

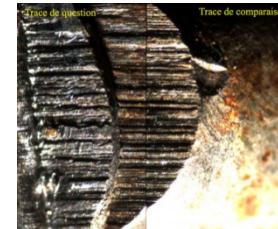
Metal theft and forensic investigations: Two application examples



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Contents

- Tool marks and micromarks



- Forensic tagging systems



Tool marks



Common points?



Tool marks in forensic investigations

The study of tool marks is based primarily on observation and comparison of characteristic marks left by the shape and micro defects of a tool (or object) that caused any kind of constraint on a support

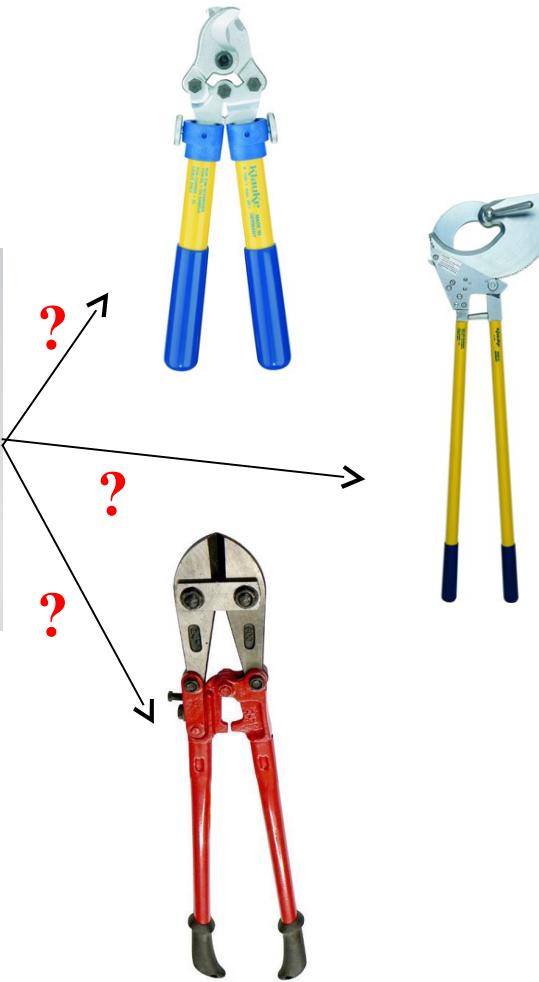
Due to the intrinsic characteristics acquired during the manufacturing process or during its use, a tool is unique and tool marks comparison could allow an exclusion or a formal identification.

Tool marks in forensic investigations

From a trace on a support, two possible types of investigations:

- Identification of a tool (or a tool family) from marks
- Comparison of tool marks (with or without a reference tool)

Identification of a tool or a tool family from marks

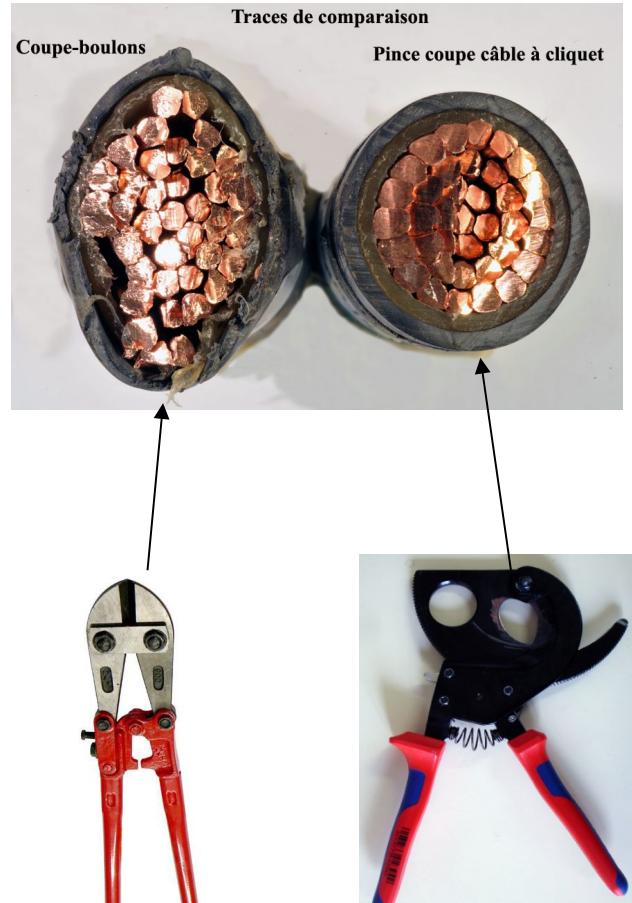


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Identification of a tool or a tool family from marks

