Information Bulletin for Shoeprint/Toolmark Examiners

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FOREWORD

Dear readers,

According to the statute of Enfsi Marks Working Group the regular scientific meetings will be organised at two yearly intervals. The arrangements will anyway take into account the triennial European Academy of Forensic Science meeting (EAFS). In a case they happen to be on the same year the EAFS meeting will replace any Marks Working Group meetings.

In this issue of the IBSTE you can find some information about the 3rd European Academy of Forensic Science meeting (EAFS) that will be held in Istanbul, Turkey, 22-27 of September 2003. Anyway I warmly recommend you to take a closer look on those given web sites on page 30. On those web sites you can find all the information concerning the EAFS meeting; the planned program for the different sessions, the form for registration, the form for sending the abstracts and the form and information about accommodation and social program. Those of you who may not have the internet connection easily in use please ask the information straight from the organisers of the EAFS meeting according to the given contact numbers and addresses on page 29.

I would like to remind you that the deadline for sending the abstracts for the papers and posters is the 1st of February 2003. The organisers of the EAFS meeting will soon send the Second Announcement & Call for Papers of the 3rd EAFS meeting according to their mailing list. I have copied some basic information of the meeting to this Bulletin, just to make sure that all of our readers get the basic information early enough.

In this IBSTE issue you can also find a short report from the 87th IAI meeting that was held in Las Vegas in August. There are also abstracts of some presentations from the footwear session of the meeting.

As an editor of the IBSTE I am always very glad when active colleagues and other professionals in forensics are sending articles, case reports, new examination methods or improvements to the existing methods to be published in the Bulletin.

This time I would like to thank Franco Taroni and John Buckleton for sending their review under the title of "Likelihood Ratio as a relevant and logical Approach to assess the Value of Shoeprint Evidence". The discussions of the interpretation of forensic evidence will continue… You can find this article on page 15 of this issue.

I would also like to thank Per Krat from Denmark for sharing with us their idea to use powder as one choice to enhance snow impressions for photographing.

Sincerely yours,
Anja Ytti

87TH INTERNATIONAL EDUCATIONAL CONFERENCE OF THE IAI

Las Vegas, Nevada
August 4-10, 2002

Anja Ytti

The 87th International Association for Identification (IAI) Conference was held this time in the famous city of Las Vegas in Nevada, USA. Maybe due to the famous city the conference gathered together over 1300 participants from over 30 different countries. The European mark examiners had representatives at least from Germany, the Netherlands, Sweden, Iceland and Finland. During the five days conference there were available over 100 presentations, about 70 workshops and a large exhibition area with 60-70 exhibitors.

The presentations and workshops were concerned footwear and tire track examinations, electrostatic lifting, casting techniques, fingerprints, crime scene investigations, earprints, bloodstain pattern interpretation, photography and digital image techniques, forensic art, forensic archaeology, expert testimony in the court and other forensic specialities. Forensic examiner, Eric Gilkerson, from the FBI laboratory, Washington, was mainly responsible for organising the program dealing with footwear and tire track examinations.

This year one of the main topics in the program was the worry about the increasing use of digitised cameras at the crime scene. The resolution of those cameras are not always

good enough to take examination quality photographs. I would also like to mention that the interesting study done about the discrimination of two-dimensional Military Boot impressions based on wear patterns will be published as a whole in the Science & Justice publication during this autumn.
You can find here some of the abstracts of the presentations in the Footwear & Tire Track session.

SNOW IMPRESSIONS: PHOTOGRAPHY, CASTING & EXAMINATION

James Wolfe & Lesley Hammer, Department of Public Safety Crime Laboratory, Anchorage, Alaska

Snow, although an excellent medium for impressions presents a unique set of collection and preservation challenges. This presentation will provide attendees with instructions and techniques for photographing, coating, casting, evaluating and examining shoe impressions in snow. Factors such as snow type, temperature, weathering, type of spray coating, and deciding whether to cast with dental stone or sulfur will be discussed. Complete instructions of all methods will be provided and examples of the methods in action will be illustrated.

RESOLUTION CAPABILITIES AND LIMITATIONS OF DIGITAL IMAGING SYSTEMS USED FOR FOOTWEAR IMPRESSION PHOTOGRAPH

Thomas Musheno, Federal Bureau of Investigation, Laboratory Division, Washington, D.C

Many law enforcement agencies are switching to digital imaging systems. This presentation illustrates the capabilities and limitations of digital capture systems and film based capture systems used to photograph footwear impressions.

Law enforcement agencies are increasingly replacing conventional film capture systems with digital capture imaging systems to photograph crime scenes and evidence, including footwear impressions. The increased use of digital systems is due to a number of factors which include ease in which the capture system work, low cost of some digital systems, speed in which a digital image can be processed and hard copy produced, and in many cases the false claim that digital systems are better for all uses than conventional photography.

To conduct a comparative analysis of footwear impressions, the examiner first looks for the shared class characteristics of the questioned and known footwear impressions. Class characteristics are characteristics that are common to a group, such as shape, style, size, and model. If the impressions share class characteristics, the impressions are then examined for random or unique identifying characteristics. Unique or identifying characteristics are characteristics that happen by chance, such as cuts in the sole of the shoe or rocks or glass imbedded in the tread of the shoe. These unique identifying characteristics in the questioned impression are compared with any from the known impressions to determination if an identification can be made.

The resolution of the system capturing this imagery is critical. If the resolution of the system can not record sufficient detail to permit analysis of the class and random or unique identifying characteristics, then a thorough comparison can not be done and the questioned footwear impression is of limited value.

This presentation will illustrate, through side by side comparison, the capabilities and limitations of currently used digital capture systems ranging in price from a few hundred to tens of thousand dollars as well as film based capture systems when photographing footwear impressions.

