Home Office

Fingermark Visualisation Newsletter

February 2016

In memory of Dr Valerie Bowman

It is with great sadness to inform you that Valerie Bowman passed away on 19th December following an ongoing battle with cancer. Her funeral was on 31st December.

Val came into our lives in 2003 where she headed up the fingerprint programme at HOSDB until the organisational restructure from HOSDB to CAST in 2010. She retired from CAST in 2012, but continued to work on the Fingermark Visualisation Manual for a further year and was instrumental in its production. Val was a passionate and determined person who never seemed to seek the limelight but got on with the job and inspired others to pull together. Her drive, commitment and ability to make work fun were second to none. The delivery of the FVM was closure for Val and her time at the Home Office and it will continue to be her legacy. She will be deeply missed.

It is hard to believe that it has been two years since the launch of the Fingermark Visualisation Manual in the UK. A lot has happened in that time and this newsletter aims to bring you up-to-date with some of the activities within the fingerprint area at CAST.

Some of the information is nothing new – simply a reminder of how to access previously published documents that will be useful for ISO 17025 accreditation; some of the information is a snapshot of current activities both in- and out-of-house; and finally some is highlighting possible future activities.

CAST, like others, are working within staffing and budgetary constraints, but there is still an active, yet smaller, group of staff working on fingermark visualisation. In order to ensure continued support to the FVM in future years it is imperative that we work in close collaboration with industry, academia and law enforcement agencies, so that the best guidance can be given and directed to where guidance is needed most. On the operational side, it is positive news that a FEL Technical Group, chaired by Emily Burton, GMP, has been re-established. Governance will be provided through the existing Forensic Science Portfolio Board structure with the Forensic Delivery Board acting as the conduit into this structure. This group will act as a steering group to advise CAST on emerging policing priorities in respect to fingerprint development. On the research and development side, there is now an active 'Industry and Academia' group (chaired by CAST) that meet twice a year to share ideas and experiences. Some of the outputs from such engagements are described later in this newsletter.

We hope you find the information within this newsletter useful.

FINGERMARK VISUALISATION MANUAL

Editor: Dr Helen Bandey
(**helen.bandey@homeoffice.gsi.gov.uk**)

Workshops

From January – April 2014, four of the lead authors of the FVM (Helen Bandey, Steve Bleay, Rory Downham and Vaughn Sears), with the support from College of Policing Harperley Hall trainers, travelled across the UK to deliver familiarisation workshops to help end-users transition from the former *Manual of Fingerprint Development Techniques* (MoFDT) to the FVM. The feedback from workshop participants was very positive and it was clear that this was an important part of implementing the FVM effectively within organisations. One year on, Helen Bandey and Rory Downham were invited to deliver similar workshops to An Garda Síochána, at their headquarters in Dublin, Ireland. Again, this was received positively and CAST are now considering running future workshops for police and non-policing customers, UK and international. As a sign of the times, there will unfortunately be a cost associated with this training, although amounts are yet to be determined until it is clear that there is an appetite for such workshops. If you would like to register your interest in future workshops, please **email the editor** and you will be kept informed of any planned events.

Sales

All UK law enforcement agencies received free copies of the FVM for unrestricted use within their organisation.

FVM workshop at Harperley Hall

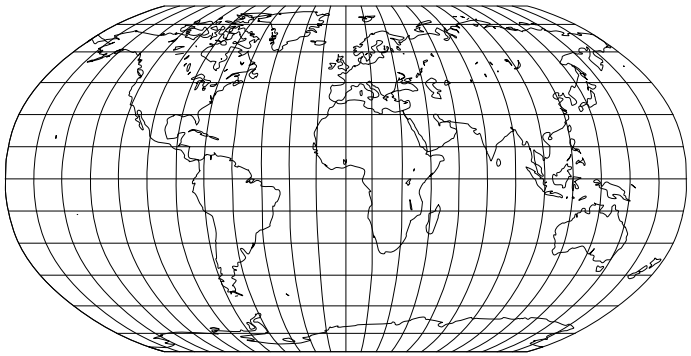
From April 2014 the FVM was made available to organisations or individuals outside of UK law enforcement including industry, academia and the international community. An individual copy can be purchased for £300, although there are discounts available for buying multiple copies and options available for network licences and annual subscriptions.

TSO (The Stationary Office), part of the Williams Lea Group, manage FVM sales on behalf of CAST. Since publication they have actively promoted the FVM or supported the authors with promotional material at conference and events worldwide.

In efforts to reach an even wider audience, TSO are working with Foster + Freeman Ltd, a world-leading forensic equipment supplier, and they are now actively promoting the manual via their website and global agents.

Sales to December 2015 include 215 pdf or print copies, 16 academic subscriptions and 8 overseas network licences to the following countries:

- Australia
- Canada
- China
- Cyprus
- Denmark
- Finland
- France
- Germany
- Hong Kong
- Ireland
- Italy
- Latvia
- Malta
- Netherlands
- New Zealand
- Nigeria
- Poland
- Portugal
- Singapore
- Slovakia
- Slovenia
- South Africa
- Spain
- Sweden
- Switzerland
- Taiwan
- Thailand
- UAE
- UK
- USA



FINGERMARK VISUALISATION MANUAL

Feedback on the FVM has been excellent, which is testament to the commitment and hard work of many people involved in its production. Notable examples of FVM worldwide uptake include:

- The Royal Canadian Mounted Police (RCMP) who have implemented the FVM across all of their identification units (~ 80) within Canada, thus ensuring that their forensic staff have access to the same information.
- The FVM is now considered as the standard reference manual for fingermark visualisation across Europe. It forms the basis of the visualisation section of the European Network of Forensic Science Institutes (ENFSI) 'Best Practice Manual for Fingerprint Examination' which is due for publication in early 2016.
- The US National Institute for Standards and Technology (NIST), Organisation of Scientific Area Committees (OSAC), Friction Ridge Subcommittee, are considering the FVM as one of the key documents to develop a USA standard concerning the detection of marks.

FVM sales requested should be directed to Clare Polley, Official/Libraries Sales Manager, TSO (**clare.polley@tso.co.uk**).

