



# Vacuum Metal Deposition

For latent fingerprint development

# West Technology



# About us



- Formed in 1993 as a **specialist vacuum engineering** company
- **700+** Vacuum systems worldwide
- **World leading manufacturers of VMD**
- **100+** VMD systems worldwide
- Run our own **research programs**
- Offices in **Bristol, UK & Indianapolis, US**



What is VMD?

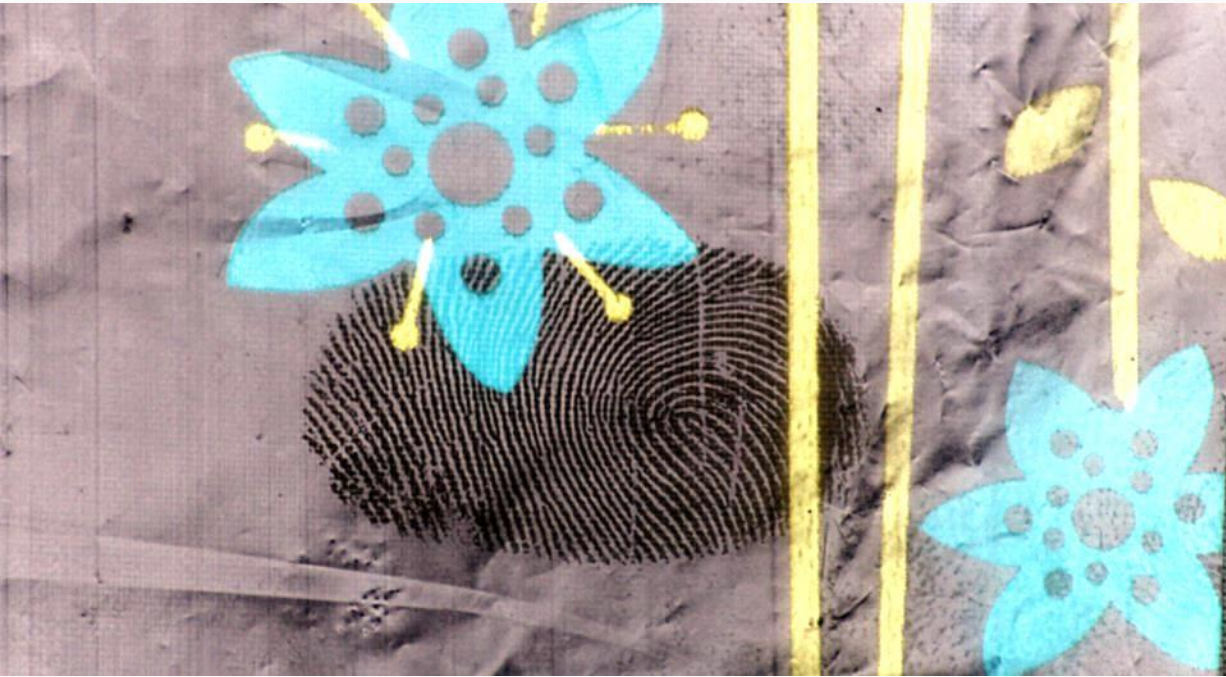


# Vacuum Metal Deposition

The coating of an exhibit with atomic layers of metal, in a vacuum chamber



# Forensic VMD



Vacuum Metal Deposition (VMD) is a powerful technique for developing latent fingerprints on non-porous, semi-porous and porous exhibits often to 3rd level detail

# Key benefits

compared to other development techniques



Process aged exhibits exposed to adverse conditions



Low interference with subsequent DNA testing



Visualisation of marks/grab impressions on fabrics



Does not hinder subsequent ballistic testing

# Important VMD users

## Research Institutions

- UK Home Office CAST
- European Fingerprint Working Group (EFPWG)
- Abertay University (Scotland)
- The University of the West of England
- University of Technology Sydney
- University of Lausanne (Switzerland)
- Institut de Recherche Criminelle de la Gendarmerie Nationale (France)
- Netherlands Forensic Institute

## Law Enforcement

- US Government Agencies
- Pinellas County, FL
- Baltimore Police Department, MD
- LAPD/LASD, CA
- NYPD
- Metropolitan Police, London
- Royal Canadian Mounted Police
- New Zealand Police
- Scottish Police Authority Forensic Service
- Criminal Intelligence Service (Austria)





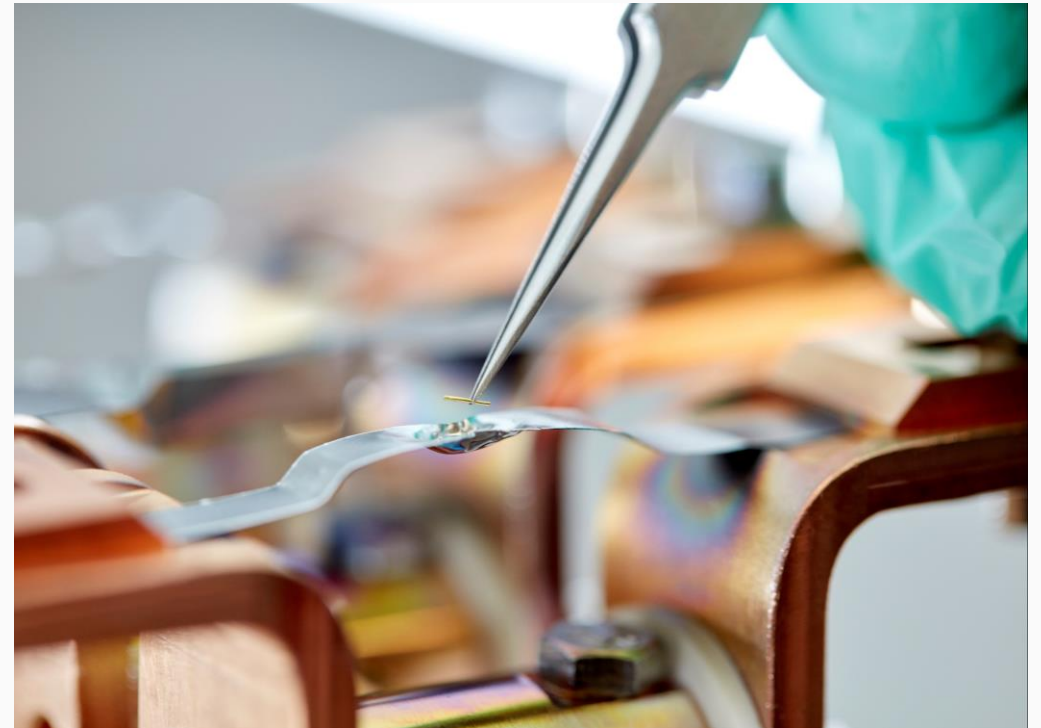


# The process

# The VMD process

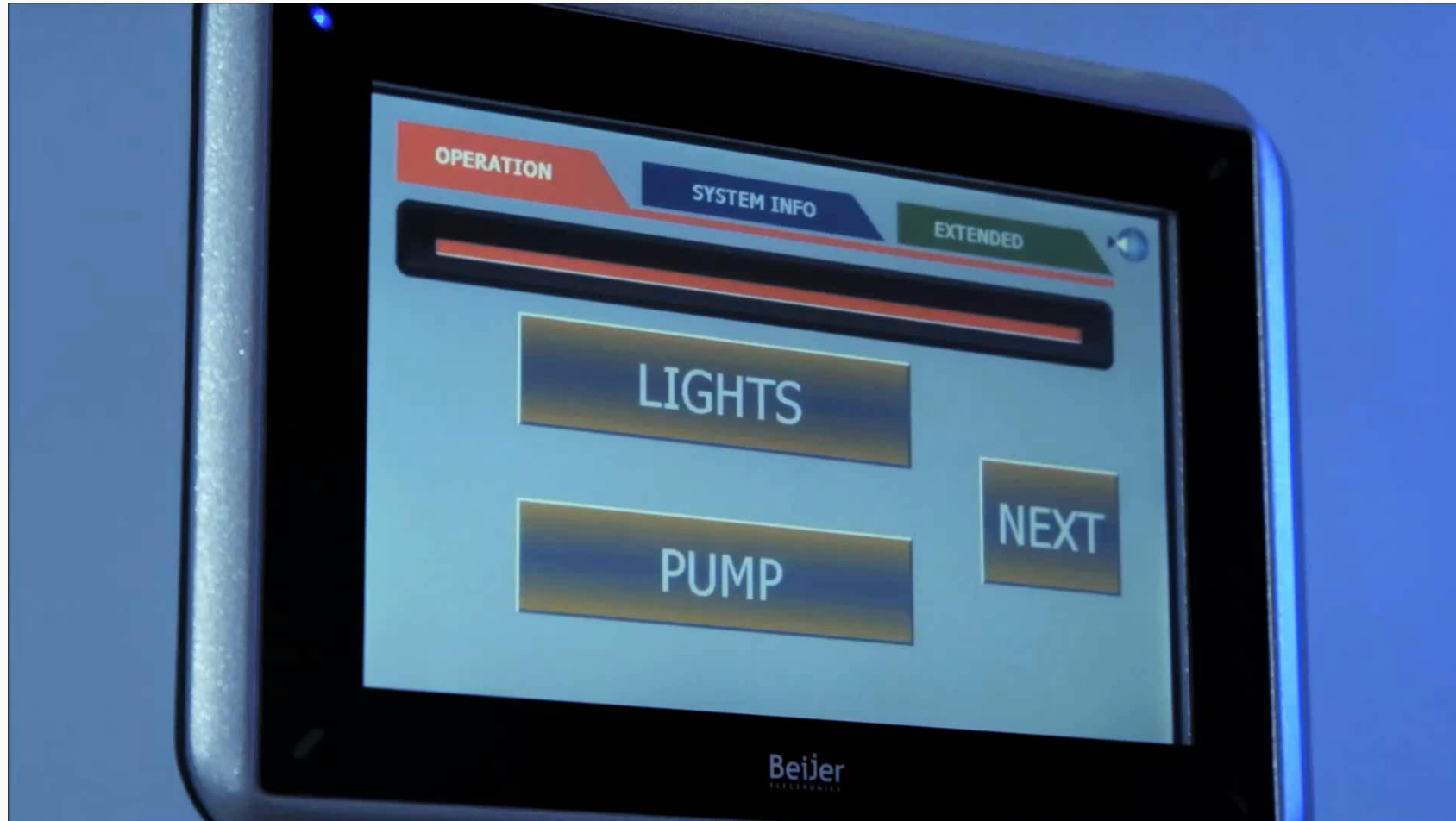
To perform a VMD process 4 things are needed:

1. Vacuum chamber
2. Substrate/exhibit
3. Heat source (for evaporation)
4. Evaporation metal material

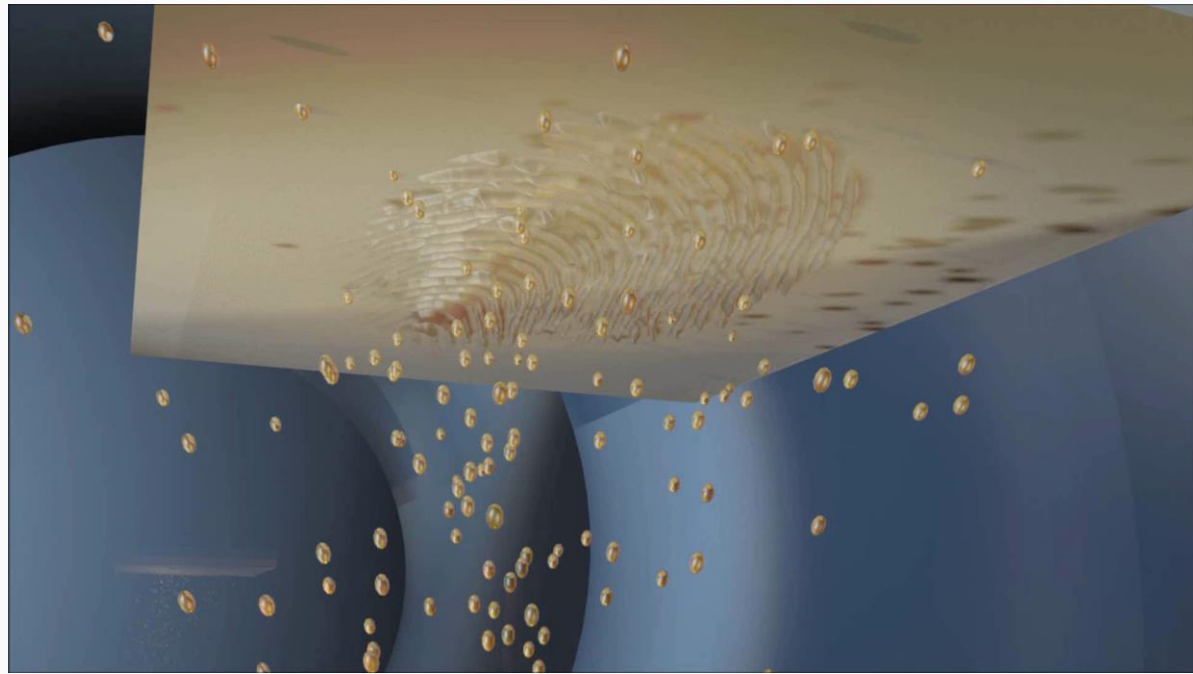


# The VMD process

The sequence is:



# Traditional gold/zinc process



Understanding the process

# Typical development



Normal VMD development =  
reverse of inked print

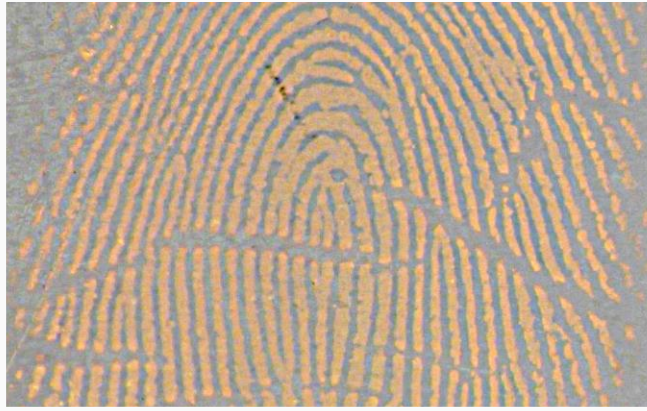
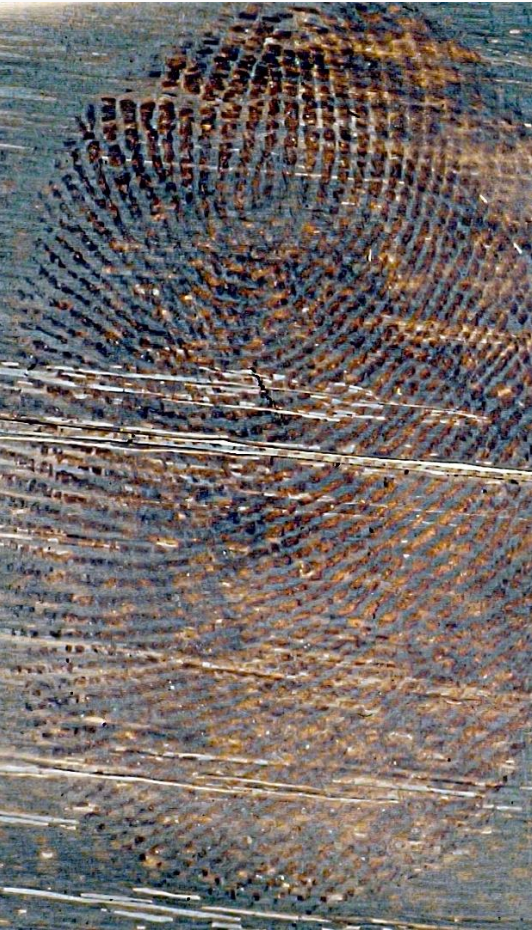


