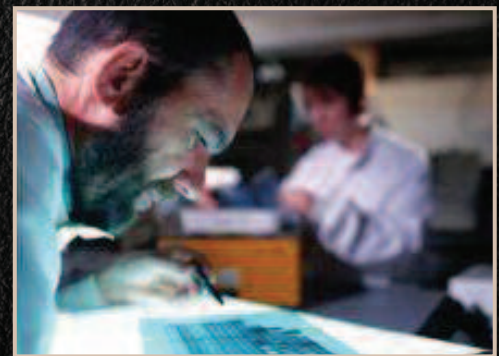
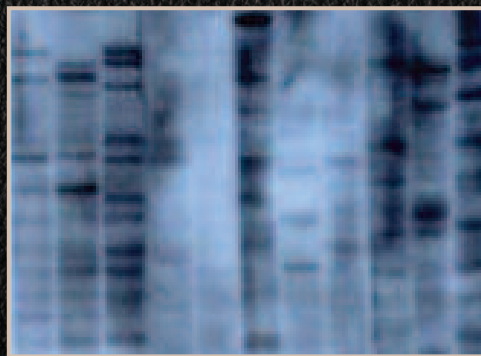




SOUTH WALES POLICE
MUSEUM

“Every Contact Leaves a Trace” – A History of Fingerprinting



The History of Policing in Wales

“Every Contact Leaves a Trace”

– A History of Fingerprinting

Introduction

For just over 100 years, police forces within the United Kingdom have had possession of a powerful tool in the fight against crime – the use of fingerprinting for identification.

Fingerprints provide an extremely reliable means of identification. The system is based on the fact that no two individuals have the same finger, palm or footprints. These areas of the human body are covered by minute ridges frequently interrupted by endings or forks. These interruptions are known as characteristics. Each person has a uniquely different distribution of characteristics that develop in the womb and persist throughout life. They even remain unchanged some time after death, making the recognition of corpses possible.

It has been known for people to try and alter or destroy their prints by cutting their fingertips or burning the skin with acid, but such attempts are usually not successful. Minor skin damage is easily repaired by the body, so that the same ridges reappear in the new skin. Even if major scarring is caused, the rest of the hand will still leave the same prints, while the scars themselves form a new identifying mark.

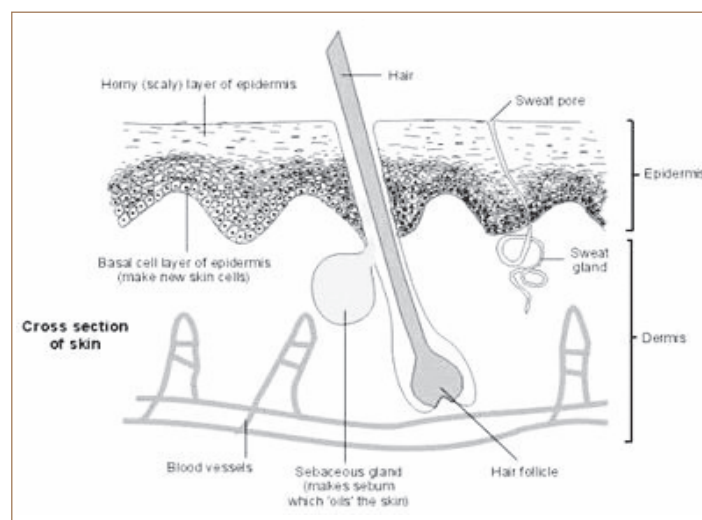
What is a fingerprint?

Our skin is composed of two layers, the epidermis and the dermis. The epidermis is the thinner of the two layers and serves as a tough protective covering. The dermis is the thicker layer of skin which lies protected under the epidermis, and contains the sweat and sebaceous glands.



A Fingerprint

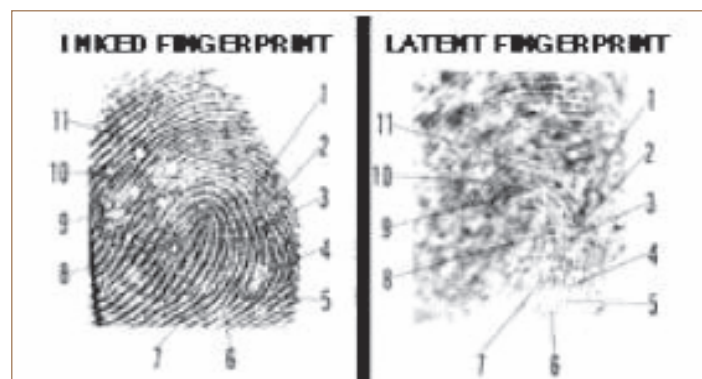
This cross-sectional diagram of the skin shows the Sweat Gland, which releases sweat consisting of water, salt and urea, and the Sebaceous Gland, which releases oils on to the surface of the skin. The products of these two glands constitute a fingerprint, a mark that is left when we touch something.



Cross-sectional diagram of the skin

Fingerprints can be **visible** when our fingers are dirty or oily, or **latent**, when they are made only by the sweat that is always present on our finger ridges. Latent fingerprints are difficult to see but can be made visible for identification.

