrate this possibilities we will show a selection of measurement results from different samples with different resolutions and different sizes. With the 3d alignment is it possible to align 2 measurement results with the same. This method make it possible to compare the microstructure from one sample with a reference object. The automatically 3d alignment will be demonstrated on the example of a growing beard on a human face.

## MARKS SCALE COMMITTEE AND THE RANGE OF CONCLUSIONS

Dr. Horst Katterwe  
Chairman of the Committee on Harmonisation of Conclusion Scales  
ENFSI Marks Working Group  
Bundeskriminalamt, Kriminaltechnisches Institut  
D-65173 Wiesbaden

A Scale Committee was established in the Marks Working Group in the Group's business meeting in Stockholm, June 1999. It was agreed that the aim of the committee would be to harmonise the conclusion scales for the marks examiners. The group consists of nine voluntary members representing seven countries.

After this establishment the Committee has arranged a meeting in Wiesbaden, in the spring of 2000, some draft documents have been produced. The Committee presented the first outcome of their work business sessions of the Marks Working Group in the EAFS Cracow 2000 meeting.

In July 2000 the Committee received comments to their spring documents from four forensic scientists of the Forensic Science Service (UK) with a number of arguments against the Committee. The Committee invited two Bayesianists (UK,NL) to a meeting in Brussels (Nov. 2000) to introduce their ideology.

As the idea of harmonising the conclusion scales was warmly welcomed by the members of the MWG in the 1999 meeting, the Committee (Belser, Birkett, Girod, Katterwe, Keereweer, Moes, Shor, Volkerryck, Ytti) is very proud to welcome in Berlin 2001 so many representatives in a forum for discussions about the range of conclusions: Bayesianists and Non-Bayesianists.

## A REPORT ON THE AFTE THEORY OF IDENTIFICATION AND RANGE OF CONCLUSIONS FOR TOOLMARK IDENTIFICATION AND RESULTING APPROACHES TO CASEWORK

Bruce Moran  
Sacramento County District Attorney  
Laboratory of Forensic Sciences  
Sacramento, California, USA

In 1992 the Association of Firearms and Toolmark Examiners Association (AFTE) adopted a theory of identification and a range of conclusions for toolmark identification. This theory of identification is based on subjective non-quantitative estimates of the amount of agreement in striated toolmarks. The examiner then draws on his or her experience and compares the agreement observed with what they have come to perceive as toolmark identifications. There is no actual numerical counting in this process. There are a growing number of examiners in the

United States that believe that clear and convincing scientific evidence exists to distinguish between a true striated toolmark identification and random striae matching. This requires counting groups of consecutive matching striae (CMS). Although all examiners "pattern match", especially during the initial searching phase of a toolmark comparison, this latter group actually counts groups of CMS when "minds eye" matching is achieved. This counting has its greatest utility when very limited quantities of striae are available for comparison. Numerical cut off criteria for striated toolmarks were posed in mid 1997 and has been subjected to much peer review and testing since then. The author will conclude by describing how he: 1) uses AFTE's theory of identification and range of conclusions and; 2) has extended the AFTE theory of identification by adopting numerical criteria (see AFTE Journal articles Vol. 32, No 3, Summer 2000, pg. 231 - 251 and Vol. 32, No 4, Fall 2000, pg. 326 - 331). For those who choose to adopt this objective approach, which is soundly based on scientific principles and research, it stands to reason that there is no need to describe subjectivity by statistical means in deciphering the difference between true identifications and non-identifications.

#### HOW TO EXPRESS PROBABILITY IN FOOTWEAR COMPARISON

Robert B Kennedy  
Royal Canadian Mounted Police  
Ottawa, Ontario, Canada KIA OR2

A footwear comparison, unlike a fingerprint comparison, lends itself to degrees of probability during the comparison process. While mathematical and statistical probability can only be done with class characteristics, levels of certainty can be expressed by using individualising characteristics and is dependant on the experience and training of the specialists. We cannot give mathematical or statistical probability with individualising characteristics (accidental characteristics) because possibility of that characteristic reoccurring cannot be expressed mathematically.

I will discuss the value of one simple mark on the outsole of a shoe, the value of different wear patterns and the subjective role they play in forming an opinion. This evaluation of degrees of probability can also apply to the forms of physical comparisons and allow us to give our true opinion when describing our conclusions. I believe that probability should have a limited number of levels - Could Have Made, Likely Made, Positively Made, Likely Did Not Make and Did Not Make. This conclusion will depend on the training and experience of the examiner.

I will also discuss the Bayesian Theorem and its influence on the footwear identification process. Although not currently used to any great extent for physical comparisons in North America, this approach is being discussed at length in the European forensic community.