# Applications

# Non-porous exhibits

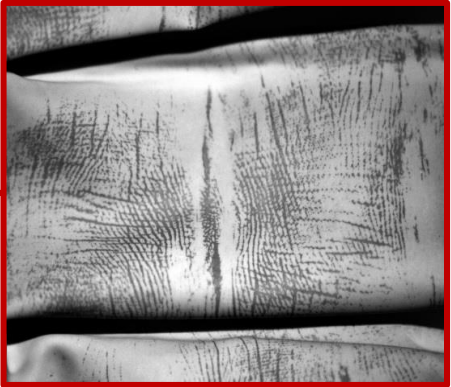
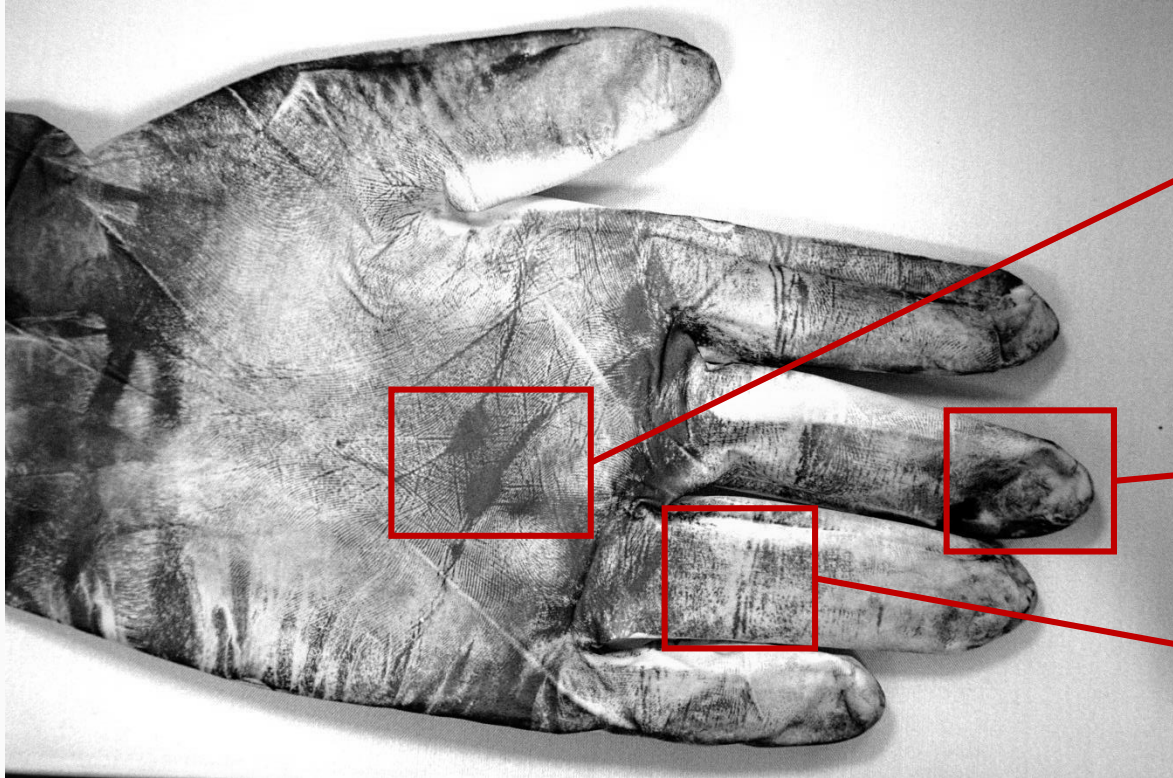


# Narcotic wraps





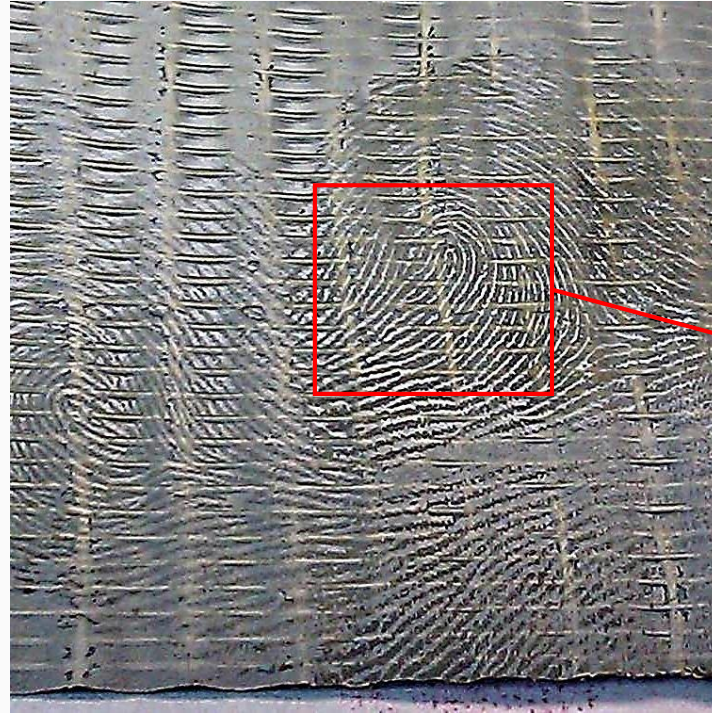
# Latex gloves



# ┌ Porous exhibits



# Adhesive tape



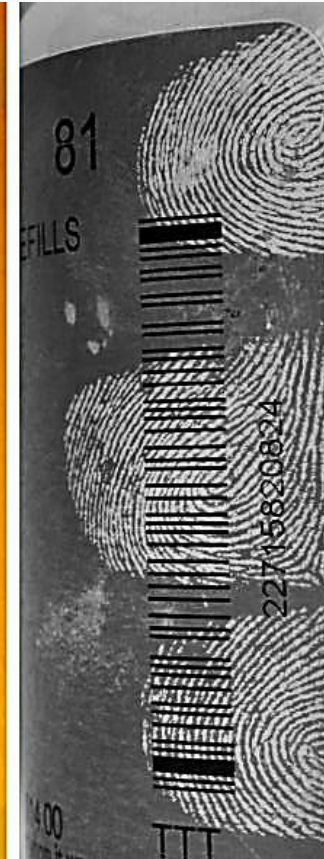
# Paper



# Thermal receipt paper



# └ Porous & non-porous



# └ Weird & wonderful



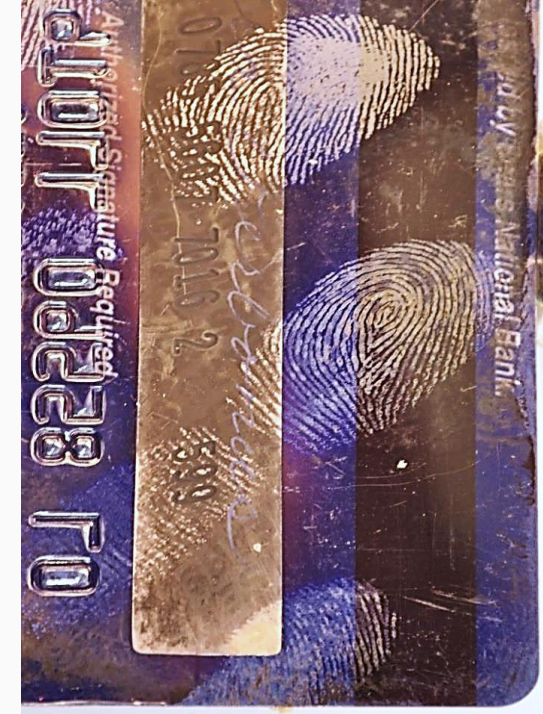
# Sequential processing



Cyanoacrylate Fuming



+ Sterling Silver



+ Sterling Silver/Zinc



# Multi metal processes



Silver



Gold/Zinc



Gold/Zinc + Silver

# Multi metal processes



**Gold + zinc process**  
followed by a  
**Silver process**



# Casework

# Austrian state police



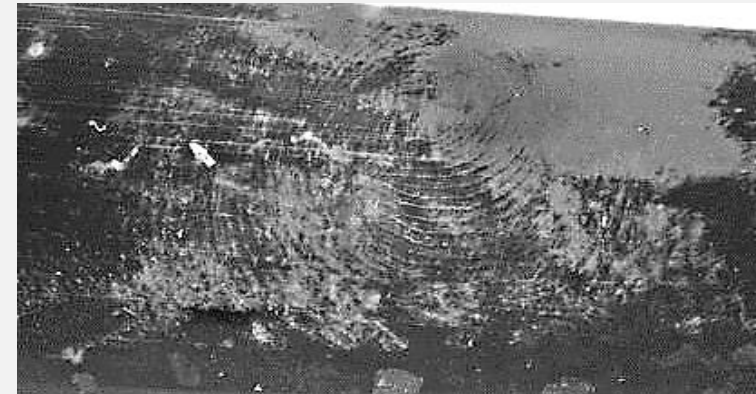
**2017**  
Kitchen knife  
used in a  
murder



Knife was  
wiped clean  
of blood after  
the stabbing



Knife  
processed  
using a VMD  
gold+zinc



Fingerprint  
successfully  
developed on  
blade and  
matched to  
suspect

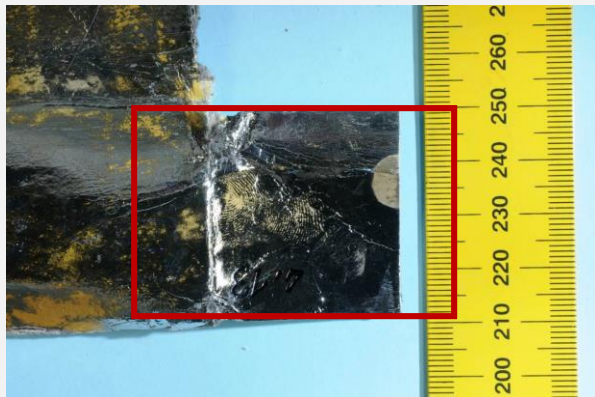
# Austrian state police



2017  
Robbery at ATM



**Key evidence**  
Heavily wetted  
cardboard latex  
glove packet



Packet processed  
using a VMD  
gold+zinc



Fingerprint  
successfully  
developed and  
matched to suspect

*"The VMD is going to become an important part of our work in the lab and it is going to be used more and more especially in case of wet exhibits"*

