

Information Bulletin for Shoepprint/Toolmark Examiners



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FOREWORD

Dear colleagues,

Due to many reasons you have the first issue of the IBSTE of 2002 in your hands this late as in June. We are tending anyway to publish at least two issues more during this year. I would like to use an opportunity here to remind all our readers that new ideas what to put on the Bulletin are always welcomed.

You can get an overview what has been done within the Marks Working Group (MWG) by reading the annual report of the year 2001 on page 6 of this issue. I think one topic we all remember from last year is the discussion about the Bayesian approach in the interpretation of shoeprint examinations. The scale committee of the MWG gathered together in London in the laboratory of the Forensic Science Service in the beginning of March. You can find a review about the discussions in that meeting and the future plans of the scale committee in this IBSTE.

The following bigger event for the Marks Working Group will be the next SPTM meeting. According to the statute of MWG the next SPTM meeting will be arranged together with the EAFS 2003 meeting. The EAFS meeting (European Academy of Forensic Sciences) will be held in Istanbul, Turkey, 22-26 of September 2003. At the moment the steering committee/board of the MWG have very limited information about the structure and contents of the meeting but you will be kept informed about the EAFS meeting through these IBSTE issues and our e-mail discussion list for the SPTM community.

I wish you a warm and nice summer!

Sincerely,
Anja Ytti



Marks Working Group
Chairman Dr. Horst Katterwe



ANNUAL REPORT 2001

GENERAL

The Marks Working Group is one of the forensic science working groups of the European Network of Forensic Science Institutes (ENFSI). This working group covers examinations in a wide range of disciplines including tool marks, lock and key examinations, manufacturing marks, restoration of erased numbers, footwear marks, tyre marks, glove marks, bare feet and other related topics (but not fingerprint (dactyloscopy) related topics).

The general aims of the Marks Working Group are:

- To raise the level of expertise in marks examiners
- To promote best Quality Assurance practises in the fields of expertise covered by the Working Group.

These aims are to be achieved by

- Ensuring that there is an interchange of information between examiners in different organisations through scientific meetings, personal contacts and a regular information bulletin.

- Promoting research covering the various types of examination conducted by members of the working group.
- Establishing good contacts between the Marks Working Group and other relevant groups (either other ENFSI working groups or external organisations such as IAI and AFTE).
- Considering collaborative exercises with a view to standardising the levels of conclusion reached in different organisations.

1. MEMBERSHIP

At the end of 2001 the Group had 67 full members and 119 guest members, a total of 186 members. The members represented 35 different countries.

As the work of marks examiners not only covers toolmarks and shoeprints but also a wide array of other types of examinations, the Group prefers to keep the membership open, thus gaining benefit from the experience of a wide membership. According to the statute of the group, the experts coming from non-ENFSI institutes will hold a 'guest member' status.

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3. TERMS OF REFERENCE

WG newsletter

Again, like in the four past years, several issues of the publication 'Information Bulletin for SP/TM Examiners' (IBSTE) were published (in 2001: 3 issues). At the end of 2001, the print of the Bulletin was about 250 copies which were delivered to 36 countries. The editor of IBSTE has been changed during 2000. The new editor is Anja Ytti / Finland, co-editor Gerrit Volckeryck / Belgium.

WG www site

Updating the information on the www site of the MWG has mainly involved adding the latest Information Bulletins and new requests for help on the Wanted page. The WGwwwsite is updated by Sirkka Mikkonen and Anja Ytti (both from Finland).

Information service

Like in the previous year, the Group has increasingly been approached through e-mail contacts with requests for assistance. These have included:

- search for information or special knowledge to help in investigations of serious crime
- search for contact information when special expertise has been needed
- requests for article copies for different types of forensic scientific examinations

These types of requests have been received about thirty times during 2001.

In 2002 an e-mail discussion list ("closed" e-mail group) will be installed. 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 mean to discuss with a lot of people on one or other topic.