#### A BAYESIAN VIEW ON THE INTERPRETATION OF SHOEPRINT EVIDENCE

Dr. Marjan Sjerps and Isaac Keereweer  
Netherlands Forensic Institute  
2288GD Rijswijk, the Netherlands

The Bayesian approach to interpreting forensic evidence has stimulated discussion in many areas of forensic science, such as DNA, glass, and fibres. We explore the application of the Bayesian framework to shoeprint examination and compare the Bayesian and the method currently used in the Netherlands. The Bayesian approach measures the strength of the evidence with the likelihood ratio (LR). We investigate how the numerator and the denominator of the ratio correspond to the current way of interpreting the results of shoeprint examination, and conclude that it fits rather nicely. A fundamental difference, however, is that in cases where the shoeprint examiner cannot be certain the current method results in conclusions about the probability that a shoe made a print, whereas the Bayesian method results in conclusions about the strength of the evidence. As a consequence, there is a difference in the wording of the conclusion but this is easy to overcome. We think that the Bayesian framework sheds a new light on interpreting shoeprint evidence, which may result in a different or more conscious use of information in casework and in new lines of research. Vice versa, shoeprint examination provides an interesting area of application and will stimulate thought in Bayesian evidence interpretation.

#### DAMAGES ON THE BRAKE HOSE OF A CAR - AN ATTEMPT ON A PERSONS LIFE OR FAULT IN PRODUCTION

Christian Dlugos  
Bayerisches Landeskriminalamt, Kriminaltechnik  
D-80636 Munchen

In January of the year 2000 a taxi driver came to swerve caused by a defect in the brake system. The reason of the fault was the loss of brake fluid through a leak in a damaged area of the brake hose. Because in this period a lot of robberies on taxi drivers took place, on supposed first to an attempt on a persons life.

The brake hose was dismantled by the competent police agency and sent to the laboratory of the Bavarian State Bureau of Investigation. It should be examined, which tool has cut the brake hose. Already at the first examination of the brake hose appears some doubt to the theory of an attempt on a persons life: some plane areas and typical rubber marks on the brake hose indicates a "natural abrasion". To support this hypothesis, the car was examined. There in the back right wheel case we discovered an outstanding fold rubbing on the installed brake hose. This fold corresponds to the damages on the brake hose concerning the dimensions and morphology.

This demonstrates, that the damages on the brake hose does not derives from an attempt on a persons life. This damages are a fault in the cars production.

#### ANALYSIS OF PATTERNED INJURIES AND INJURY-CAUSING INSTRUMENTS WITH FORENSIC 3D/CAD -SUPPORTED-PHOTOGRAMMETRY (FPHG)

Dr. Walter Bruschweiler, Marcel Braun  
Wissenschaftlicher Dienst - Stadtpolizei Zurich  
CH - 8004 Zurich

Forensic 3-Dimensional/Computer Aided Design supported Photogrammetry (FPHG) plays an important role in the field of the documentation of forensic relevant objects; particularly when a detailed 3D reconstruction is necessary. The method allows for example to examine a patterned injury and an alleged Injury-causing Instrument with respect to matching features. The objects to be evaluated have to be series-photographed in order to be evaluated virtually on the computer. These system (RolleiMetric) measures and calculates the spatial location of distinctive points on the object's surfaces and creates 3D data models of the objects. In a 3D/CAD program, the graphically portrayed volume models of the two objects are compared against each other.

#### INVESTIGATION ON THE FREQUENCY OF USE OF MECHANICALLY COPIED CAR KEYS, PART II

Michael Braune, Aline Körschgen, Marcel Barten  
Bundeskriminalamt, Kriminaltechnisches Institut  
D-65173 Wiesbaden

About the change of the surface of a copied car key (hard material - steel) depending on the frequency of use was reported during the SPTM-meeting in 1997. The surface of the key was investigated and documented after successive operations on a cylinder using a SEM. There was

no correlation between the n-th operation and the corresponding traces of use on the surface of the key.

Actually we make the same experiments using a car key made of German silver (Cu, Zn, Ni). The results of the investigations with this soft material will be presented.

## IDENTIFICATION OF SUSPECTS AND LOCATION FROM KEYS

Marc Weber Tobias, J.D.  
Investigative Law Offices Security Laboratories  
Sioux Falls, South Dakota 57109 USA

Keys can provide extremely valuable and complex information about suspects, perpetrators, victims, connected locations, how they were cut, and the locks they fit. The criminalist or investigator may be called upon to conduct a forensic analysis of locks and keys for many reasons. These are classified according to primary information that can be developed, and are discussed in detail by the author.

