

Multidisciplinary Collaborative Exercises

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IAI Nashville, 08/03/2021

ENFSI





The European Network of Forensic Science Institutes (ENFSI) was founded in 1995 with the purpose of:

- Improving the mutual exchange of information in the field of forensic science; and
- Improving the quality of forensic science delivery in Europe.

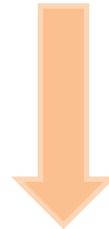
Besides the general work in the fields of quality and competence management, research and development, and education and training, various forensic expertises are dealt with by 17 different Expert Working Groups. Therefore, ENFSI has been recognized as the monopoly organization in the field of forensic science by the European Commission.

Collaborative Exercises

- Collaborative Exercises address specific issues, such as troubleshooting, method validation, or characterization of reference materials
- Aim: to foster a collective understanding on where improvement opportunities exist

Monopoly Project 2016

Steps Towards a European Forensic Science Area – STEFA
ISFP-2016-AG-IBA-ENFSI project 779485 co-funded by the
Internal Security Fund of the European Union



Collaborative Exercises covering
different forensic disciplines

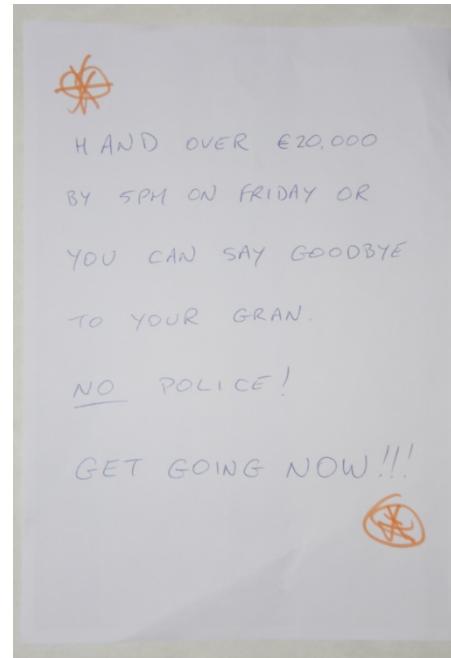
Monopoly Project 2016

Background

- Historically Proficiency Tests (PTs) and Collaborative Exercises (CEs) within the Forensic Science area have only been carried out within a single discipline.
- PTs or CEs tended to cover only the examination and interpretation aspects of the individual forensic processes.
- However the “real” world is normally more complex than a single examination, and in many instances forensic material must be examined for a number of different evidence types.

2019 – first attempt of multidisciplinary CE

A Collaborative Exercise has been developed covering DNA, fingerprints, documents and handwriting



2019 – first attempt of multidisciplinary CE

Team composed of 2 experts belonging to the four different working groups (DNA, fingerprint, documents, handwriting)

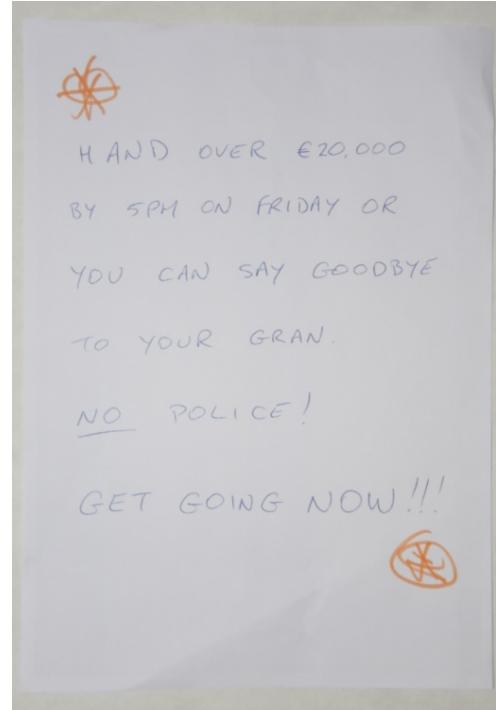


The test

The Netherlands Forensic Institute (NFI) volunteered to prepare the samples



envelope



Threatening letter

The test

Reference materials

Handwriting - handwriting from the three suspects (A, B, C) produced in jpeg format (scanning resolution 600dpi) .