THE DISCRIMINATION OF TWO-DIMENSIONAL MILITARY BOOT IMPRESSIONS BASED ON WEAR PATTERNS

Robert D. Blackledge & William P. Herzig, Naval Criminal Investigative Service, San Diego, California
Tara L. Fruchtenicht, El Cajon Police Department, El Cajon, California

The idea for this study had its genesis with the observation that the lugs and stars present on the outsoles of some types of military combat boots have a truncated wedge shape. Because of this taper, the areas on the outsoles making contact with a flat surface are at a minimum when the boots are new, but increase with wear. This pattern is also present on commercial footwear having Vibram® brand outsoles. Clearly, this feature (lugs and stars having a truncated wedge shape) would facilitate a higher level of discrimination based on the amount of time a questioned boot had been worn.

However, might there be additional discrimination due to individual differences in weight, bone structure and locomotion mechanics? To rigorously test this hypothesis, we wanted to eliminate all other variables. Ideally, when new all of the boots in the study would be of the same brand, the same size anf foot (we wanted only size 10 Regular, male, right boots), and all have the same outsole patterns produced by the same mold. Additionally, all of the individuals involved in the study would wear the boots for the same length of time and all is engaged in the same activities. In an attempt to approach this ideal, we selected U.S. Marine Corps recruits, all at the end of their fifth training week.

At the end of the fifth training week, to rapidly record the two-dimensional outsole impressions we used a commercial footwear impression kit featuring a chemically infused pad and sensitized paper. Recorded at the same time were the size information present on the tongue of each right boot. Impressions of some new boots were also obtained as standards. It was not possible to obtain the impressions of the new boots before they were issued to Marine recruits, or to insure that all outsoles had been produced by the same mold. An image analysis system was used to acquire the two-

dimensional impressions as files. Certain outsoles features were then selected and measurements made using a commercial marker/measurement system. Measurements were recorded on spreadsheets (MS Excel 97) before being transferred into a database program (MS Access 97) for analysis.

To test the discrimination power of this series of measurements, all of the original footwear impressions sheets whose selected feature measurements had been entered into the database were taken away. A number of these sheets were selected, their original identifying marks removed and then added to these selected sheets were several footwear impression sheets not yet entered into the database. These were randomly lettered and then presented to the operator of the image analysis, marker/measurement system as "unknowns". We wanted to eliminate accidental features (cuts, nicks, nail holes, etc.) as a discriminating factor in this study. Therefore, after measuring the features of the "unknown", they could only be searched against the database containing the previously entered feature measurements. Based on repeated measurements, a range of +/- 0,03 cm was found to be normal variation. Matching criteria of +/- 0,10 cm gave results with the best combination of least false inclusions/false elimination. With these criteria no false elimination's occurred. There was one false inclusion (all measurements fell within the +/-0,10 cm range), but the measurements for the actual match had overall closer agreement.

EUROPEAN MARKS EXAMINERS WORDING, THE BAYES RULE AND A CAUSALITY MODEL FOR EVIDENCE INTERPRETATION

Dr. Horst Katterwe, Forensic Science Institute, Bundeskriminalamt, Wiesbaden, Germany

A European Scale Committee was established in the ENFSI Marks Working Group with the aim to harmonize the conclusion scales for the European marks examiners. Meanwhile, the Committee received comments to their documents from the Forensic Science Service (FSS)/UK with a number of arguments against the ideas of the committee. So, some forensic scientists of the FSS were invited in 2000 to meetings in

Cracow (EAFS) and in Brussels discussing the so-called Bayesian Approach (likelihood ratio). In May 2001 in an ENFSI Marks Conference in Berlin, a panel session about "Range of Conclusions" was established by the author with reports about: principles of interpretation; alternative hypotheses and Bayesian theory; examination results and report conclusion; how to express probability in footwear comparison; a likelihood ratio view on the interpretation of shoeprint evidence. A summary of the results of the mentioned European meetings will be given. Furthermore, a causality model for evidence interpretation in shoeprint and toolmark cases, based on the relationship between the cause ("working surface" of the tool or of the shoe) and the effect (evidence mark/print) that it has, will be introduced in this report.

A STUDY INTO SHOE SIZING AND ITS RELATIONSHIP WITH FORENSIC FOOTWEAR IMPRESSION EVIDENCE IN LAW ENFORCEMENT

Dwane S. Hilderbrand, Scottsdale Police Crime Laboratory, Arizona, USA

Hypothesis Statement: This research paper will illustrate that there is a slight correlation between a questioned footwear impression at a crime scene and the height of the person that could have made it, and the actual shoe size of a shoe that could have left it?

Investigators often ask questions concerning footwear impressions recovered from crime scenes. These questions quite commonly include "what size shoe made the impressions" and "how tall was the suspect".

This is a study of athletic shoe sizing that was conducted to determine if there is a relationship and/or a correlation between the actual shoe sizes, the measured size of the questioned footwear impression located at a crime scene and the height of the person that made it. A survey was conducted to collect data on individual heights, shoe size and the measured length of actual shoes of five major brands.

AN EVALUATION OF ABTS AND FLUORESCEIN FOR THE ENHANCEMENT OF BLOODY FOOTWEAR IMPRESSIONS AND THE SUBSEQUENT EFFECT ON DNA ANALYSIS

Mike Smith, Eric Gilkerson & Heather Seubert, Federal Bureau of Investigation, Washington, USA

Two different chemical reagents, Fluorescein and ABTS (2,2 -azino-di (3-ethylbenzthiazolinesulfonate(6) diammonium salt), were evaluated for their ability to enhance bloody footwear impressions. The pros and cons of both chemicals will be evaluated, including the effects in subsequent DNA analysis.

