

Information Bulletin for Shoepprint/Toolmark Examiners



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Foreword

Dear readers,

Time flies! Within a few weeks we all can celebrate the New Year 2003.

I hope many of you have already made plans to participate the EAFS2003 meeting in Istanbul, Turkey. You will find the important web addresses from the page 26 of this IBSTE issue. From those web sites you can get the latest information about the meeting. Please remember also that the dead line for sending the abstracts for oral or poster presentations is on the 1st of February 2003. The deadline for early registration is on the 1st of April.

During this year there has been articles in every IBSTE issue concerning Bayesian interpretation in shoeprint examinations versus the use of "traditional" propability scale. There is no exception this time either. You can read the comments of the chairman of the scale committee of Enfsi Marks Working Group, Horst Katterwe, to the article published in previous IBSTE. Also you can read the letter of Christophe Champod and Graham Jackson sent to the scale committee of MWG in last February. The discussion is still very actual. The scale committee of MWG will have its next meeting in January in Vienna. The report of the meeting will be published in the next Bulletin.

In this IBSTE issue you can find also a short description of the IAFS2002 meeting in France where one of the workshops arranged was Footprint Evidence.

I wish you all a nice and peaceful Christmas time and all the best for the New Year 2003.

Sincerely,
Anja Ytti



16th Meeting of the International Association of Forensic Sciences (IAFS)

Anja Ytti

The 16th IAFS meeting was held in Montpellier, France in September 2-7, 2002. The conference was taking place in France for the first time. There were participants from 68 countries all around the world and 65% of the participants were Europeans. The program included eight Plenary Conferences, nine Breakfast Seminars, two Panel Sessions, four Continuous Education Conferences, five Special Sessions, about 330 oral presentations, 337 Poster Presentations and 15 Workshops. One of the workshops was arranged under the title "**Footprint Evidence**".

The Scientific Committee of the IAFS had asked me to be in charge of arranging the "Footprint Evidence " workshop. Within the very limited time I had in use to plan this workshop I sent the invitation letters to the forensic examiners and podiatrists I know working on this special field in Europe and in Canada and in USA. In the invitation letter I asked them to give a presentation in this Footprint Evidence workshop. After receiving several positive answers and I was able to make the program for the workshop.

All those 15 workshops were arranged on the 2nd and 3rd of September whilst the whole other program of the meeting started on the 4th. This was a very good arrangement because this way all the attendees of the whole day workshops had also a chance to follow the whole program of the meeting.

In the program there was not special topic for Marks examinations this time. That was the most obvious reason for quite a few presentations of marks examinations in generally. There were anyway interesting presentations concerning Bayesian interpretation, bloodstain pattern interpretation and toolmark examinations like for example "The cut characteristics of an optical fibre cable by different tools" done in the laboratory of the HSA, Singapore.

The next IAFS Meeting will be held in Hong Kong, China in August 2005.

SOME ABSTRACTS OF THE PRESENTATIONS AT THE MEETING

BAREFOOT IN LONDON

Birkett, John

Objective: This paper looks at the types of examination carried out in London with respect to bare foot impressions.

Nature of the study: A survey of recent cases gives background information about the cases of this type done here and the methods used for comparisons.

Materials and Methods: Bare foot impressions at scenes of crimes and foot impressions inside footwear are recorded using photography under different lighting conditions and can also involve chemical enhancement. Other wear and distortion to the soles and uppers of footwear items may also be important in the comparison. Impressions of the suspect's feet may also be taken using various methods.

Results: Comparison of barefoot impressions of a suspect and those at scenes of crime can show significant similarities or differences to link or eliminate the person. Impressions inside footwear as well as wear and creasing to the footwear itself can also show these similarities and differences.

Conclusion: It is possible to establish links between barefoot impressions at the scene of a crime and the person suspected of leaving them. It is also possible to establish links between different items of footwear with respect of the regular wearer.

COMPARISON OF BAREFOOT IMPRESSIONS TO CRIME SCENE IMPRESSIONS

Robert B Kennedy

Key words: Bare foot, Insole, Outsole

Statement of Hypothesis: Barefoot impressions are unique to the individual

This paper has two objectives.

- (1) To show the uniqueness of the pressure areas on the bottom of the bare foot.
- (2) To show how a barefoot impression can link a suspect to a crime scene, by comparing the barefoot impressions, found inside of footwear that has been identified back to the crime scene to the barefoot of a suspect.

Forensic barefoot morphology 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 another 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 crime scene.

As a result of several murders which took place in New Brunswick in 1989 and the necessity of linking the suspect to a pair of work boots that had been identified back to one of the murders, a research project was set up to study the uniqueness of barefoot impressions.

It is a known fact that anyone committing a crime, must walk to, from, and around the crime scene, leaving telltale footwear impressions, and at times, barefoot impressions. There are a number of instances where the examination of a footprint, recovered at a crime scene, can be extremely important. The most obvious example is the comparison

of a suspect's bare foot with that of an impression found at a crime scene in mud, blood or some other medium. Often overlooked, but equally important, is the possibility of eliminating a suspect whose feet do not match the crime scene impression. Also dependant on the uniqueness of a barefoot impression is the technique of matching a foot to the impression found on the inside of a shoe. Crime scene footwear impressions, having several accidental characteristics, can be positively identified to the shoes that made the impression at the crime scene. If a suspect is not found in possession of this footwear, it may still be possible to link the suspect to the footwear and hence to the crime scene. This is accomplished by comparing the wear areas on the out sole of the shoe, the wear areas, caused by the tops of the toes, on the inside uppers of the shoe, and the darkened and indented sweat areas found on the insole of the shoe, to the shoes the suspect may have been wearing at the time of arrest and with the inked barefoot impressions taken from the suspect.

UPDATE ON THE CONTINUING RESEARCH IN BAREFOOT MORPHOLOGY

Robert B Kennedy

Key words: Bare foot, morphology, footwear, and weight bearing areas

Statement of Hypothesis: Barefoot impressions are unique to the individual

To prove the hypothesis that barefoot impressions are unique to an individual a computer database has been constructed, using inked barefoot impressions from volunteers.

If plantar friction ridge detail is observed, then a positive identification can be made in exactly the same fashion as a fingerprint identification. This study, on the other hand, is aimed at comparing the overall foot morphology as presented in a two dimensional inked barefoot impression. For the purpose of this study only the two-dimensional shape of the foot contacting a flat surface is being used. The three-dimensional form is

only considered when making the actual physical comparison between suspect and crime scene impressions.

It should be emphasized that this computer research is based solely on various distance measurements and is only used to prove the uniqueness of the bare foot and not used as a search medium for crime scene impressions.. A computer database program is used to make the initial searches based on a series of measurements of the volunteered inked impression. Any "hits" that are generated by the computer search, are examined by a Forensic Identification Specialist by examining the actual inked impressions. At that time, the detailed morphology of the foot is compared before a conclusion is reached. In this manner, the study mimics an automated fingerprint identification system (AFIS) where the computer locates and reduces the possible number of respondents which are then compared and confirmed by a human expert.

The Database has been automated and after each impression is traced on acetate, that impression is scanned into the computer, which orientates each impression and find the centre line of the foot. Land marks are located on the foot (ie centre of heel, centre of each toe, width of ball of foot and with of heel) and measurements are calculated between each landmark. A total of one hundred measurements are calculated for each foot which is extracted by the program and entered into the data base. Each impression is then searched for any matching feet in the collection.

To date we have collected barefoot impressions from approximately 11,000 volunteers (22,000 feet) and these are being added to the data base daily.

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

DEATH CAME AFTER THE HOCKEY GAME

Charles F. Belser

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 at her address shortly after midnight. The following day the girl didn't show up at work and the local police was notified by concerned co-workers. 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 on 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 perpetrator 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 if the investigators had to deal with more than one.