Improvement suggestions

Fingermark visualisation is a complex field and every effort was made by the editorial team to present the information in a format that is easy to follow, useful to the practitioner, and relevant to working practices at the time of publication. However, there may be sections that don't quite work, need expanding, are too complex etc. that you believe could be improved upon. The editor is keen to hear these improvement suggestions, so please email Helen with your thoughts.

Errors

Although every effort was make to eliminate errors, a small number did creep through. If you spot any can you please report them to the editor and they will be amended in future updates.

Updates

The future

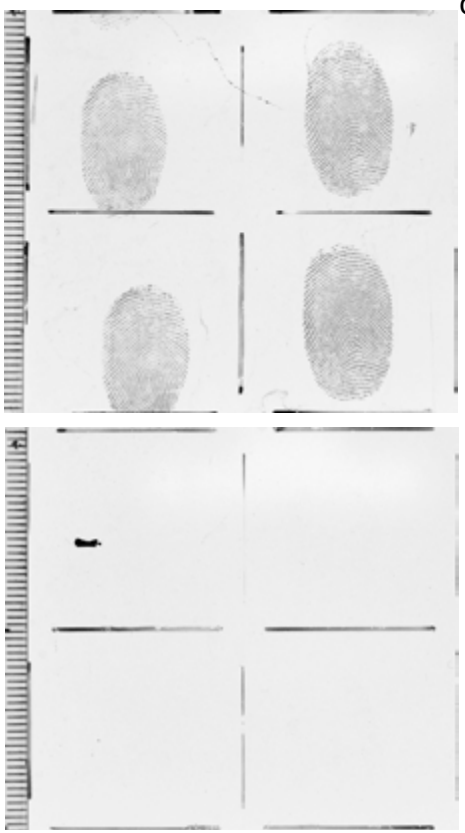
CAST will deliver updates to the FVM when there is a significant body of information to update. The mechanism of this is still to be determined, but if you are interested in being involved in the process then please contact the editor. This will likely involve the occasional meeting at the CAST facilities in Sandridge, Hertfordshire. It is worth emphasising that the relevance of information within the FVM is strongly dependent upon input from operational staff, so if you have views then please get in touch.

No more CHIP(s)

From 1st June 2015 the EC Regulation on classification, labelling and packaging of substances and mixtures (CLP) came into full force and the old regulations (CHIP) have now been phased out. The FVM was published during the transition period and so contains information on both systems within Chapter 3, Hazard Symbols (3.2.30 – 3.2.33) and certain process instructions within Chapter 5 (Health and Safety: labelling solutions). Going forward, only information relating to the CLP regulation is current and reference to CHIP regulations will be removed at the earliest opportunity.

Iron oxide powder suspension – a case study for chemical specification

CAST have received multiple reports of ineffective iron oxide powder suspension formulations where marks are either not developing or are of very low contrast (a & b).



a)

b)

Images of attempts to develop planted latent fingermarks on glass with iron oxide Powder Suspension where the source of the iron (II/III) oxide was different between (a) and (b). Clearly (a) has developed good quality marks as expected, whilst (b) has barely developed any ridge detail.

This is caused by variations in the specification of the iron (II/III) oxide powder. During the writing of the FVM, CAST took the decision to provide the chemical specification in preference to specific manufacturer's product details where possible. This approach goes some way to future proofing the information as suppliers and their products can change. The specification for the type/grade of iron (II/III) oxide in the FVM is given below:

Common Name	Iron (II/III) oxide
Alternative Name(s)	Iron oxide (FeO. Fe2O3), magnetite, pigment black 11 (CI77499)
CAS number	1317-61-9
Grade	Precipitated (synthetic), magnetic, particle size: 200nm – 1µm.

Iron Oxide specification as described in the FVM 5.PS.6

Many suppliers do not provide all of this information leading to uncertainty about whether or not the correct powder has been sourced. The consequences of 'getting it wrong' are clearly shown in the images on the left, and also recognised within the CAST *Fingerprint Source Book* v1.0, Chapter 3, Powder Suspensions, Critical Issues, p182:

'Performance of powder suspensions is often critically controlled by the particle size and the shape of the materials concerned which can vary widely with methods of preparation. Use of other generic sources of what is nominally the same chemical may result in very different results and batch testing is recommended.'

In addition, Powder Suspension is a relatively new process and its mechanism, including the powder specification, is not fully understood. However, it is known that the iron (II/III) oxide used in the CAST validation studies is effective (and this forms the basis of the FVM specification) and manufacturer's details are given below in an effort to ensure the correct powder is sourced.

Company	Fisher Scientific	Lanxess
Product	Iron oxide, pure,magnetic, precipitated	Bayferrox® 318, synthetic iron oxide Fe_3O_4
Detail	CAS: 1317-61-9 Grade: laboratory reagent Product code: 10385990 Legacy product code: I/1100/53	CAS: 1317-61-9 CI: Pigment black 11 (77499)
Comments	Used for all validation studies.	Manufacturer and supplier to Fisher; can be bought in bulk

Commercially available iron oxide powders known to be effective in Powder Suspension formulations at the time of testing

This is not to say that all alternative products are less effective, but additional validation work will be required to ensure that it works as expected.

RESEARCH & DEVELOPMENT

Service manager: Vaughn Sears
(**vaughn.sears@homeoffice.gsi.gov.uk**)

In-house studies

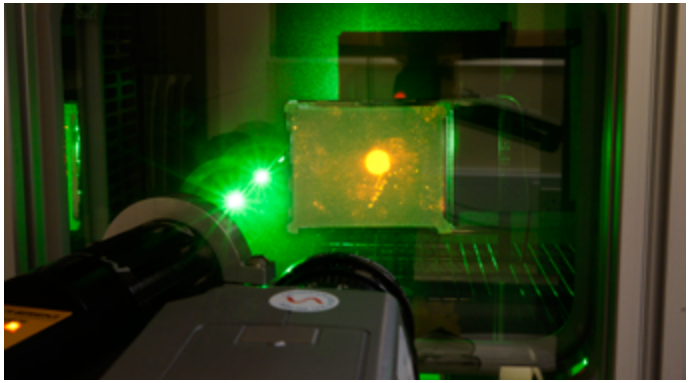
Indandione – the new DFO?

CAST is reinvestigating Indandione as a replacement for DFO on porous surfaces. Indandione is being adopted for use in many countries around the world following studies of the latest formulations.

Studies carried out by CAST from 1998 to 2001 and 2008 found DFO to be more effective, although in the latter study indandione developed more and better quality marks on brown envelopes and cardboard. Therefore indandione was placed in the Fingermark Visualisation Manual (FVM) as a Category B process.

CAST has looked at several of the accepted non-flammable formulations that are currently in use and used the results to make changes to the one given in the FVM. The latest formulation includes methanol which improves brightness of the developed marks with the same development conditions.

Further work to be completed includes validating the process on a wider range of papers, card and board, comparing DFO to the new indandione formulation and a pseudo operational trial. Then, if indandione proves more successful than DFO, we would seek permission from the forensic regulator to carry out an operational trial.



A typical experiment to help determine optimal oven processing parameters for Indandione. The image shows a sample inside the 'DFO' oven. The illumination source and measurement equipments (luminance meter) are located outside the oven and fluorescence intensity is measured in real time during heating.

Polymer banknotes

The Bank of England will be introducing polymer banknotes into circulation in late 2016. The rollout will start with £5 banknotes, and £10 banknotes will follow a year later. The change from paper to polymeric notes will impact on fingermark recovery methods and further guidance is required for optimum recovery processes and sequences.

The FVM already contains immature guidelines in the form of a non-porous secondary chart (FVM page 4.12). The information within Chart 1.7 Currency (Polymeric) was based upon recovery methodologies (at the time of writing) used in some countries that already have polymer banknotes in circulations (e.g. Australia and Canada). It was given low maturity as it was unclear whether the guidance would be effective on the proprietary substrates that will be used in Bank of England polymer banknotes.

A selection of Australian polymer banknotes

In order to improve the guidelines ahead of the rollout, CAST have obtained test banknotes from the Bank of England, so that comparison testing of processes can be carried out on notes that will be very close to the final product.

This work is currently progressing in-house at CAST, where conventional processes are being tested. Due to the confidentiality restrictions of using test banknotes and due to CAST's security arrangements, the Bank of England has agreed that other parties can test processes on the notes provided the work is done within the CAST laboratories.

For this reason, Foster + Freeman Ltd are testing novel powders and imaging methods, and West Technology Systems Ltd are testing VMD methods. The results of this limited study will be shared ahead of the rollout and this is likely to increase the maturity of Chart 1.7 from 1-bar to 2-3 bars (out of a 5-bar rating system). Only when the real notes are issued and further studies are conducted will the maturity increase further.

RESEARCH & DEVELOPMENT

Note: We have recently been informed that Scottish polymer banknotes will undergo a change so that they have material compatibility with the Bank of England notes and that these notes will be issued at the same time as those from the Bank of England.

One-step Superglue

Several organisations (including academic institutes, operational laboratories – UK and overseas, and CAST) have independently evaluated (to varying degrees) commercially available one-step superglue products that eliminate the need for separate superglue fuming and dye staining. These products continue to develop, with manufacturers regularly bringing out new and improved formulations.

Testing by most organisations has focussed on products produced by Foster + Freeman Ltd (PolyCyano UV) and Global Forensics Ltd (Lumicyano™, superseded by LumiKit™); however the Dutch company BVDA are now producing more alternative products (PECA Fluor Extra and PECA Multiband). Early indications suggest that in some cases they are comparable in effectiveness to normal Superglue Fuming and BY40 dye staining, if used as recommended, and therefore worthy of further in-depth studies.

Effectiveness aside, there is an obvious advantage to using such products – they are fluorescent and so eliminate the need for liquid-based fluorescent dye stains. This should reduce overall processing time and potentially allow successful treatment of previously problematic surfaces (i.e. surfaces that would background stain if conventional dye staining solutions were used). However, there may be practical limitations that must be considered prior to use. They include:

1. **The stability of the fluorescent marks:** some products produce marks that fade quickly and require immediate imaging; some produce marks that are initially dim and brighten over time. Consideration must be given to the time between development and searching/imaging.
2. **The brightness of the fluorescent marks:** some products produce marks that are considerably fainter than typical BY40 stained superglue marks. Consideration must be given to search methods as dim marks are more likely to be missed than bright ones.
3. **Interference from substrate fluorescence:** some products require illumination with UV light sources which typically give higher background fluorescence than visible wavelength illuminations, although the extent is very substrate dependent. Consideration must be given to whether marks will be missed as their fluorescence is swamped by background interference. This will be more of a problem if the marks are not brightly fluorescent in the first place.
4. **The cleanliness of the fuming cabinet:** some product manufacturers instruct that the fuming cabinet must be clean and must not have old cyanoacrylate residue present. Consideration should be given as to whether more regular cleaning, potentially before every run, is practical in an operational laboratory.

Currently, in the FVM, these products are grouped together under ‘Fluorescent Superglue Fuming’ and are allocated as a category ‘C’ process (page 6.2.8) with a low maturity (2-bars). Based upon the evidence to date, it is anticipated that these types of products will be promoted to category ‘B’ with a slightly higher maturity at the first available opportunity. Considerably more validation data is required if they are to appear on charts in Chapter 4. However, they are certainly processes that should be considered if regular Superglue Fuming/Dye Staining cannot be used.

If you are using one or more of these processes within your laboratory and are willing to share data and/or practical experience with CAST then please contact either Helen or Vaughn on the email addresses given early in the newsletter.