TIRE TRACK DOCUMENTATION AND PHOTOGRAPHY METHODS FOR BETTER COMMUNICATION BETWEEN THE CRIME SCENE ANALYST AND THE TIRE TRACK EXAMINER

Donald W. Doller, Suffolk County Crime Lab, Hauppauge, New York, USA

Tire tracks located at a scene make very useful forensic evidence. However, the effectiveness of the evidence is related to the communication between the crime scene analyst collecting the evidence and the tire track examiner who is responsible for examining the evidence. Shortcomings in documenting and photographing the tire tracks will have an impact on the lab examination of the evidence. This presentation will explain the difficulties and expectations of both the crime scene analyst and the tire track examiner and offer our lab's method of documentation and photograph as one possible solution.

Eiffel Tower in Las Vegas

Dancing Water in Las Vegas

LIKELIHOOD RATIO AS A RELEVANT AND LOGICAL APPROACH TO ASSESS THE VALUE OF SHOEPRINT EVIDENCE

FRANCO TARONI [1,2] and JOHN BUCKLETON [3]

[1] *Institut de Police Scientifique et de Criminologie, University of Lausanne, Switzerland*
[2] *Institut de Médecine Légale, University of Lausanne, Switzerland*
[3] *Institute of the Environmental Science and Research, Auckland, New Zealand*

We read with deep concern the special issue of the *Information Bulletin for Shoeprint/Toolmark Examiners* vol.8, n.1, June 2002 considering the use of scales of conclusions.

The discussion as presented is really very disappointing, and is unlikely to provide a firm basis upon which to found the future science of shoeprint interpretation. The wish for unification of thinking is commendable but must not overlook the claims of scientific truth which is often found by reasoned argument and research. This field is of particular importance because of the widespread use of shoeprint evidence, but is also likely to be challenging because of the difficulty in objectively and numerically assessing the weight of evidence. This is, in part, due to the inherent complexity of shoeprint comparison. It is important that readers do not react adversely to these words. Lack of objectivity and our inability to be numerical does not imply that we are wrong, or that our science is invalid. As pointed out in the bulletin there have indeed been

admirable efforts to improve the objectivity of shoeprint examination, and much more extensively in the related fields of firearms and toolmark examination. However it must be admitted that issues such as 'quality' and the detailed shape of any correspondence has, as yet, defied any effective numerical analysis. The very subjectivity of the assessment is what most explicitly requires a firm scientific foundation.

As suggested this problem has been considered by groups working in the fields of toolmark and firearms identification. These groups have also suggested scales for reporting comparisons at the source level, and in many cases this has reflected what we will term here a posterior probability. These practitioners are comfortable with these scales and often discuss the graduations in them. It is likely that these scales are useful in stimulating discussion and consistency, and most examiners using them are unaware that there is a fundamental logical fault in their construction. The question is not merely academic. We could ask: *what damage is done by reporting a subjective posterior probability or assuming a prior probability?*
For us and in a number of major court cases, the answer has been a very great amount of damage indeed.

In this review we would add some explanations of some minor understandings that have occurred but more importantly we put the probabilistic issue into a firm context. The conclusion, for us, is unavoidable: a verbal scale presenting posterior probabilities on the issue of interest, say, the origin of a shoeprint cannot be supported by a probabilistic argument considering the evidence alone. It must involve the consideration of a prior probability[1] .

[1] I.W. Evett, What is the probability that this blood came from that person? A meaningful question. *Journal of the Forensic Science Society* 23 (1983) 35-39; I.W. Evett, *A discussion of the deficiencies of the coincidence method for evaluating evidential value and a look towards the future*. The 10th IAFS Triennial Meeting, Oxford (UK), 1984; I.W. Evett, Bayesian inference and forensic science: problems and perspectives. *The Statistician* 36 (1987) 99-105; I.W. Evett, J. Thompson, *Evidence, interpretation and the nature of science*. 7th ENFSI Meeting, Helsinki (Finland), 9-11 May 1996; I.W. Evett, Towards a uniform framework for reporting opinions in forensic science casework. *Science and Justice* 38 (1998) 198-202; I.W. Evett, Verbal conventions for handwriting opinions. *Journal of Forensic Sciences* 45 (2000) 508-509.

The 'full Bayes' scale as reported is indeed a posterior probability and appears to have been formed by assuming a prior probability of 1 (pg 19). This is accepted practice in paternity cases, but is difficult to defend there and is coming under scrutiny. The argument would be that there is little prejudice in a paternity case in assuming prior odds of 1. This is debatable in a civil paternity case but very likely to be completely indefensible in a criminal shoeprint case[2]. We suspect that the real basis of the proposed scale is not an assumption of prior odds of 1, but rather that the unavoidable subjectivity of the process combined with an opaque thought processes has been subsumed in the honest opinion of an expert, albeit that it most likely contains a logical fault. We would strongly argue for transparency in the thought process. As forensic scientists with many years of shoeprint examination between us we have personally welcomed the clarification of our own thought processes.

The experience we have acquired in paternity cases has led us to a deep skepticism of scales of posterior probability. In such paternity cases scientists routinely offer to a court of justice a posterior estimate of the probability that Mr X (the putative father) is the genetic father of a child using a prior probability of 1.

We turn to the question presented at pages 11 and 15 of the *Bulletin*: « *Estimation of prior odds: who is best able to estimate an useful 'scientific prior probability'?* […] *is this the task for the lawyers? Why shall this estimation not be the task for the scientists*?»

