

VSC APPLICATIONS

Intersecting Lines Toner & Ink

Application Note
ISSUE 1
August 2013



The determination of a sequence of lines is a common issue for questioned document examiners.

Typically it is very difficult, if not impossible to determine which line was made first under normal white lighting. There is an optical illusion that occurs where the darker coloured line will appear to be the line that is on top.

The following short study provides a method using the Foster + Freeman VSC range for determining the sequence of lines between a pen (ink) line and a printed (toner) line.

The study was carried out with 4 different pens written on top of laserjet toner, and then the reverse with the laser jet toner printed over the written pen (ink) lines.

The intersections were examined using the Co-axial light source with a VSC6000/HS.

APPLICATION IMAGES

Black ballpoint pen

Ink first	1
Toner first	2

Blue ballpoint pen

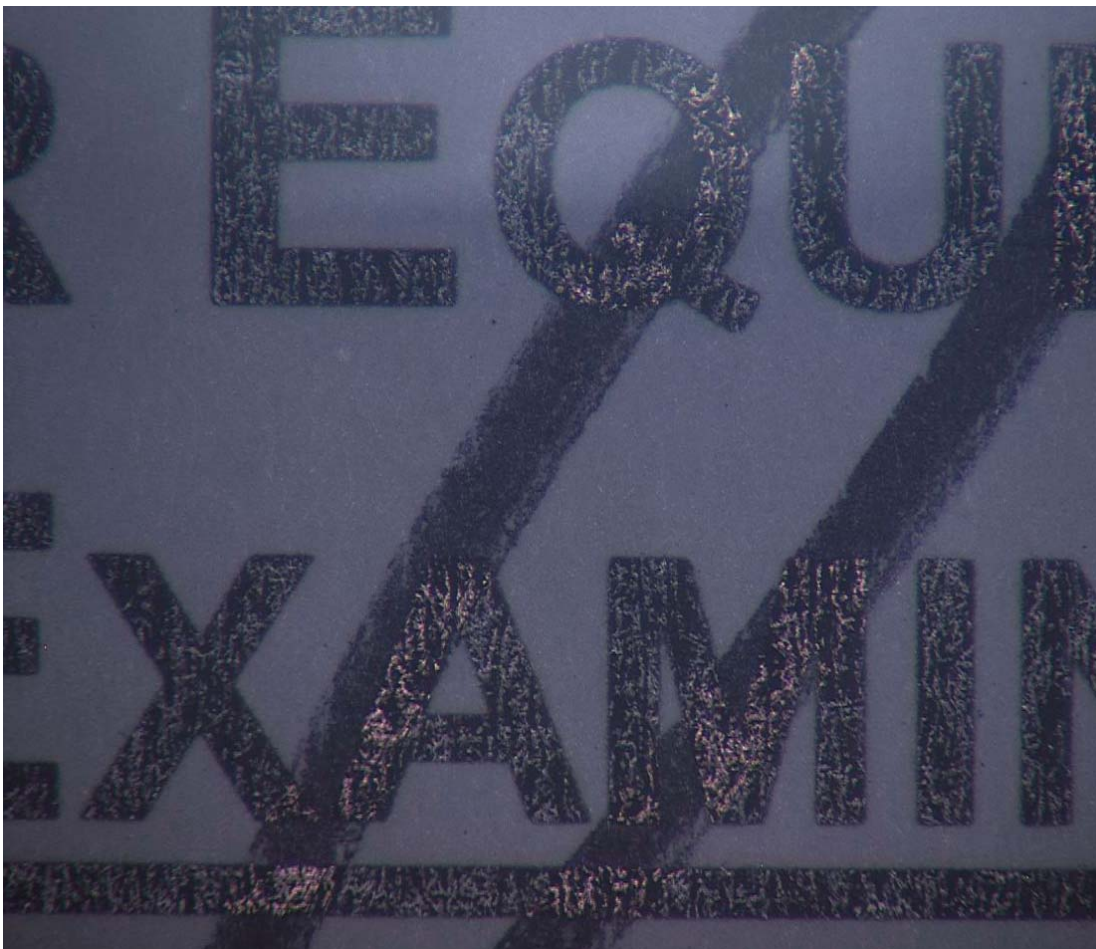
Ink first	3
Toner first	4

Black permanent marker

Ink first	5
Toner first	6

Blue gel pen

Ink first	7
Toner first	8



Sequence Determination

It is common for a forensic document examiner to be asked to determine the order in which two inks were added to a document.

Other methods of sequence determination include:

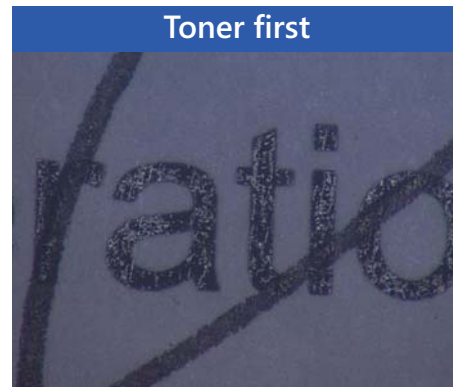
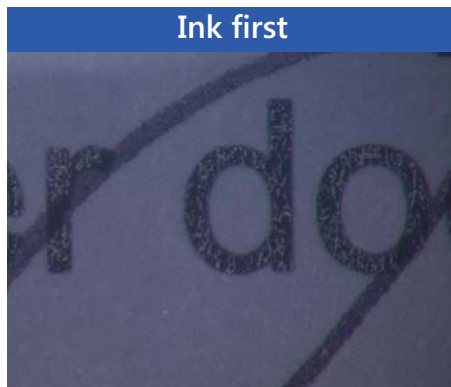
- Scanning electron microscopy, a relatively slow and costly method of analysis.
- Atomic Force Microscopy, which requires highly specialised equipment.
- Lifting tapes, which can damage evidence and have a poor success rate.

Note the "bronzing" effect where the pen (ink) line is on top of the printed (toner) line.

This is not apparent when the printed (toner) line is on top of the pen (ink) line.

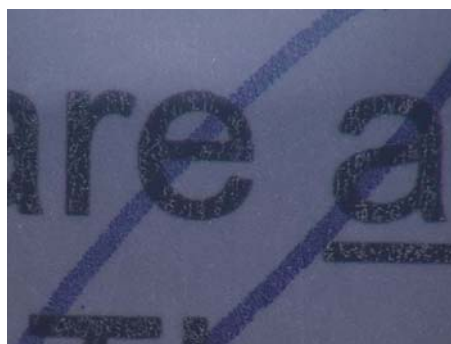
Pen 1

Black ball point



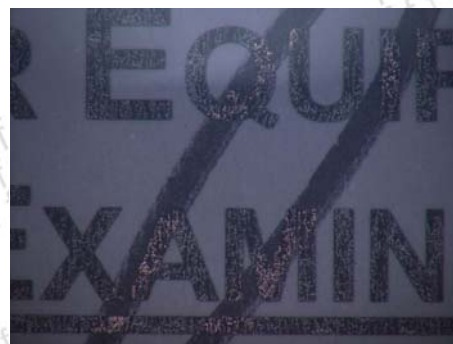
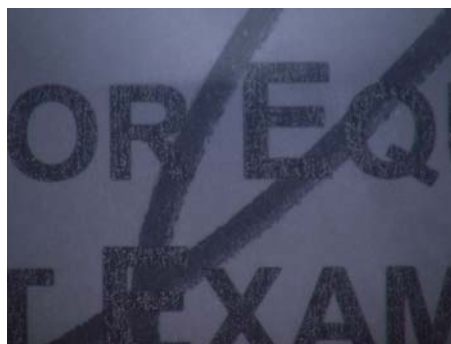
Pen 2

Blue ball point



Pen 3

Black permanent marker



Pen 4

Blue gel pen



Using the co-axial light source it has been possible to determine the sequence of lines. It should be noted that this "bronzing" effect has only been observed with interactions between 'toner vs ink' and is not observed in 'ink vs ink' intersections.