Contacts to other WG'S

The ENFSI Marks WG has contact to other WGs:

- WG Quality and Competence Committee (Anja Ytti)
- Conclusion Scale Group "Firearm" (Horst Katterwe)
- 3D Forensic Image Committee (Isaac Keereweer)

There are good contacts to the IAI (International Association for Identification) and to the AFTE (Association of Toolmark and Firearm Examiners).

4. AND 5. STATEMENT OF OBJECTIVES & PLAN INCL.

ACHIEVEMENTS AGAINST PLAN (ISSUES SOLVED; OUTSTANDING ISSUES)

Scale Committee

A 'Scale Committee' was established within the MWG with the aim of creating a common scale of conclusions to be used in the reports of marks examinations in Europe. The Committee has volunteering members from six countries under the chairmanship of H. Katterwe / Germany. The other members come from Belgium, Finland, Switzerland, Israel, UK).

After the establishment the Committee has arranged a first meeting in Wiesbaden/Germany, 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. In Sept. 2000 in Cracow there were hot discussions with the members of FSS. Then, the Committee invited two

"Bayesianists" (UK, NL) to a meeting in Brussels (Nov. 2000) to introduce their ideology. End the end of the workshop in Brussels the chairman (Horst Katterwe) gave the following homework: Do some hard thinking over the the problem of the 'a prior probability':" Who is best able to estimate an useful 'scientific a prior probability'?" The jury?? The scientist!!.

The arranging committee of the 4th SPTM meeting in Berlin 2001 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 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 "amputated Bayesian approach" in the interpretation and gave their comments why the "amputated Bayesian approach" is not suitable for mark examinations.

Automatic Comparison of Marks

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 the 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) also in Berlin carried out a feasible 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' (three-dimensional imaging

device based on the principle of structured light), and attained as gray value images by light microscopy photography, respectively.

A report of the first part of the project - a feasible study - was given in Stockholm 1999, the second part was a development of a prototype applicable in forensic science examinations in the BKA Wiesbaden and in the PTU Berlin. The third part of the project "development of a commercial system for the use in European forensic labs" will be the next step: are there EU funds?

In addition to these methods the BKA asked the "Institut für Mess- und Regelungstechnik, Universität Karlsruhe/Germany" for cooperation in the field of image processing strategy. The institute in Karlsruhe 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.

Footwear pattern databases

The results of a study demonstrated that there are a great number of different footwear pattern databases in use by law enforcement agencies and a huge amount on information within the systems. Standardizing the system will be difficult but it would still be useful to establish a common approach that would make it possible to better utilize the information as needs arise. Efforts will be made by the FSS to find out ways for improved co-operation.

Collaborative Exercises

The members of the Group would be very interested in participating in collaborative exercises. The majority question is where to find resources to arrange such exercises.

For the moment shoeprint and toolmark proficiency tests are being arranged in the Netherlands for the police officers of the regional Crime Scene Units. It will be discussed in the Netherlands if the possibility exists of expanding these tests to an international level. The representative of the Dutch Forensic Laboratory will take this forward.

Also, the Forensic Science Service / UK is arranging collaborative exercises in footwear identification in the UK. The FSS representative offered to discuss in his organisation the possibility of extending these to other countries.

Information databank on research

In addition, establishing an international databank on the research work done in the areas of interest for marks examiners was felt to be important. Volunteering members from Belgium, the Netherlands, Switzerland and the United Kingdom will try to do further work on this subject.

Certification program in Footwear Identification

The International Association for Identification (IAI) has established a Footwear Certification Program for shoeprint examiners. The only possibility to participate in the writing part of the exam has been offered in the annual IAI Training Conferences which are held in the USA.

The Marks Working Group suggested to the IAI that it would be taken into consideration whether the MWG could be authorised to give the written exams for FW Certification in Europe. At the end of 1999, the proposal was accepted. The written part of the test was offered first time in the EAFS 2000 meeting in Cracow and second time in the 4th SPTM Meeting in Berlin 2001. Until this six european shoeprint examiners (from Sweden, Norway, Finland and Belgium) have been

certified according to the requirements and testing set by the IAI Footwear Certification Board.

There are two IAI-documents, which give a description of the Certification process: "Requirements for Footwear Certification and Application" and "Footwear Re-certification Policy and Procedures".

Meetings

EAFS 2000 in Cracow, September 12 - 16, 2000

The Second European Academy of Forensic Science Meeting was arranged in Cracow in 12 - 16 September 2000. All the arrangements for the daily programmes, scientific sessions and social programmes were great and Cracow really offered a unique and charming atmosphere for the conference. Special thanks to Andrzej Chochol who was a member of the organizing committee of the conference. He was a very helpful host for the members of the Marks Working Group along his many other duties during the conference. In two scientific marks sessions there were seven interesting papers . There were representatives from Austria, Estonia, Finland, Germany, the Netherlands, Poland, Spain, Sweden, Switzerland, United Kingdom and USA.

MWG Board meeting in Cracow, Sept. 13, 2000

In the board meeting a discussion was made about new board members and the new MWG chairman.

Heikki Majamaa / Finland and Henk Doverman / NL had left the board: many thanks for all the work in the board. And especially for Heikki Majamaa - as the first WG Marks chairman - he had always very useful ideas for the forensic co-operation within ENFSI, Europe and the other continents.

MWG business meeting in Cracow, Sept. 13, 2000

In the MWG business meeting a proposition was made that (beside the "old members" John Birkett / UK and Horst Katterwe / Germany) Anja Ytti / Finland, Gerrit Volckeryck / Belgium and Isaac Keereweer / NL shall be new board members and Horst Katterwe / Germany shall be the new chairman. All the candidates were voted in the board.

Conclusion Scale meeting in Cracow, Sept. 13, 2000

There were "hot discussions" during the "Workshop Conclusion Scale" with Ian Evett, Christoph Champod, Graham Jackson (all FSS) on "one side" and Sandra Wiersema (FBI) with others on "the other side". End the end of this workshop the chairman (Horst Katterwe) gave the following "homework": Do some hard thinking over the problem of 'a prior probability': "Who is best able to estimate an useful 'scientific a prior probability'?" The jury?? The scientist!!

Conclusion Scale meeting in Brussels, Nov. 27 - 28, 2000

The main topic being discussed together with Marjan Sjerps (NL) and Christoph Champod (FSS) in Brussels was the basis of harmonized scale. Should it be based on an "Amputated Bayesian Approach" or should it be based on probabilities as the scales in use currently are based in many countries? And the "homework" of the chairman to the members was again an answer to the following question: "Estimation of prior odds: is this the task for the lawyers? Why shall this estimation not be the task for the scientists?"

MWG Board Meeting in Brussels, Nov., 28, 2000

Since many of the members of the scale committee are also members of the MWG Board, a Board Meeting was also arranged in Brussels. In the Board Meeting the possibility to make IBSTE in the future only as an internet version was discussed. One advantage of an internet version would be that it will save time and the amount of work of the editor. Furthermore an internet version could anyway be better quality of the IBSTE: you could use colours, all kind of graphics in different articles. The disadvantage of an internet version is that there exists quite a big group of readers who don't have internet connection easily in use.

SPTM Berlin, May 15 - 18, 2001

This meeting was organised by the Institut Polizeitechnische Untersuchungen (PTU) in Berlin and the Bundeskriminalamt (BKA) in Wiesbaden in cooperation with the Marks Working Group of ENFSI. The topics of the meeting included:

- Marks in general (toolmarks, shoesole and tire prints, locks and keys, restoration of erased numbers);
- Panel session: reporting conclusions (Bayesian, non-Bayesian);
- Session of automatic comparison of marks and profile measurements methods including a visit to the Fraunhofer Institute in Berlin where informations on the field of image processing and pattern recognition as well as manufacturing of technical surfaces were given.

FIFTH MEETING OF THE COMMITTEE ON THE HARMONISATION OF CONCLUSION SCALES IN FOOTWEAR CASEWORK

Forensic Science Service, London, March 1st & 2nd, 2002
Gerrit Volckeryck/MWG scale committee member



INTRODUCTION

Just after the second committee meeting (in Wiesbaden), a proposition of Charles Belser (Zurich, Switzerland) triggered a reaction of the U.K.'s Forensic Science Service (Christophe Champod and some of his colleagues). They argued that the proposition was in contradiction with the logic of probability theory and therefore was unscientific. Likelihood ratio should be used instead. This ended up in a debate which hasn't ended up to date. The debate focussed mainly on the question whether or not "Bayes' Theorem" should be applied in forensic science in general and – more specifically - in footwear identification problems. This sometimes heated discussion forced everyone in the "Marks" business to at least think about and eventually reconsider the principles he/she uses. As the debate went on, it got more and more polarized. This wouldn't help the committee to reach its goal : a harmonisation of the conclusion scales. Therefore, it was time to make a round-up and to go on with the (newly) acquired insights towards the goals that had been set at the start of this committee in Stockholm.

AGENDA

1. Welcome
2. Agenda
3. Retrospective views:
 - a. Stockholm 1999
 - b. Wiesbaden 2000
 - c. Cracow 2000
 - d. Brussels 2000
4. Berlin 2001 : Panel Session „Range of Conclusions“
5. AFTE, Newport Beach, 2001 : Bayesian or Non-Bayesian ?
6. Reproaches of some forensic scientists (FSS/UK, Univ. Lausanne)
against the conclusion scale of the „Marks Scale Committee“: justified
or fallacious?
7. German Marks Meeting, München 2001:
8. A one-sample-causality-model and the whole Bayes‘ rule in mark cases
9. The six steps conclusion scale of the ENFSI Marks WG:
 - a. theoretical argumentations for each step
 - b. experimental „step-standards“ and their photographic demonstrations
to help verify that the results of the examination are properly
10. Next conclusion scale meeting
11. AOB
12. Closing

DISCUSSION

Both the comments by those who are in favour of the L.R. approach as the ideas of the more traditional “probability scale” adepts were discussed. Chairman Horst Katterwe had prepared a summary of the main objections for the use of “probability scales” made by the F.S.S. and the Lausanne University (Reproaches

of Forensic Science Service, published on page 23). In another text (published on page 26) Horst Katterwe have commented on these objections and reproaches. Christophe Champod and Graham Jackson have later commented on Horst Katterwe's text in their letter. The main things to be remembered from this discussion :

- most of the traditional Shoeprint/Toolmark examiners are already using Bayes' rule implicitly, without realising.
- some of the Shoeprint/Toolmark examiners are using Bayes' rule explicitly. They are making conclusions, using a "probability" wording. One can do this, using the full Bayes' rule, if the judicial system allows the SP/TM examiner to adopt the prior odds.
- If the judicial system doesn't allow the scientist to assess the prior odds, he will have to make his conclusions, using only the likelihood ratio (partial Bayes' rule). From the viewpoint of the FSS (Champod et. Al) prior odds should be the burden of the courts.
- Chairman Horst Katterwe proposes to set default priors (1), when using the full Bayes' formula in shoeprint and toolmark casework. Whenever they display individual characteristics, the population of shoe outsoles, tools, ... is 1. This is the case with most of the tools and used shoes. Using default priors would also make it possible to transform "probability" scales into "support" (likelihood) scales and vice versa.
- The goal of the committee is to find a way to harmonise the conclusion scales, so that different examiners would draw the same conclusions when examining the same case and one would be able to compare the conclusions drawn in different labs in different countries even though they don't use the same wordings.

Champod's and Jackson's letter in response of Horst Katterwe's points of view certainly was a breakthrough in the discussion. It meant that a compromise had been reached. As an aside : the differences between the ideas of traditionalists and Bayes' adepts aren't too big anyway. From this moment, the committee could go on with the "real work".

