Forming the cornerstone of many criminal proceedings, forensic science can uncover evidence that can make or break a case. Here, Editor Amy Caddick asks four forensic science experts about developments and challenges in the field, and what makes the discipline so engaging...
While often considered a new field, forensic science in fact has a long and interesting history that spans hundreds of years. However, the development of technology has plunged it into the public eye and completely changed the capabilities of the sector.

Despite the importance of forensic science in criminal cases, a colossal blow was delivered in 2010 when the government announced that the Forensic Science Service (FSS) would be one of the casualties of its austerity measures.

In March last year, the institution finally closed, despite considerable protest from experts in the field. Many thought its closure would have a negative impact on the ability of the police to conduct thorough investigations and could lead to miscarriages of justice, while others doubted the government had weighed the true cost of closing the FSS – a view that is gaining increasing credence.

Dr Ann Priston OBE, JP, President of the Forensic Science Society, has a background in biochemistry and physiology and over 40 years’ experience as a forensic scientist. Sharing her thoughts on the closure of the service, she asserts: “I don’t doubt that it was a bad move. I’ve not met a single person who has been able to justify it. The impression that everyone in the field has is that it was a decision made in haste and without proper consultation.”

As evidence continues to emerge about the true cost of the FSS, it is hard to disagree with Priston’s assessment. Although outsourcing services – and in some cases in-sourcing services – has undoubtedly been costly, and the FSS was said to be haemorrhaging around £2m a month, the long-term cost of closing the service could prove considerably more expensive.¹

“We’ve also lost a wealth of expertise,” says Priston. “A lot of staff with a huge amount of experience have lost their jobs as a result of the closure. It was a very rash and rather foolish mistake.”

Government austerity measures that led to the death of the FSS have also had a further, significant impact upon the forensic science sector because of cuts to police budgets.

“Police forces have had their funding cut by around 20%, and as a result forensic science budgets have also been slashed,” Priston highlights. “Many police forces are now undertaking some of this work themselves to save money, which in turn has led to a reduction in the amount of contracts private companies are receiving.

“The problems resulting from these budget cuts are potentially immense. I can’t say for sure that closing the FSS will lead to miscarriages of justice, and frankly it would be stupid to hazard a guess, but it is a real concern. Only time will tell.”

Priston is also concerned about standards slipping or varying between institutions, as different laboratories work in different ways. She warns that there needs to be standardisation across the field to ensure laboratories, whether located in the private sector or in police stations, all meet the same criteria.

“Following a review of forensic science the Home Office appointed a science regulator with responsibility for quality standards,” she says, “but the whole issue of science on the cheap is certainly a worry.”¹

¹ www.bbc.co.uk/news/science-environment-21251162
THE THANATOCHEMICAL REACTION

Often, after a murder is committed, one of the first things the killer does is to bury the body in a remote location, removing a key piece of evidence from any ensuing inquiry. Over time, flora will hide a fresh grave from sight, making it all the more difficult for investigators to find.

However, when a body is buried in the ground, it releases chemicals into both the soil and the air that can be identified by forensic science techniques. Thanatochemistry is a growing discipline that enables experts to identify clandestine burial sites by detecting known compounds associated with a dead body.

John Cassella, Professor of Forensic Science Education at Staffordshire University, explains how thanatochemistry is assisting forensic scientists in locating the remains of murder victims.

"The idea of thanatochemistry is that we can take soil samples from an area and use analytical chemistry to locate a hotspot that suggests a body could be buried there," he says. "There are specific chemicals that you would expect a decomposing body to give off as it breaks down. Therefore we should be able to capture these compounds and, using gas chromatography – mass spectrometry – decipher what chemicals are present."

Advances in technology are only increasing the capabilities of thanatochemistry. However, there are still many challenges to overcome.

"We really need to be looking towards the use of human cadaveric material," says Cassella. "In the US, researchers have already stepped away from the use of pigs in studies and are increasingly using human cadavers to give more accurate results. There is a need for such a facility in this country. It would allow us to collect more accurate data, which in turn allows us to present more concrete evidence in court.

"It's also a fantastic opportunity for the UK to become a nexus, the focal point for researchers to come to learn what happens during the decomposition process."

Another issue within the field is the need to shorten the period between collecting samples and receiving the results of their analysis. Currently, soil samples are tested in laboratories and it takes a considerable amount of time to generate outcomes.