RESEARCH & DEVELOPMENT

Studies directly supported by CAST

Forensic recovery from metal surfaces, including fire-arms and ammunition

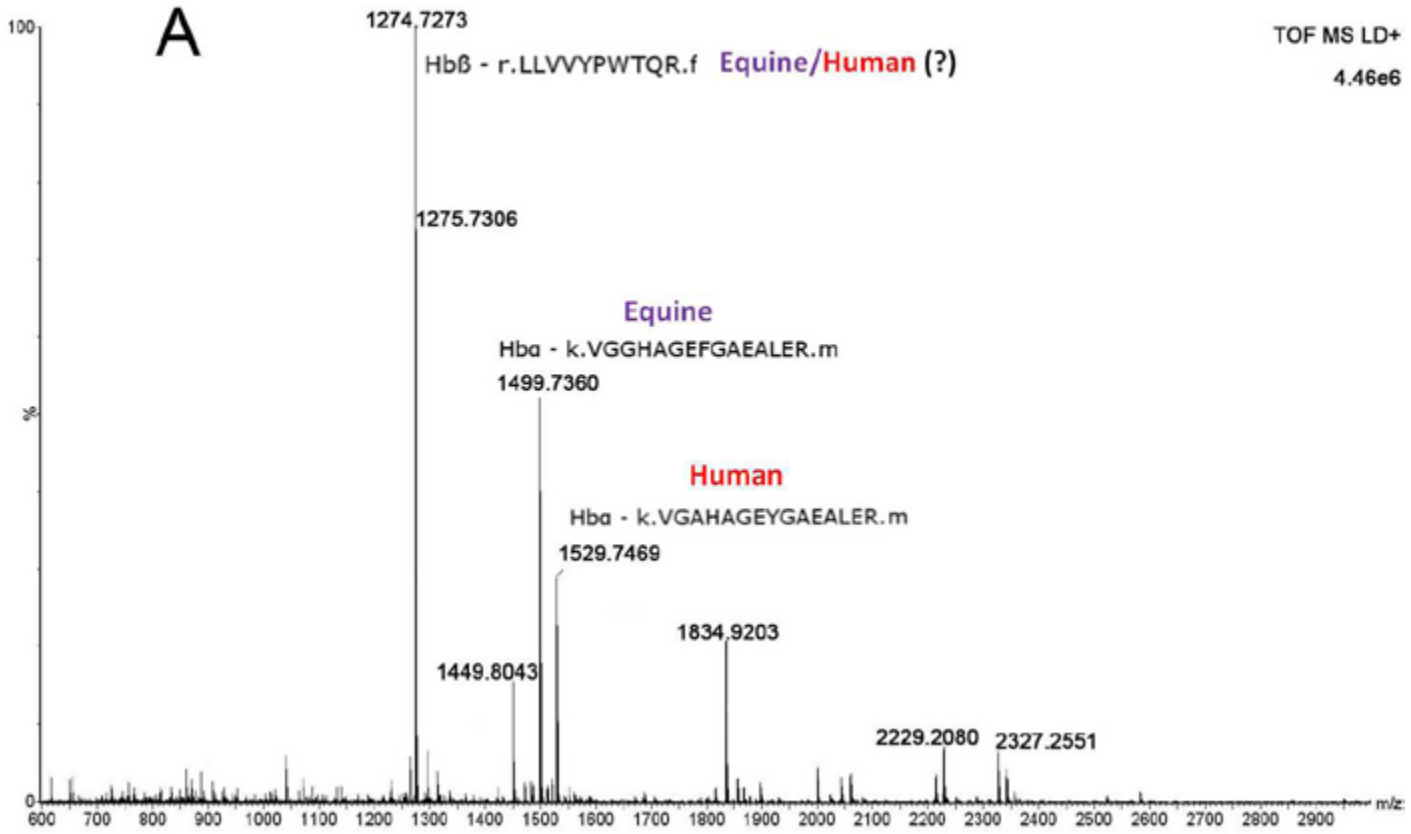
CAST are match-funding a PhD at Dundee University looking at systematic investigation into fingerprint and DNA recovery from fired ammunition and handguns. Currently the student is screening 20 different processes on metals to establish which is effective at developing fingermarks.

Maximising evidence from blood and other body fluid contamination

CAST are match-funding a PhD at Sheffield Hallam University, which started in September 2014, looking at a multi-informative and specific detection of blood in both untreated fingermarks and fingermarks previously enhanced with protein stains via Matrix Assisted Laser Desorption/ Ionization – Mass Spectrometry (MALDI-MS) based strategies.

The student has had success in determining human haemoglobin from a nine year old blood sample that was treated with acid black 1. It has also been possible to detect both horse and human haemoglobin from a mixture of the two types of blood.

The test kits currently used by forensic providers and police forces are only presumptive for the presence of human blood and are subject to false positives, whereas MALDI will positively identify human blood and is much more sensitive, able to work on tiny amounts from a fingermark ridge.



MALDI MS spectrum of an extract of a mixed sample containing human and equine blood. Although there is uncertainty for the haemoglobin peptide at m/z 1274.7272, the peptides at m/z 1499.7358 and 1529.7469 unequivocally indicate a mixed origin deriving from equine and human blood respectively.

They are also carrying out some infinite focussing microscopy to see blood marks in 3D, which may be useful in determining whether a blood contaminated mark has been deposited on a clean surface or whether a finger has made contact with a pre-existing blood spot.

RESEARCH & DEVELOPMENT

Evaluation of processes for fabrics

An MSc project at Kings College London has been studying whether powders, powder suspensions, VMD or Lumicyano could be used to develop fingermarks on waterproof fabrics.

Examination of fingermarks using microscopy

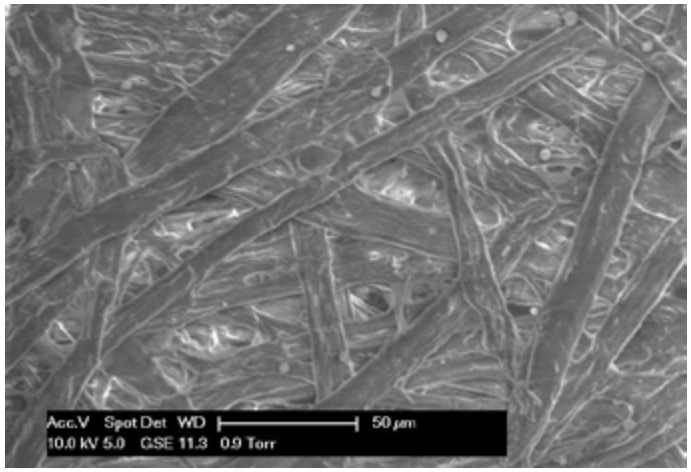
An MSc project at London South Bank University used scanning electron microscopy (SEM) to examine the surfaces of weathered metals and the appearance of fingermarks developed using several processes on these surfaces with the aim of establishing how weathering affected how marks were developed.

Fundamental studies

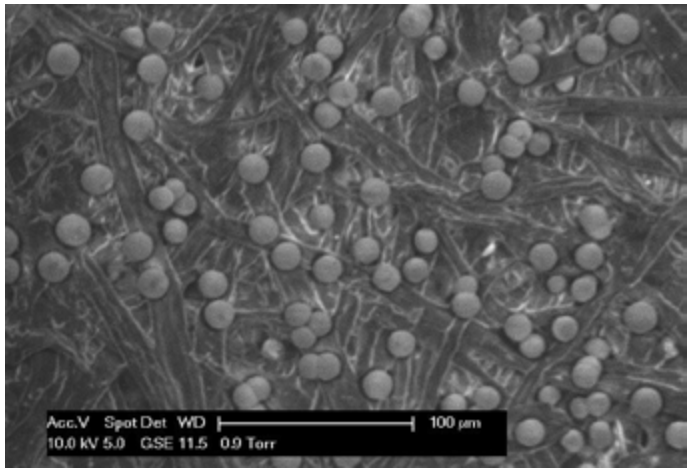
CAST have match-funded a PhD at Manchester University which looked at mechanisms of latent fingerprint interaction with surfaces and development processes. The student looked at fingerprint topography and charge with time using atomic force microscopy (AFM) and laser scanning microscopy (LSM). They have been able to demonstrate that fingerprint ridge material flows then dries giving an intermediate area on the edge of the ridge that has different properties to that of the ridge or inter-ridge on an ideal and a real sample.

Liquid metal deposition – Physical Developer

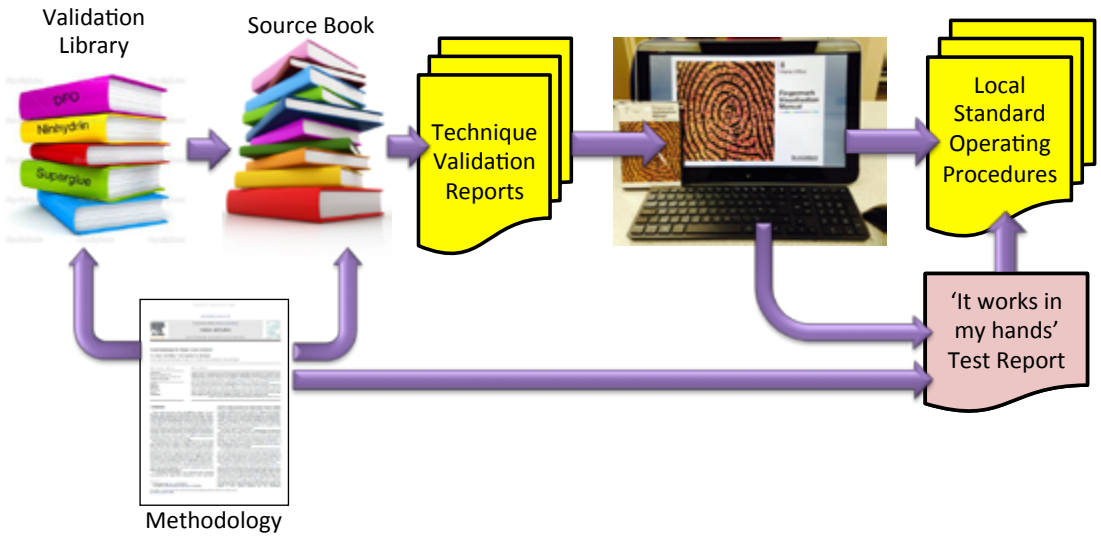
CAST are match-funding the cost of a PhD at Leicester University, looking at the nucleation and growth phenomena of metal-based latent fingerprint technologies. So far the student has found that the particles of silver deposited by PD contains no iron from the redox system, that development starts within seconds and that the particles of silver continue to grow for at least 15 minutes.



©University of Leicester
SEM images for fingerprints after 1 minute (above) and 15 minutes (below) on white copy paper which have been enhanced by PD showing growth of silver particles



ISO 17025



Relationship between CAST documents (left of FVM) and documents expected of fingerprint laboratories (right of FVM)

Available information on process validation

CAST have pulled together a wealth of information around process validation with the aim of ensuring that the bulk of validation work is not repeated by every police laboratory, thus saving time and money. The documents and how they link are shown below:

Fingerprint Source Book

Editor: Dr Stephen Bleay (**stephen.bleay@homeoffice.gsi.gov.uk**)

The CAST *Fingerprint Source Book* provides the Forensic Science Regulator and the United Kingdom Accreditation Service (UKAS) with the background evidence behind the advice given in the 2nd Edition *Manual of Fingerprint Development Techniques*. It is an extensive document (~500 pages) and has been made available through the government website:

https://www.gov.uk/government/publications/fingerprint-source-book

It is currently undergoing a review so that the information will be aligned with that provided in the 1st Edition *Fingermark Visualisation Manual*. It is anticipated that it will be available on the website in early 2016.

The '***Validation Library***' is held by CAST and simply a collation of the papers and reports that are referenced within the Source Book. Many of the references are available in peer reviewed journals, whilst others are student reports, newsletters etc. that have not been through an external peer review process, but form the basis for some of the information within the FVM.

Technique Validation Reports

'Technique Validation Reports' have been written by CAST for the main processes within the 2nd Edition *Manual of Fingerprint Development Techniques* and are available for download from POLKA (Forensic Quality Standards community). They are short linking documents between the Manual and the *Fingerprint Source Book* i.e. they inform where to find information (such as the validation of processing parameters etc.) and give direct page references to the Source Book and the wider literature.

Along with the *Fingerprint Source Book*, these documents also need updating to align with the FVM and this will be done as soon as CAST has the resources to do so.

Methodology

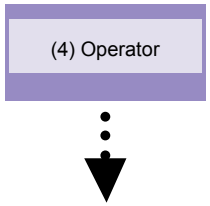
Appendix 2 within the FVM contains an overview of the general steps require for method validation and the full reference for the CAST methodology paper can be found on page A.2.5. The International Fingermark Research Group's paper described on that page has since been published and the full reference is:

Guidelines for the Assessment of Fingermark Detection Techniques, *Journal of Forensic Identification*, vol. 64, pp. 174-200, 2014.