[2] B. Robertson, G. A. Vignaux, Extending the conversation about Bayes. *Cardozo Law Review* 13 (1991) 629-645; B. Robertson, G. A. Vignaux, Inferring beyond reasonable doubt. *Oxford Journal of Legal Studies* 11 (1991) 431-438; B. Robertson, G. A. Vignaux, Expert evidence: law, practice and probability. *Oxford Journal of Legal Studies* 12 (1992) 392-403; B. Robertson, G. A. Vignaux, Probability – The logic of the law. *Oxford Journal of Legal Studies* 13 (1993) 457-478; B. Robertson, G. A. Vignaux, Taking fact analysis seriously. *Michigan Law Review* 91 (1993) 1442-1464; B. Robertson, G. A. Vignaux, Crime investigation and the criminal trial. *Journal of the Forensic Science Soci*ety 34 (1994) 270; B. Robertson, G. A. Vignaux, *Interpreting evidence – Evaluating forensic science in the courtroom*. John Wiley & Sons, Chichester (1995).

First, we briefly review the essentials of the Bayesian model in evidence evaluation to clearly support our proposal of a likelihood ratio scale.

BAYESIAN PERSPECTIVE AND THE RELEVANCE OF THE LIKELIHOOD RATIO

We assume that the scientist agrees that probability is a rational way of quantifying uncertainty. We do not require this probability to be expressed exactly, nor does it need to be numerical, we will be comfortable with terms like 'I feel that this is a high probability'. If a reader does not wish to use probability to assess uncertainty then we suggest that this article will be irrelevant to them.

Consider the situation where we have a shoeprint at the scene of a crime, E_C. We are provided with a shoe, E_S, which is alleged to have made the shoeprint. Without even looking at the shoe or shoeprint you are asked the question: What is the probability that this shoe made this shoeprint, H_P? There may be some background evidence, I, that assists with this evaluation, but recall you cannot look at either the shoe or the shoeprint. Admittedly this is hard. Please remember how hard it is to answer this question because it will be vitally important later. At this point let us call this probability x. Hence we are asking the probability that H_P is true given the background information I, $\Pr(H_P|I)$ and we have assigned this the value x. But this has taken no account of the evidence, E_C and E_S.

Inference from data is nothing other than the revision of such opinion in the light of *relevant* new information. So, the main point is the study of how the evidence changes degrees of belief; from our prior assessment $\Pr(H_P|I)$, by observation of characteristics, E_C and E_S, to posterior, $\Pr(H_P|E_C,E_S,I)$. This change is probabilistically made through Bayes' theorem although there may be other unpublished and non-probabilistic ways to do this. These alternative ways must fail the test of coherence, since probability theory

already has the claim on that criterion. We would feel that these alternative approaches would be difficult to defend in court.

This leads us to write out Bayes' theorem for this case

$$\frac{\Pr(H_P|E_C,E_S,I)}{\Pr(H_D|E_C,E_S,I)} = \frac{\Pr(E_C,E_S|H_P,I)}{\Pr(E_C,E_S|H_D,I)} \times \frac{\Pr(H_P|I)}{\Pr(H_D|I)}$$

where H_D is the alternative hypothesis to H_P; that is the shoeprint was not made by the shoe. It is customary to drop the I behind the conditioning bar, simply to avoid complexity in the terms, but it should be remembered that it is implied. This explains part of the misunderstanding on pg. 27 pt 4.

What is the meaning of *relevant* new information (evidence)? Relevant evidence could be defined as proposed by the US Federal Rule of Evidence 401 as evidence that has any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence. So, how better than a likelihood ratio to detect any changes from a previous state of knowledge to a posterior state?

Evidence is logically relevant only when the probability of finding that evidence given the truth of some hypothesis at issue in the case differs from the probability of finding the same evidence given the falsity of the hypothesis at issue. This method is advantageous, because it evaluated the relevance of evidence offered by both the plaintiff and the defendant[3]. This same point is reiterated in judicial literature[4].

Here then is the first advantage of the likelihood ratio. It offers a clear measure of the relevance of a new information.

[3] R. Lempert, Modeling relevance. *Michigan Law Review* 75 (1977) 1021-1057.

[4] D. Kaye, Quantifying probative value. *Boston University Law Review* 66 (1986) 761-766; T.D. Lyon, J.J. Koehler, The relevance ratio: evaluating the probative value of expert testimony in child sexual abuse cases. *Cornell Law Review* 82 (1996) 43-78.

USEFULNESS AND EFFECTS OF THE LIKELIHOOD RATIO

Bayes rule tells us that we then take the prior odds and multiply them by the likelihood ratio of the scientific evidence in order to arrive at the posterior odds in favour of the issue of interest. The court then has to consider whether those odds meet the required standard of proof. Thus the expert could say (i.e. in paternity cases) 'however likely you think it is that the defendant is the father on the basis of the other evidence, my evidence multiplies the odds X times'[5].

As clearly mentioned by Royall[6] some find the preceding statement dubious. To them it is not clear whether a likelihood ratio of 4, say, represents the same strength of evidence in all contexts. These doubts come from failure to distinguish between the strength of the evidence, which is constant, and its implications, which vary according to the context of each application (prior beliefs, available actions, etc.).
The key point is that observations with a likelihood ratio of 4 are evidence strong enough to quadruple a prior probability ratio. The exact values of the prior probabilities do not affect the likelihood ratio although they, obviously, would affect the posterior probabilities. The effect of a likelihood ratio of 4 is always the same. It produces a fourfold increase in the probability ratio, regardless of whether a prior ratio is actually available in a specific problem or not!

Thus here is the second advantage of the likelihood ratio. It offers a clear measure of the evidence. Neither the prior probabilities not the posterior probabilities do this. The prior probabilities take no account of the evidence whereas the posterior probabilities combine both the evidence and the prior probabilities.

The prior odds represent the view on the prosecution and defense hypothesis before the scientific evidence is presented. This is something that is formed in the minds of the

[5] B. Robertson, G.A. Vignaux, Unhelpful evidence in paternity cases. *New Zealand Law Journal* 9 (1992) 315-317.

