

Why use Forensic Geoscience exercises as part of your Science course.



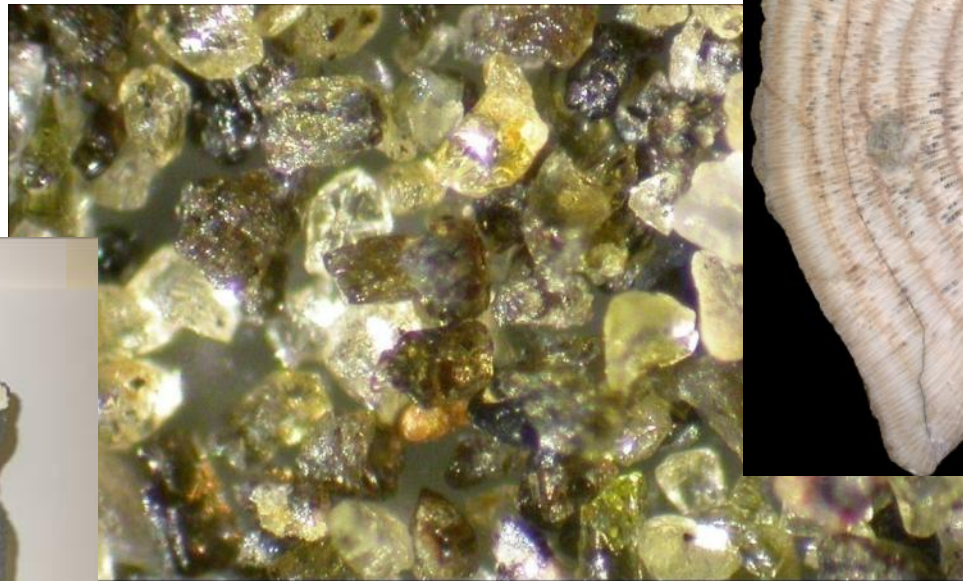
Maggie & Peter

What is Forensic Geoscience?

“Forensic Geoscience uses evidence from geological materials at the scene of a crime to support or defend against a prosecution in court.”

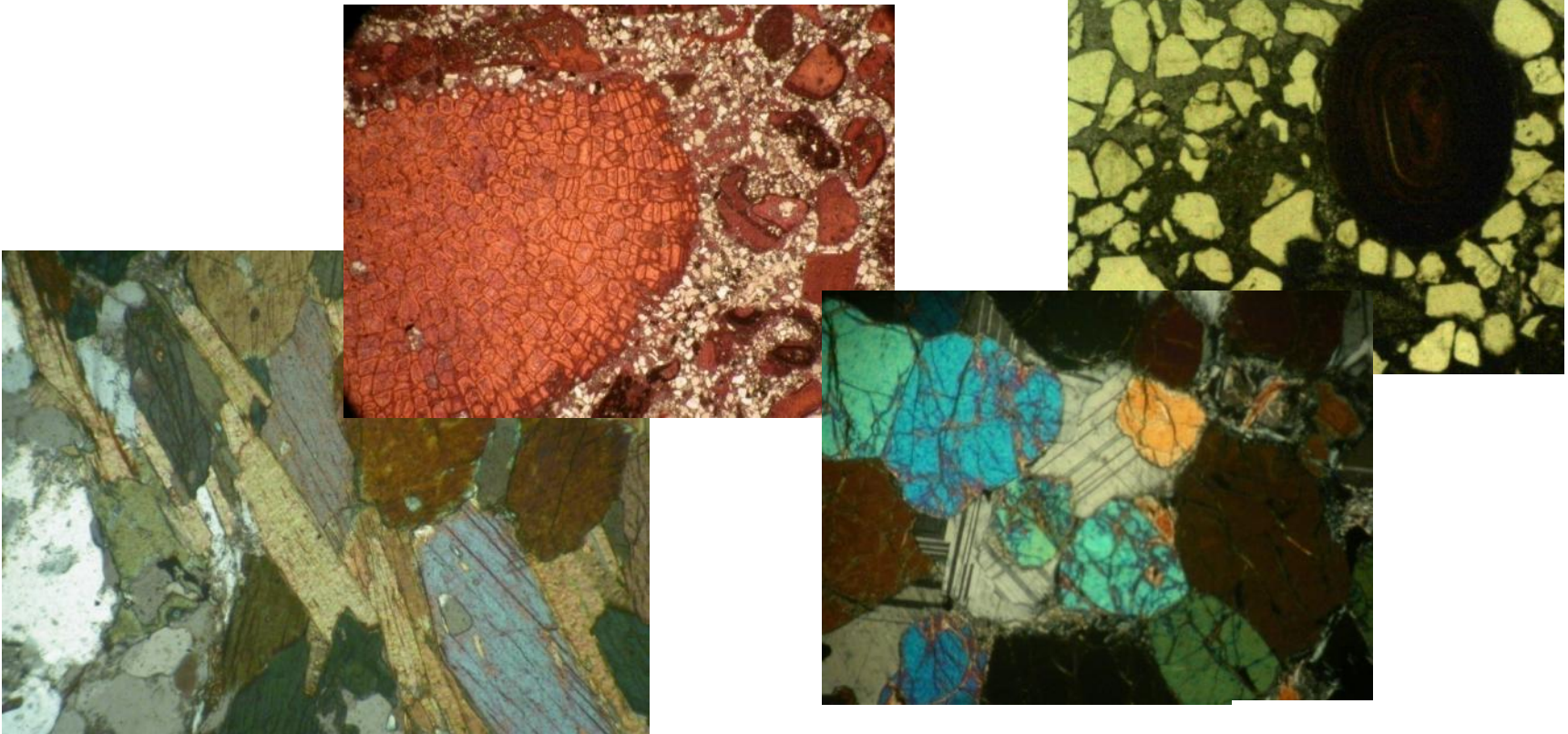
Methods of investigation used on geological materials

