

How SOIL EVIDENCE helped solve a



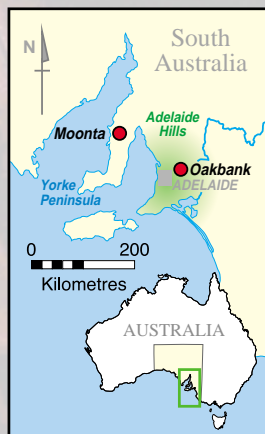
DOUBLE MURDER CASE

THE CRIME & THE EVIDENCE

September 2000. Oakbank, Adelaide Hills, South Australia. Wife, mother and son reported missing.

Following day, mother's car found abandoned, Yorke Peninsula. Muddy and bloodstained shovel among items recovered. Suspect arrested, Moonta. Refused to answer questions. Where were the bodies? Impossible to search the whole area from Oakbank to Moonta!

ENTER THE SCIENTIST



CSIRO soil scientist Dr Rob Fitzpatrick is called to assist the investigation. Soil material on the front and back of shovel examined for clues to the location of the bodies. Soil Clues found on the shovel:

- Clean working edges and smeared structure indicated use in a wet soil (A)
- Cemented soil stuck to the rear section at the back of the shovel blade indicated wetness
- Soil appearance on the front of the shovel blade showed that it had been wet and sloppy
- Soil was compacted in the handle housing on the back of the shovel, indicating that it had been used to flatten soil
- Large angular (not rounded) quartz grains were not typical of surface soils because they showed no signs of transportation and smoothing. Such grains are only found at depth (B)
- Fine grained yellowish pink material had the appearance of being a mixture of iron oxides and clay (C)

- Small white fragments had the appearance of deep, sub-surface kaolinite-rich weathered zones such as a mining area or quarry (D). Soil lump showing actual size of small white fragments (E)
- Absence of plant organic material indicated the soil had come from a deeper layer
- Low pH (acid) and low electrolyte concentrations (low salt levels).

Dr Fitzpatrick believed that the soil came from an industrial gravel quarry, probably in an acidic/low salt region of the Adelaide Hills.

CLOSING IN ON THE SITE

- Soil and geological maps, together with associated evidence, led detectives and soil scientists to investigate the Oakbank Quarry in the Adelaide Hills
- Colour and structure of quarry materials resembled soils found on the shovel. Samples were collected
- Back at the CSIRO lab, Dr Fitzpatrick with X-ray specialist Mark Raven compared samples from the quarry and the shovel using X-ray diffraction techniques (see chart on right)
- Composition of quartz, kaolinite, mica and talc in the samples were a match, just like fingerprints
- Dr Fitzpatrick was convinced that the bodies would be located in the wet area of the quarry. One detective returned daily believing the bodies may be uncovered by foxes.

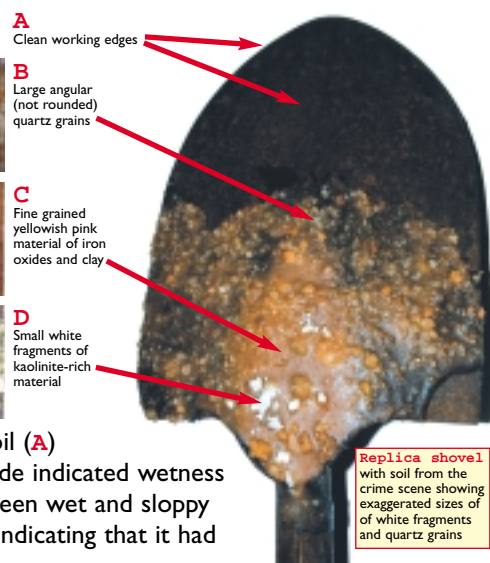
Monday 9 October

- Foxes exposed a human hand near a large pool of water Dr Fitzpatrick had pinpointed. A second body was uncovered fifty metres away the following day.

CASE SOLVED, suspect confessed and convicted of murder without million dollar court case.

The successful use of CSIRO soil expertise in helping solve a double murder led to the formation of the Centre for Australian Forensic Soil Science (CAFSS) in 2003 involving six core partners.

Since then, the centre has advised on over 30 criminal investigations and run national/international workshops.



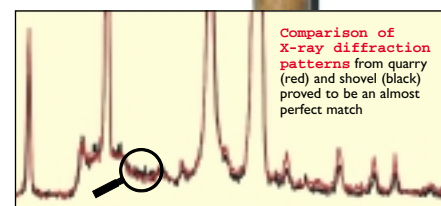
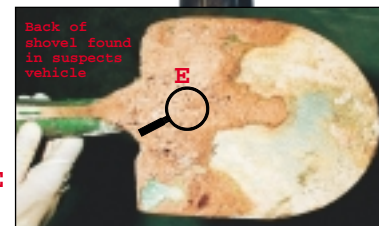
A Clean working edges

B Large angular (not rounded) quartz grains

C Fine grained yellowish pink material of iron oxides and clay

D Small white fragments of kaolinite-rich material

Replica shovel with soil from the crime scene showing exaggerated sizes of white fragments and quartz grains



Comparison of X-ray diffraction patterns from quarry (red) and shovel (black) proved to be an almost perfect match



Wet area

White kaolinite-rich weathered zones