"What we want to be able to do in the future is undertake field tests on site," says Cassella. "So, for example, the forensic scientist collects a soil sample, puts it into the equipment kept in the back of his or her vehicle and the results are churned out there and then.

"In the UK, we’re looking at around five years before this kind of equipment is rolled-out here, simply because it is not a multimillion pound grant-funded project. There isn't a team of scientists developing the product. It's a small group of interested academics who want to take this from a theoretical idea, to laboratory and then on to the crime scene.

"One of the major limitations of this field is the significant lack of funding readily available for forensic science across the board. There needs to be more support from government, from private industry, and the UK research councils really do need to step up and give more support to the sector."

John Cassella
Professor of Forensic Science Education
Staffordshire University
j.p.cassella@staffs.ac.uk
www.staffs.ac.uk/staff/
profiles/jpc3.jsp
Forensic anthropology is making significant strides in research and development and is increasingly being relied on by police investigators. Professor Sue Black, Director of the Centre for Anatomy and Human Identification (CAHID) at the University of Dundee, is an expert in the field, and here discusses its function in modern society.

“The forensic anthropologist has many roles to play, depending on the nature of the case in question,” she says. “They may simply confirm to police that the bones found in a garden are those of a dog and not human. So they must be as comfortable to work with non-human as they are human remains. CAHID undertakes about 300 such cases in a year.”

Forensic anthropologists are often called into cases if there is difficulty identifying the deceased, as Professor Black explains. “Anthropologists in this situation would be expected to provide evidence of the sex of the individual, their age, their height, ancestral origin and any other feature that might assist in identification, e.g. previous diseases, fractures, etc. An odontologist will provide information on the teeth. If this biological profile does not assist in the identification, the specialised facial reconstruction experts such as Professor Wilkinson at Dundee will reconstruct a face that could then be released to the public in an attempt to identify the deceased.”

In cases where there are mass casualties, particularly acts of terrorism or genocide, the forensic anthropologist can also play an important part in the identification process.

“Their role here is firstly in the identification of remains at the scene, especially if there has been disruption to the remains, in triage at the mortuary to identity body parts (anatomical training is very important here) and also in their normal role of extracting information about identity,” says Black.

With purse strings tightening, CAHID also offers free services for police forces – an arrangement that Black asserts is mutually beneficial, in getting around budget issues facing the police and providing student anthropologists access to real-life criminal evidence.

While the UK is a long way behind the US in terms of recognition of the field, this is slowly being rectified.

“The landscape has now changed with the discipline being represented in its own right, both within forensic service providers and within universities,” says Black. “Forensic anthropology now has an organisation – the British Association for Forensic Anthropology – and its professional body is the Royal Anthropological Institute. With the Forensic Regulator, this partnership has just completed formal documentation for accreditation purposes so that this year will see formal professionalisation of the discipline in the UK – a long way behind our US colleagues who achieved this in the 1970s.”
THE DIGITAL DYNAMIC

The dramatic growth of digital technologies has made cybercrime a hot button issue, and seen computer forensic science become an increasingly integral part of many criminal and civil cases.

Dr Olga Angelopoulou, a computer forensic scientist at the University of Derby, explains what her role involves and the benefits of using digital evidence in criminal proceedings.

"The computer forensic scientist is the specialist who will need to deal with the collection, acquisition, examination, analysis and presentation of the digital evidence," she says. "In other words, he/she is the person who has the skills and knowledge to successfully identify digital evidence after a computer crime has taken place and assess the techniques employed by the attackers.

"The aim of digital forensics is to find out how a computer related crime occurred and prosecute the accuser under the relevant acts, if necessary. There are numerous situations in which computer forensics is required, such as identity theft, copyright infringement and industrial espionage."

Not all digital evidence collected is necessarily linked to computer crime however, as Angelopoulou explains. "In these cases computer forensics is required in order to identify relevant digital evidential data to a case that could strengthen or eliminate the initial accusation. For example, a mobile phone could be a valuable source of information in detecting the communication between the owner and his peers in a drug trafficking case."

As digital technologies continue to advance, new challenges emerge, cloud computing – the storage of data on remote servers – being the latest example.

"The growth of cloud services is constant and data is being spread around across different data centres and in virtualised environments," says Angelopoulou. "However, there is no best practice structured yet to indicate to us how to effectively reconstruct the data from a cloud environment. There is of course a lot of active research on the field and a number of tools are currently being developed."

As digital products become more sophisticated, so too must the methods of gaining evidence from these devices.