1. Hand specimen identification of rock & mineral samples



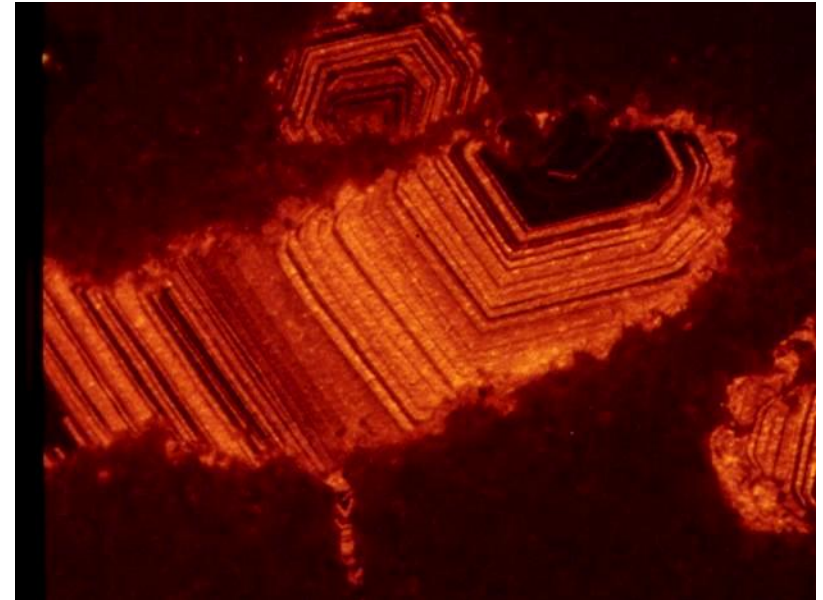
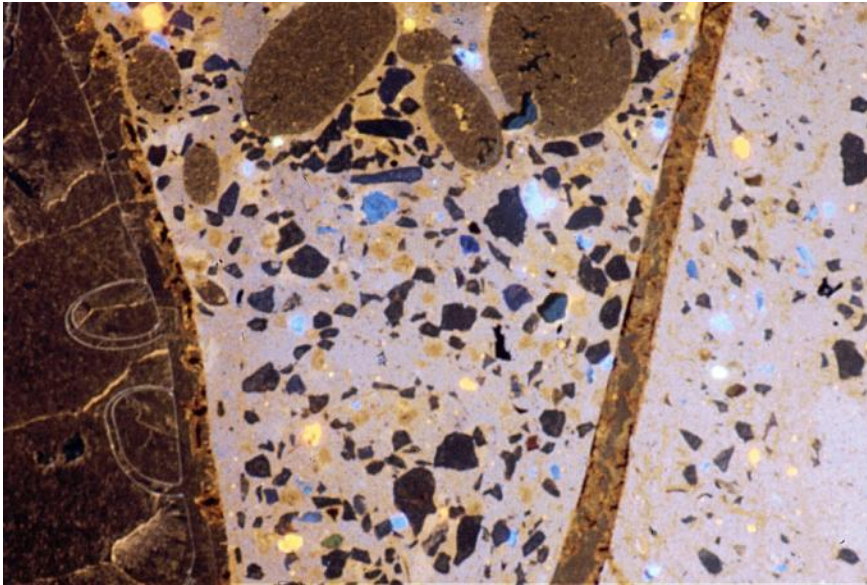
Methods of investigation used on geological materials

