Got a Crime to Solve? Call in the Soil Scientists
Mary Makarushka

When Australian police were alerted to the disappearance of two women from their home outside the city of Adelaide in September 2000, they found blood and broken glass in the house, and one of the family cars was gone.

Police discovered the empty vehicle the next day, 100 miles from the women’s home; in the trunk were a bloody knife and a shovel caked with dirt. They soon arrested the 22-year-old driver, but he refused to give them any information to help find the women: his mother and grandmother.

With so little to go on and such a large area to search, detectives took the unusual step of contacting a team of soil scientists from CSIRO, the Australian national science agency, for help with the investigation.

To scientist Robert Fitzpatrick and his colleagues at the Land and Water lab outside Adelaide, the material on the shovel spoke volumes. It was smeared and compacted in a way that suggested that it had been used to both excavate and tamp down soil in a wet location, and its pH value showed it to be more acidic than the soils of the peninsula where the vehicle had been found. Under a microscope, it contained particles with an angular shape typical of materials created by a human activity, such as mining. And a mineralogical analysis revealed the presence of talc, a mineral found only in the area’s mountains and foothills.

Based on that analysis, his soils team recommended searching in the industrial gravel quarries of the Adelaide Hills, far from the place where the suspect had been arrested. The correct quarry was identified, and the two bodies were ultimately recovered. For the man in custody, Matthew Holding, the case ended in a guilty plea and a sentence of 18 years in prison.

But for the scientists and the police, the case was a powerful demonstration of the ways standard soil science techniques could aid criminal investigations. This collaboration would lead to the 2003 establishment of the Centre for Australian Forensic Soil Science (CAFSS), with Rob Fitzpatrick as its director and an active advisory board made up of law enforcement and forensic science experts from around the country. To date, CAFSS has advised on more than 100 cases, including violent crimes such as rape and homicide, counterterrorism and other issues of national security, and more esoteric crimes, including dinosaur egg smuggling.

“We’re using normal, ordinary pedological tools,” says Fitzpatrick, referring to soil color, morphology, chemistry, and other standard means of classification and analysis. “The big challenge for us was to understand the forensic and the police way of doing things and how to operate in court. So we’ve done training courses on how to deal with a jury and how to communicate with a jury. We’ve also had to develop a guideline manual as to how we deal with a sample when it comes in.”

Soils can be a very potent type of trace evidence for linking a suspect to a crime scene.

At the CAFSS labs, each soil sample is bar-coded so that the chain of custody or the record of each time someone takes possession of it, can be easily and reliably documented. An expert in sample security visits the lab every three months to certify its procedures.

“That is all really new stuff that you don’t normally do in soil science,” Fitzpatrick says. “And putting these things together, we can play a major role in assisting the police.”

It’s Elementary, My Dear Watson

Perhaps the earliest documented case of a forensic comparison of soils was in Berlin to solve a crime that took place on a Prussian railroad in April 1856. A barrel containing silver coins had been emptied and refilled with sand during transit. Using a light microscope, he then examined features of the sandy soil particles, such as color and shapes, to compare them with the soil from the barrel and determine the station from which the sand originated.

Later, in 1891, the Austrian Hans Gross is considered one of the fathers of forensic science.

M. Makarushka, contributing writer, Soil Science Society of America, Madison, WI.
doi:10.2136/sh2012-53-5-lf
Published in Soil Horizons (2012).
© Soil Science Society of America
5585 Guilford Rd., Madison, WI 53711 USA.
All rights reserved. No part of this periodical may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher.