

Fresh Thought on Forensic Science

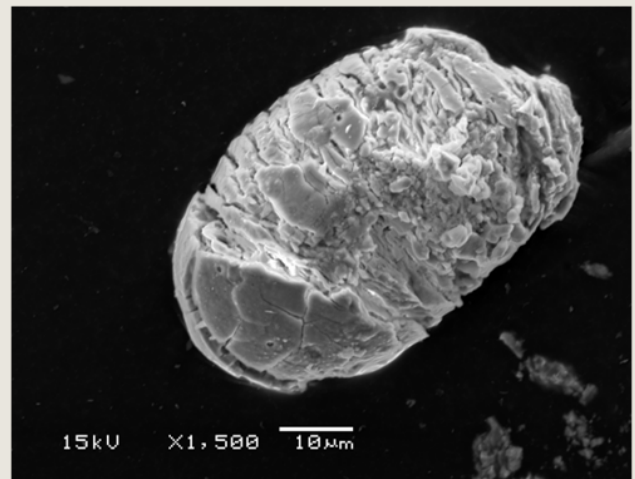
From enabling the dramatic arrest of Dr Crippen in 1910 to the quest to bring the killers of teenager Stephen Lawrence to justice, science has long established itself in the frontline of the fight against crime.

But could it achieve even more? Under the energetic directorship of Dr Ruth Morgan, the UCL Centre for the Forensic Sciences is rethinking how evidence is collected, analysed, interpreted and presented, while challenging assumptions that shape the search for the truth.

Rooted in cutting-edge research and a unique teaching programme, the Centre harnesses skills from across UCL, collaborates with SES members and other universities, and works hand-in-hand with policy-makers, the criminal justice system and industry to develop more reliable ways to help exonerate the innocent and identify the guilty.

A New Line on Crime

At the heart of hit shows like *Silent Witness*, ‘forensic science’ is a broad-brush term. Spanning everything from DNA profiling to digital data analysis, it embraces disciplines as diverse as chemistry, genetics, psychology, computer science, archaeology, botany and more besides. But while the image may be one of painstaking collection of crime-scene evidence or late-night peering into microscopes in lonely laboratories, **forensic science is actually as much about thought processes as scientific procedures.**



“Traditionally, the focus has been on analytical techniques that can identify and classify tiny amounts of blood, fabric, gunshot residue or other materials,” Ruth Morgan explains. “Here, we take a more holistic view and seek to build the evidence bases that can underpin forensic evidence recovery, analysis and interpretation. How does the brain interact with evidence and why might it jump to conclusions? Is evidence presented in ways that factor-in barristers’ and jurors’ preconceptions? Are we looking for it in the right places and do we understand how miniscule quantities can be moved innocently via intermediate objects?”

Established in 2010, informed by real-life casework and passionate about delivering real-world impact, the Centre channels its expertise into:

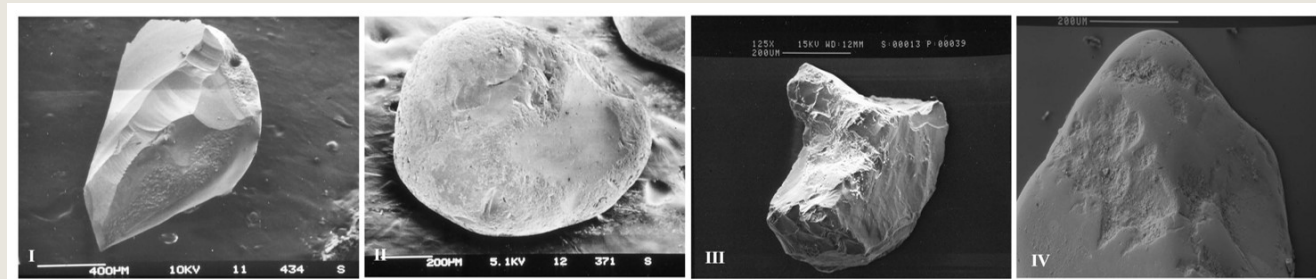


- **Research:** a multidisciplinary programme explores how trace evidence behaves in different contexts and environments, and how evidence is interpreted and presented (e.g. why might wrong assumptions be made about the presence of DNA?)
- **Teaching:** an MSc in Crime & Forensic Science and PhDs delivered across UCL departments and featuring collaborative research projects with the University of Oxford and King's College London, for instance, prepare students for careers with the National Crime Agency, the police, government, the civil service and other organisations.
- **Consultancy:** The Centre offers advice and guidance to public and private sector organisations in fields such as evidence interpretation, DNA evidence and soil analysis.

Excellent relationships with the City of London Police, the Metropolitan Police, Principal Forensics and the Natural History Museum, for example, are complemented by strong links with companies like Oxford Instruments (developing approaches for semi-automated analysis of trace materials) and forensic document examination experts Foster & Freeman.