Documents - two printouts of two copy machines (Device 1 - Kyocera TASKalfa 2552ci; Device 2 - HP Color LaserJet CM6040MFP)

Fingerprints - fingerprint samples from the three suspects (A, B, C) produced in tiff format (scanning resolution 1000dpi)

Traces

Handwriting

The “original” threatening letter was written by an individual in Scotland and scanned, at 600dpi, by a colleague at Scottish Police Authority (SPA) Forensic Services in Scotland.

This scanned image was then sent to the EFSI in Estonia.

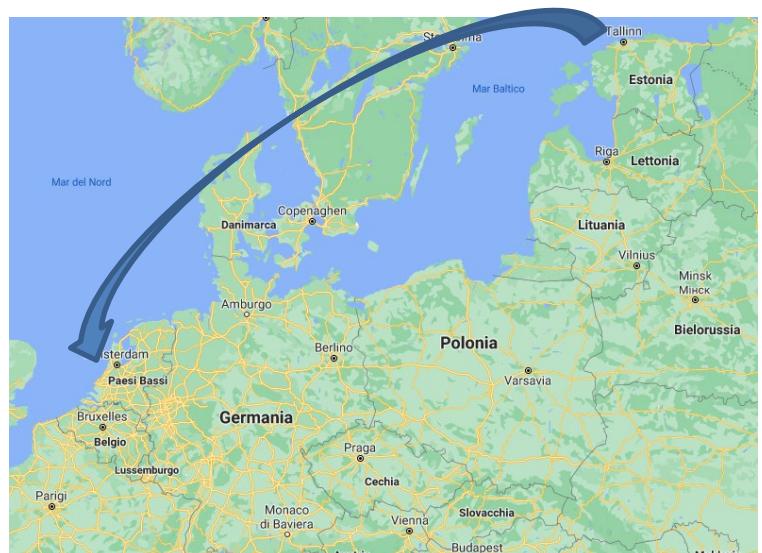
Traces

Documents

The threatening letters were printed on a suitable (colored) laser printer. The handwriting on the envelope was created using a very deliberate disguise mechanism, produced by none of the individuals that prepared the sample handwriting.

On each questioned letter there were also indented impressions of a handwritten telephone number “07534595393”.

This material was then delivered to the NFI in the Netherlands. There, the material was ‘sterilized’ using ultra-violet radiation before the final exhibits were prepared.