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

FACTORS INFLUENCING THE DIRECT IDENTIFICATION OF A HUMAN BEING ON THE BASES OF FOOTPRINTS

Krzysztof Borkowski

Specialist literature defines "foot of every human being" as a unique one, and therefore obtaining of the same foot impression from two, different individuals is practically impossible.

Experts (Quantico, February 1998) admit categorical identification in relation to bare footprints as well as inside a shoe. However, in all forensic examinations, categorical opinions are determined by individual, and not group characteristics, as required by identification theory.

The main problem in footprint examinations is to indicate what an individual feature is. Since 1999, a "Stopa" research study, under the auspices of the Scientific Research Committee, has been conducted in the Central Forensic Laboratory of the Police. Our experience drawn from the study allowed to develop a research method connected with identification of footprints, starting from setting up an essential working site, determination of the scope of reference (comparative) material generation, up to the use of electronic podometer. The presentation shall include practical casework examples.

THE STUDY OF SHOE WEAR PATTERNS: HOW VALUABLE ARE SHOE WEAR PATTERNS IN FORENSIC IDENTIFICATION?

Dr. Wesley Vernon

Attempted use has been made of shoe wear patterns in forensic identification in the past, but due to problems which occurred, they are now treated sceptically, with attempted interpretation falling into disuse. A study has taken place in which shoe wear patterns are considered again in a forensic identification context. Podiatrists with diagnostic expertise in shoe wear pattern interpretation participated in this study, which commenced with a Delphi consensus technique. In the past, clinicians have believed that known foot pathologies would produce characteristic shoe wear patterns and that this apparent fact could have value in identification. Early findings in the study suggested that this was a misconception, although an instrument to facilitate the description and comparison of shoe wear patterns was created.

A following questionnaire to further investigate podiatrists experiences in this area led to the production and validation of a new paradigm to explain the relationship of factors influential in shoe wear pattern production. Shoe wear patterns still have limited use in identification as it has now been shown that they cannot be interpreted in isolation. The study, however demonstrated a means of describing and comparing wear patterns and that a contextual relationship exists with the shoe owner, thereby strengthening their value as a class characteristic, where the owner is available for examination. This improved understanding, should prevent repetition of the mistakes of the past, where shoe wear patterns are concerned.

THE DEVIOUS ART OF LEGAL OBFUSCATION RE 1974 YOM KIPPUR MURDERS CONNECTICUT USA

Dr. Norman Gunn

Sub Title : How a forensic podiatrist's knowledge and experience defeated the defence lawyers` attempt to thwart the cause of justice.

This is a history and anatomy of a double murder case covering an unheard of four court trials. From the date of the murders to conviction and sentencing equalled twelve years. Circumstantial evidence, which brought about an arrest and an incarceration had been nullified. The only other evidence was bloody shoeprints three and a half years old. This Canadian forensic podiatrist accurately read analysed and explained the killer's lower limb and foot pathology needed to make the imprints. Taken back into custody and radiographed by court order he was found to have the described physical foot dysfunction.

Defence attorneys pointed to a Satanist drug addict as the murderer. He committed suicide and three and a half years later this podiatrist aided in the disinterment of his body and the x-raying, measuring and palpation of his foot structures. Conclusion - no pathology, too short, too small, too narrow.

CUT CHARACTERISTICS OF AN OPTICAL FIBRE CABEL BY DIFFERENT TOOLS

Yap Angeline Tiong-Whei, Lim Thiam-Bon, Chong Pui-San, Tay Ming-Kiong Michael

Objectives: The fracture of a brittle or ductile material due to failure or deliberate cut has been well studied by many in the forensic science field. However, damages to ductile and brittle materials combined in a composite are not as well documented and understood. The objective of this study is to examine the cut characteristics of such a composite material using common single-bladed and double-bladed cutting tools such as penknife, scissors, pruning shears and diagonal pliers.