Objectives :

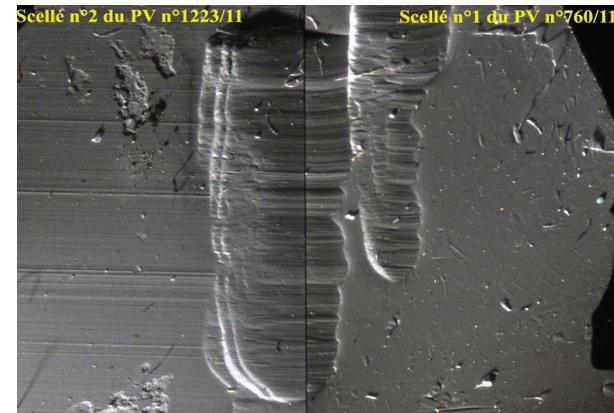
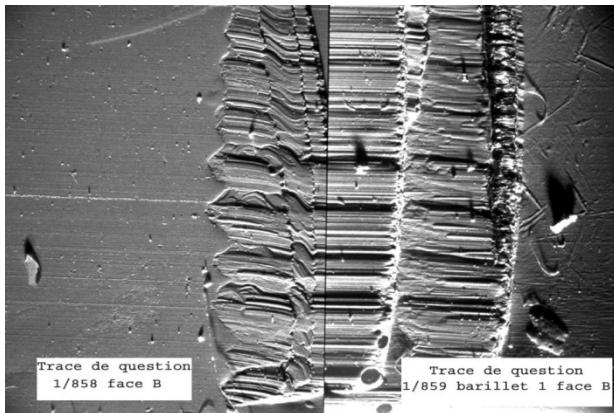
- Guide investigators on the type of tool to search and seize .
- Define a modus operandi



Comparison of tool marks

Main objective :

Determine if an unique tool produced the marks to make comparisons between different cases.



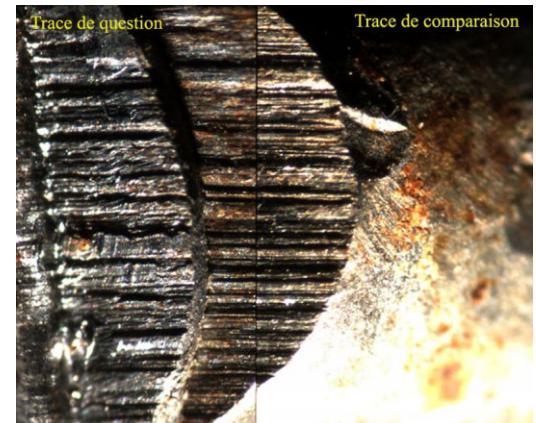
Example: marks on lock cylinders without a reference tool

Comparison of tool marks

- Determine the uniqueness of the tool as the source of marks
- Guide investigators to an unique author or team
- Highlight a serial phenomenon (similar marks) or independent and isolated facts (specific marks)



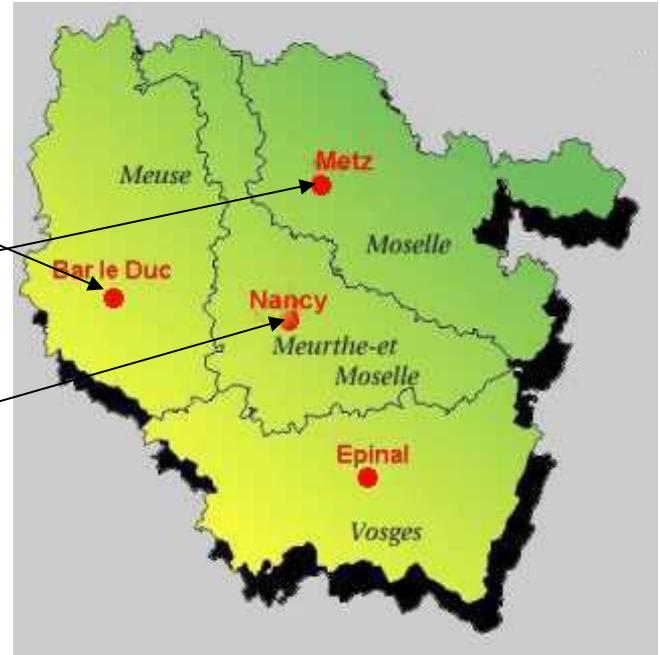
Comparison of tool marks



If a reference tool is available:

- The comparison of marks can confirm if the reference tool is the one used for the theft.
- Identify the authors or the team by case's resolutions which have this tool in common.

