ABSTRACT
At autopsy several skin and tissue injuries to the skull of a female were observed. A section of skull containing the defects was removed for examination. Upon inquiry it was discovered that the husband visited a forensic metal foundry in which one of two tools having a triangular point shape was being used. A microscopic viewing of the wounds showed an impression similar to the resulting cut at the foundry. A histological examination of the tool and the skull fragment revealed similar features of fracture and tear. Additionally, silvering of the struck area similar to foundry sand and the foundry the suspect worked at was recovered from the skull. Although the murder weapon was never recovered, the presence and condition of foundry sand in the skull and secondary tool that matched the tool from the foundry are convincing evidence that the missing tool was the murder weapon. The suspect plead to find digital murder weeks prior to trial.

THE CRIME
- A divorced two months earlier into a police department 280 miles from his home and farm. **You may want to check on my wife.**<br>- The police found the house in a state of almost complete desolation consisting of several jagged open wounds.<br>- The body was located at the site of a metal roof with scattered impact impressions.<br>- The non-contrasted X-rays of the skull showed no bone fragments from a natural looking metal roof shots containing foundry sand.<br>- A set of ore-hand tools tools is strikingly missing.

THE AUTOPSY
- bone section removed at autopsy and submitted for examination
- Impression evidence
- X-ray shows bone and metal.
- Foundry sand was recovered from the skull.
- The murder weapon was never recovered.

PARTICLE ANALYSIS
- A small section of skull was cut out from the submitted piece and measured on an SEM using a high resolution carbon fiber. A laser SEM equipped with a focused ion beam (FIB) and energy dispersive spectrometer was used to examine particles embedded in the bone.

QEMSCAN
- A sample of the known foundry sand was embedded in epoxy and all 492 particles analyzed.
- QEMSCAN is an integrated automated system which provides quantitative analyses of minerals, rocks and mineral materials.
- QEMSCAN is an alternative method for Quantitative Evaluation of Minerals by Scanning electron microscopy and a registered trademark owned by FTS Company.
- QEMSCAN identifies mineral phases using backscattered electron and electron detector signals, in combination with electron-induced secondary X-ray emission. In addition to chemical analysis and mineral mineral counts, non-MICRO analysis provides several information.

SUMMARY
- The murder weapon was never recovered, a tool (possibly foundry) and used at the foundry was sub- mitted for testing. Foundry sand particles on the tool were similar to those found embedded in the victim's skull. The weapon (possibly a file) disengaged foundry particles to the skull. The tool on display was made by the same employee that fabricated the original tool.

CONCLUSIONS
- A tool with a pointed triangular shape exhibiting a rare, thin-walled tool could have made the blood transfer impression on the roof. The tool found in the remaining tool at the foundry has similarities to this impression. A tool with a similar shape could have made the bloody impression on the roof. The triangular iron grates and gravel particles containing magnesium, aluminum, silicon, and iron, similar to those found in the skull. The foundry tool was similar in morphology and composition to those found in the foundry tool.
- Magnetic foundry sand grains with black coatings containing minerals, aluminum, silicon, and iron, similar to those found in the skull. The results are similar in morphology and composition to those found at the foundry and probably originated from the foundry.