The following topics will be examined:

- Keys and how they were Cut
- Keys and Tool Marks
- Identification of Locks, Keys, Suspects, Victims, Locations, Vehicles, and Property
- Manufacturing Process
- Criminal association and terrorist file
- Queries Regarding Identification
- Basic Key Design
- Lock Manufacturers
- Key Blank Manufacturer
- Mechanisms
- Keyways
- Stampings on Key Head
- Key Codes
- Copy or Original
- Examination of Striae to Determine if Original or Duplicate
- Keys: Substance over Form

## PRACTICE OF SHOEPRINT EXAMINATION IN LITHUANIA: REALITY AND EXPECTATIONS

Dr. Janina J. Juskeviciute  
Department of Criminalistics  
Law University of Lithuania  
Vilnius 2057, Lithuania

In the report the criminality situation and the shoeprint examination problems in Lithuania are analysed. Two-three samples of the most interesting shoeprint cases are presented.

## ENHANCING AND LIFTING TWO-DIMENSIONAL GREASY FOOTPRINTS

Yaron Shor, Baruch Glattstein, Sarina Weisner  
Israel Police Headquarters, Div. of Identification and Forensic Science (DIFS)  
Jerusalem 91906, Israel

Enhancement of weak two-dimensional shoemarks is often necessary due to the poor image detail. The methods of chemical enhancement of footwear marks in dust and physical lifting methods such as gelatin or adhesive lifters to enhance visibility are well established.

Greasy or oily footprints may be found in various scenes of crime. This kind of footwear impression will not adhere to gelatin or to adhesive lifter. Cyanoacrylate followed by staining with BY40 is regarded in the literature as a reagent for chemical enhancement for oily or greasy footwear marks on smooth non-porous surfaces. In this study we have examined the possibility of using a Small Particle Reagent (SPR), Crystal violet (CV) and the indicator 3', 3'', 5', 5''-Tetrabromophenolphthalein ethyl ester (TBPE) as reagents for the enhancement of greasy or oily footwear marks on smooth surfaces. The performance of these reagents was compared to that of the Cyanoacrylate followed by BY40. The feasibility of lifting the enhanced marks was examined as well. It was found that applying SPR reagent followed by gelatin lifting is the most effective method.

## FLUORESCEIN: A MORE USER-FRIENDLY REPLACEMENT FOR LUMINOL ?

Renaat Develtere (1), Bert Van Dijck (2), Stefan Lambrecht (3), Karolien Van Dijck (4),  
Kurt Meyfrootd (3), Gerrit Volckeryck (3)

(1)Federal Police - Laboratorium voor Technische en Wetenschappelijke Politie - Kortrijk -Belgium

(2)Federal Police - Laboratorium voor Technische en Wetenschappelijke Politie - Gent -Belgium

(3)Federal Police - Laboratorium voor Technische en Wetenschappelijke Politie - Brussel -Belgium

(4)Katholieke Hogeschool Kempen - Department Gezondheidszorg en Chemie - Geel -Belgium

Luminol is already used for descades to detect bloodstains which are invisible to the naked eye. It's sensitivity is it' main advantage. There are however some disadvantages which make it difficult to use and document. In 1999, Rene Gelderman and Martin Eversdijk have improved the application of the luminol reagent and documentation of the visualised marks considerably. Despite these improvements, some of the disadvantages remain, notably the short lived reaction. Since the early 90's the Fluorescein technique is being used. The chemical reaction is basically the same as with luminol, but instead of the chemiluminescence of luminol we have fluorescence using an ALS. Also the reaction is longer. In this way it is easier to document the results. Our goal is to combine the sensitivity of luminol and the ease of documenting of fluorescein to get results which show enough detail in the enhanced marks to be able to identify them.

Tests are being done to optimise the formula of fluorescein and to compare it's sensitivity to that of luminol. At the SPTM meeting we will present the preliminary findings of our research project.

## UPDATE ON THE CONTINUING RESEARCH IN BAREFOOT MORPHOLOGY

Robert B Kennedy  
Royal Canadian Mounted Police  
Ottawa, Ontario, Canada KIA OR2

Forensic barefoot morphology is a discipline which deals with the comparison of the weight bearing areas of the bottom of a bare foot in order to establish a link between the bare foot of an individual and an impression found in mud, blood or inside of a shoe that has been matched back to a crime scene. Footwear impressions are quite often found at crime scenes and many times a match between a suspect footwear and the crime scene can be established, but it becomes necessary to establish the wearer of the footwear in order to link a suspect back to the shoe and hence back to the crime scene.