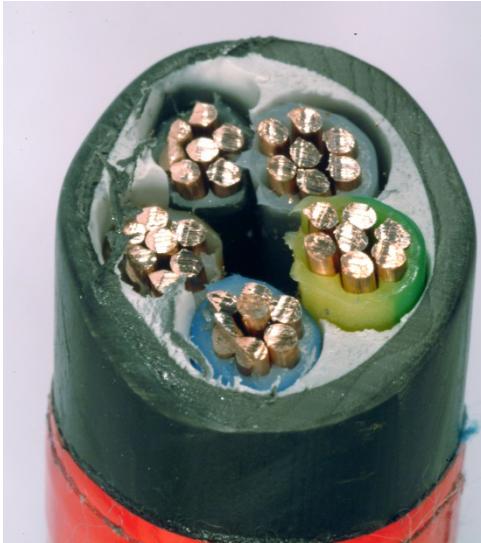
An example



Three cases: any links?

An example

BAR LE DUC (55)



Ratchet cutters

METZ (57)

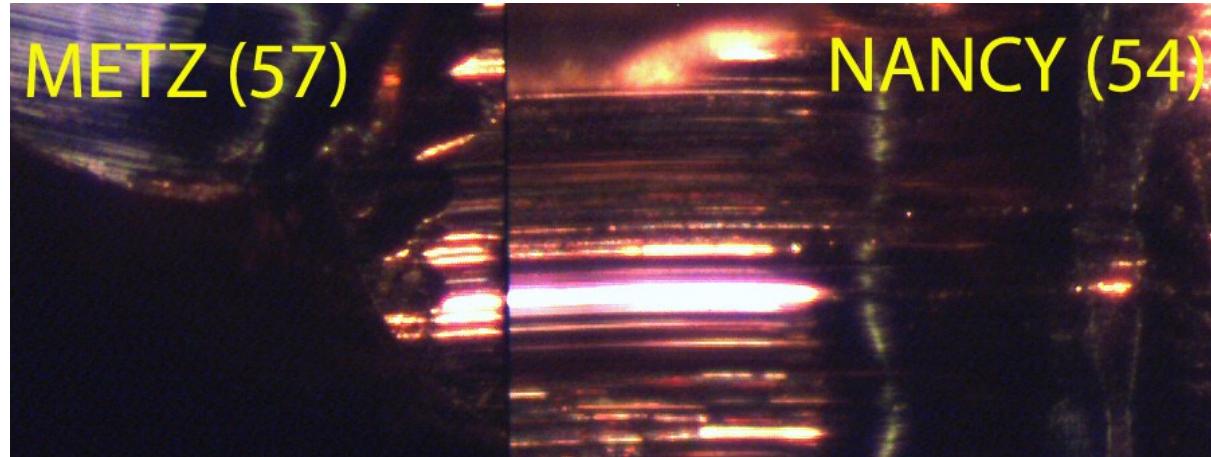


Bolt cutters

NANCY (54)



An example

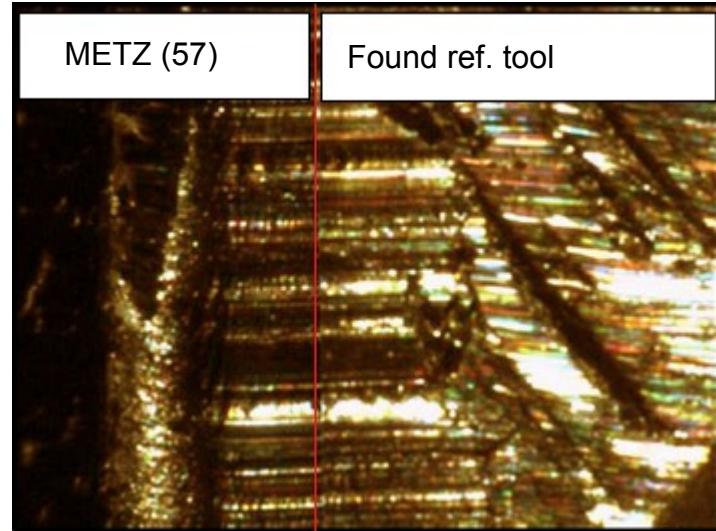


→ The same tool is used

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An example

Reference tool found in
a suspect's house



Conclusion :

The bolt cutters found in the suspect's house was
used for these two thefts (at least)

Forensic tagging systems

- Several private companies (SmartWater, SelectaDNA, NanoTag, Olnica...)
- Systems for marking of places, goods or persons
- « Coding » technologies based on various principles or formulations
- « Synthetic DNA » sometimes mentionned