Casebook

The Centre represents an evolution from Dr Morgan's earlier work at the University of Oxford, where her research aided re-examination of the 2001 murder of Rachel Manning – a case where metallic particles found on the victim's skirt and in a van were instrumental in securing two convictions. Proving that the particles were, in fact, quite common and could cling to clothing for many hours contributed to the decision to allow a retrial, which led to the overturning of the convictions; another man was tried and jailed for the crime in 2013.



This kind of fresh thinking, now at the heart of the Centre's philosophy, is making its presence felt right across the forensic science field, as these two examples demonstrate:

- **Spotting tell-tale signs of terrorism in sewage:**
Recent terror attacks worldwide have highlighted the rising threat posed by homemade explosives and bedsit bomb-making factories. The need for early-stage detection is all too acute, so could something as mundane as wastewater be part of the answer? In collaboration with King's College London – and working with a range of organisations including Thames Water and the Environment Agency – research student Sally Gamble has shown how tiny traces of explosives such as triacetone peroxide, washed off hands, utensils or containers, can be extracted from sewerage networks, analysed and used to produce

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Dr. Ruth Morgan, Director, UCL Centre for the Forensic Sciences



‘hotspot’ maps revealing where they originate. Building on existing techniques harnessed to pinpoint illicit drug factories, this approach has potential to offer intelligence to direct surveillance operations, which can be a powerful weapon in preventing devastating terror attacks before they come to fruition.

- **Making fingerprint analysis more effective and efficient:**

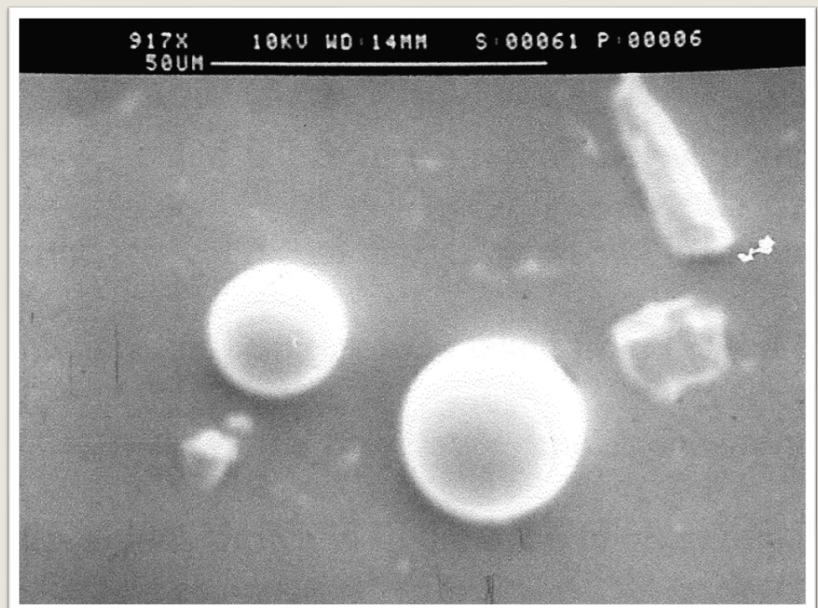
Fingerprint laboratories routinely face conflicting pressures: firstly, to decide which prints are of sufficient quality to forward for more detailed analysis – a crucial step in ensuring no valuable evidence gets overlooked; secondly, to weed out prints of insufficient quality and avoid time being wasted assessing them during investigations. Working with the Fingerprint Laboratory of the Metropolitan Police’s Evidence Recovery Unit, PhD student Helen Earwaker found that the lab was forwarding a higher percentage of insufficient marks than was acceptable according to its own guidelines. She also identified that, in serious cases, the lab was forwarding more inadequate fingermarks while in less serious cases it was discarding more potentially useful marks. These findings provided the foundation for changing the lab’s pre-selection process and embedding a consistent, more robust approach to decision-making.

According to the Evidence

Having met its needs to date by utilising facilities and hiring equipment from across UCL and beyond, the Centre is now launching a crowd-funding campaign to finance a dedicated forensic evidence interpretation research facility, which would also be available to external users.

“When it comes to understanding forensic evidence, smart science and standard procedures are only part of the story,” Dr Morgan concludes.

“Context and critical thinking are crucial. A lot comes down to individuals having to interpret the significance of evidence and reach a view, aware that forensic science doesn’t deal in irrefutable absolutes.”



Working closely with its partners across government, public services, academia and industry, this message looks set to secure an ever-wider hearing in the years ahead.

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Key Publications

H. Earwaker, R.M. Morgan, A.J.L. Harris and L.J. Hall (2015). [Fingermark Submission Decision-making within a UK Fingerprint Laboratory: Do Experts Get the Marks that They Need?](#) *Science and Justice* 55 (2015), pp.239-247.

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