To establish the uniqueness of individual barefoot impressions, volunteered inked impressions has been collected and processed by scanning each set of impressions into a computer program that automatically orientate each impression, locate the 66 landmarks on each foot and calculate the measurements of the feet. The data is send to a central database, and each new entry is searched against all the barefoot impressions in the database. The research is showing that barefoot impressions are unique to an individual. After entering thousands of barefoot impressions in our database, no two feet have been found, so similar that identity can be mistaken.

To date we have collected barefoot impressions from approximately 9,000 volunteers (18,000 feet) and these are being added to the data base daily. Impressions are still being from volunteers and it is hoped that by the end of the year 2002 we will have impressions from approximately 20,000 volunteers (40,000).

The research is showing that Barefoot impressions are unique to an individual, however further research will be carried out to prove this hypotheses scientifically.

#### USING GELATIN LIFTERS IN A HYDRAULIC PRESS FOR LIFTING SHOEPRINTS

Yaron Shor, Baruch Glattstein, Tsadok Tsach, Asia Vinokurov  
Israel Police Headquarters, Div. of Identification and Forensic Science (DIFS)  
Jerusalem 91906, Israel

A method for lifting two-dimensional dust footwear marks on rough or porous surfaces, such as cardboard or cloth using a gelatin lifter in a hydraulic press, was examined. In cases where the level of roughness of the surface on which the shoeprints are found is high (such as Mazonit - compressed cardboard) or soft materials (such as thick cloth), better lifting was obtained by the press in comparison with the conventional method of placing the lifter on the shoeprints. In other cases the pree method gained results equal to those obtained from the conventional method. Based upon the results of the study, the authors are using the method in real cases, depending on the surface from which shoeprints are to be lifted. It is the author's intention to study the method for lifting shoeprints from other surfaces.

## IDENTIFICATION OF CHARACTERS USED TO EMBOSS LICENSE PLATES USED BY ROBBERS - THE HELP OF TRACABILITY IN THE MATTER OF LICENSE PLATES

Andre Desmarais  
Laboratoire de Police Scientifique de Lyon  
F-69134 Ecully Cedex

Last year, I have been designed by a judge, to determine if some license plates had been made in one garage or more. For that task, I received two sets of plates, seized on two cars. These cars had been used by men at the occasion of robberies, in Corsica island.

To compare with plates, I received also four sets of license plates, made in garages at the request of the police. These garages had been chosen because of the presence, on the plates, of references of manufacturing easily comprehensible.

At first, I identified one set of plates, seized on one car, with one set of comparison, made in one garage. The second set could not be matched with any of the comparison items. I noticed that the two items of this second test had not been made on the same press. Indeed, the pattern of the characters was different. Furthermore, the manufacturers of this two plates were also different. Two codes could be observed. The first code, referring to a list given by the Ministry of Transports designated the manufacturer. The second one, after a call to this manufacturer indicated with accuracy the date of manufacturing. The fact that the region where the events occurred was an isle was very interesting. Indeed, that day, only one garage received bare plates from this manufacturer.

Nowadays, I do not have any more information about this inquiry.

According to recent laws, manufacturers who sell license plates in France must have a special codification, able to identify the origin of a plate. In the future, it will be possible to determine with exactitude the name and the address of the person who buys a set of plates ... I am able to show some examples.

## WORKSHOP EARPRINT EVIDENCE: SCENE OF CRIME MARKS AND TAKING STANDARDS

Gerrit Volckeryck (1) and Michel Moes (2)

(1)Federal Police - Laboratorium voor Technische en Wetenschappelijke Politie - Brussel - Belgium

(2)Federal Police - Laboratorium voor Technische en Wetenschappelijke Politie - Eupen - Belgium

In recent years, the international forensic community has been talking a lot about earprints: A Frye hearing and a subsequent murder trial in the USA and three murder trials in the UK even made headlines in "normal" newspapers and TV shows. In all four of them earprints had been used as evidence for the prosecution and each time Cor van der LUGT from the Dutch College for Criminal Investigation and Crime Control was one of the expert witnesses. In co-operation with people from the National Training Centre in Durham (UK) the Dutch college organised two European Ear Identification Courses. Twenty examiners from different European countries attended it. In a workshop hands on training will be provided to look for, enhance, measure and lift scene of crime earprints. In the same way it will be shown to take standards from the ears of suspects or witnesses.

## METHODS FOR PHOTOGRAPHING SHOEPRINTS AND OTHER MARKS

Kjell Carlsson and Ulf Lorentzi

Stockholm Police Department

S-10226 Stockholm

We know from experience that different type of prints need different kind of lighting methods. We mean that the difference in result between using one method or another (for the same print) can be identity or not.