Materials and methods: The material used in this study was a multimode optical fibre cable commonly used for local area networks. It has 12 optical fibres surrounded by tough synthetic fibre (for increased tensile strength and compression resistance) and enclosed in a plastic outer sheath. Each optical fibre consists of a brittle inner glass core and glass cladding, a viscous gel region for buffering and a ductile colour-coded plastic jacket. Test cuts of the cable using the above-mentioned cutting tools were made. The resulting cuts were examined using stereomicroscope as well as scanning electron microscope for the characteristics of the cuts. Material analyses of the different components of the optical fibre cable were also carried out using SEM and FT-IR spectroscopy.

Results: Test cuts using a single-bladed tool such as a penknife produced relatively clean cuts with striations on the cut surfaces of the colour-coded plastic jacket. Some glass cores and claddings were cut through in a clean manner while some others presented irregular cut surfaces. On the other hand, test cuts using double-bladed tools such as pruning shears, scissors or diagonal pliers led to a mixture of effects such as significant lateral compression, necking, pinching and stretching on the colour-coded plastic jacket. Breakage of the glass cores and claddings was either uneven or occurred

at different points. The proportion of the various types of effects observed with each type of double-bladed tool was also studied.

Conclusion: The optical fibre cable presents a very interesting material for the study of the different characteristics of cuts made by various tools because of the many components making up the entire cable. This study showed that cuts made by single-bladed tools displayed characteristics very different from double-bladed tools. Double-bladed tools were found to vary in their effectiveness to completely sever the multi-component cable. Differences in cut characteristics are shown to be useful for identifying the type of tool used to cut an optical cable.

Comments of Horst Katterwe to the Article of F. Taroni and J. Buckleton

Likelihood ratio as a relevant and logical approach to assess the value of shoeprint evidence

In „Information Bulletin for Shoeprint/Toolmarks Examiners, Vol.8, No.2, September 2002, p.15-25“

Horst Katterwe
BKA

Chairman of the ENFSI WG Marks and Chairman of the Scale Committee of the ENFSI WG Marks

„In London (March 2002), during the Conclusion Scale Meeting, a compromise had been reached: A Six-Level Transformation Scale, including „Level“ / „Full Bayes Rule“ / „Likelihood Ratio (partial Bayes‘ rule)“.

We decided: from this moment, the committee could go on with the „real work“.

I think, we shall do so in January 2003 in Vienna, because in the review of Taroni and Buckleton there are no new arguments. We discussed all the mentioned arguments in our scale committee.

Also, the idea to supply the factfinder with a table (or a graphical representation) of prior and posterior probabilities (odds) is not a new one. I mentioned this idea in our

Scale Committee, referring to the publications of Bender R., Röder S., and Nack A: Tatsachenfeststellung vor Gericht, Band I, Becksche Verlagsbuchhandlung, München 1981, page 171-201; or Nack A: Beweislehre, in Kube/Störzer/Timm: Kriminalistik, Band 2, 189-211, Boorberg Verlag 1994. In these publications you can find the above mentioned tables of prior and posterior probabilities as well as LR-values („abstrakte Beweiskraft“).

However, some comments to the article, especially to „the **shrewd** attorney’s interrogation of one expert witness“ (page 22, 23). I don’t understand, why this interrogation is shrewd. My feeling is, that this expert witness would be ploughed, when doing a certification test according the standards of the IAI; AFTE or according the rules in Germany. So the „shrewd attorney’s interrogation“ is not a good example. For better understanding you shall read first the original one and then a better improved one, which is one of the best examples to estimate scientifically prior odds.

„Original Interrogation“

Question	Answer
You assume that there is a 50% chance that the defendant has intercourse with the mother?	Yes.
Do you know anything at all about the alleged father?	No.
Do you have any information that he ever had intercourse?	No.
But you still assume a 50% change he did ...?	Yes.

And that 50% is built into your formula?	Yes.
You have no scientific basis to assume that there is a 50% probability he has an intercourse with the mother, do you?	No.