Traces

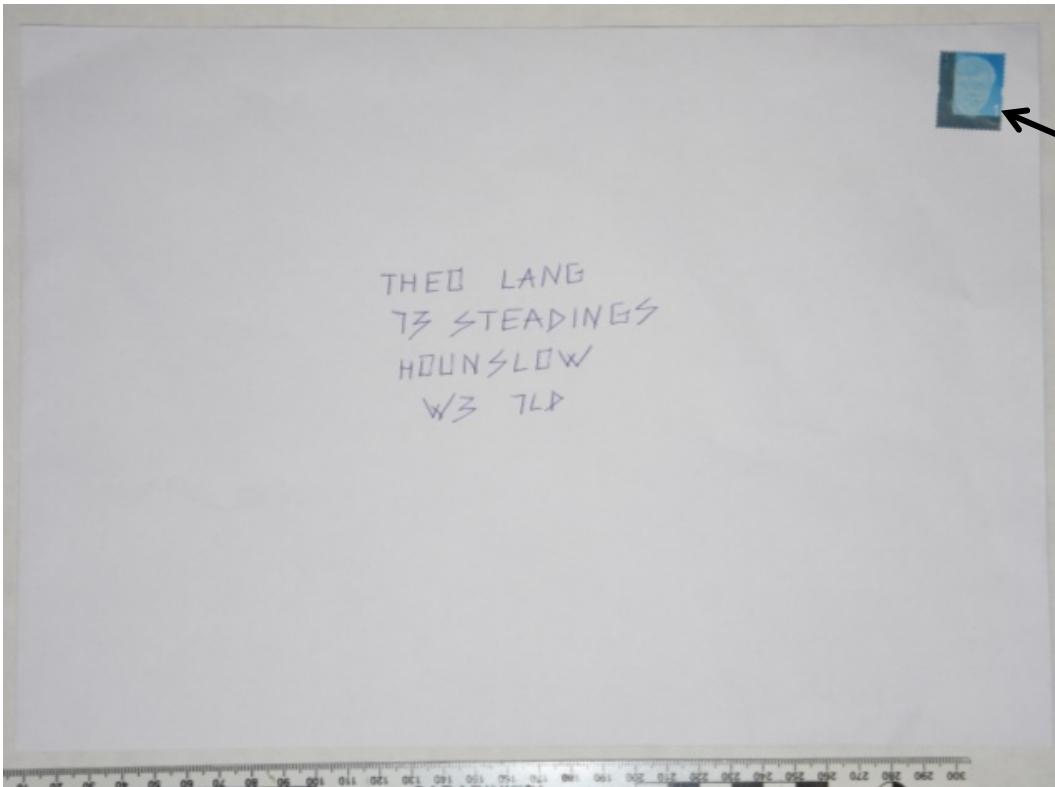
DNA and Fingerprints

The process of depositing the fingerprints and DNA material for the Collaborative Exercise was undertaken by members of the project team at the forensic facilities of the NFI in the Netherlands.

In May 2019, using suitable control methods to prevent DNA and fingerprint contamination, the team deposited the DNA and fingerprints

2019 - CE

Traces



Mark #4

Smeared fingermark deposited behind the postage stamp, containing DNA



The possibility existed for this mark to move from the postage stamp to the envelope

envelope

Traces

How a mark containing DNA was created?



- Extracted DNA from a known blood donor was used in combination with a L-Alanine solution (aqueous solution 0,45% w/v)

- The marks were deposited by means of a stamp



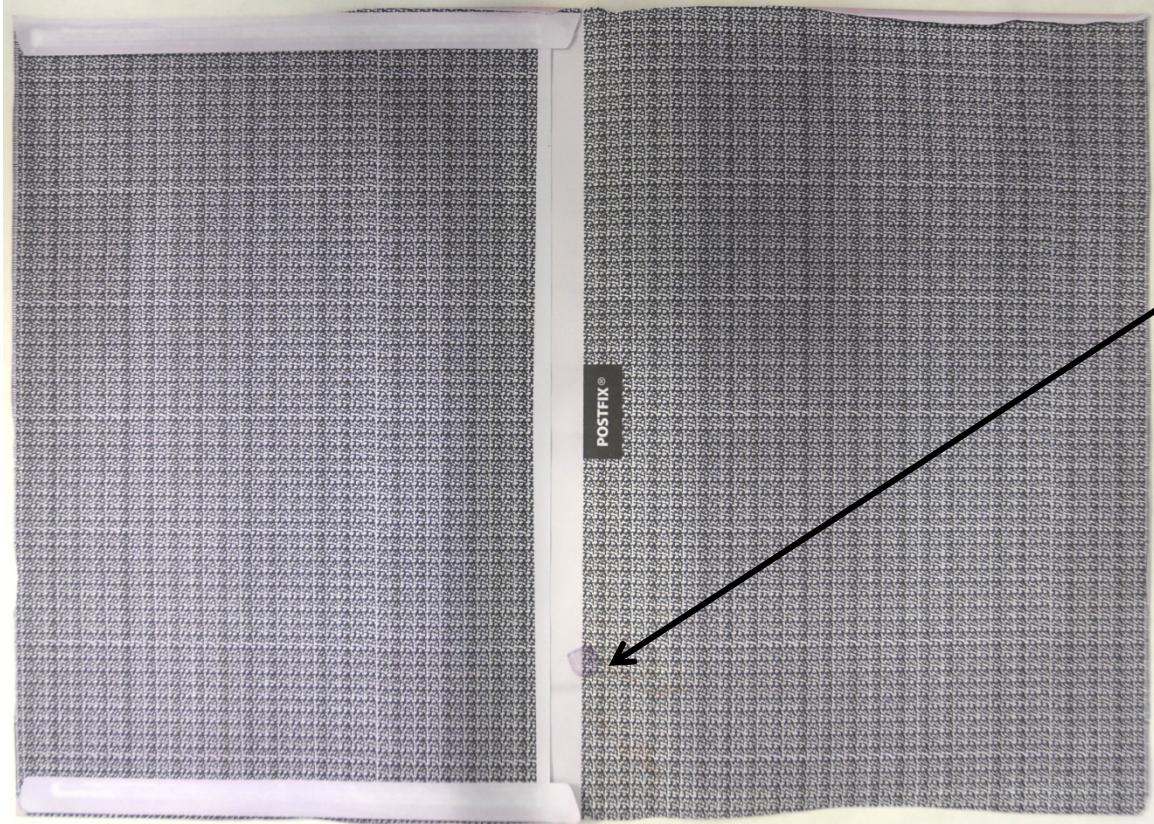
Stamps bearing manufactured "fingermarks"