[6] R. Royall, *Statistical evidence – a likelihood paradigm*. Chapman & Hall, London, 1997 at 12.

judge and jury. It is very unlikely that it is numerically expressed and there is no need that it should be numerical. Strictly it is not the business of the scientist to form a view on the 'prior odds' and most scientists would strictly avoid this. These odds are based on the non-scientific evidence and it is the duty of judge and jury to assess this.

The use of this approach typically reports the likelihood ratio only. By doing this the scientist reports the weight of the evidence without transgressing on those areas reserved for the judge and jury. This is the reason that the term 'the logical approach' has been used to describe this method. Another option was 'the likelihood ratio' approach. The term that is being avoided is 'the Bayesian approach' which is the term used in most papers on this subject including our own.

To gain familiarity with this formula it is useful to consider a few results. What would happen if the likelihood ratio was 1? In this case the posterior odds are unchanged by the evidence. Another way of putting this is that the evidence is inconclusive, or irrelevant (as previously defined).

What would happen if the likelihood ratio was greater that 1? In these cases the posterior odds would be greater than the prior odds. The evidence would have increased our belief in H_P relative to H_D. Another way of putting this is that the evidence supports H_P. The higher the likelihood ratio the greater the support for H_P.

If the likelihood ratio is less than 1 the posterior odds would be smaller than the prior odds. The evidence would have decreased our belief in H_P relative to H_D. Another way of putting this is that the evidence supports H_D. The lower the likelihood ratio the greater the support for H_D.

The likelihood ratio (LR) is, obviously, a numerical scale. One point can be hinged to words without argument; that is that a LR of 1 is inconclusive. Other words may be

attached to this scale to give a subjective verbal impression of the weight of evi dence[7]. This association of words with numbers is subjective and necessarily arbitrary.

The question of development of the prosecution and defence hypotheses was introduced above but was not discussed in any depth. In fact the defence are under no obligation to offer a hypothesis at all. This is the subject of a large scale initiative in the UK Forensic Science Service called the Case Assessment Initiative[8]. The subject warrants separate treatment. Even though it has been introduced under the heading of 'the logical approach' the development of propositions is actually universally important to evidence interpretation by any method.

THE USE OF PRIOR ASSESSMENTS

As in paternity cases, in all transfer evidence, testimony as to the posterior probability as suggested by a great majority of your readers has a distressingly large potential for confusing or misleading the jury and occasionally for embarrassing the expert witness. Consider, only for sake of illustration purposes, a shrewd attorney's interrogation of one such witness as reported by Aikin and Kaye[9] in a paternity cases:

Question: *You assume that there is a 50% chance that the defendant has intercourse with the mother?*

Answer: *Yes.*

Question: *Do you know anything at all about the alleged father?*

Answer: *No*

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[7] I.W. Evett, J.S. Buckleton, Some aspects of the Bayesian approach to evidence evaluation. *Journal of the Forensic Science Society* 29 (1989) 317-324; C. Aitken, F. Taroni, A verbal scale for the interpretation of evidence. *Science & Justice* 38 (1998) 279-281; C. Champod, I.W. Evett, Commentaries on 'Some observations of the use of probability scales in forensic identification'. *Forensic Linguistics* 7 (2000) 238-243.

[8] R. Cook, I.W. Evett, G. Jackson, P.J. Jones, J.A. Lambert, A hierarchy of propositions: deciding which level to address in casework. *Science & Justice* 38 (1998) 231-239; I.W. Evett, G. Jackson, J.A. Lambert, S. McCrossan, The impact of the principles of evidence interpretation on the structure and content of statements. *Science & Justice* 40 (2000) 233-239.

[9] M. Aikin, D.H. Kaye, Some mathematical and legal considerations in using serological tests to prove paternity. In: R.H. Walker (Ed.) *Inclusion probabilities in parentage testing*. American Association of Blood Banks, Arlington (1983) 155-169 at 164.

Question: *Do you have any information that he ever had intercourse?*

Answer: *No.*

Question: *But you still assume a 50% change he did …?*

Answer: *Yes.*

Question: *And that 50% is built into your formula?*

Answer: *Yes.*

Question: *You have no scientific basis to assume that there is a 50% probability he has an intercourse with the mother, do you?*

Answer: *No.*

Never mind if the prior probability used by the scientist is 1 over 2 (as routinely done in paternity cases) or 1 in a trillion. The problem is still there: *how to correctly assess a prior probability if the relevant information on the case under examination are not available to the scientist?* Recall the question at the start of this paper. We asked you to state the probability that this shoe made this shoeprint, H_P? You could not look at either the shoe or the shoeprint. Recall that this was hard. This was the prior probability. It is based on the non-scientific evidence and is the province of the court. The scientist is not in the best position to assign it, nor should she. We would strongly advocate that the ENSFI Marks working group should not do so either.

If the scientist is not to assign priors then who should? Some commentators have proposed that the choice of the prior odds be left to the legal decision-maker. But a variant that avoids some calculation problems is available and represents an excellent compromise. It is to supply the factfinder with a table (or a graphical representation) of prior and posterior probabilities (odds) not to induce him to state his prior and to settle on the corresponding posterior, but rather to facilitate his mixing and weighing all the evidence by displaying the impact that scientific evidence has across a wide range of prior odds.

In fact, this approach does not ask the judge/jurors to produce any number. It merely shows them how a 'true' prior probability would be altered, if one were in fact available. It thus supplies the jurors with as precise and accurate an illustration of the probative force of the quantitative data as the mathematical theory of probability can provide. Such a chart should have pedagogical value of the juror who evaluates the entire package of evidence solely by intuitive methods, and who does not himself attempt to assign a probability to the 'soft' evidence. There appears to be no reason in principle why a juror could not generate a prior probability that could be described in terms of the objective, relative-frequency sort of probability. This practical difficulty does not undercut the conceptual point[10].