Forensic tagging systems

- A common goal: Fight against crime (burglary, hold-up...), metal or construction equipment thefts...
- A common way: to discriminate the origin of an object
- A particular case: ink staining systems



Different kinds of solutions

- Sprays
- Goods protection (art, vehicles, multimedia materials, jewelry, metal...) by applying product (gel, grease, solution, powder ...) or tags
- Indoor or outdoor transferable marking systems (grease...)
- Mid/long-range marking devices

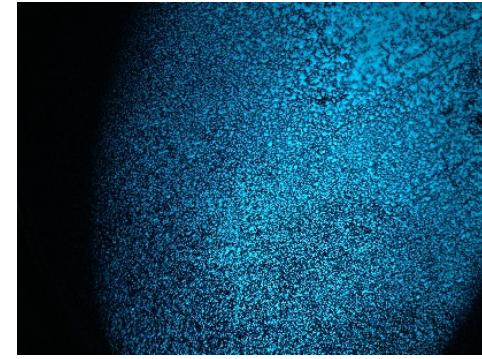
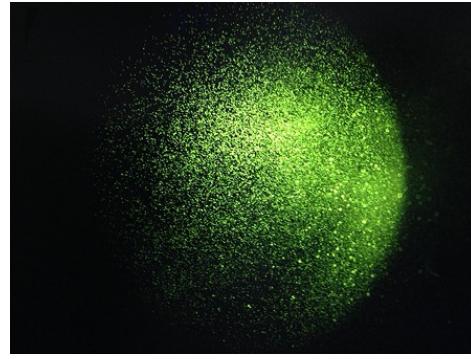
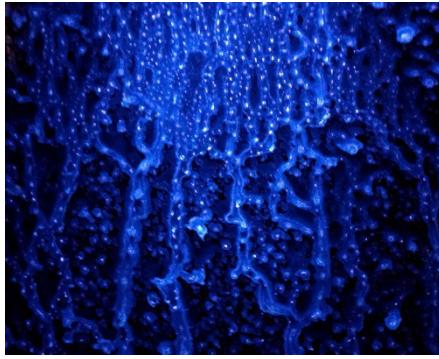


The providers

- Similar strategies
 - Specific display for each provider (importance of deterrence)



- Fluorescence detection (UV light)



The providers

- Some specificities
 - Choice of different markers
 - Minerals
 - Biologicals
 - Micro-tags



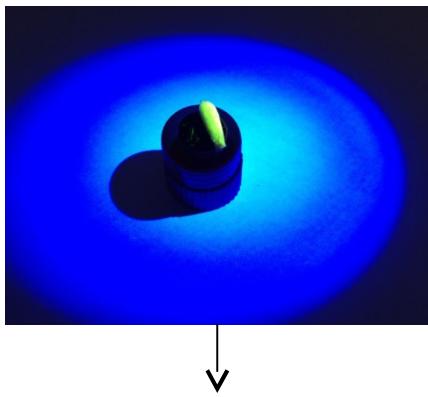
Highlighting

Detection with UV light

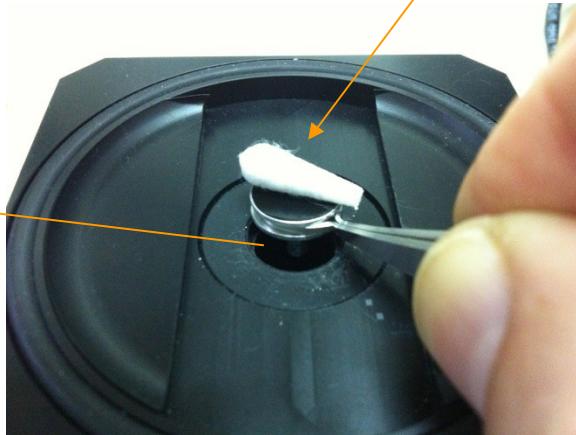
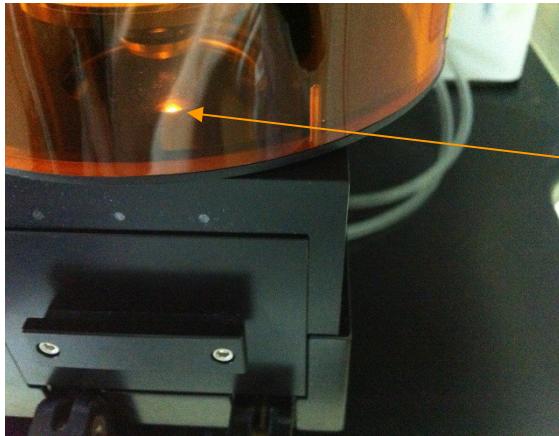


Caution!