Traces

How a mark containing DNA was created?

The pad and stamp were used to apply the L-Alanine/DNA mixture onto the decontaminated material. The stamps, letters and envelopes were cleared from contaminating nucleic acids by irradiating each side in a CL-1000 UV-CrossLinker at 900 mJ/cm² for 60 min

Traces



Envelope (inside)

Mark #3

Partial fingermark deposited on the inside of the envelope (in a position compatible with use), over black printing in the background (no DNA)



↓
Imaging test (also)

Traces

How the marks without DNA were created?



- An aqueous solution of L-Alanine (0,45% w/v) was prepared and used
- The marks were deposited by means of a stamp

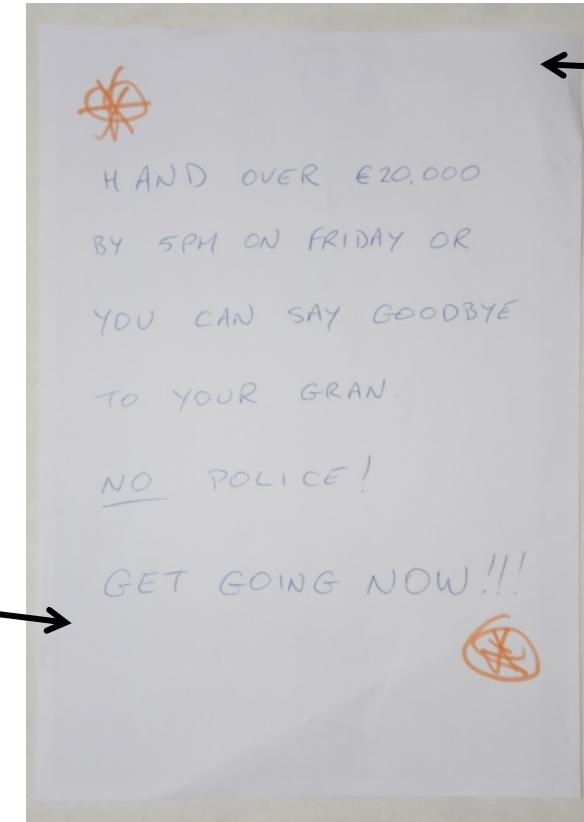


Stamps bearing manufactured "fingermarks"

2019 - CE

Traces

Mark #1
Partial fingermark
deposited on the
bottom left
(no DNA)



Threatening letter

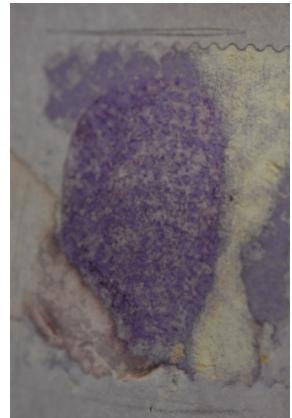
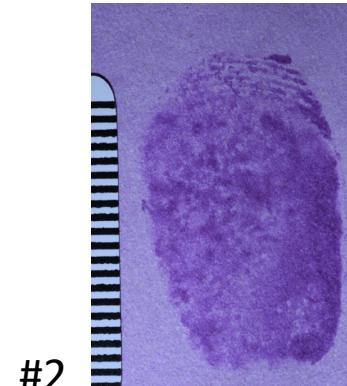
Mark #2
smeared fingermark
deposited on the top
right containing DNA



Traces

Summary

| Mark | Where | DNA | Of value (from a fingerprint perspective)? |
|------|----------|-----|---|
| #1 | Letter | NO | YES |
| #2 | Letter | YES | NO |
| #3 | Envelope | NO | YES |
| #4 | Envelope | YES | NO |



Timetable

- Distribution: May 2019 (by post) → (luckily) no problems incurred
- Deadline: 31st of July 2019 → ≈ 60 days to complete the CE
- Participants: 29 (DNA/FP) / 30 (HW/DOC) laboratories (out of 33 subscribers) – ~90% response rate
- Preliminary report (ground truth): sent out to the participants on 20th of December 2019
- Final report: sent out to the participants on 25th of November 2020 – Covid-19 was one of the causes of the delay

Main issues

1) Preparation - fingermarks containing DNA

As for DNA, a lot of time was spent to achieve consistency between samples

In the first Pilot Study, NFI tried to use human semen as stable and controllable source of DNA. The results of the Pilot demonstrated the process was not reproducible enough for the standard extraction and visualization techniques used in case work.

An extensive phase of tests was performed using saliva, blood, peripheral blood mononuclear cells (PBMC) and buffy coat.

Main issues

1) Preparation - fingermarks containing DNA (Continued)

Conclusions from these experiments were that a fingerprint contains $\sim 1 \mu\text{L}$ fluid of which 90% is washed away after ninhydrin treatment. Furthermore 25% of DNA remains in the paper after extraction.

Overall conclusion was that a higher concentration for depositing was needed → extracted DNA from a known blood donor was used

Main issues

2) Preparation - Reproducible fingermarks

It was noted (and in some way expected) that the quantity of L-Alanine solution deposited and the pattern of the fingerprint showed some variations between samples due to the deposition process.

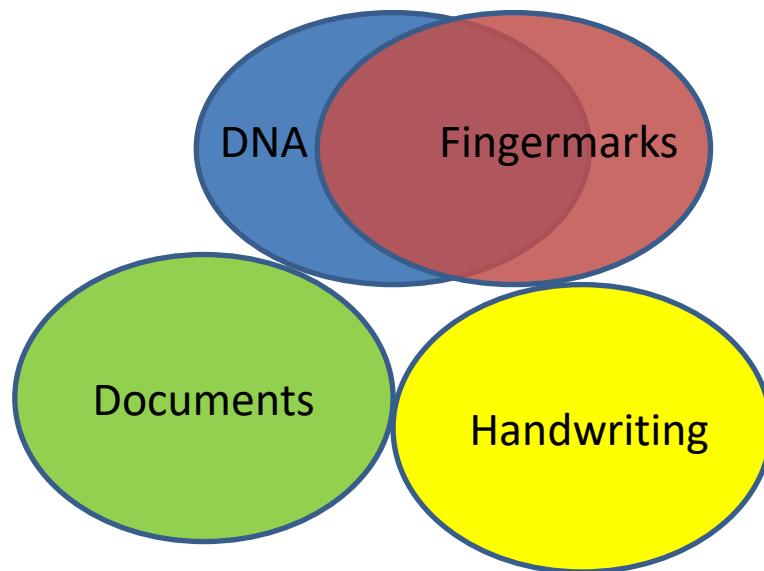
Mark #3 was not deposited in the exactly the same position

→ This means that the laboratories did not receive fingermarks to be developed (mark #1 and mark #3) which were exactly the same

Main issues

3) Conceptualization – handwriting and documents?

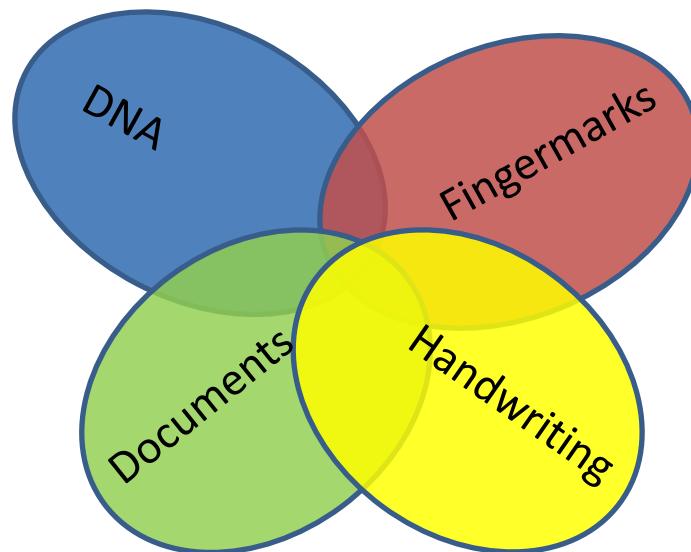
Handwriting and document analyses were performed independently from the other disciplines – **no real multi-discipline activity!**



Main issues

3) Conceptualization

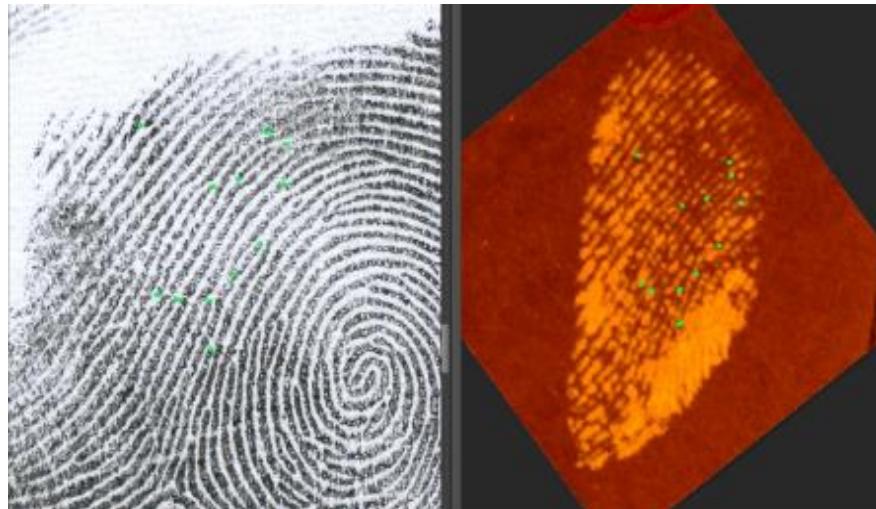
Real multi-discipline activity (ideal)



