Centre for Australian Forensic Soil Science

Soil properties as evidence in forensic investigations

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Recently there has been an increased usage of soil materials in forensic science. Forensic soil science requires appropriate methods for sampling, separation and analysis. We have developed the following systematic examination sequence. Firstly, soil morphological features are visually examined and then with a stereo binocular microscope. Secondly, infrared spectroscopy and magnetic susceptibility analyses are made on whole samples. These are then sieved and the smallest size fractions used for X-ray diffraction analyses. Further analyses using a petrographic microscope, SEM, TEM, ICP-MS or XRF may be necessary.
The following seven criminal and environmental forensic case studies demonstrate how soil properties have been used to discriminate between and match soils for critical evidence in:

- Solving a double murder case by identifying the similarities between mineral assemblages (kaolinite crystallinity and presence of mica, talc and rutile) in soils on a shovel and also from a quarry. The soils had a common provenance and revealed the location of two buried bodies.
- Identifying the locality of stolen ferns from a conservation park.
- Identifying the provenance of soil removed from a site containing aboriginal artifacts.
- A sexual assault case in which a comparison was made between soil minerals on clothing and a vehicle, with samples from the crime scene.
- Identifying the provenance of an industrial dust settling on parked vehicles. The mineralogy of these dusts identified them as coming from a cement works.
- Identifying the possible overseas provenance of soil on boots belonging to a suspected terrorist.
- Comparing dinosaur nest soil-like materials from imported samples and samples provided by Australian museums sourced from Henan Province, China.

Purpose and Aims of CAFSS

- To promote efficient and effective use of resources, by establishing the first formal worldwide network of soil and forensic scientists that will maintain a critical mass of research expertise in soil forensics to fight crime, terrorism and environmental pollution.
- To promote science excellence and co-operation with stakeholders by conducting research and communicating results and analysis techniques to forensic scientists in Australia and internationally.
- To promote confidence in forensic soil science by performing in a direct service capacity for specific criminalistic and environmental forensic cases.
- To provide leadership and best management practice in forensic soil science.

CSIRO · Government of South Australia · Forensic Science SA, Department for Administrative and Information Services · The University of Adelaide Australia · Flinders University · Chemistry Centre · University of South Australia

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Applied and research strengths

Produce new information about world and Australian soil properties and apply it in cutting-edge and internationally collaborative forensic research projects involving the following five discipline areas of soil science: (i) soil profiling, (ii) soil chemistry, (iii) soil mineralogy, (iv) soil molecular diagnosis and (v) soil geophysics.

Activities

- Employ appropriate soil science techniques to assist in the search, location and recovery of soil and mineral samples from crime and/or disaster scenes in Australia or overseas
- Counter terrorism and crime by developing and employing new soil technologies
- Assist DSTO and forensic archaeologists with work on detection of near surface buried targets such as land mines, unexploded ordinance and graves
- Facilitate the transfer of expertise from international soil and forensic scientists to Australian researchers and industries in order to increase our national competitiveness in emerging technologies
- Undertake specialised soil analyses for Australian (State, Territory, Federal) and International Police, forensic science and environmental agencies
- Establish and contribute to collaborative research projects and focus groups (e.g. quality assurance) with these organisations
- Conduct workshops, seminars and training courses on soils for police, other institutional professionals and undergraduates
- Provide opportunities for postgraduate students to undertake research projects related directly or indirectly to questions posed by clients.

Critical mass of expertise in Forensic Soil Science

CAFSS is a partnership between CSIRO, Forensic Science SA, The University of Adelaide, Flinders University, University of South Australia, NIFS (The National Institute of Forensic Science) and Chemistry Centre WA (Core Partners).

The centre incorporates Network Members from State, Territory, Federal (e.g. DSTO) government organisations and agencies, Universities, Police and international forensic science agencies. Also included are organisations such as SMANZFL (Senior Managers Australia New Zealand Forensic Laboratories), SET (Science, the Engineering & Technology Unit Of the Prime Minister & Cabinet) and private industries.

The Centre has a Management Board, which confirms and monitors strategic directions and ensures that the forensic soil science activities (focus groups concerned with quality assurance, innovation & research, and education & training) are performed in a financially sound manner with due regard for the relative merits of various national and international soil/forensic-related network members.

Contacts for further information

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