Inspector Fischer – Austrian State Police

# Aged fingerprints

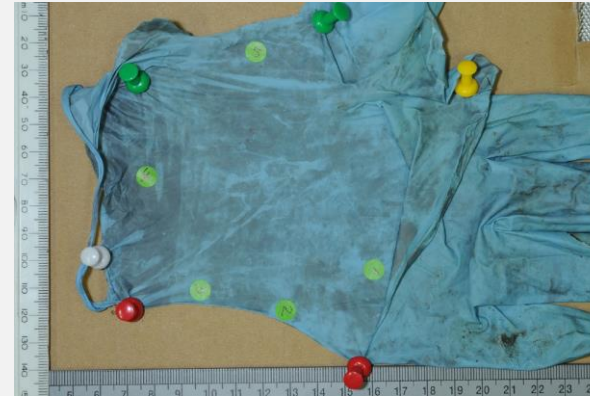


- Key evidence – Along the rural East Coast during the early 1990s, the remains of five middle-aged men wrapped in plastic bags were found
- At the time, no usable prints were developed
- In 2000 – gloves and two dozen of the bags collected from the bodies, processed with VMD
- Over 30 fingerprints developed which were matched to Richard Rogers Jr.

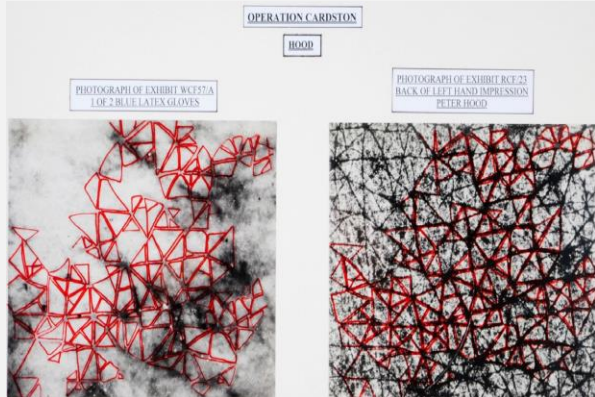
# Submerged items



**October 2010**  
Murder in  
Warwickshire, UK



**Key evidence**  
Heavily wetted  
blue latex glove



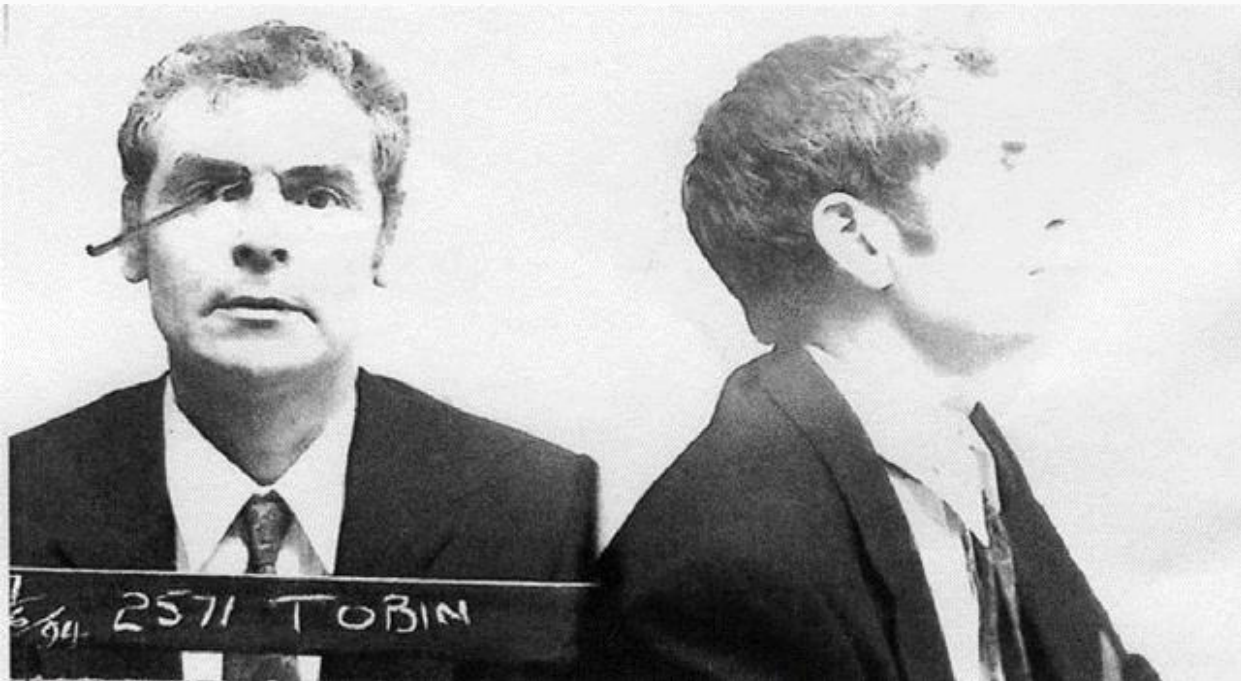
**January 2011**  
processed with  
VMD  
Skin texture mark  
from back of hand



**Convicted of  
Murder**  
Peter Hood and his  
partner given life  
sentences

*“Because the gloves had been wetted, the likelihood of success using the superglue fuming technique on this exhibit was significantly reduced”*

# Adverse conditions



16 year old prints– Peter Tobin, UK

- Key evidence –Remains buried in 1991 wrapped in black plastic bags covered in concrete and earth
- 2007 – remains found in black plastic bags processed with VMD
- 4 fingerprints developed that were identified as Peter Tobin's.
- Tobin subsequently found guilty for 2 other murders and given life sentences

*“Gold and zinc was applied in a vacuum to the bags. This process is very sensitive, but detects the fatty constituents from sweat on older prints.”*

Peter Sibbald, SPSA



# Contaminated fingerprints



Evidence was processed from a case of a four-year-old homicide that previously had no suspects. The evidence was several trash bags. These bags were heavily contaminated with the victim's blood and concrete dust that covered the entire surface. Prior attempts using Superglue Fuming failed to establish any ridge detail.

After processing the bags in a VMD system, several prints were developed along with an entire palm print. The recovered prints were then photographed and scanned into the computer for identification. A match was found. The suspect was arrested, and along with other evidence, was later found guilty by jury on all counts including special circumstances.

*“Vacuum Metal Deposition provided the break in this case that allowed the Detectives and the District Attorneys' office to solve and prosecute this case”*



# Alternative metals

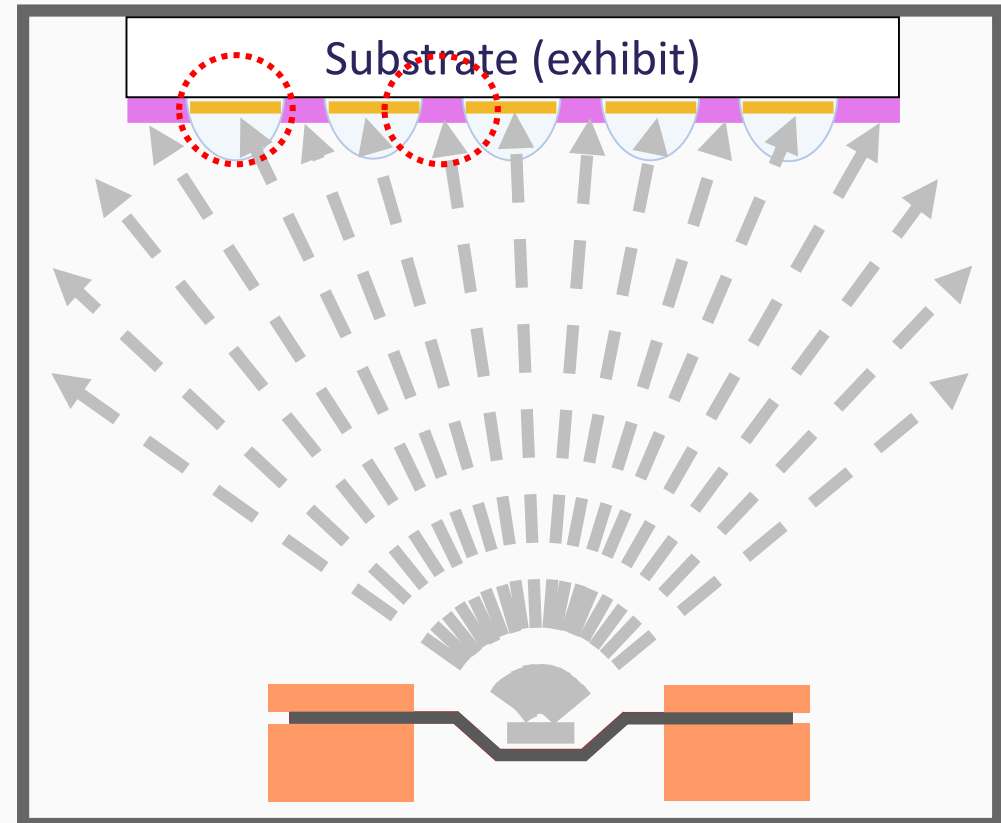
# Alternative metals

e.g. silver

Incoming **silver atoms absorbed** by **fingerprint residue**.

At the same time **atoms** also **deposit** on **ridge-free surface** of substrate (including furrows).

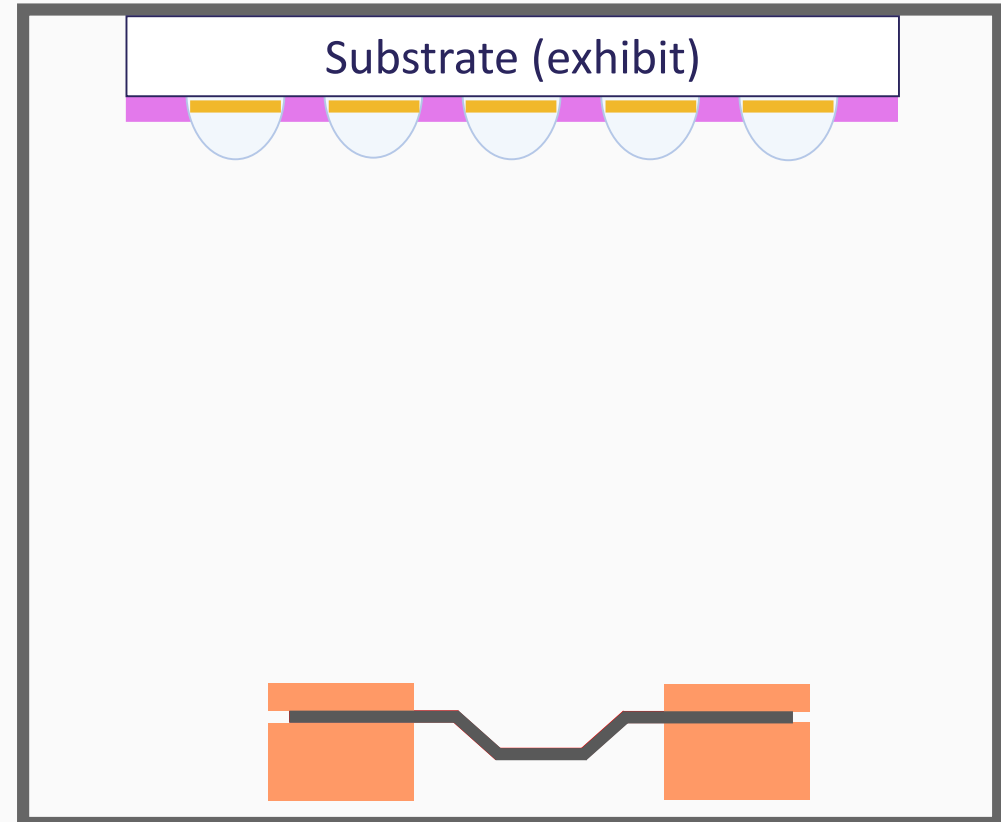
The deposited silver atoms form **clusters**.  
The **absorbed silver clusters** are a **different size** to the clusters in the furrows.

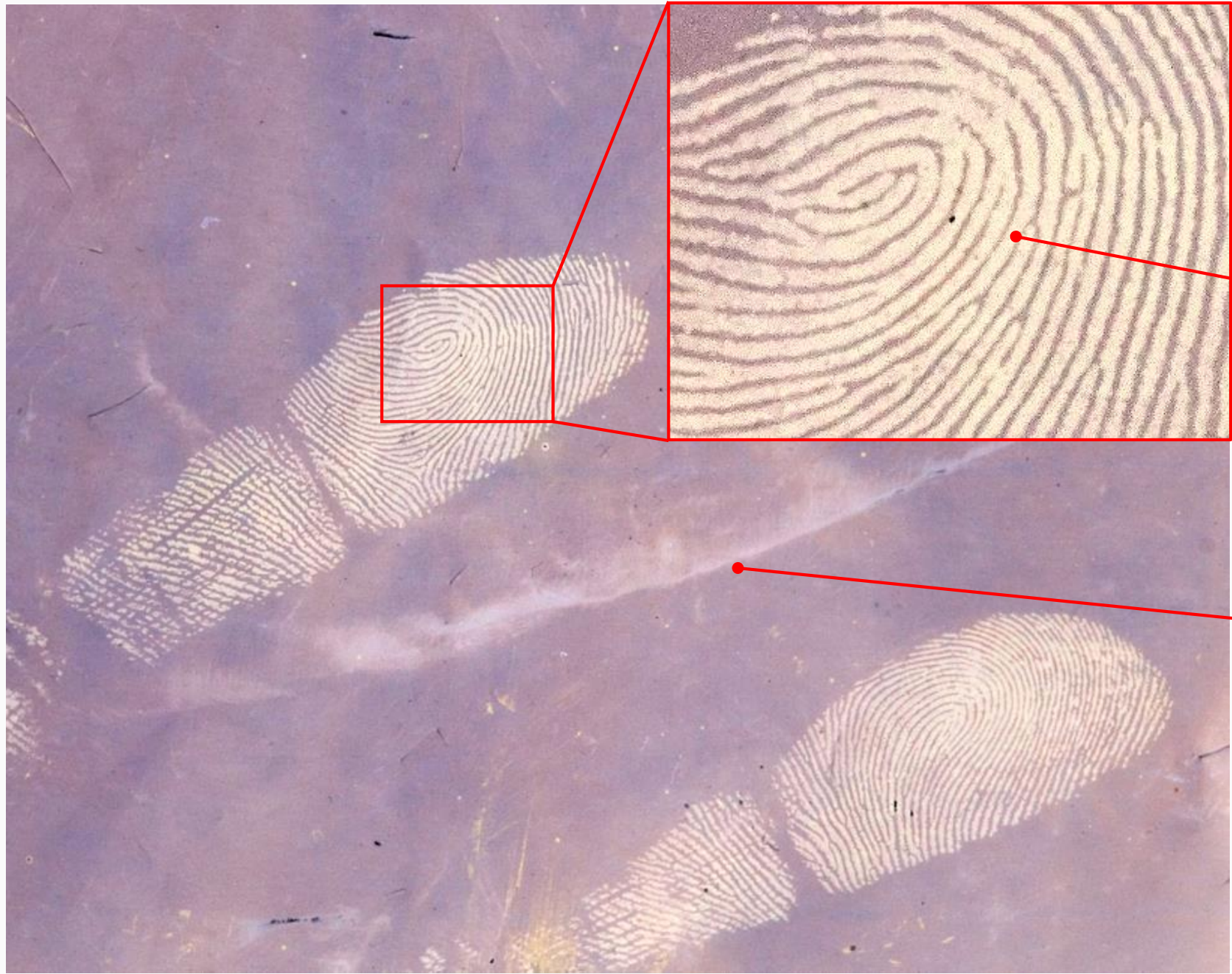


# Alternative metals

e.g. silver

The **difference in size** (and distribution) causes a marked **variation in the wavelengths** of the reflected light.





# Silver VMD on Saran Wrap

Light yellow ridges

Purple substrate and furrows



# Imaging VMD prints

# Contrast

Many developed VMD marks require minimal digital enhancements and can be photographed instantly



# Black trash bag



High contrast fingerprints – gold + zinc

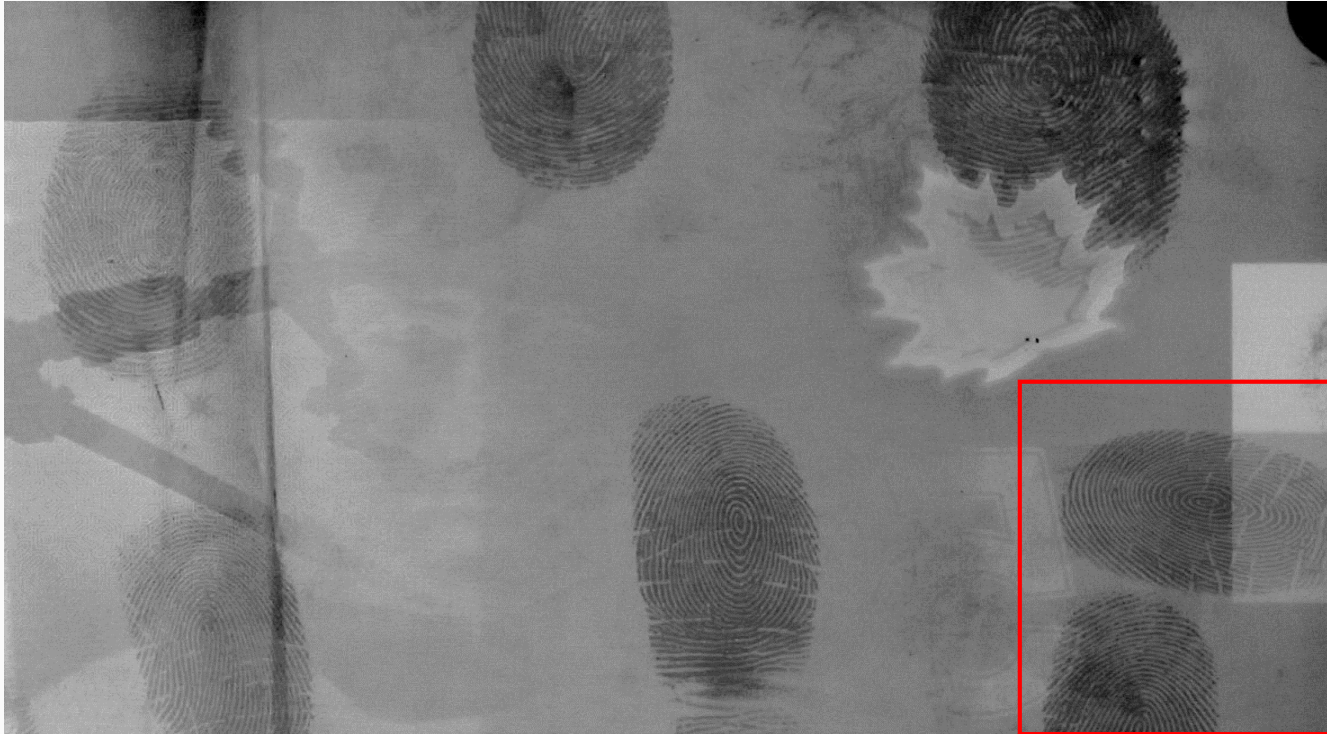




# Third level detail



# Background removal



Imaged using halogen light and 645nm long pass filter

Canadian Banknote - Copper process



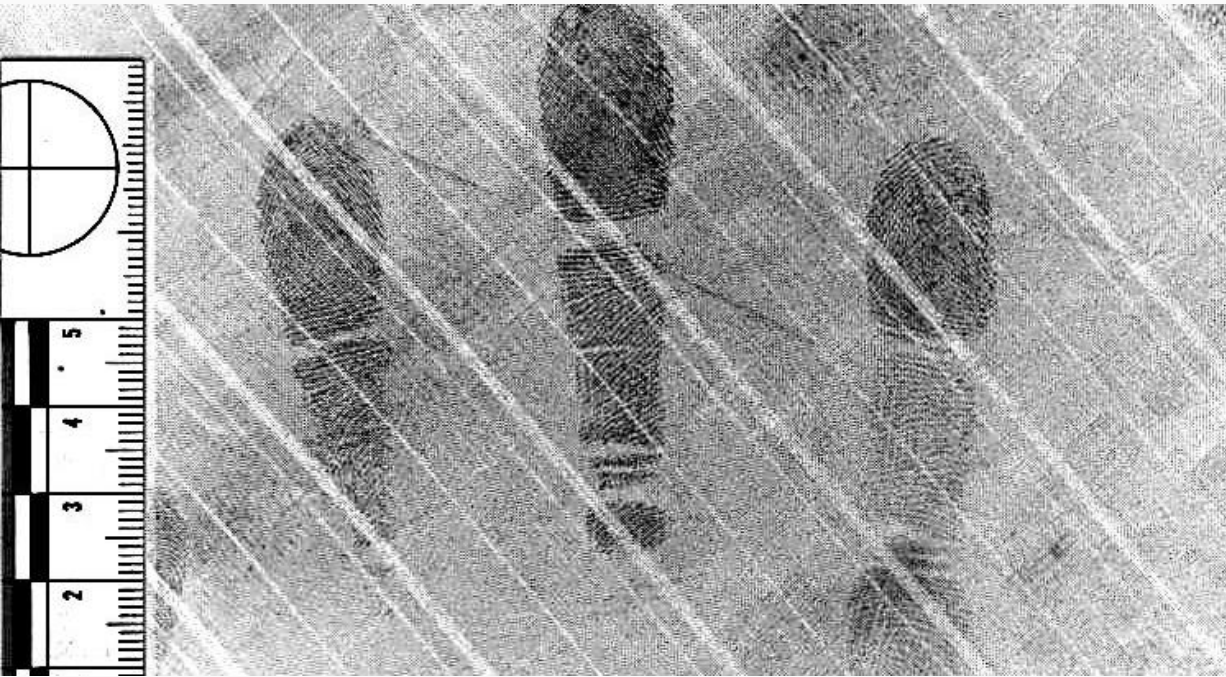
# Latest R&D

# Key research projects

- **Fingerprints on Fabric**
- **VMD impact on DNA**
- **Fired ammunition**



# Fabrics



After positive results on polyester & cotton, continued key research in 2018 into developing prints on fabric using VMD

# Waterproof jacket



# Black polyester satin

Ridge detail  
successfully  
developed



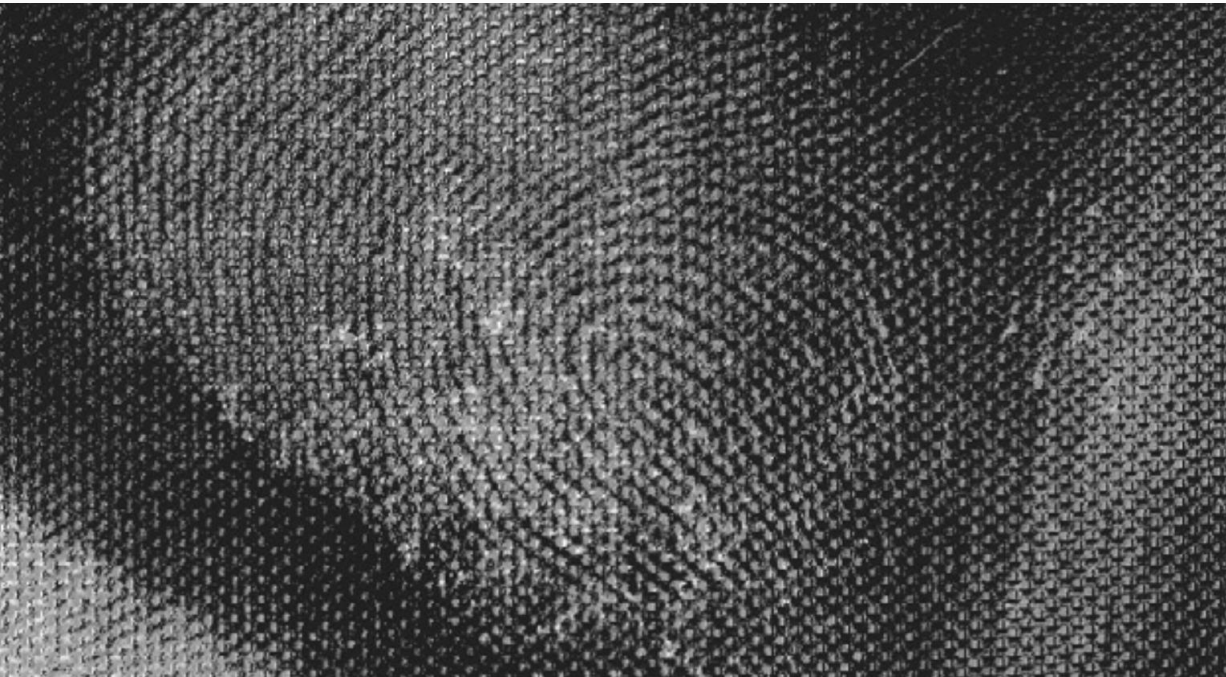


# White polyester/cotton mix



Partial ridge  
detail  
successfully  
developed

## Past research



Fingerprint (aged 14 days)  
developed on polyester  
using silver VMD process

*Visualisation of fingermarks and grab impressions on dark fabrics using silver VMD. Fraser, J et al., 2013*

# Future research on fabrics



Range of fabrics – cotton, polyester, mixed

Range of colours and patterns

Washed vs. unworn

CAF > VMD vs. VMD > CAF

Alternative metals



DNA

# Initial research

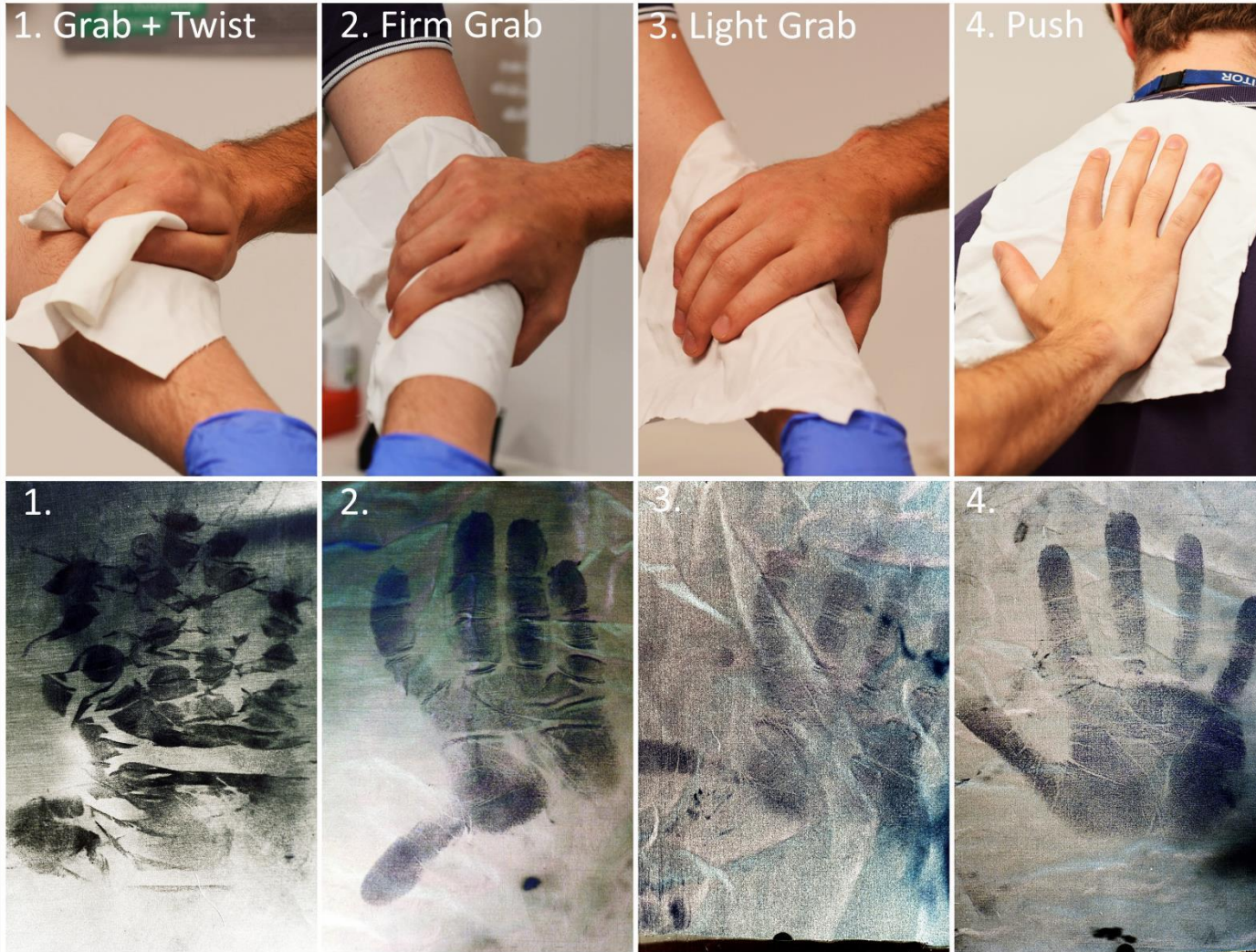


Research<sup>1</sup> carried out by the NFI<sup>2</sup> concluded **VMD had low interference on subsequent DNA testing**

1. Raymond, J. et al. (2004) *The effect of common fingerprint detection techniques on the DNA typing of fingerprints deposited on different surfaces. Journal of Forensic Identification.* 54, (1), pp. 22-44.

2. *Netherland Forensic Institute*

# Grab marks



A range of different 'Grab' mark developed on cotton/polyester shirt using silver/zinc which can be used to rapidly target DNA



# Fired ammunition

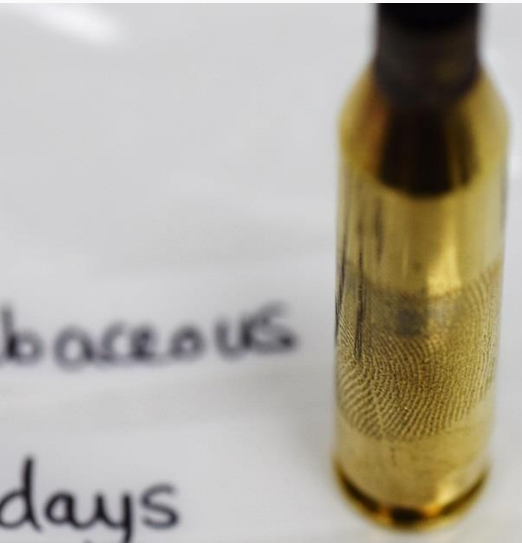
# Fired ammunition



Natural and sebaceous prints deposited onto cartridges **prior to firing** by a single donor and then fired after a set time period up to 28 days



# Fired ammunition



# Spent casings



68%  
Recovery

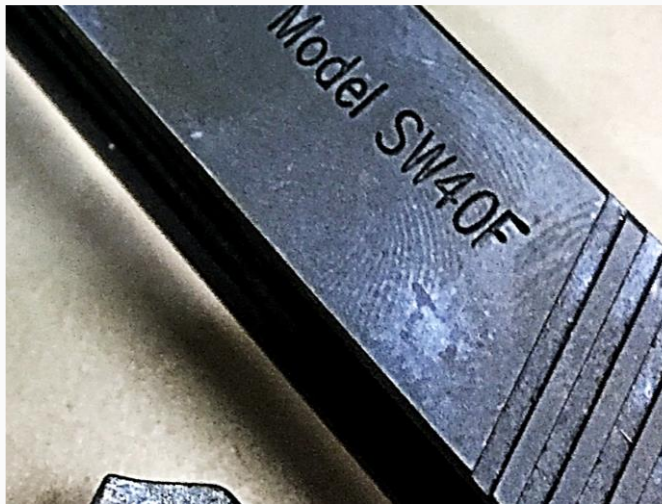
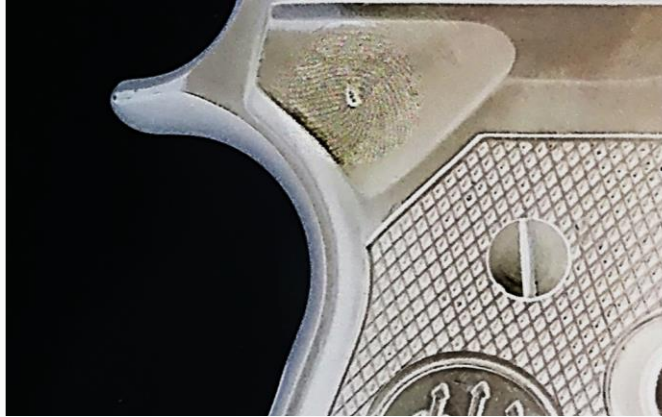
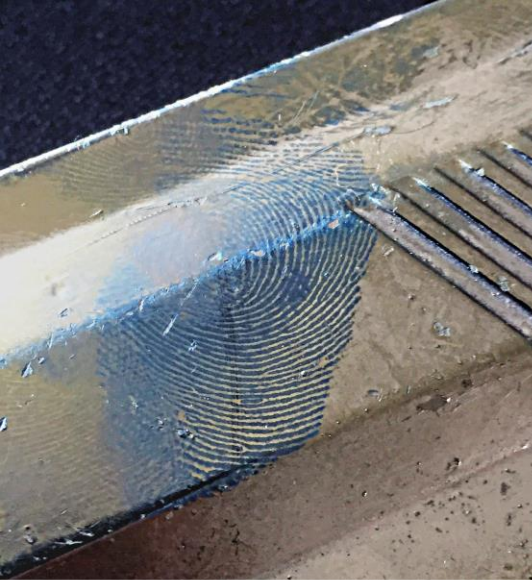


# Firearms



Exciting research being carried out with our US partners to **develop identifiable prints on firearms** using new types of metals such as copper and sterling silver