Some courts[11] have supported this view: « The expert's testimony should be required to include an explanation to the jury of what the probability of paternity would be for a varying range of such prior probabilities running from 0.1 to 0.9. »

This is a logical consequence of the fact that judge/jury hears testimony concerning whether the alleged father and the child's mother had sexual intercourse during the time that conception could have occurred, about the timing and frequency of such an intercourse, about the possibility that someone else is the father; all this information allows them to assess a prior odds on the ultimate issue. On the contrary, the expert, ignoring all this investigative information, arbitrarily fixes the prior odds.

CONCLUSION

Do the readers really think that conclusions like 'the sample examination supports the hypothesis that the mark … came from … and these results are at least X times greater if the stain originated from … than from …' is unacceptable? It seems 'no' for some judges[12]. Please remember that earlier criminalists have already asked the correct

[10] D. Kaye, The laws of probability and the law of the land. *The University of Chicago Law Review* 47 (1979) 34-56 at 52-53.

questions in document, toolmarks, shoeprints and fingerprint examinations and have attempted to offer the correct answers[13]. Is it not the meaning of statements of earlier criminalists like Bertillon and Locard when they claimed that information provided by the scientist is just a piece of evidence which has to be corroborated by others to reach an absolute certainty for justice, and that the scientist is not the judge and thus he should not be influenced by facts of moral order? This opinion has been shared and clearly expressed in a famous judicial case at the beginning of this century:

«It is absolutely impossible for us to know the a priori probability, therefore we cannot say 'This coincidence proves that the ratio of the probability that the document is a forgery to the complementary probability (that it is not a forgery) is of a know value'. We could only say that following the observation of this coincidence this ratio is becoming X times greater than before the observation».

We reiterate that the relationship of prior odds, likelihood ratio and posterior odds well illustrates the different roles of the court (represented by judges and juries) and the forensic scientist. The court is concerned with the odds in favour of one hypothesis or another based on knowledge of the investigative information. The forensic scientist is concerned with the effect of the evidence on these odds. This is summed up succinctly by a court's comment that

« Leaving the choice of the prior odds to the legal decision-maker is preferable to presenting or using an unarticulated prior probability » [14.]

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[11] State of New Jersey vs. J.M. Spann, 130 N.J. 484; 617 A. 2d 247, 1993.

[12] « We note and we follow and accept unreservedly Dr Evett's evidence to us and his structures to us that we cannot look at one hypothesis, we must look at two and we must test each against the other […] what is the probability of the evidence if the Respondent's hypothesis is correct ? what is the probability of the evidence if the Appellant's hypothesis is correct ? Dr Evett tells us (and we follow it) that if the answer to the first question is greater than the answer to the second question, then the Respondent's hypothesis is supported by the evidence. »*Johannes Pruijsen vs. H.M. Customs & Excise*, the Crown Court in Chelmsford, U.K. July 30, 1998.

[13] F. Taroni, C. Champod, P. Margot, Forerunners of Bayesianism in early forensic science. *Jurimetrics Journal* 38 (1998) 183-200.

[14] In Re the Paternity of M.J.B. : T.A.T. (144 Wis.2d 638; 425 N.W.2d. 404, 1988).

ENHANCING THE SNOW IMPRESSIONS WITH RED POWDER FOR PHOTOGRAPHING

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In the Information Bulletin for Shoeprint and Toolmark Examiners, Vol.7 No.3, November 2001, there was an article "Casting Track Evidence in Snow" written by James Wolfe and Leslie Hammer. They described how to emphasise an impression in snow by using grey paint primer or Snow-Print wax.

Here in Denmark we have discovered that if we brush the shoe impression in snow with the red fingerprint powder, even the smallest details will appear on the photo. Before casting the impression we also use Snow-Print wax.

The surface of the impression is compressed and can be brushed carefully with powder without molesting it. Anyway the brush and the powder must have the same temperature as the surroundings. If there is too much powder in the impression, it can easily be blown away.

The red powder we use is ferric oxide used for searching fingerprints and the brush is normal soft brush made of the hair of a squirrel or of a marten. The film we use is a Kodak Professional T400CN black & white film, process C-41 (CN: Colour Negative processing).