ENFSI MARKS WG SIX STEPS CONCLUSION SCALE

It had already been discussed at the Wiesbaden meeting how many steps would be needed to differentiate between different levels of resemblance, without becoming too complicated to be handled by experts and laymen. A six-level scale got the support from all of the members of the scale committee :

Proposed six-level transformation scale

Level	Full Bayes' rule	Likelihood (partial Bayes' rule)
1	Identification	Identification
2	Very probable	- Very strong support for proposition A - Strong support
3	Probable	Moderately strong support
4	Non conclusive (possible yes / possible not)	- Moderate support - Limited support for proposition A - No support - Limited support for proposition \oplus - Moderate support
5	Probable not	- Moderately strong support - Strong support - Very strong support
6	Elimination	Elimination

The committee believes that two “absolute” conclusions are necessary : One positive and one negative. Although categorical conclusions like “identification – individualisation” aren’t supported by a Bayesian model, L.R. can be so high that the examiner can conclude “beyond reasonable doubt” that the object is (or isn’t) the source of the mark.

One inconclusive level is added in between. Since most of the times it’s easier to exclude an object as the possible source of a mark than to include it, it was decided to add two positive and one negative non-absolute conclusion levels. That was easy.

As each member gave his/her theoretical argumentation for each of the six levels, different points of view aroused. Isaac Keereweer from the Dutch NFI explained how shoeprint examiners evaluate acquired features on shoe outsoles in his country. The value given to the feature depends on its complexity and size, following strict guidelines. This system, which had already been presented at the Stockholm SPTM meeting, has proved to be successful in the Netherlands to get an harmonisation of the conclusions being drawn. Some members of the committee criticised the system as being too strict and too severe, since very many acquired features are needed to conclude to “individualisation”. Besides these points of criticism, everyone agreed that this type of system is ideal to get everyone in line and that the principle to assign values to each acquired feature depending on size and complexity, is a good one.

The other members’ argumentations for each of the six levels were less detailed. It became clear that definitions of terms would be needed to make sure that everyone is talking the same language and that exercises would be needed as a basis for discussion :

FUTURE

1. A new meeting will be organised at the end of 2002 or beginning 2003. Each member of the committee has to prepare for this meeting by :
 - a. redoing the shoeprint comparisons which have been distributed by the NBI for the SPTM meetings in 95 and 97. Conclusions from these comparisons will be made and explained, using the proposed six steps (full Bayes' or Likelihood Ratio) scale and :
 - i. the proposal of Isaac Keereweer (his strict scheme to define the value of accidental characteristics).
 - ii. the current procedure that is being applied in the lab of the member.
2. The terms being used in shoeprint casework have to be defined. Gerrit Volckeryck will make a proposition before the end of October 2002.
3. The definition of terms and the results of the comparisons will be sent to all the members for comments before the end of October 2002
4. Publishing the results of this meeting in IBSTE

REPROACHES OF FORENSIC SCIENCE SERVICE

(See reference to this on page 18)

1. The chosen terminology of the proposed "conclusion scale" (identification, very probable, probable, non conclusive, probable not, elimination) is in complete contradiction with the **principles of evidence interpretation**. Moreover, it is argued implicitly that the proposal derives from the consideration of a Bayesian approach to the interpretation, whereas on the contrary a coherent implementation of that framework shows that the **proposed scale defies the logic of probability theory**. If it is illogical, then it cannot **claim** to be scientific.
2. 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.
3. The **model of the Bayesian approach** can be illustrated by the following formula (odds form of the Bayes theorem):
$$O(A/I,E) = P(E/A) / P(E/\oplus) * O(A/I).$$
4. This formulation (the odds form of the Bayes theorem) **clarifies the position of the scientist as well as that of the jurist** and defines their relationship. The scientist is concerned solely with the likelihood ratio ($LR = P(E/A) / P(E/\oplus)$), whereas jurists deal with the odds on A. Likelihood ratios 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**".

5. The scientist cannot give an opinion on the form of a probability for the truth of a proposition unless he/she: either transpose the conditional (the prosecutor's fallacy), which is illogical; or takes account of the truth of non-scientific evidence, which is inadmissible. **The scientist should not take the artificial view on the number of potential sources. This assessment should be case specific and as such is outside the duty of a scientific expert**, and should remain the province of the factfinder. The scientist does not usually have access to the background information (at least in the adversarial system of justice) which is available to juries or judges. 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.
6. The statistician will use a model which tends to represent the variability of tool marks. **To our knowledge, no adequate accepted model exists at the present time.**
7. For tool marks, it is common to **claim the individuality of a mark** in reference to the manufacturing process of the tool or its "life" (to claim = to state that something is true, even though it has not been proved).
8. The distinction of roles is generally not respected in literature and practice; see for example the verbal conclusions proposed by the Marks Conclusion Committee. These conclusions offer the court an incorrect answer, if **they are based only on scientific examination to a question the court is interested in. A complete assessment** must combine both the forensic statement and background information.
9. **It is really a shame** that the Bayesian 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 in specialised scientific literature has been associated with such a perspective.

