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Case closed

In a secret location somewhere in England is a vast warehouse filled with battered files and forensic samples - the accumulated evidence of thousands of unsolved crimes. Now, thanks to scientific advances, these cold cases are being revisited, and offenders such as Brian Field, who killed 14-year-old Roy Tutill in 1968, are being convicted of crimes they committed decades ago. Stephen Moss reports

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Paul Hackett, DNA manager for the Forensic Science Service, Birmingham. Photograph: David Sillitoe

Orlando Elmhirst, who runs the "cold cases" unit at the Forensic Science Service's headquarters in Birmingham, used to be an archaeologist. "I realised my career was in ruins, so changed jobs," he jokes. But in a way it's not such a huge change, because at the FSS he is engaged in something akin to criminal archaeology - the solving of crimes, using the latest advances in DNA technology, that have defeated detectives for decades.

"Archaeology and forensic work are very much the same," says Elmhirst, who was a scientific support manager with Leicestershire police before he joined the FSS. "You have to sift through an awful lot of data, pick out the nuggets that are relevant, and have those recorded and preserved." Elmhirst is currently sifting through thousands of unsolved sex cases from the past 20 years, under the banner of a Home Office initiative called Operation Advance.

Advance has so far secured 35 convictions - of men who thought they had got away with rapes committed years ago. Parallel investigations by individual police forces have also solved a string of totemic old cases: the murder of 14-year-old schoolboy Roy Tutill in 1968; the rape and murder of 63-year-old Norah Trott in Rochford, Essex in 1978; the murder in 1975 of 11-year-old Rochdale schoolgirl Lesley Molseed, whose body was found on Rishworth Moor in West Yorkshire in 1975. "Advances in modern science techniques," said Judge Gerald Gordon, sentencing Tutill's murderer Brian Field to life imprisonment, "should stand as a warning that there is no hiding place for sexual and

violent criminals."

DNA profiling, by which our genetic make-up can be read from a small amount of cellular material (typically blood, semen, hair, skin, saliva, even dandruff), was developed in the mid-1980s by Sir Alec Jeffreys, professor of genetics at the University of Leicester. It has revolutionised forensic science, but the revolution has come in stages, and today it is possible to get a profile from a tiny sample of DNA that would in the past have been insufficient for scientists to break down. So Elmhirst is looking again at 15,000 cases where science may suddenly be able to solve the whodunnit.

Somewhere in central England - the location is kept secret for security reasons - the FSS has a vast warehouse filled with case notes and forensic samples, the accumulated evidence of 1.5m cases, many thousands of them unsolved. "There's a huge amount of material stored here," says Elmhirst, "ranks and ranks of case files. The trick is finding out which are relevant if you want to do cold cases. It's a goldmine, but you have to find your little seam to get in there."

By relevant he means those that have not been solved, and above all those containing material that might yield a DNA profile. He shows me a battered blue file containing notes on the rape of a 13-year-old girl in 1993. He knows from the report made by the forensic scientist at the time that there was semen on the girl's underwear. He also knows that the relatively primitive DNA profiling techniques then in use could not obtain a profile. Now, by subjecting the sample to today's more sophisticated methods - one scientist tells me you used to need DNA of the size of a 50p piece, but now a pinhead-sized quantity will do - it should be possible to get a profile. Then the police will be halfway to getting a suspect.

That, though, is only one part of the revolution. The other part is the UK national DNA database, which, since it began in 1995, has been steadily adding names and now has 4.25 million people on it. When the database was set up, only those convicted of crimes were recorded. However, a series of changes in the past decade has widened its scope, so that today virtually everyone who is arrested - the test is whether the arrest is for an offence that could lead to imprisonment - has to give a mouth swab and is added to the database. The police now feel they have the majority of the UK's active criminal population recorded.

It is likely that the man who committed the 1993 rape will be on the database - rapes tend to be committed by men with a history of sexual assaults and other offences. Elmhirst has only to check that the crime remains undetected, run the profile - a long sequence of numbers that codes the DNA - through the national database, and there is a strong chance he will get a match, the name of a suspect for the police to pursue.

There has been a spate of recent convictions as the combination of new DNA-profiling techniques and the vast database of those who have had contact with the police in the past 13 years have begun to take effect. As well as Operation Advance's systematic appraisal of cold cases, individual police forces are undertaking their own reviews of notorious unsolved crimes - murderers and serial rapists are their principal targets - and working with scientists to undertake forensically led reinvestigations.