# Firearms

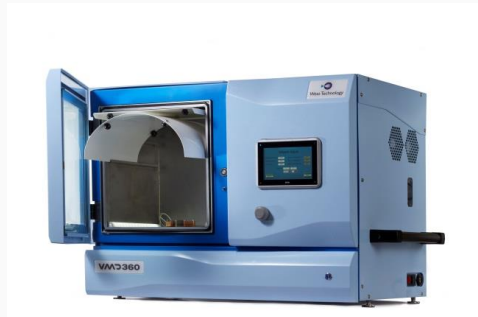




# VMD systems

# VMD Systems

## VMD 360



\$50,000

## VMD 560



\$125,000

## VMD 1260



\$200,000

# User friendly



You don't need to be a vacuum specialist to operate our systems

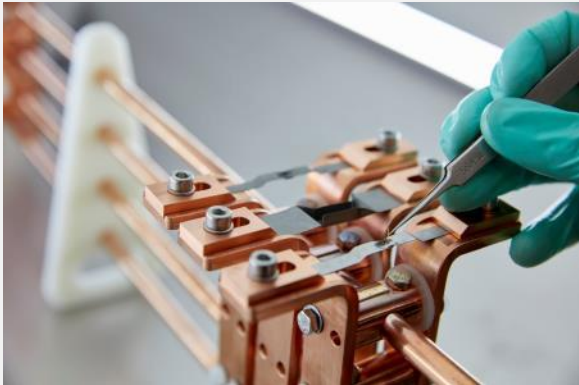
# VMD systems



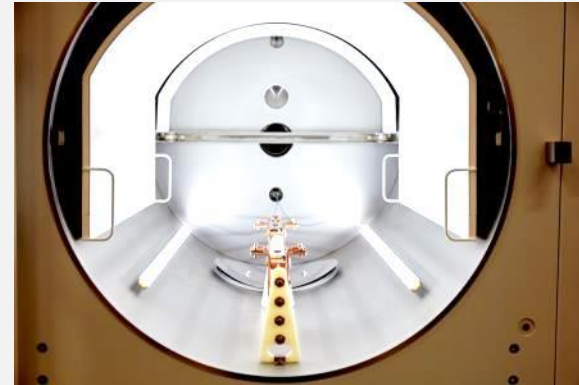
Icon based controls



Large viewing window



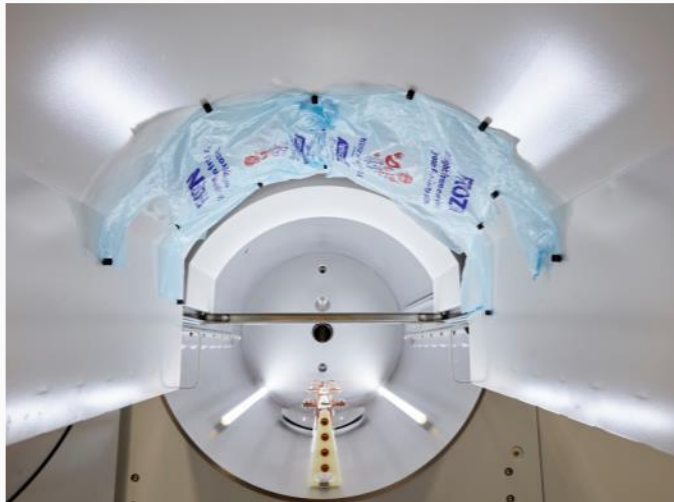
Optimised central evaporation



Excellent chamber illumination



# Magnetically suspend exhibits



Fast processing

Typical process time

**10mins**

# Process cost

**\$0.8**

**The cost of a single Gold/Zinc  
process in the VMD360**



# Service & support

# Warranty

All our systems are extremely low maintenance and  
come with a 12 month warranty

As standard on all major components

# Service & application support



US support



Eleigh Brewer  
Forensic Scientist

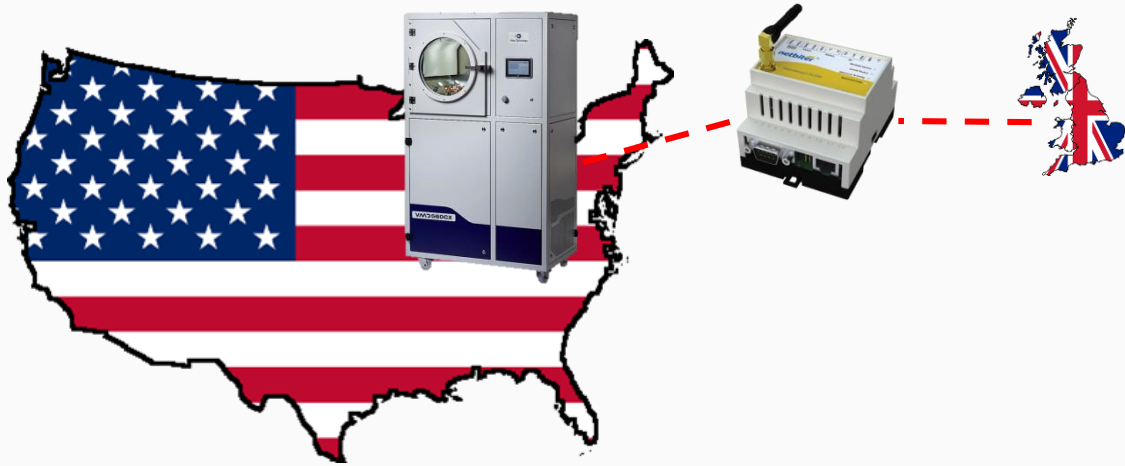


Application and  
R&D laboratory



West Technology  
Forensics Engineers

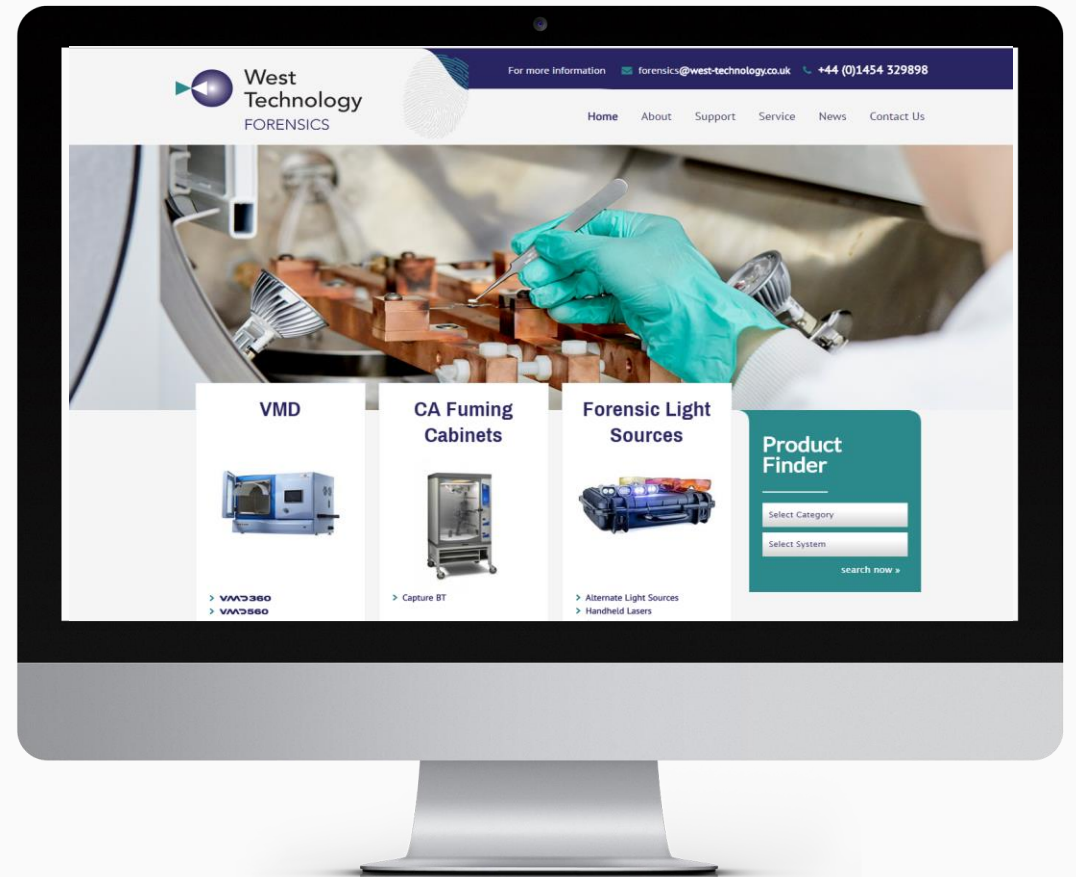
# Remote diagnosis



Using a **Netbiter** allows **secure remote connection** to VMD systems worldwide using a cellular data connection

# Further info

Visit our website for all the latest R&D updates





Get in touch.

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