COMMENTS/OBJECTIONS TO REPROACHES OF FORENSIC SCIENCE SERVICE AND UNIVERSITY OF LAUSANNE

Horst Katterwe

1. Introduction

The recent comments by Champod, Evett, Jackson, Birkett (IBSTE Vol. 6, No. 3, October 2000), and Taroni, Margot (IBSTE Vol. 7, No. 2, June 2001), as well as the article by Taroni, Champod, Margot (AFTE Journal (Vol. 28, Number 4, October 1996, page 222 - 232) warn against use of probability scales in marks comparison. In my opinion, certain arguments advanced in the papers are fallacious and need to be corrected.

For easier understanding the following scenario and the following definitions of events are used:

On a burglary scene, a tool mark left on the front door is collected. Following police enquiry, a suspect is apprehended and his tools are seized, including several screwdrivers. A sufficient agreement in striae is reported between the mark from the scene and a mark made by one of the working surface of the collected screwdrivers. **The court wants to know if one working surface of the screwdrivers** (e.g. the macro/micro topography of that technical surface produced by random processes [which can be described by probability theory methods]) **has produced this tool mark.**

I

Some background information has been collected before the forensic examination. For example, data from the police investigation, eyewitness statements or data from the criminal historical record of the suspect, will contribute to I. Typically this information will reduce the number of potential suspects and, by extension, the number of potentials tools which could have been used in the specific case.

E

A match (in striation for example) has been reported between the tool mark left on a scene and the working surface of one screwdriver.

A

This particular screwdriver [including the mark generation process (action of the tool, position and movement of the tool working surface relative to the surface being marked)] has produced the tool mark.

⊕

This particular working surface of the screwdriver [including the mark generation process] has not produced the tool mark.

COMMENTS AND OBJECTIONS TO REPROACHES

Horst Katterwe

1. I don't know which kind of "principles of evidence interpretation" has to be considered. Moreover, the conclusion scale committee argued not only implicitly but also explicitly, that the proposal derives from the consideration of a Bayesian approach to the interpretation. A coherent implementation of that framework shows that the proposed scale is in best agreement with the logic of probability theory, especially in best agreement with the whole Bayes' rule, and in best connection with science.
2. In many part of science perfect knowledge does not exist. But I can't agree that always non-perfect knowledge must be described numerically in "terms of probabilities". I don't really know, what the meaning of "terms of probabilities" is. Scientists are working with models (descriptions of systems or structures) including well-defined parameters, showing the limitation of the range of validity. When working with well-defined physical models, physicists use mathematics for the expression of the ideas. But in most cases the mathematics used - solving the problems by physical laws - has not generally to do with applications of formulas of the probability theory.

Here are some examples:

the motion of the planetary system is described by classical laws of attraction of gravity without perfect knowledge of the individual masses and without contemplating methods for their actual measurements.

Newton's notions of a field of force and of action at a distance as well as Maxwell's concept of electromagnetic waves were at first decried as "unthinkable", since perfect knowledge of the existence of a field force or electromagnetic waves did not exist. However, these notions (notion = an idea that is not very clear) were described by physical laws using "non-probability-mathematics".

In addition, all physical measurements are affected by some degree of experimental error because of the inevitable imperfections in the measuring device, or the limitations imposed by our senses (vision and hearing) which must record the information. The precision of a measured number (value) - including the connotation of inaccuracy and uncertainty - allows us to define the number of significant figures.