This workshop is divided into one part of slide presentation (results from various cases) and one part of practical demonstration,

Examples of methods we would like to show are following:

- Photography in "darkfield lighting" for prints on clear glass, prints lifted with transparent tape and prints on clear plastic film lifted with electrostatic technique
- Photography in low oblique light for prints on black gelatine lifters, prints on black-silver film from floor with electrostatic technique
- Photography in reflected light for prints on glossy surfaces and prints on black gelatin lifters
- Photography in UV-light for prints in blood
- Photography in transparent mirror for prints on glossy surfaces

## European Shoeprint Examiners are flying back home from Berlin



We sincerely hope to meet you again some day!

Strips reprinted from the "Nero" album "Windkracht 2000"  
with kind permission of Marc Sleen, author

## GENERAL COMMENTS ON THE SCALE OF CONCLUSIONS IN SHOEMARKS – THE NEED FOR A LOGICAL FRAMEWORK

Franco Taroni<sup>1,2</sup> and Pierre Margot<sup>1</sup>

<sup>1</sup> Institut de Police Scientifique et de Criminologie, University of Lausanne, Switzerland

<sup>2</sup> Institut de Médecine Légale, University of Lausanne, Switzerland

We have followed with great interest the discussion on the use of a verbal scale in shoeprints conclusions that appeared in volume 6 (2000)<sup>2</sup> and would like to add a comment on the different positions expressed. We must first state that we are in a complete agreement with remarks made by the Forensic Science Service, because undoubtedly, there is a real need to adopt a logical framework to present evidence in court and the Bayesian approach deals with such a necessity.

It seems to us that there are three aspects of interpretation concerning shoeprints on which comments may be reiterated:

- I. Scientists have to be convinced that uncertainties should be described numerically in terms of probabilities. In fact, since perfect knowledge does not exist, probability is basic to all action, decision or assessment under uncertainty. Probabilities obey laws which are essential for coherent inferences.
- II. Decision-making is a choice between actions or hypotheses. A person is faced with a decision problem whenever there is a choice between at least two courses of action. Moreover, in order to make a decision on an issue, assessments of background information (obtained prior to the analysis of forensic evidence) and of forensic evidence are needed. The scientist does not usually have access to the background information (at

---

<sup>2</sup> Champod C., Evett I., Jackson G., Birkett J., Comments on the scale of conclusions proposed by the Ad Hoc Committee of the ENFSI marks working group. *Information Bulletin for Shoeprint/Toolmark Examiners* 6 (2000) 3: 19-21; Majamaa H. Comments to the FSS comments. *Information Bulletin for Shoeprint/Toolmark Examiners* 6 (2000) 3: 19-21.

least in the adversarial system of justice) which is available to juries or judges (or to the expert in the inquisitorial system)<sup>3</sup>. Thus, the scientist is generally not able to assess correctly the odds prior to forensic evidence in favour of an issue. This means that the numerical statement (or the opinion) given by the scientist is not sufficient on its own to determine the final odds in favour of the issue (for example, the recovered shoe left the mark on the scene).

III. Likelihood ratios, as proposed by the Forensic Science Service, can be expressed using a verbal scale phrasing conclusions like “the evidence (slightly, strongly, very strongly, etc.) supports the prosecutor’s hypothesis against the defence’s hypothesis”<sup>4</sup>. This way of reporting does not provide an answer on the truthfulness of the hypotheses themselves, but only an answer on the degree of support for one hypothesis versus another in the context of the case. Other *LR*-verbal scales has been also proposed in specialised literature<sup>5</sup> and might be used to develop further such a concept.

Thus, forensic scientists should generally give the court an evaluation which illustrates the convincing force of the results<sup>6</sup> and this is inevitably linked with probability as a measure of uncertainty and with the likelihood ratio concept, simply because the scientist is generally not in a position to assess (or express an opinion on) the final odds in favour of an issue (hypothesis) due to the lack of information. A complete assessment must combine both the forensic statement and background information.

---

<sup>3</sup> Margot P., The role of the forensic scientist in an inquisitorial system of justice. *Science & Justice* 38 (1998) 71-73.

<sup>4</sup> Evett I.W., Bayesian Inference and Forensic Science: Problems and Perspectives. *The Statistician* 36 (1987) 99-105; Champod C., Evett I., Jackson G., Birkett J., Comments on the scale of conclusions proposed by the Ad Hoc Committee of the ENFSI marks working group. *Information Bulletin for Shoeprint/Toolmark Examiners* 6 (2000) 3: 19-21.

<sup>5</sup> Aitken C.G.G., Taroni F., A verbal scale for the interpretation of evidence. *Science & Justice* 38 (1998) 279-281.

<sup>6</sup> Kaye D.H., Proof in Law and Science. *Jurimetrics Journal* 32 (1992) 313-321.