One of these, conducted by West Yorkshire police, led last November to the jailing for life of Ronald Castree for the sexual assault and murder of 11-year-old Rochdale schoolgirl Lesley Molseed in 1975. She had been stabbed 12 times. The case had haunted not just Lesley's family but the West Yorkshire force, too. It had bungled the original investigation, pressured local man Stefan Kiszko into confessing and, with a conviction obtained, destroyed the forensic evidence. Kiszko served 16 years in prison and died

shortly after his conviction was quashed; Lesley's older brother Freddie committed suicide; her sisters Laura and Julie were traumatised.

In 1999, West Yorkshire reopened the case. They had a suspect - not Castree - and wanted to check whether his DNA matched anything from the crime scene. The only forensic evidence that remained was held at the FSS's Wetherby laboratory, in the form of Sellotape tapings. Back in the pre-DNA days of 1975, Sellotape had been run across Lesley's clothing to see if any fibres from her murderer's clothes could be picked up. The FSS had kept those strips of Sellotape in sealed containers.

When the case was reopened, one of the scientists at Wetherby had a brainwave. "We knew Lesley Molseed's knickers were stained with semen," says Cathy Turner, who headed the forensic team that reinvestigated the case. "But in 1975 there was no DNA and there had been no review of the case since. Because there had been a conviction, we didn't have the original items any more - the police had destroyed them. But someone suggested that as well as picking up fibres, the tapings might have picked up body fluids too."

The catch was that in trying to extract DNA from the tapings, the fragile bits of Sellotape - the last shreds of forensic evidence - would be destroyed. Turner commissioned some experimental work to see whether it was in theory possible. This proved a success, so West Yorkshire police and the FSS took the gamble. It paid off: in 2000, sufficient DNA was extracted from the tapings to obtain a profile. "To be able to extract sperm heads from a piece of Sellotape that had lain in a drawer for 25 years was absolutely fantastic," says Detective Chief Superintendent Max McLean, head of the crime division in West Yorkshire police, who ran the new investigation. "The scientists could say this profile was from sperm; the donor of sperm was going to be the killer."

What the police did not have was a name. "The first thing we did was search the national DNA database and some international databases," says McLean, "but no match came up. But at least having a profile allowed us finally to eliminate Kiszko, Robert Black, Peter Sutcliffe, other well-known female and child killers, as well as our original suspect from 1999. In the debate on DNA, it's often lost that the elimination powers of DNA evidence are very important."

McLean's team took swabs from 1,500 men, including several known paedophiles. An appeal was made on Crimewatch. Familial searches - whereby checks are run on the database to find a DNA code similar to that of the suspect - were run. Still nothing concrete. But the original profile was being run through the computer regularly, and in 2006 it came up with a full match. In 2005, Ronald Castree had been arrested for an alleged sexual assault. He had not been charged, but his DNA had been routinely taken at the police station and placed on the national database. The police now had a named suspect for the murder of Lesley Molseed.

DNA cannot, on its own, gain a conviction. A judge in Scotland recently threw out a murder case where the prosecution had felt the DNA evidence was watertight, saying there had to be corroborative evidence. Judicial qualms were also underlined just before Christmas when Mr Justice Weir, acquitting Sean Hoey of all charges in connection with the bombing of Omagh in 1998, dismissed the presentation of the forensic evidence on which the prosecution in the case was relying and, for good measure, cast doubt on so-called low copy number (LCN) DNA, the method that makes it possible for the most microscopic samples - for example a few cells on a piece of clothing or the trigger of a gun - to yield profiles.

The supporting evidence in Castree's case - admittedly largely circumstantial - was that

he lived three-quarters of a mile from where Lesley had been abducted, had previous convictions for gross indecency and assault (pre-database - sample-taking was not retrospective), and could not account for his whereabouts on the day Lesley was murdered. He was convicted on a majority verdict.

"When the guilty verdict was read, I felt like a giant skyscraper had been lifted from my shoulders," said April Molseed, Lesley's mother, in an interview shortly after the trial ended, "this giant weight that I have carried with me for 32 years. It was such an incredible feeling of relief. Now I can go to Lesley's grave to tell her the news, and at last she can rest in peace." "This has been a bonding experience for the family," says McLean. "It has brought an element of closure. The family feel that to have achieved this after so long is fantastic."

McLean is quick to point out that getting DNA evidence is part of a police investigation, not a substitute for one. "It's not a magic solution," he says, "and doesn't replace good detective work - proper interviewing of eyewitnesses, for example. Good detectives need to understand the consequences of the scientific work they commission." It is a point every officer makes: DNA is another weapon in the armoury, not the knockout blow in the fight against crime.

"It's the biggest revolution in forensic science since fingerprinting, and a massive change for policing," says Gary Pugh, the Metropolitan police's director of forensic services, "but it's not infallible and prosecutions won't proceed on the basis of DNA alone. You need other evidence with it, so it's not the be-all and end-all."