„Katterwe’s improved version“

Question	Answer
You assume that there is a 50% chance that the defendant has intercourse with the mother?	Yes, I do. But I must add that this includes also that there is a 50% chance that the defendant has not intercourse with the mother.
Do you know anything at all about the alleged father?	Yes, I do. I know, this male person is - like all the other male persons in the world - unique . However, he has a lot of features, which are class characteristics, like: he is male, he has two eyes, two ears, ..; but he contains also identifying characteristics: fingerprint, DNA, ..: that make him unique. So, in a paternity case, identifying characteristics must be considered. Therefore, the suspect person is representing a „ one-sample-population “.
Do you have any information that he ever had intercourse?	No, I do not. I am in a state of having „ a maximum lack of information “.
But you still assume a 50% chance he did ...?	Yes, I do. But this includes also the alternative hypothesis „he did not“ with a 50% chance.

<p>And that 50% is built into your formula?</p>	<p>Yes, it is; but not only that 50%. The 50% chance that he did not is equally good considered in the formula. So, I am in a neutral position and I do not support any of the two hypotheses involved in this case.</p>
<p>You have no scientific basis to assume that there is a 50% probability he has an intercourse with the mother, do you?</p>	<p>Yes, I do, because in a case representing a “one-sample-population“ with two possible outcomes, like:</p> <ol style="list-style-type: none"> 1. Yes, this man is the father, and 2. No, another man (not the defendant) is the father plus simultaneously with no other information („maximum lack of information“), the scientific basis to assume <p>1) that there is a 50% probability he had an intercourse with the mother and 2) that there is a 50% probability he had not an intercourse with the mother, is founded on a rule in Shanon’s information theory (1942): entropy and the lack of information. You can find this formula in many books of probability and mathematical statistics (but see also: Katterwe/Koerschgen „Proceedings for Shoeprint/Toolmarks Examiners SPTM Berlin 2001“, pages 191, 192).</p>

So, I think this is a very brilliant example that all the relevant scientific information is incorporated (inherent) in the „sample of examination“ (here: the defendant), for making an estimation of the „prior odds“. Non-scientific information is not used and is not necessary, because the required as well as the sufficient information is inherent and

incorporated in the examination-sample. Therefore: this example is a most brilliant one (a „case in point“) to show, how you can estimate the prior odds, using only scientific information. Thank you very much for this example.

It is easy to modify this example to toolmarks and shoeprint cases, because you only must replace „the defendant“ by „**the working surface** of the tool/shoe“.

The most important **scientific information is „prior“ incorporated, or is „prior“ inherent in this part of tool/shoe.** This part of the tool/shoe („the working surface“) is a technical product with a technical-produced surface. In the „working surface“ there are an immense number of randomly (purely accidentally) distributed microscopic and/or macroscopic surface irregularities: **Roughness = „Unique Signature“: One-Sample-Population.**

Now, we shall go on with the real work!“

Horst Katterwe
Wiesbaden, 02.10.2002

Comments on the current Debate on the Bayesian Approach in Marks Examinations

Christophe Champod and Graham Jackson

London, 28/02/02

Comment of the editor: This is a letter the scale committee of Enfsi Marks Working Group received at the scale committee meeting in FSS laboratory, London in February 2002. The letter is published now here with the permission of Christophe Champod and Graham Jackson.

We have read the exchange of letters and emails in preparation to the next "Conclusion Scale" committee in London (1-2/03/02). We thank John Birkett for offering us the opportunity to share our views.

When reading the recent exchanges, it is not without sadness that we discovered a very polarised debate: Bayesians versus 'traditional'. It has never been our intention to come to such a dichotomised stage where the discussion appears to have reached an impasse. At no point did we want to force dogmatic positions, our aim being to promote discussion and explore the way examiners make inferences on a daily basis.

In our opinion, Horst Katterwe offered a very balanced view: the Bayesian perspective provides a very useful tool for a scientist to think about scientific evidence. Examiners are Bayesians without realising it! Once, the inferential steps have been identified, it is

much easier to discuss a scale of conclusions. The Bayesian framework is a very good medium for communication among scientists.