Guidance on 'suitable' dark adaptation

It has come to our attention that practitioners are being asked by UKAS to demonstrate that they are suitably dark adapted as recommended in the FVM. This is a reasonable request because when conducting a fluorescence examination for latent marks with the eye (as opposed to an imaging system) it is important that the eye is suitably adapted to the dark otherwise weakly fluorescing marks will be missed.

A real world example of this is the ability to see stars in the sky: firstly if you go from a well lit area, (e.g. your house) to a dark outside area, you may not see many stars initially, but as you wait more and more stars appear; secondly if you live in a city where there is significant light pollution, you will see fewer stars (even when dark adapted) than you would if you lived in a rural area with minimal light pollution. This has direct correlation to visualising mark when conducting fluorescence examination searches where the points above relate to the dark adaptation time and the level of room blackout respectively. On page 5.FE.12 the FVM says:



a) If viewing items with the eye, the operator must be suitably **dark adapted** before beginning fluorescence examination. This step is not necessary if viewing items through a live capture imaging system.

There is a link from this text to page 5.FE.49 (supplementary information) where dark adaptation is briefly described. This is copied below:

Dark adaptation (and light adaptation): The ability to see faint fluorescence arising from treated and untreated fingermarks is a critical factor in the successful execution of Fluorescence Examination. The sensitivity of the eye increases in the dark. In order to detect very faint fluorescence it is necessary to allow time (15-30 minutes) for the eyes to become sufficiently dark adapted (full dark adaptation can take up to 40 minutes). Light adaptation, on the other hand, is very quick (full light adaptation takes only five minutes). If the dark adaptation of the examiner is not maintained then it will be necessary, once again, to allow sufficient time for dark adaptation to be restored.

Usefully, the dark adapted eye is insensitive to deep red light. It is therefore possible to use a red torch, very low level room lighting or a red safe light to maintain the sensitivity during the examination period. Red goggles can also be used for dark adaptation.

The speed of dark adaptation depends on a number of factors including, but not limited to, wavelength of light, viewing time in brighter 'pre-dark adaptation' light, area of retina illuminated, viewer's age and eye condition.

Suggestions on dark adaptation in a laboratory environment are described below.

Sensible measures:

1. **Be aware of how your eyes adapt in the dark.** This is more of a training exercise for those new to working in the dark and/ or those wanting a better appreciation of the benefits of dark adapting. Familiarise yourself with the appearance of your fluorescence examination room whilst dark adapting (no goggles/glasses). Observe light-leakage e.g. from under the door, or from around the windows etc. Make a mental note of how your observations change the longer you spend in the dark. This is more an exercise to appreciate how much more you can see as your eyes adjust to the dark and is a good indicator of what you should be seeing in the room prior to starting an examination. [It may also be that you see too much and should consider additional blackout solutions].
2. **Consider the brightness of the marks being observed.** The fluorescence emission from something like Basic Yellow 40 is very bright and will be observed with minimal, if any, dark adaptation – your eyes don't have to be that sensitive. On the other hand, the brightness of marks found during an initial fluorescence examination could vary, and the eye must be adapted to low light level conditions if the weakest of marks are to be found (15-30 minutes as described in the FVM).

3. **Reduce time spent in the dark adapting by wearing dark adaptation goggles first.** This may look odd to colleagues unfamiliar to the process, but it has dramatic effect on the time required to sit in the dark, adapting, plus you are able to carry out other tasks simultaneously. For full impact, the goggles should be well-fitted so that stray light is eliminated. Ideally the goggles should block light below 640 nm, however standard long-pass 593 nm (1% transmission) goggles are a good compromise between optimal dark adaptation requirements and enabling the wearer to see enough to carry out other tasks.
4. **Minimise light interruptions during examinations.** This includes turning the lights on and off during examinations. If light is needed for writing, marking up etc. try to use red subdued lighting (a dim, red torch would do) or put the 'dark adaptation' goggles back on if normal room lighting is to be used. Of course, this must be balanced with the need for regular breaks as these types of examination can be very tiring to the eyes.

Foster + Freeman Ltd. are now selling a simplified dark adaptation test ('Crime-Lite® Eye') that may help practitioners know when optimum dark adaptation is achieved.

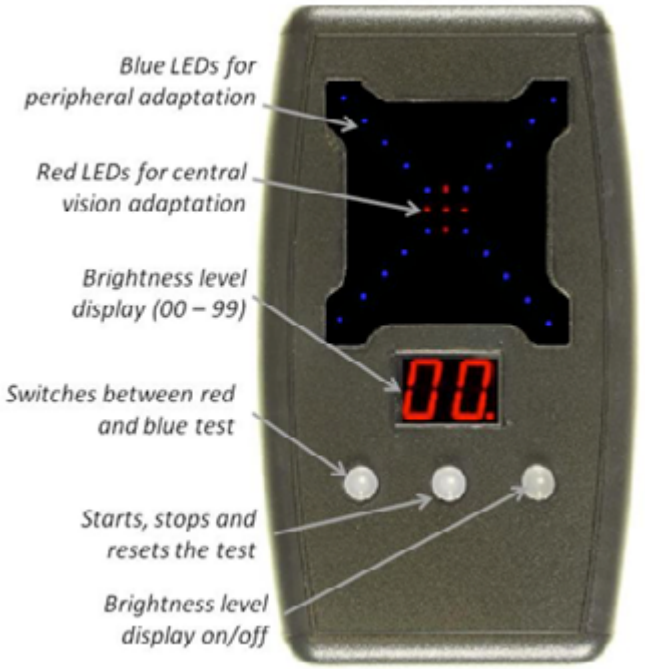
This type of kit is potentially useful as it focuses on the eye's sensitivity rather than simply using a standard length of time for dark adaptation.

It is unclear exactly what sensitivity levels are required for different types of examinations, but someone competent in fluorescence examination and knowledge of dark adaptation (as described here and in the FVM) should be able to set the test to sensible levels.

Background

The information in the FVM was based upon well-documented dark adaptation theory and experimental work conduced at CAST from 2009–2010 (key results are shown at the end of this article).

The following information will be further explained within the CAST *Fingerprint Source Book* 2016 update. However it was felt important to include it in this newsletter as it clearly shows the difference that simple steps can make to improving visibility during the first minutes of a search where blackout conditioned are required.