This distinction of roles is generally not respected in literature and practice (see for example, verbal scale proposed in fibres evidence). Another example are the verbal conclusions proposed by the Ad Hoc Committee of the ENFSI Marks Working Group. Notably the group proposed: (1) Identification, (2) very probable, (3) probable, (4) non conclusive, (5) probably not, and (6) elimination. These conclusions offer the court an incorrect answer if they are based only on scientific examination to a question the court is interested in<sup>7</sup>. These conclusions are inappropriate for the main reason that the scientist has assessed the final odds (he/she makes a statement about the final odds on an issue) without knowledge of the background information on the specific case. In a Bayesian language, the Committee's verbal scale are statements on final probabilities for a hypothesis of source of the shoe mark. They are not a likelihood ratio. Unfortunately, these conclusions make comments on the truthfulness of the hypotheses themselves.

In conclusion, let us express a brief remark on 'Comments to the FSS comments' proposed by Majamaa<sup>8</sup> even if we support his last suggestion that all the Working Group Chairmen should be officially approached to discuss the introduction of the Bayesian framework and inviting them to participate in a general the debate<sup>9</sup>. In fact, we believe that when uncertainty does exist (and it exists in every forensic science field), and a statistical approach is possible, then this approach is the best one available since it offers an index of the uncertainty based upon a precise and logical

---

<sup>7</sup> Robertson B., Vignaux G.A., *Interpreting Evidence - Evaluating Forensic Science in the Courtroom*. John Wiley & Sons, Chichester (1995).

<sup>8</sup> Majamaa H. Comments to the FSS comments. *Information Bulletin for Shoeprint/Toolmark Examiners* 6 (2000) 3: 19-21.

<sup>9</sup> The ENFSI DNA Working Group has already approached the discussion on evidence evaluation, see for example: Taroni F., Lambert J., Fereday L., Werrett D., *The evaluation and the presentation of forensic DNA evidence in European laboratories*. European Network of Forensic Science Institutes – DNA Working Group, Technical report (1999), presented at the Madrid (Spain) meeting.

line of reasoning<sup>10</sup>.

In conclusion, it should be specified that the likelihood ratio in the Bayesian framework has been introduced in the forensic context at the beginning of last century (1908) during the Dreyfus case to assess Bertillon's conclusion on the *bordereau* (document examination)<sup>11</sup>. Therefore, it is really a shame that such an approach to evidence evaluation and interpretation is still viewed with scepticism and as a novelty in numerous field of scientific evidence. This is so despite that for about twenty years, the evaluation of trace evidence (DNA, glass, fibres, etc) in specialised scientific literature has been associated with such a perspective.

### ***Appendice***

The essential of the Bayesian approach is briefly reviewed because it is especially useful with scientific evidence evaluation and interpretation<sup>12</sup>. The evidence,  $E$ , is a combination of two pieces of information; for example, observations on the recovered marks (the transfer trace) and observations associated with a suspect (mark from a known shoe or a control material). There value of these observations has to be assessed.

Bayes' theorem permits the decision-maker the revision based on new information ( $E$ ) of a measure of uncertainty about the truth or otherwise of an issue (hypotheses  $H_1$  or  $H_2$ ). The theorem shows how to combine prior, or background information ( $I$ ) with new data to give posterior probabilities for particular outcomes or issues.

---

<sup>10</sup> Kingston C.R., Kirk P.L., The use of statistics in criminalistics. *Journal of Criminal Law, Criminology and Police Science* 55 (1964) 514-521 ; Evett I., Criminalistics : the future of expertise. *Science & Justice* 33 (1993) 173-178.

<sup>11</sup> F. Taroni, C. Champod, P. Margot, Forerunners of Bayesianism in early forensic science. *Jurimetrics Journal* 38 (1998) 183-200.

<sup>12</sup> Aitken C.G.G., *Statistics and the Evaluation of Evidence for Forensic Scientists*. John Wiley & Sons, Chichester (1995).

Let  $O(H_1 | I) = P(H_1 | I) / P(H_2 | I)$  be the ratio of the probability of an issue  $H_1$  to the probability of its complement  $H_2$ . The model allows one to alter a priori odds in favour of  $H_1$ , in the light of new information, to obtain a *posteriori* odds,  $O(H_1 | I, E) = P(H_1 | I, E) / P(H_2 | I, E)$ , on the issue, through simple multiplication by the likelihood ratio (*LR*),  $P(E | H_1, I) / P(E | H_2, I)$ .