"We regard it as part of the evidence, not all of the evidence," says Tony Lake, chief constable of Lincolnshire and forensics spokesman for the Association of Chief Police Officers (Acpo). "If we found some DNA we would be looking very hard for other evidence, knowing that it will not go to court without it."

Lake believes it is time for a more informed debate on the role and extent of the DNA database, and says he is pressing Acpo to say where it stands on whether it should, as Tony Blair argued before he stepped down as prime minister, be made universal. Libertarians, in contrast to the former PM, say it should be scaled back: why should those who are not convicted be on it, or a child - this is Lake's own example - cautioned for throwing cream buns when he or she was 12? At the moment, once you are on, you are there for life. Indeed, probably longer - your name will come off 100 years after your date of birth.

Lake's own view is that though the present compromise was arrived at haphazardly, it strikes the right balance. "A universal database is too extreme," he argues. "There is a danger that we would lose the consent of the people we police. But to start taking people off is littered with all kinds of risks. The real question is a practical one. How are you going to solve crime? We are now solving celebrated cases that go back many years, and when you look into the eyes of a victim who sees their case has actually been solved many years later, or of the bereaved, that is massively powerful."

One reason Lake does not want names taken off the database is the increasing use of familial searches. He mentions the case of the so-called "shoe rapist" James Lloyd, who raped at least four women in South Yorkshire in the mid-1980s and kept their shoes. Lloyd was convicted in 2006 after his sister was arrested for drink-driving and gave a close DNA match to semen samples taken from the victims of the rapes 20 years earlier. "The only question Lloyd asked his sister after her arrest was, 'Did they take your DNA?'" says Lake. "When she said yes, he knew it was only a matter of time."

Another successful use of familial searches led to the successful prosecution last October

of Geoffrey Godfrey for a rape committed in Bridgwater, Somerset in 1993 - one of the convictions obtained under Advance. "The case had been investigated 12 years previously without success," says Colin Dark, who reassessed the forensic evidence two years ago. "It hadn't been possible then to get a full profile from the semen stains found on the victim's clothes, but the samples had been put into a tube, frozen and could now be reanalysed. This time, with the new technology, we were able to come up with a profile, which was loaded on to the database. No match was found, so we tried a familial search instead and came up with 4,000 near-matches." A close relative, again on the database because of a driving offence, proved to be the key.

"What's really exciting now," says Paul Hackett, the FSS's national DNA business manager (his whizzy title reflects the fact that the government is privatising forensic services and opening the market up to more providers), "is that you can go back to a case file from 1990, '80, '70, '60, look through the evidence that was collected at the time, and you can say, 'We can do something with that.' You're going back to the file and looking at it with a completely different set of glasses on."

"Unsolved cases never go away," says Judith Cunnison, a forensic scientist who worked for two years on the case that led to the conviction of Wayne Doherty for the rape and murder of 63-year-old Norah Trott in Rochford, Essex, in 1978. "They lie quiescent for a while, and there is huge satisfaction when you solve them, not least because it gives some solace to the family. You can't help becoming involved: the horror of the attacks and the enormity of the crime strike you when you're looking at the photographs."

In the Norah Trott case, samples from 1978 had been reanalysed in 1994 but without getting a profile. The case was reopened in 2003 on the 25th anniversary of the murder, and this time the use of LCN made it possible to generate a code that could be fed into the DNA database. In July 2004, Doherty was arrested for drink-driving in Cambridge, a mouth swab taken, the sample added to the national database, and the match made.

"Norah Trott was a 63-year-old lady just going about her business," says Cunnison. "These cases should never be forgotten." Nor is solving them of archival interest only. Many murderers and rapists remain dangerous almost all their lives. "Rapists and paedophiles tend to be serial offenders," says the Met's Gary Pugh. "They have a predatory nature and if they get away with it they'll still be doing it at the age of 60 or 70."

Forensic science is increasingly taking centre stage in modern policing, and it is symptomatic of their new status that scientists are no longer seen as mere adjuncts to police officers on TV but command their own shows. The experts are flattered by the growing public and media interest, even if they find their television avatars impossibly glamorous people achieving suspiciously rapid resolutions.

The middle-aged, grey-haired, sombre-jacketed Elmhirst is not at all glamorous. But, as he clutches the file detailing the rape of a 13-year-old girl who will still bear the scars of that horrendous attack, there is no disguising the single-mindedness of his passion. "I must admit," he says, "that when you are in that cold, horrible hangar that houses forensic material from past investigations and you pull out a case like this, you think 'Yes!'" Judges will rightly counsel caution, libertarians will express misgivings, and many arguments about the application of DNA evidence and the scope of the database lie ahead, but there remains something warming about Elmhirst's determination to apply pure science to impure life.

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