3. The odds form of the Bayes rule is written here in an incorrect and illogical way. The event "I" is missing in the likelihood ratio. So, the written formula defies the logic of probability theory. If it is illogical, then it cannot claim to be scientific.
4. On the basis of an incorrectly and illogically written Bayes rule an interpretation of the position of the scientist as well as that of the jurist is given. If you think, that the event (I) ("the non-scientific background") is important for an estimation of the prior odds, then consequently the event (I) will be very important for an estimation of the likelihood ratio too.

On that manner a division of the Bayes rule into two parts - one for the scientists (the likelihood ratio) and one for the jurists (the prior odds) - is illogical. Furthermore, the interpretation of the likelihood ratio is not easy to understand: what is the logic, that the numerator of the likelihood ratio has always to do with "the prosecutor's hypothesis" and the denominator has

always to do with "the defence's hypothesis"? Why shall scientists give answers to non-scientific hypotheses?

5. The scientist can give very well an opinion on the form of a probability without transposing the conditional and without taking account of non-scientific evidence. I agree, the scientist is not able to assess correctly the prior odds in all forensic cases. But the estimations of prior odds on the basis of scientific informations are in most cases easier and more correctly than the estimations of the likelihood ratios (even restricted to scientific informations). In a scientific Bayesian Marks Analysis, which is part of a „statistical pattern recognition“, the symbol A in $p(A)$ refers to a mathematical description of the true structure in the „working surface“. The prior probability $p(A)$ is chosen to reflect the prior knowledge of the structure. The symbol E will refer to the observed comparison image. The likelihood $p(E/A)$ will usually be determined by physical considerations of the observation process, and is assumed to have been determined by past experiments. The posterior $p(A/E)$ is the basis for all inference on and decision from A.

In my opinion, science is concerned with all kinds of knowledge, based on examination and testing, and on facts that can be proved. And I think, something is logical, when it based on a series of facts, reasons, and ideas that are connected in a correct and intelligent way. The application of a scientific model must guarantee a logical duplication in that manner, that other scientists are able to duplicate the results under the conditions mentioned in the description (range of validity) of the used model. So, the transparency of the range of validity and of the ideas is a very important factor. This means that the numerical statement - restricted to scientific information - given by the scientist is sufficient on its own to determine the final odds in favour of an scientific event.

6. It is really a shame (by using the words of above mentioned authors) when reading, that "no adequate accepted model representing the variability of tool marks exists at the present time". However, there are many publications -the first published for more than 50 years - dealing those models of various

authors, like Biasotti, Brackett, Deinet, Katterwe, Klingenberg, Turkowski and ...

7. It is another shame, when reading, "it is common to **claim** the individuality of a mark in reference to the manufacturing process of the tool or its life". However, the individuality of marks has been proved experimentally, described with the help of mathematical models, and published in many scientific articles both in books and in journals during the last fifty years. A very good overview is given in the book „Technische Oberflächen“ (H. Weingraber, M. Abou-Aly, Vieweg Braunschweig 1989, ISBN 3-528-06318-1): Technical surfaces including statistics procedures: Tschebyscheff-Polynoms, Beta-functions, microgeometrical analysis for random surface structures, statistical behaviour of surface profiles, ...
8. The distinction of roles (jurists / scientists) is very well respected by the Marks Conclusion Committee. The conclusions don't offer the court an incorrect answer. The conclusions are based only on scientific informations to a scientific question the court is interested in. The validity range of the model is given and the parameters are well-defined: the model is based on transparency. The estimated inputs to the used "really Bayesian model" of the Scale Committee don't use information not relevant to the evaluation of the actual scientific comparison. The application of a mathematical model, which can solve simultaneously scientific and non-scientific problems, is not the task of a mark examiner, but see for example the publication: "Modell (inclusive Bayes' rule) zur gemeinsamen wahrscheinlichkeitstheoretischen Auswertung mehrerer Indizien", K.-U. Perret in Kube/Störzer/Brugger: Wissenschaftliche Kriminalistik, BKA Forschungsreihe, 1984. This publication is busy with a theoretical model, using simultaneously scientific and non-scientific informations.
9. The Bayesian approach to evidence evaluation and interpretation is not viewed with scepticism in marks comparison. With scepticism is viewed that only the "Likelihood approach" shall be the only way to evidence evaluation and

interpretation, and that the "Likelihood approach" is (illogically) called as "Bayesian approach".

I for myself was very busy in the interpretation of marks examination by means of the Bayes' rule for more than twenty years. It is really another shame that the above mentioned authors didn't read the publications of Deinet, Katterwe, Klingenberg, Nack, Nissen, published during the 1980th.

COMMENTS AND OBJECTIONS TO REPROACHES

NFI department of shoeprints & toolmarks,

Isaac Keereweer

Marcel van Beest

Jan van de Velde



To the first 5 statements, we make the following remarks:

No matter which approach we take, in the end an investigation will provide us with one or more similarities or dissimilarities. These findings will apply to accidental and class characteristics, which we will assess and with which we will establish a certain level of agreement. With each level goes a verbal statement, what we call a conclusion. This level of agreement is what we should standardise. This is exactly what constitutes the rate of support of a hypothesis.

What verbal conclusion scale we use is dependent on the country, in which the forensic laboratory resides, and to our opinion is less important for the harmonisation of the level of agreement.

We appreciate the fact that the current probability-scale gives us the prosecutor's fallacy. However, this has nothing to do with the Bayesian approach. To prevent the prosecutor's fallacy, the courts have to be made aware of this. We cannot change this over night. Of course, this will take time and effort.

To rate examinations which are expressed in a non-Bayesian way as being non-scientific is nonsense. The Bayesian approach itself is an inductive method and as such, according to fundamental science-philosophers, non-logic and thus non-scientific.

When the Bayesian approach is being practised, it must be practised consistently, i.e.: when databases are being used, a Likelihood Ratio on the rate of completeness and truthfulness of the database should be made. The same goes for eyewitness testimonies. In both cases a contra-hypothesis of partial completeness and partial-truthfulness can be formulated.

There are still other parts of the process that a Bayesian uses, which are based on the non-scientific assumption that they are categorically right. (Like, the examiner conducts his examination according to the one and only correct method, reproducible and right.)

When diverse Likelihood Ratios are being combined, the estimations in the LR's are being multiplied as well, making the total error unacceptable.

Statements six and seven need no comment on our part.

On statement eight however we feel that in our practice we just take the forensic evidence in account and not the background information, unless it is directly related with the forensic evidence (like the availability of the production numbers). Our proposed probability scale however, may not be the best way to express this.

On statement nine:

It is not so much with scepticism that we approach the Bayesian perspective, as well as the way it is being presented lately; as the one and only right way to do our job in a scientific way. We have just proven this wrong. Let's try to make clear to one and other how we reach a certain level of agreement in an examination, in order to reach the same conclusion in the same way. How to present the level of agreement is only the next step in our co-operation.

I hope that these remarks will contribute to a conclusion of the Bayesian dispute, so we can go on with the things that we intended to do.

ANNOUNCEMENTS

FORM FOR CONFIRMATION OF DETAILS

The last issue of the IBSTE included a form for confirming the information we currently have about people associated with the Enfsi Marks Working Group. Many thanks for all those active people who have sent the form back. Your addresses and contact numbers etc. have been already up-dated.

Anyway there still exist quite many people who have not sent the form back. If you, dear reader, now remember that you have not sent the form back could you still fill the form and send it to Anja Ytti (the editor) as soon as possible. By sending the form back your name will be included in the mailing list of the IBSTE also in the future. Please let us know also if you wish to receive an email when a new case is published on the "Wanted" page of the MWG website.

FORTHCOMING EVENTS

* 16TH MEETING OF THE INTERNATIONAL ASSOCIATION OF FORENSIC SCIENCES (IAFS)

2-7 September 2002, Montpellier, France

IAFS 2002 web site: www.iafs2002.fr

(the program, workshops, registration form and accommodation form will be found on the web page)

* INTERNATIONAL ASSOCIATION FOR IDENTIFICATION (IAI)
Annual Educational Conference

4-10 August 2002, Las Vegas, NV, USA

IAI web site: www.theiai.org



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