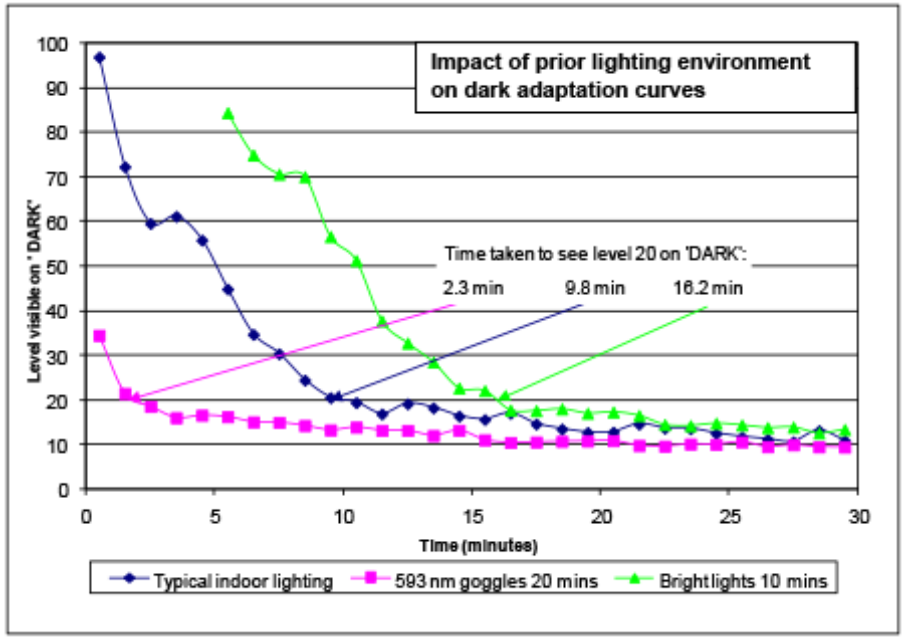


Dark Adaptation Readiness Kit (DARK) developed by CAST for in-house testing of staff's ability to 'see' in the dark. The kit measures the brightness level at which the LED emission is just perceived.

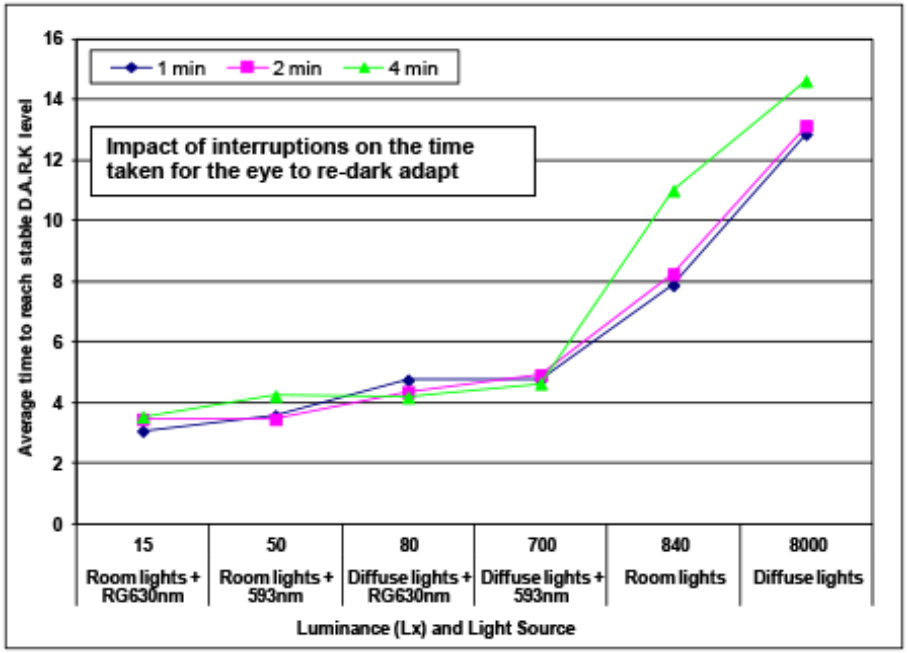
In 2009 CAST designed and built a dark adaptation monitor and this is pictured above. 'DARK' was a simple test designed to enable the operator to measure the 'brightness' level at which the LED emission is just perceived at various stages during the dark adaptation process. The 'brightness' level at which the LEDs become visible drops with time and then stabilises as full dark adaptation is achieved.

ISO 17025

The figures to the right were generated using the 'DARK' test and represent averages across a range of donors. The top figure shows the impact on the dark adaptation curve of the operator's environment prior to starting this test. It clearly shows the benefit of minimising light exposure (both in intensity and wavelength) as an operator preparation step. The bottom figure shows the impact of interruptions on they eyes ability to see low light levels, and clearly shows that simply turning room lights on and off is bad for dark vision, even for short time periods. It also shows that the impact can be minimised by reducing the intensity of the light and restricting wavelengths to the red end of the spectrum.



Lowest perceived level on 'DARK' as a function of time for subjects in a blacked out room. The plots show the impact of pre-adaptation lighting conditions on the time taken to reach full dark adaptation.



Time to recover full dark adaptation (according to 'DARK') as a function of the type of interruption. The different plots show the impact of interruption time on re-dark adapting.

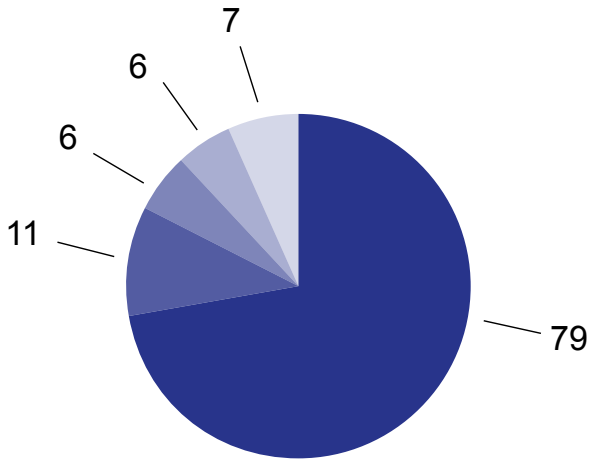
ADVICE SERVICE

Service manager: Vaughn Sears (**vaughn.sears@homeoffice.gsi.gov.uk**)

CAST has an advice service to answer enquiries about fingermark visualisation and related areas (footwear mark recovery, crime scene, ISO 17025 etc.). In the first half of the financial year 2015/16 CAST answered 109 enquiries, mainly in the form of telephone calls and emails.