More explicitly:

$$\overbrace{O(H_1 | I, E)}^{\text{Posterior odds}} = \underbrace{O(H_1 | I)}_{\text{Prior odds}} \cdot \underbrace{\frac{P(E | H_1, I)}{P(E | H_2, I)}}_{\text{Likelihood ratio}}$$

The likelihood ratio measures the value of the evidence in terms of a pair of hypotheses, indicating if the given set of observations (characteristics observed on the shoeprint mark and on the mark of the control material) supports one hypothesis,  $H_1$ , more than the other,  $H_2$  (prosecution versus defence). The concept of evidence is therefore relative: it shows how observations should be interpreted as evidence for  $H_1$  vis-à-vis  $H_2$ , but it makes no mention of how those observations should be interpreted as evidence in relation to  $H_1$  alone<sup>13</sup>.

---

<sup>13</sup> Royall R.M., *Statistical Evidence - A Likelihood Paradigm*. Chapman Hall, London (1997).

## MARKS WORKING GROUP E-MAIL DISCUSSION LIST

From the very beginning, it has been the goal of the Marks Working Group to promote communication and discussion between its members. The SP/TM meetings, IBSTE and the MWG website have been used for this purpose up to now. We're not planning to abandon those ideas. On the contrary : We're proud to offer you a fourth possibility : an e-mail discussion list. Since most of the people nowadays have an e-mail address, or at least have access to the internet, the MWG board thought it would be a good idea to start an e-mail discussion list. It's a fast, cheap and versatile means to discuss with a lot of people on one or other topic.

Some of you might be acquainted with e-mail groups. For those who aren't : a short description on how e-mail groups work :

You have to subscribe to the list, which can be done by :

- replying to the invitation we will send to all the people of the SPTM community of whom we know the e-mail address.
- Subscribing on-line while visiting the e-mail group's home page at [http://groups.yahoo.com/group/ENFSI-Marks\\_working\\_group](http://groups.yahoo.com/group/ENFSI-Marks_working_group)
- (only if you're not able to use one of the above mentioned possibilities) send an e-mail to [Gerrit.volckeryck@village.uunet.be](mailto:Gerrit.volckeryck@village.uunet.be)

However, we have chosen to have a "closed" e-mail group, which means that your application has to be approved. People being known to belong to the SPTM community will be approved without further questions. Others will be asked to introduce themselves.

This introduction will be sent to all the members. If no one opposes to the new member, his application will be approved.

When you send a message to the group's e-mail address : [ENFSI-Marks\\_working\\_group@yahoogroups.com](mailto:ENFSI-Marks_working_group@yahoogroups.com) , it will automatically be forwarded to all the members. Any reply by one of the members of the list will be distributed in the same way. In this way we can have real discussions (about conclusion scales, for instance), share information and (professional) jokes, etc. All the messages coming from the group will be easily recognised in your mailbox by their tag [ENFSI-Marks\_working\_group].

All the messages will be filed at the group's home page. So even if you unsubscribe for some time (during a holiday, for instance), you can view the messages that were sent during that time on the home page. There's also some space available to upload files (photographs, articles, ...) that are too large to attach to an e-mail. On a separate page you can add links to interesting websites.

We're already looking forward to meet you there!

## **SEMINAR FOR EAR PRINT EXPERTS**

I.C.R. Zutphen – the Netherlands 7-8 February 2001

Gerrit Volckeryck

On 7-8 february 2001, the Institute for Criminal Investigation and Crime Science in Zutphen, the Netherlands, organised a Seminar for Ear Print Experts. Forensic examiners from all over Europe attended : England, Scotland, Ireland, Norway, Finland, Sweden, Poland, Switzerland, the Netherlands, Belgium and Spain. Most of the attendees had been taking one of the international earprint courses in 1998 or 1999 at the same institute. The goal of the seminar was to give an update on new developments, insights and research projects to all of the experts. Equally important was the progress each of the participants had been making in his/her own country over the last few years. And then there were, of course, the informal contacts over a glass of Belgian beer to discuss on small problems and tips to solve them.

Cor Van der Lugt started with an update on the American Kunze-case, which had been provoking a Frye-hearing on earprint evidence in the U.S. some years ago. Ever since then earprint evidence has been the talk of the town. Discussion on the internet and in magazines, on conferences and in the media were the result. A very intensive opposition campaign by André Moenssens and some co-workers resulted in a retrial of the Kunze-case. This new trial will be held later this year.

## Identification of ear images

A second controversial case was the identification of an ear of a robber who had been videotaped during some robberies. Even though the man had been masked, his ear(s) weren't. Cor Van der Lugt was asked to do a comparison and he concluded very strongly towards an individualisation. Experts of the Dutch National Forensic Laboratory opposed to this conclusion. André Hoogstrate, a statistician from this lab put up a blind test in which identification experts (not necessarily trained in earprint comparison) and laymen had to compare video-images of ears. 22 people were videotaped at 2 gas-stations as masked "offenders", masked and unmasked "suspects". The VHS tapes were digitised, only retaining the ears for comparison purposes. During the tests sets of 2 films were displayed on a computer screen, requiring two answers from the respondents:

- Is there enough information in the video to individualize based on the ears?
- Are these films of the same person?

This test showed there is information about the ears in the images : the respondents perform better than could be expected from chance. Moreover, identification experts can better decide



whether they have sufficient information and their results are notably better than those of the non-experts. During the second day of the seminar the attendees were asked to perform the same test. Their results were better than those performed earlier, although almost without exception the earprint examiners indicated that there was insufficient information in the images to individualise the ears.

After this test, the original images of the real robberies were shown. It must be pointed out that, although the videotapes for the tests were made on the same locations and with the same equipment as those of the robberies, the quality of the images of the test – probably due to the digitalisation process – was much poorer than that of the original robbery tapes. The latter showed much more information about the ears of the videotaped people than the first. Therefore the results of the test – though quite interesting – can't be compared directly to the conclusions which were reached by the experts in the robbery case.

André Hoogstrate, a statistician of the Dutch Forensic laboratory talked about earprints and statistics and validation. Furthermore he proposed an "AFIS"-like database for earprints to be

used in the future. He also did some extensive explaining about the “earimage”-test he put up (see above).

### **Functional Pressure**

George Maat, an anthropologist of Leiden University in the Netherlands, introduced the concept of “functional pressure”. While listening to a door or another object in order to hear what’s happening on the other side of it, people try to close the auricle to the door to use the latter one as a second tympanic membrane. In doing so, it will have two consequences :

- It will enhance the sound (closing the auricle)
- It will limit the vibrations of the object (pressure against the object)

The listener will always try to find the optimum balance : the functional pressure, which is high enough to close the auricle but not too high in order not to deaden the vibrations (=sound) of the door. The functional pressure is individual and remains the same over a long period of time. Therefore earprints made by the same person will have only slight variations.

In the same lecture George Maat did some explaining on a research project on classification of earprints. Most of the time we will have an imprint of tragus, antitragus, crus of helix, antihelix and helix rim. Some measurements are being taken for classification. They seem to have some things in common with the Iannarelli-system. The anti-helix can be a good basis for classification. It will also be a good parameter for functional pressure.

He also pointed out that some skin creases can be used to assist in identifications of earprints :

- In between the lobe and tragus on one hand and the cheek on the other hand
- On the helix-rim
- On the antihelix

### **Database**

Julie Edgar of the National Training Centre in Durham (U.K.) made an update on the Durham reference database. The new version of the EarPrint Database System is being developed by a software company (WPC Software Ltd, Keynsham Bristol) for the NTCSSCI and the ICR. The database is being conceived for the Durham reference earprint collection. No attempt has been made up to now to convert it to a database that can also handle a scene of crime collection. One of the problems to use this kind of database might be the privacy regulations in different countries.

## **International**

Each of the participants made a small presentation about the progress made in his/her own country. Most of them made considerable efforts in training policemen and crime scene examiners. During these training sessions they focussed on awareness, lifting techniques and comparison prints. This resulted in the first real cases in countries which didn't have an earprint history up to then. Other countries talked about identifications that had been made over the last few years. In one special Swiss case (Canton Geneva – Laurent Canel) one single serial burglar was involved in over 200 cases where earprints had been recovered over a period of about 10 years. Recently a suspect has been apprehended. More than 200 marks, of which some of them were 10 years old, were identified. Still others did some research, like the development of a control system for pressure while taking comparison earprints, using a scale (Poland) and enhancement methodology (Scotland).

## **Projects – progress - future**

- Dutch SENTER project
  - time schedule: 09-2000/09-2001
  - Guide Software, NFI, ICR/LSOP, LUMC, TNO-TPD, TNO-FEL
  - Focus: detection techniques, image processing, search tools.
- EU project
  - time schedule: 09-2001/09-2005
  - Guide Software, NFI, ICR/LSOP, LUMC, TNO-TPD, TNO-FEL, Univ. Glasgow, Univ. Rome, Univ. Huddersfield, NTCSSCI.
  - Focus validation.
- Cor Van der Lugt's textbook on earprint identification is ready for publishing
- A "closed" e-mail discussion list for earprint examiners has been started (see [www.groups.yahoo.com/group/earprint\\_examiners](http://www.groups.yahoo.com/group/earprint_examiners))

A webpage on earprints will be added to the "Marks Working Group"-site



**ISSN 1455-4194**