We have argued that the prior odds should remain the burden of the court and, indeed, that contrasts with Horst view that the scientist should adopt in every case a default position with even priors. This is just a difference in the application of the process within the criminal justice system and not a fundamental incompatibility. At that stage, we think that any discussion on the priors should involve the Judiciary. At the end of the day, provided that the scientist is aware of the inferential steps he/she has taken and that that is explained in a transparent manner to the court, then the profession is on the safe side. We are advocating a likelihood ratio approach because the experience in the UK suggests that courts in this country will not let forensic scientists adopt their own default prior on their behalf. Horst is suggesting that German courts might not object to a forensic scientist doing the full job and finally concluding on the posterior odds given a likelihood ratio and default priors.

We believe that the progress now made in this discussion is important. It seems we do not differ on the process itself but just on its application in the criminal justice system. We can also take account of the challenge at the European level as the judicial systems differ between countries. Our suggestion, with respect, would be for the committee to concentrate on the inferential process and leave the rules of its application to each individual country. In other words, adopting essentially a Bayesian framework, a working compromise could be:

(1) If the Judiciary allows (when fully informed) the scientist to assign prior probabilities, then a conclusion scale using posterior terms such as probable, very probable is justified.

(2) If the Judiciary urges scientists to avoid commenting on the prior odds, then the statement should be articulated around the likelihood ratio leading to a conclusion scale in terms of various degrees of support.

At that stage of the discussion, and to choose between the two options, it seems to us that scientists in each country need to liaise with the Judiciary. The contribution of the work of this scale committee will be to have articulated the process in detail.

We would like to make some final comments on the concept of categorical opinion. Strictly speaking, an identification can be viewed as an infinite likelihood ratio. The individualisation decision is probabilistic in nature: the examiner is saying that the probability of obtaining this correspondence if the mark was left by this suspect's shoe is high and that the probability of obtaining these findings if the mark was left by a different shoe is remotely low. This translates into a very high likelihood ratio, even if we do not use numbers. The issue then is - when does a very high likelihood ratio equate to a certainty?

The transition from a very high likelihood ratio to infinity is indeed what Stoney referred to, as a "leap of faith". The phrase "leap of faith" has been interpreted by some experts as demeaning their role. That has never been our intention. It may be considered practical and acceptable to take that further step, but it is difficult to justify it logically on scientific grounds.

We are happy to leave to each scientist or court the decision as to whether or not he should offer such a categorical opinion. What matters more importantly is for the scientist to realise that an infinite likelihood ratio cannot be fully justified with data or experience, but translates an opinion, an infinite degree of belief. As before, we feel that the Judiciary should be involved in the discussion as to whether or not a forensic scientist should present the evidence in such a way. At the moment most courts appear to be content to accept such testimony. We feel that as forensic scientists, it is our duty

to make sure that courts understand the inferential steps that led us to a conclusion and it is necessary that the court agrees that these steps should be taken by the expert.

Bill Bodziak was suggesting that the advocates of the Bayesian approach were distracting footwear marks examiners from their real work by forcing them to plug virtual numbers into likelihood ratios. We sincerely hope that this committee will take notice that although the likelihood ratio stems from probability theory, our humble contribution to the discussion is not a numerical exercise. We have attempted to expose the issues in a structured way to clarify our role and duties as expert witness in the criminal justice system.



3rd EUROPEAN ACADEMY OF FORENSIC SCIENCE TRIENNIAL MEETING

September 22-27, 2003, Istanbul, Turkey

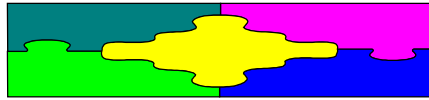
Istanbul Convention & Exhibition Center
and Harbiye Cultural Center

You can find all the information available and all the forms needed for registration, for sending the abstracts, for reserving accommodation etc. etc. for the EAFS2003 Meeting from these web sites.

<http://www.eafs2003.org>

<http://www.enfsi.org>

February 1st is the deadline for receipt of abstracts for papers and posters



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