2. Optical microscopy



Methods of investigation used on geological materials

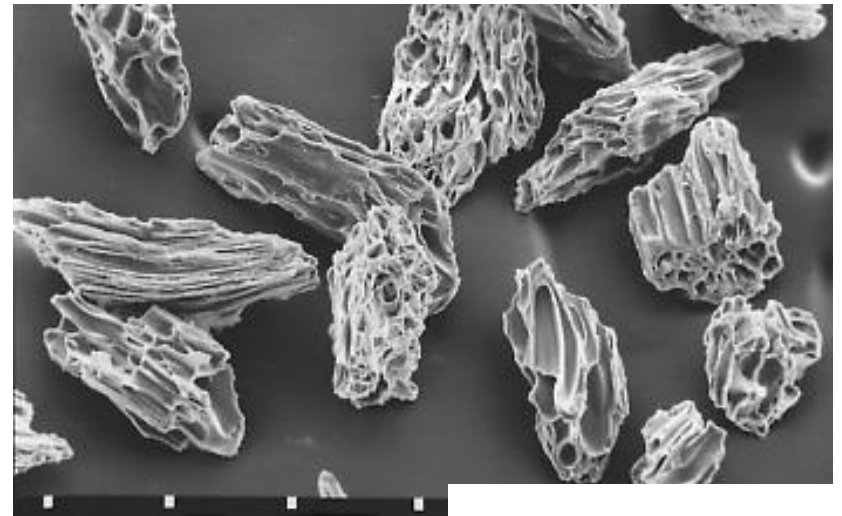
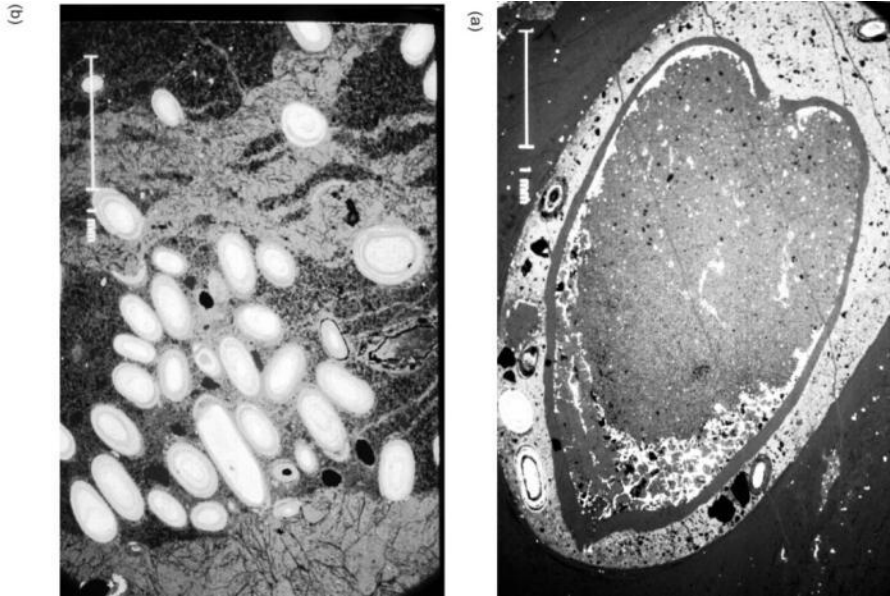
3. Cathodoluminescence microscopy



Methods of investigation used on geological materials

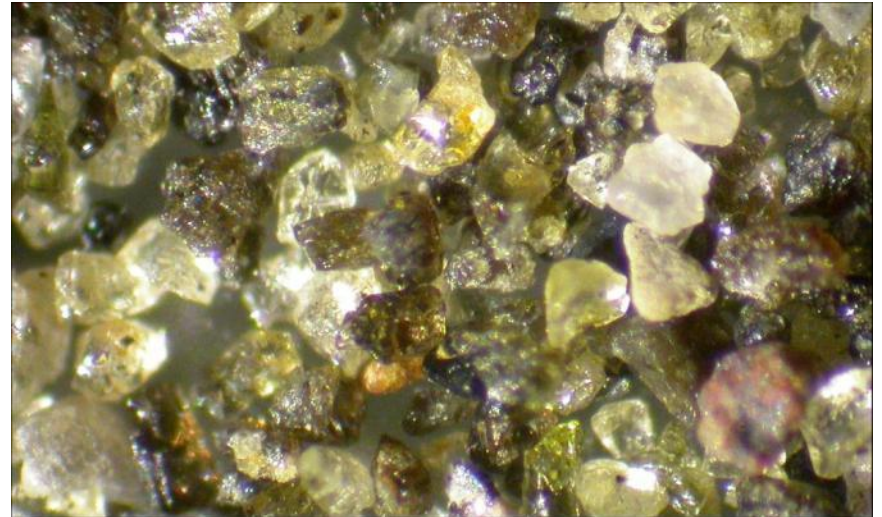
4. Scanning electron microscopy

- SEM images
- BSEM images



Methods of investigation used on geological materials

5. Sieving soil/sand particles and identification of constituent minerals



Methods of investigation used on geological materials

6. XRD & IR identification of minerals
7. Stable & radio-isotope geochemistry
8. Trace element geochemistry
9. X-ray fluorescence & infrared spectrometry
10. Electrical Resistivity Tomography (ERT)

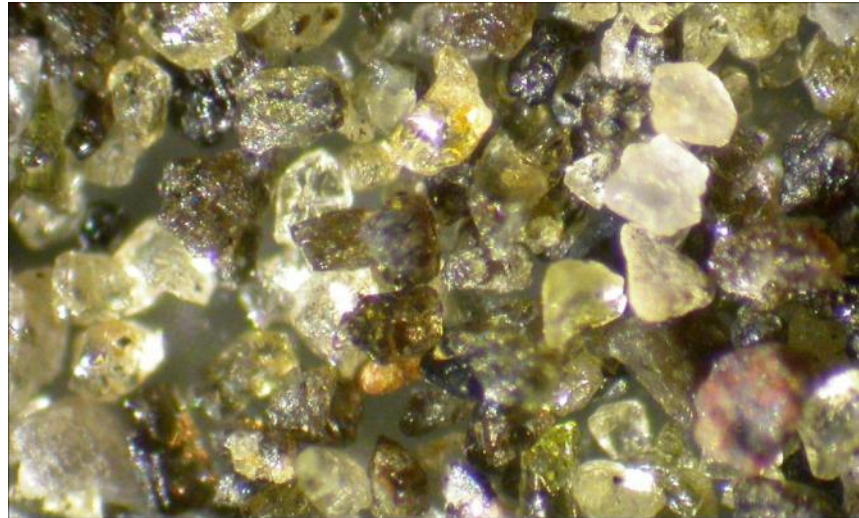
... the list goes on & on!

Evidence in recent UK murder trial

| | |
|------------------------|---|
| 10 extremely strong | physical fit & chemical/textural match or exotic particles |
| 9 very strong | chemical, textural, colour and biological match |
| 8 strong – very strong | chemical, mineralogical, textural and colour match |
| 7 strong | chemical and biological match |
| 6 moderately strong | very good chemical match |
| 5 moderate evidence | very good biological match from discrete soil samples |
| 4 weak to moderate | fairly good chemical or biological match data obtained from washed mixtures |
| 3 weak | fair chemical or biological match or sand grain shapes & surface textures >50 grains |
| 2 very weak | Quartz grain surface textures < 50 grains |
| 1 extremely weak | Pollen or sand textures with small numbers <50 grains |
| 0 no evidence | Pollen or quartz grain texture < 10 grains |

What could you use?

Sand samples



What could you use?

Tyres & tracks



What could you use?

Dirt in boot sole



What could you use?

Soil samples



Why use Forensic Geoscience exercises as part of your Science course.

- Involves students in active learning and encourages them to develop problem solving skills
- It teaches students that a negative result eliminating someone or something is still a valuable result
- It is adaptable to different age groups and abilities

Why use Forensic Geoscience exercises as part of your Science course.

- It touches on the nature of evidence – what is needed to prove something is true (or false)
- It is adaptable to local conditions – local samples of materials (soil or sand or rocks), local suspect (head teacher?)
- It teaches a social message, criminals need to be caught, people who look bad are not always guilty, people who have a criminal record might be innocent
- It is fun

What did we do?

THE DAILY CHRONIC 50p
13th September 2008

BODY FOUND IN WEST MIDLANDS

People smuggling four arrested



Early today, a dog walker discovered a body rolled in a blanket near Stourbridge. A Police spokesperson stated that they are treating the death as suspicious and have set up an incident room at the crime scene. They are linking the death to a white van found abandoned near Worthing. They believe that people-smugglers who entered Britain at Staffin on the Isle of Skye dumped the victim when he became ill. Police are asking for anyone who has seen the vehicle to contact their local police station.



White van found abandoned near Worthing.



Detective Inspector Philip Nicey, in charge of investigations said today that they had certain leads that they were following up and that four people had been taken into police custody, three men and one woman, but that nobody had been charged. He said that they were waiting for forensic tests at the crime scene, on the van and on samples taken from the four suspects.

ESTA Conference latest news - Page 17

What did we do?



Name: Jack 'the hat' McKillin

Age: 28

Height: 1.68m

Weight: 76kg

Residence: 4, Jemmy Street
Robberston

Fingerprints: 

Other distinguishing features: 'the hat'

Other forensic evidence: Sand taken from band on
brim of hat (Sample 2).

Extract of the interview with Mr J McKillin, 15/04/2003

Present DI Nicey and DS Smiler.

DIN: Where were you between the morning of 6th August 2002 and 7th August 2002?

JM: I was in Liverpool.

DIN: Are you sure about that?

JM: No.... I know I was at Formby.

DSS: What were you doing there?

JM: I was sand yachting on the beach. It's one of the best places in Europe for sand yachting.

DIN: Was anyone else with you?

JM: No, I don't think so.

DIN: Was anyone else sand yachting?

JM: No.

DIN: Have you ever been to Skye?

DSS: For the record, Mr. McKillin shook his head.

DSS: Or have you been to Worthing?

DIN: Where's that?

What did we do?



Report on the white van found abandoned on the beach at Worthing, West Sussex on 20th August 2002.

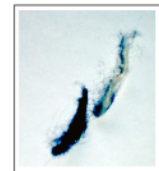
Analysis of the sand grains found embedded in the tyres of the van indicate that it had been at Stourbridge where the body of the victim was found and also found were traces of sand grains from Staffin on the Isle of Skye. In the inside of the van fibres were found that matched the fibres from the blanket that was used to hold the body. Tyre tracks at Staffin showed the same tread patterns as the tyres on this van.



Crime scene with blanket



Pattern of blanket



Fibres taken from van at Worthing found to match material and colour of blanket used to wrap victim.

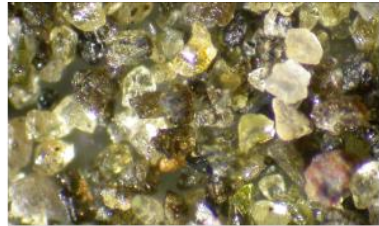


Tyre tread pattern from the van.



Tyre track from Staffin.

What did we do?



Microscopic view of sand grains from Staffin, Scotland. These sand grains match samples taken from the victim, the blanket in which he was wrapped and from the tyre treads of the white van abandoned at Worthing (Sample 5).



Sand grains from the banks of the River Severn near Stourbridge, where the body of the victim was found. These grains match grains found inside the white van abandoned at Worthing (Sample 6).



Sand from the beach at Worthing. Found only in the tyre treads of the van, but not on the victim or the blanket in which he was wrapped (Sample 7).

What are you going to do?

If you have not tried the exercise before:
have a go now.

If you have tried the exercise then why not
think up your own crime scene using the
sand samples that are here **for you to take
away.**

True scenarios.

Drug traffickers

Traffickers caught in coastal southern England linked to a location in the Netherlands where a boat carrying their consignment departed.

Why were they convicted?

The particle distribution of the sand samples did not compare with the English location the traffickers were arrested in, denying the alibi that suggested the sand to be English not Dutch.

True scenarios.

Badger baiting

Spades & boots (with abundant soil adhering) were seized from suspects & their vehicles following reports of digging at badger setts.

Why were they convicted?

Particle size distribution and composition of mineral grains in the soil on the spades & boots matched those in the soil at the site of the badger setts.

True scenarios.

Stolen Scotch

A person working for the Scotch distributor was suspected of stealing expensive Scotch after cases of Scotch opened in a store in Canada were found to contain blocks of limestone and not bottle of whiskey.

Why was he convicted?

The limestone in the cases was from a particular quarry in Central England. The suspect had access to the quarry and had often been seen taking home samples from the quarry.

True scenarios.

Soham murder

Why was Ian Huntley convicted?

Sand found in a vacuum cleaner belonging to the suspect contained the same combination of quartz grains as was found where the bodies of his victims (Holly Wells & Jessica Chapman) were found.

Other references.

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