Fingerprint Results

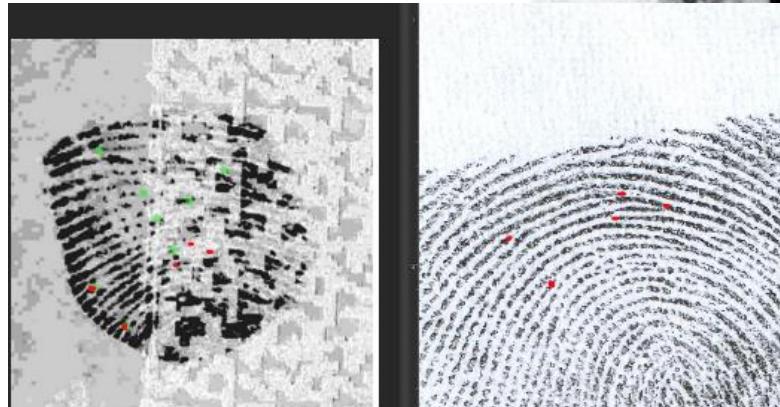
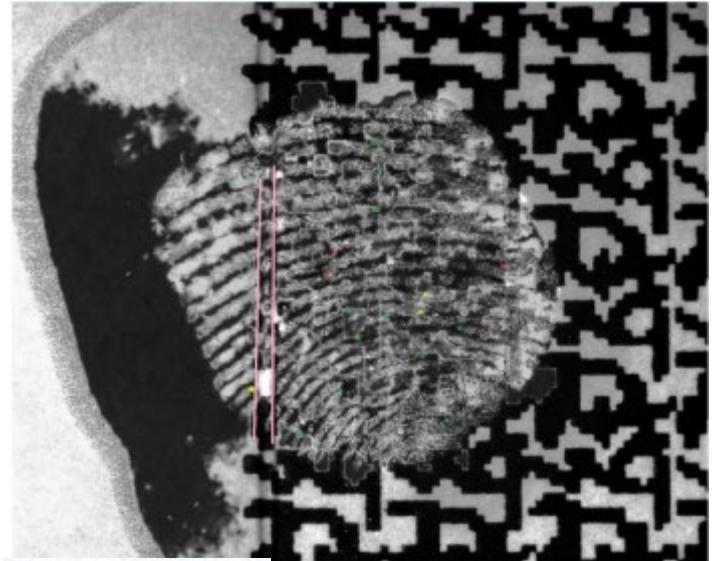
Mark 1

- Of the twenty-seven laboratories which considered the developed mark of value, twenty-six correctly identified the mark with the left thumb of Donor A.
- Only one lab concluded there was “no match”.
- Two other labs considered the mark insufficient for comparison.



Fingerprint Results

Mark 3



Proposal

In order to guarantee the continuity of the on-going collaborative testing program within the ENFSI working groups, the objectives of the program are as follows:

- To develop one multidisciplinary collaborative exercise per year covering at least 3 forensic disciplines each time (e.g document examination, handwriting examination, DNA, fingerprints, explosives, fibres/textiles).
- To identify best practices in examining certain types of exhibits.
- To evaluate possible entities capable to ensure properly designed multidisciplinary proficiency tests/collaborative exercises.



Participants

Project Leader: Francesco Zampa (RaCIS, Italy)

- **DNA-WG:** Livia Zatkalikova (IFS, Slovakia) and Titia Sijen/Sander Kneppers (NFI, The Netherlands)
- **EDEWG (Documents):** Kairi Kriiska-Maivali (FSI, Estonia) and Juergen Bugler (LKA Munich, Germany)
- **ENFHEX (Handwriting):** Maria Joao Branco (University of Porto, Portugal)
- **EFP-WG (Fingerprints):** Helen Bandey (DSTL, UK), Aldo Mattei (RaCIS, Italy) and Andy Becue/Alexandre Anthonioz (UNIL, Switzerland)
- **ETHG (Textile and Hair):** Maria Kambosos (BKA, Germany) and Eric Bouzaid (SNPS, France)
- **FINEX (Explosives):** Matthew Beardah (DSTL, UK)



Timeline

(for each of the 2 CEs, 2022 and 2023)

- Registration for the CE: around March/April
- Test material to the participants: May/June
- Test running on June and July
- Responses collected on August
- Final report to the participants within November



ACKNOWLEDGMENT

The ENFSI Fingerprint Working Group provides constant support towards fingerprint experts in Europe.

Disclaimer

The opinions or assertions in this presentation are the private views of the authors and are not to be construed as reflecting the views, position, or opinion of the Italian Ministry of Defense and/or of the European Union.

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