Further information

Per Krat

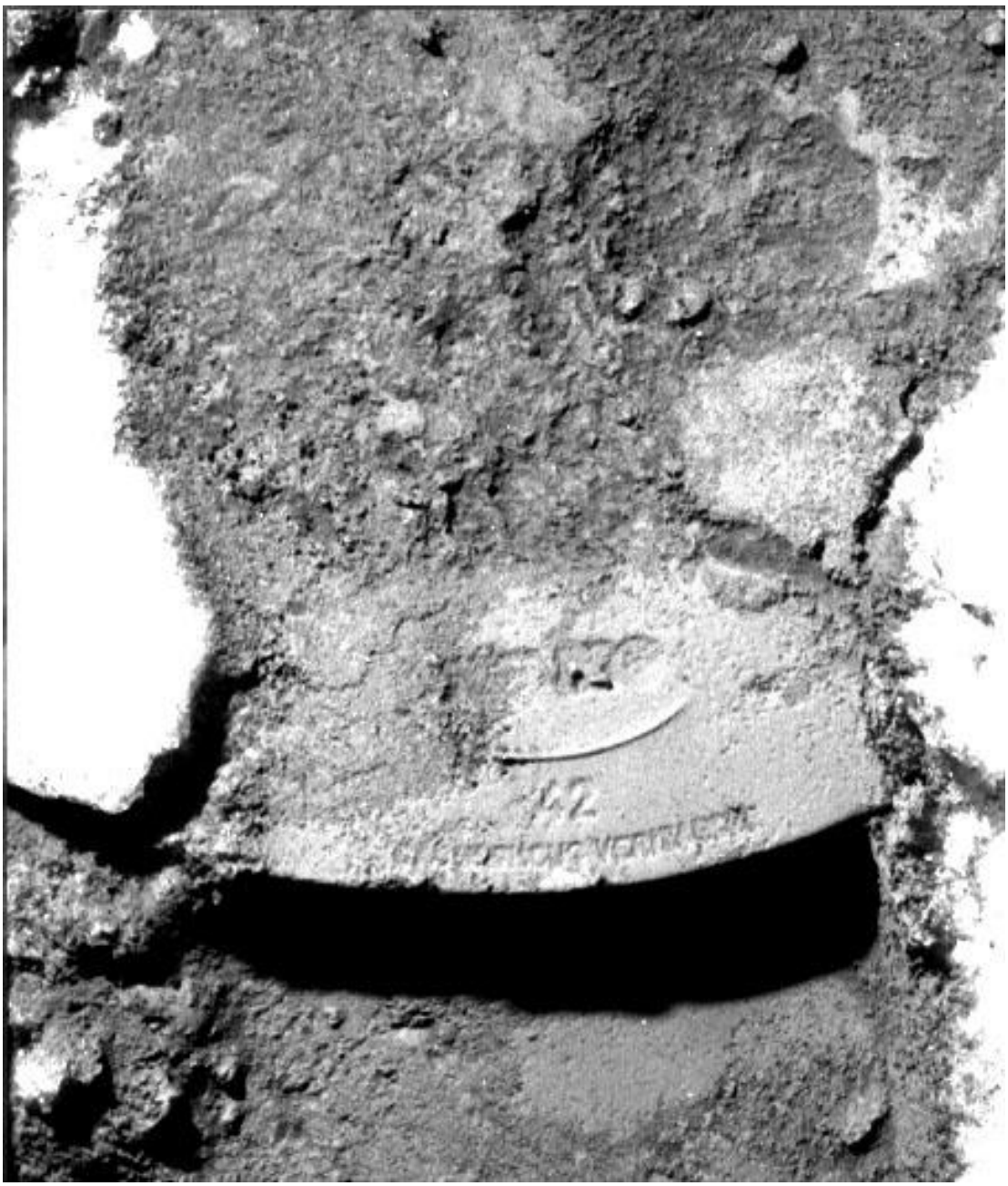
email: rpcha-ktakbh@politi.dk

Shoe impression in snow

Enhanced shoe impression in snow

AN EXAMPLE FROM A CRIME SCENE

A homicide in a forest was investigated in January 2002. After using the powder to the impression the size-number of the shoe and even the smallest letters in the impression were clearly seen. After casting the print the small letters were not readable any more and even the size-number was difficult to see. The shoe in question was a shoe with brand name Kenzo.



SECOND ANNOUNCEMENT & CALL FOR PAPERS

3rd EUROPEAN ACADEMY OF FORENSIC SCIENCE TRIENNIAL MEETING

September 22-27, 2003, Istanbul, Turkey

Istanbul Convention & Exhibition Center
and Harbiye Cultural Center
http://eafs2003.enfsi.org

Contact Information
EAFS 2003 Istanbul Meeting Secretariat
ODS Tourism and Travel Ltd.
Yildiz Cicegi Sokak 12/1 Etiler 80630 Istanbul – Turkey
Phone: (+90 212) 287 5800, Fax: (+90 212) 263 4581
E-mail: eafs2003@enfsi.org

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

http://www.eafs2003.org
http://www.enfsi.org

KEY DATES

February 1, 2003
Deadline for receipt of abstracts for papers and posters

April 1, 2003
Deadline for early registration

August 1, 2003
Deadline for meeting registration (After this date, you will only be able to register for the meeting on-site.)

Deadline for workshops, Academy-wide lunches, DNA User's Forum, Forensic Nursing Special Session, Young Forensic Scientist Forum and Student Academy registrations (There is no on-site registration for these special activities)

September 22-27, 2003
EAFS 2003 Istanbul Meeting

REGISTRATION FEES

Categories	prior to April 1, 2003 pre-registration	after April 1, 2003 and on-site
Delegates	**EURO 345.-**	**EURO 445.-**
Full-Time Students must provide student ID	**EURO 85.-**	**EURO 85.-**
Daily Registrants	**EURO 170.-/day**	**EURO 170.-/day**
Accompanying Persons must accompany a delegate or student	**EURO 170.-**	**EURO 170.-**

CANCELLATION OF REGISTRATION

You will receive a confirmation letter of your registration, once the Meeting Secretariat receives your full payment. Cancellation of registrations will be accepted until August 1, 2003 up to which date the registration fee will be refunded in full. However EURO 50.- will be deducted for administrative expenses. For cancellations received after August 2, 2003, the registration fee will become non-refundable.

ABSTRACT SUBMISSION GUIDELINES

You are invited to participate by sending the abstract of your scientific work by mail or on-line by accessing the website at http://www.eafs2003.org/sub/abstracts.php. - use the Abstract Submission Form.

Please be aware that the abstract submission deadline is February 1, 2003.

GENERAL INFORMATION

The Organizing Committee asks for the submission of abstracts on topics of interest to the forensic science community including accreditation, quality control and quality assurance, crime mapping, crime scene investigation, digital photography and imaging, document examination, handwriting analysis, DNA evidence, drugs, forensic science education and training, environmental forensics, fibers, fingerprint, fire and explosion, firearms, forensic anthropology, forensic engineering and road accident analysis, forensic information technology and computer crimes, forensic medicine and pathology, forensic nursing, forensic odontology, forensic toxicology, jurisprudence and ethics, marks, paint, forensic psychiatry and behavioral sciences, speech and audio analysis and wildlife forensics.

February 1, 2003 is the deadline for the submission of abstracts. Only abstracts written in English will be considered. The Scientific Section Program Committee will select appropriate abstracts from those submitted by February 1, 2003, deadline. Abstracts of papers must be submitted on the official Abstract Submission Form. In order for your paper to be considered for presentation you are required to complete all areas of the accompanying form. Please indicate your section and presentation choice by checking the appropriate boxes on items #1 and #2 on the Abstract Submission Form.

Scientific papers selected for presentation will be divided into two groups: Platform (Oral) Presentations and Poster Presentations.

Notification of acceptance will be sent to all presenting authors by March 15, 2003.

PLATFORM (ORAL) PRESENTATIONS

Content

Platform presentations must cover the material reported in the abstract. The nature and aim of the presentation should be stated at the opening statement. Results should be stated simply and clearly. The presentation should be finished with a summary of the essential findings. Regardless whether 35 mm slides, overhead (OHP) or multimedia (LCD) projections are used, information on the slides must be kept simple with plenty of open spaces between lines. Limit information on each slide to seven lines or less. Avoid backing up in slide lectures. If you need a slide twice, make duplicate slides. White on black, white on blue, blue on yellow or yellow on blue project best. Avoid red and blue or other non-contrasting color combinations.

Time

The Section Program Chairperson will determine the length of time that will be allocated to a specific paper. However, 12-15 minute presentations are standard. Each

presenter will be provided 5 minutes to answer questions. You will be notified by the EAFS 2003 Istanbul Meeting Organizing Committee the place, day, time and type (the final determination as to the acceptance and type of the presentations rests with the Scientific Section Program Committee) of your presentation.

Equipment

Each scientific session meeting room will be equipped with a 35 mm carousel slide projector, remote control, lighted pointer, microphone, and screen. A limited number of slide trays will be available. Speakers are encouraged to bring their own slide trays. Request for additional audio-visual equipment will be reviewed by the Organizing Committee. Speakers will be notified of the availability of their requests. Overhead and LCD projectors must be reserved.

Please indicate your request for an OHP or LCD projector by checking the appropriate box on item #7 Audio/Visual Requirement on the following page.

Computers will not be available as part of the standard audio/visual package. It is your responsibility to provide the computer used for your presentation. Please indicate your choice of connection by checking the appropriate box on item #7 Audio/Visual Requirement on the following page.

A LCD projection unit will be available in the Speaker Preparation Room. Please test the working conditions before your presentation.

POSTER PRESENTATIONS

Content and Preparation

The poster should inform the observer as to the purpose, subject matter, material and methods of the paper. It should indicate how the experiments, if any were designed and how the results were obtained.

Authors have complete freedom to choose ways of displaying their information in figures, tables, text, photographs, etc.; however. they should avoid crowding too much information into a limited space. The poster should be readable from a distance of 1 meter (3 feet).

Posters will be kept up for the entire day they are scheduled. Please be sure your poster is mounted by 8.00 a.m. and leave it mounted until 5 p.m. It will only be necessary for the author to be present at the poster for the hours noted in the program.

Each author selected for poster presentation will be provided with a 1.2m x 2.1m (4' x 7) tack board on which to display material related to his or her presentation. Thumbtacks will be provided. Please indicate any other need on item #8 Special Needs on the Abtract Submission Form.

INSTRUCTION FOR ABSTRACTS

Abstract Submission

Abstracts may be submitted in one of two ways:

1. Electronically on-line submission by accessing the EAFS web site at: http://www.eafs2003.org/sub/abstracts.php
2. By mail

a) Complete items #1-10 on the Abstract Submission Form. Type your abstract within boxed areas following the format guidelines. Proofread all information. The abstract will be used untouched (except for the insertion of a number) for reproduction in the Proceedings of the EAFS, available at the Meeting. Return the original and two photocopies of the completed form, the original abstract and two photocopies of the abstract, (and a copy on diskette if possible), by February 1, 2003.

or

b) Complete items #1-10 on the Abstract Submission Form. Do not type your abstract within the box but prepare your word processed abstract on diskette following the guidelines provided below. Return the original and two photocopies of the completed form, the diskette and two hard copies by February 1. 2003, to:

EAFS 2003 Istanbul Meeting Secretariat
ODS Tourism &Travel Ltd
Yildiz Cicegi Sokak 12/1 Etiler
80630 Istanbul / Turkey

Content of Abstract

Your abstract should be informative, containing:
A short specific title, the learning objectives, the purpose of the paper, a brief synopsis of the content or material and methods, a summary of the results, if pertinent, a general statement of conclusion. a minimum of approximately 600 words (one-half page) to a maximum of approximately 1200 words (one full-page) length. Abstracts that do not meet the one-half page minimum length criteria will not be printed in the EAFS Proceedings.

Format of Abstract

If submitted by mail, your abstract must be typed in a legible format following the instructions provided below:

1. The title, names of authors with respective degree(s), and addresses must be stated exactly as you wish them to appear in the program. Indicate with an asterisk (*) the presenting author.
2. Type abstract within boxed areas, single-spaced, 10-point size, Times New Roman font.
3. You can also mail your word processed abstract on diskette. Please follow the format guidelines provided below:
a) Software: Microsoft Word for Windows
b) Margins: Top 1" (2.54 cm), Left side: 1" (2.54 cm), Right side 1" (2.54 cm)
c) Type Font: Times New Roman
d) Type size 10 pt
e) Label the diskette with the presenting author's name. Include two hard copies of the abstract.

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