« Minerals » markers



Inductively coupled plasma mass spectrometry
(LA-ICP-MS)

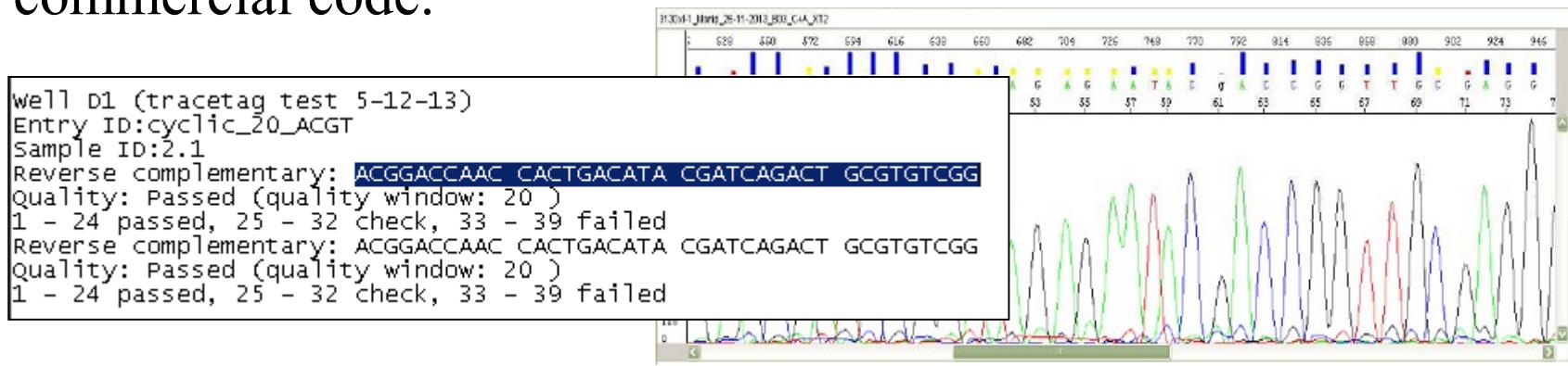


« Synthetic DNA » markers

Two analytical methods:

- Sequencing
- Pyrosequencing

→ Highlighting of a nucleotide sequence corresponding to a commercial code.



Pyrosequencing analysis

- After extraction, the DNA is amplified by PCR
- After amplification, the extract is purified for analysis by pyrosequencing.

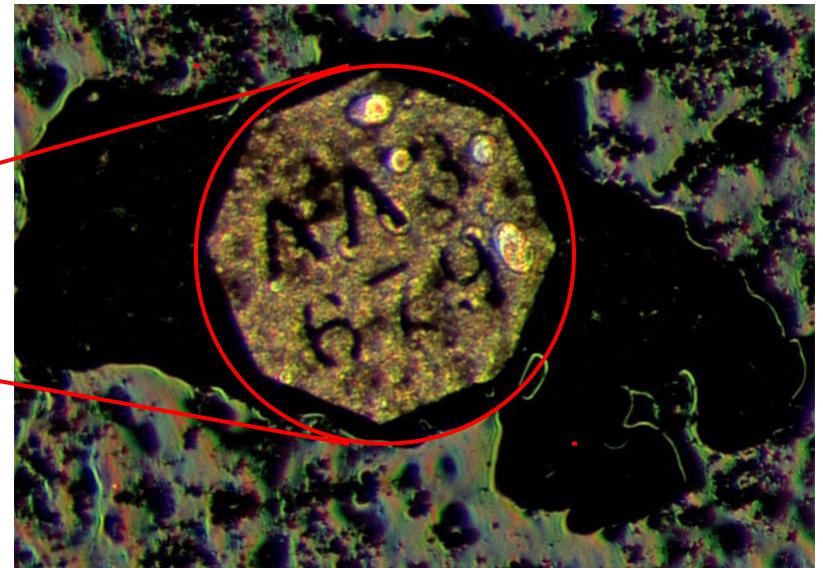


Micro-tags

Used in particular for cables marking and protection against metal theft.



Reading is possible with portable optical device (40x)



Micro-tags

Interests:

- The reading is possible on site
- The code could still be visible after calcination (typical « treatment » sustained by the cables)
- The tags could be found with a magnet

Several remaining questions:

Resistance, changes with aging, cost...

In conclusion...

There are a certain number of forensic responses to fight against metal theft.

These methods have already shown some of their potential but must be included both in local and global strategies.

They are complementary tools to other investigative actions

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Metal theft and forensic investigations: Two application examples

Thanks for your attention



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