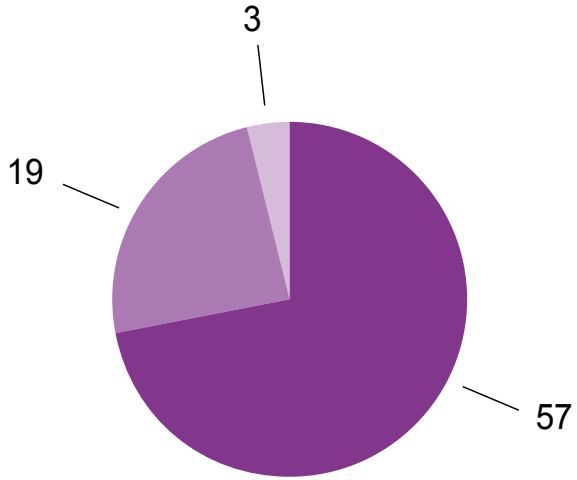
If you use this service it is important that you feedback on the usefulness of any of the advice given as it helps CAST monitor its impact and help with its future provision.

Who (109)



- 79 from UK law enforcement agencies
- 11 from international law enforcement agencies and academic institutions
- 6 from commercial organisation
- 6 from UK academic institutions
- 7 others, inc Home Office and other government departments

Subject Headings by UK Law Enforcement agencies (79)



- 57 about fingermarks and other forensic areas
- 19 about ISO 17025 and quality issues (1 less than in the whole of FY 14/15)
- 3 about other (Inc health and safety, laboratory design issues, crime scene etc.)

FUTURE WATCH

Regulation (EU) 517/2014 - 'On Fluorinated Greenhouse Gases'

CAST are aware of the following information and will be monitoring its progress and act accordingly. Restrictions on the use of such solvents may impact considerably on the operational capability to develop marks on porous surfaces, unless alternative processes are developed.

The objective of EU Regulation 517/2014 is to protect the environment by reducing emissions of fluorinated greenhouse gases (F gases).

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change of the United Nations Framework Convention on Climate Change stated that, on the basis of existing scientific data, developed countries would need to reduce greenhouse gas emissions by 80% to 95% below 1990 levels by 2050 to limit global climate change to a temperature increase of 2 °C and thus prevent undesirable climate effects.

To reach this target, the European Commission has adopted a roadmap for moving to a competitive low carbon economy in 2050. Part of the roadmap states that non-CO2 emissions, including fluorinated greenhouse gases but excluding non-CO2 emissions from agriculture, should be reduced by 72% to 73% by 2030. To this end Regulation 517/2014 places F gases into two groups – Annex I which contains hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) and Annex II which contains unsaturated HFCs, some of which contain chlorine, and fluorinated ethers and alcohols.

F gases in Annex I will see a reduction of the quantity being placed on the market year on year until 2030, while F gases in Annex II are subject to only to have the quantity being placed on the market reported to the EU commission.

3M NovecTM HFE7100 fluid is listed in Annex II so at present is not subjected to any use restrictions. However, it should be noted that some of the F gases in Annex II have more Global Warming Potential (GWP) than some of those in Annex I so there may be future modifications to which F gases face restrictions.

OTHER NEWS

The European Network of Forensic Science Institutes (ENFSI)

The EC provides financial grants to ENFSI for project-based activities and currently CAST staff members are active in two fingerprint related Monopoly Programme (MP) funded projects:

(1) MP2012: Best Practice Manual for Fingerprint Examination (Jan 2014- Dec 2015)

CAST contact: Dr Helen Bandey (**helen.bandey@homeoffice.gsi.gov.uk**)

The ENFSI Fingerprint Working were awarded a two-year grant to produce a 'Best Practice Manual for Fingerprint Examination', covering visualisation, imaging and comparison. This will contribute towards a key ENFSI objective to have BPMs for all of the forensic disciplines within its organisation. The development of the BPM draws upon the widest possible experience from across the whole ENFSI community and it reflects a balanced view of what is considered to be 'best-practice'.

(2) MP2013: Proficiency tests for the fingerprint domain (Jan 2015–Dec 2016)

CAST contact: Jonathan Vaughan (**jonathan.vaughan@homeoffice.gsi.gov.uk**)

This activity is undertaking a broad look at the difficult area of fingerprint proficiency tests (PTs) and collaborative exercises (CEs). This will include the development of at least two PTs/CEs across the full forensic process – development, imaging and individualisation. It will also review the past experience of PTs/CEs since 2006, evaluate the real costs of conducting PTs/CEs and look to the organisation of international PTs/CEs in the future.

Further details on ENFSI and its activities can be found at: **www.enfsi.eu**

2016 ENFSI Fingerprint Working Group meeting

This year's meeting will be hosted by the Police Service of Northern Ireland, Belfast from 6th - 9th September. CAST have been actively involved with this working group for many years and during the 2015 meeting in Barcelona Helen Bandey was appointed the lead for the visualisation sub-group. If you would like to find out more about this operationally driven meeting, and find out about and engage with our European colleagues, then please contact Helen for further details.

Winston Churchill Memorial Trust

http://www.wcmt.org.uk

'Travel to learn – return to inspire…'

'We fund British citizens to investigate inspiring practice in other countries, and return with innovative ideas for the benefit of people across the UK.'

Helen Bandey was lucky enough to be awarded a Winston Churchill Travelling Fellowship and completed her travels to North America in August/September 2014. Helen is keen to raise awareness of the WCMT and encourage others to apply for this once-in-a-lifetime opportunity. It is open to anyone from any background – you just need an idea! Please take the time to visit their website and learn more about the charity. If you are interested specifically in Helen's trip, full details can be found in her report which is located on the WCMT website at: **http://www.wcmt.org.uk/fellows/reports/crime-reduction-sharing-fingermark-visualisation-best-practice**.