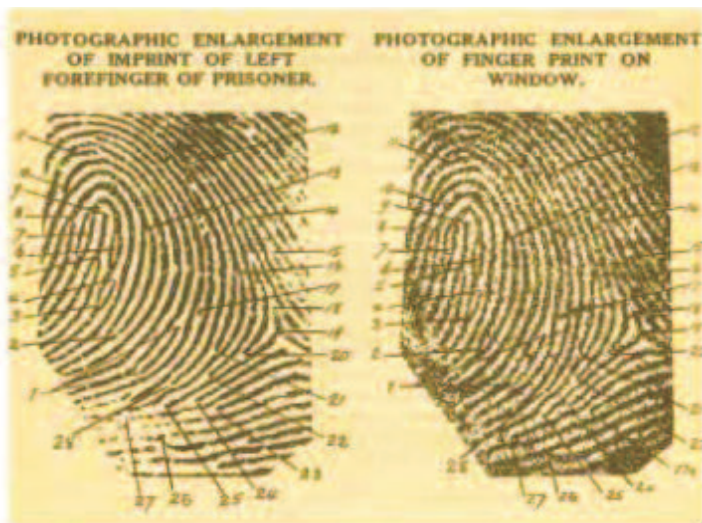
Any fingerprint left at a crime scene is known as a latent fingerprint. Latent fingerprints may be left on almost all surfaces, sometimes even on human skin. Numerous techniques are used to make latent prints visible, such as lasers, powders and alternate light sources.



Comparison of Inked and Latent Fingerprints

Fingerprints and Crime

Fingerprints from the scene of a crime must be matched with a set already on file. If a suspect has never been convicted of a crime before, there will be no record of their fingerprints for comparison. This is why a suspect is fingerprinted when charged. If there are 16 points of similarity with the fingerprint found at the scene of a crime, this can be presented as evidence in court.



In the example above, the finger impression left on the window fixed the identity of a burglar. He subsequently pleaded guilty and was sentenced to five years imprisonment.

The 8 Basic Fingerprint Patterns

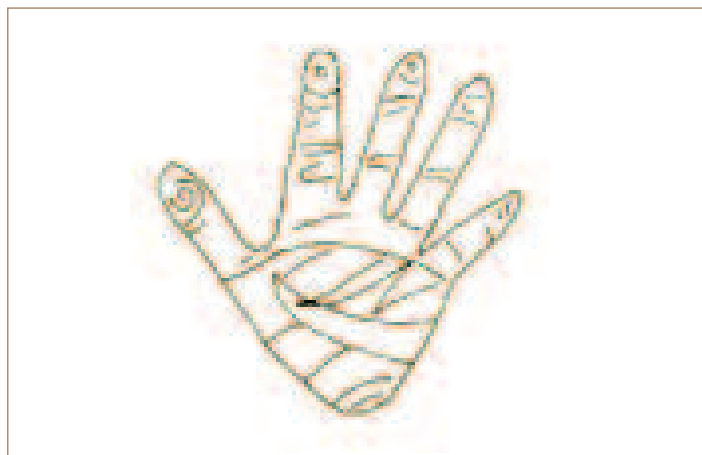
The study of fingerprints is known as **DACTYLOSCOPY**.

The lines on a fingerprint represent the ridges of the skin and the white spaces are the furrows. You can see that some ridges end abruptly, some fork or cross, and some ridges are lakes or islands. These are called “ridge characteristics” and the study of these ridge characteristics is the means by which fingerprint identification is determined.

There are 8 standard patterns which are used to classify fingerprints:

A **COMPOSITE** print occurs when combinations of the ARCH, LOOP and WHORL are found in the same print. Examples of composite prints are Central Pockets, Lateral Pockets, Twinned Loops and Accidentals.

Catching the Criminals – A Timeline of Fingerprinting



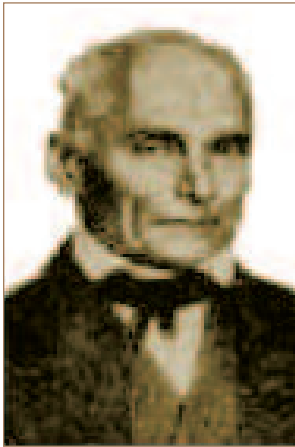
One of the etchings found at Nova Scotia

- Prehistoric cave wall etchings found in Nova Scotia, Canada, showed a hand with ridge patterns sketched on it in a crude manner. Fingerprints were used on clay tablets in business transactions in Ancient Babylon and in China a contract of loan, known to be 1200 years old, showed a finger impression at the end of a signature. This indicated that man knew of the significance of such patterns thousands of years before their potential was realised.
- In Ancient Rome, Quintilian, an attorney, showed that bloody palm prints were meant to frame a blind man for his mother’s murder.
- In 14th Century Persia government papers of the day featured impressions of fingerprints.
- In 1684 Dutch Botanist Dr Nehemia Grew wrote a paper on his observations of patterns of the fingers and palms and the arrangements of sweat pores and epidermal ridges. He referred to the sweat pores as “little fountains” not knowing that they would later be used in identifying criminals at crime scenes.



Marcello Malpighi

- In 1686 Marcello Malpighi, a Professor of Anatomy at Bologna University in Italy, carried out research work on fingerprints. A layer of human skin was named after him. Crucially however, Malpighi failed to make the link between fingerprints and their use as a means of identification.
- In 1818 Thomas Bewick, an English engraver, author and naturalist used engravings of his own fingerprints to identify his work. A caption added to one of his carvings – “Thomas Bewick – his mark” is so faithfully reproduced that it is possible that Bewick was one of the first to recognise the individuality of a fingerprint.



Johannes E Purkinje

- Johannes E Purkinje, Professor of Anatomy at Breslau University in Germany, presented a thesis in 1823 in which he described nine types of finger patterns. However like Marcello Malpighi before him, he did not suggest any use for personal identification.



William Herschel

- In 1858 Sir William Herschel, a member of the Indian Civil Service, had for some time been interested in fingerprints as a means of identifying one individual from another. During this period of his career he was responsible for the payment of allowances to pensioned Indian soldiers and had great difficulty preventing impersonation. He began taking fingerprints from each soldier as he was paid

and found he could distinguish the genuine claimants from the fake, which abruptly stopped any unfair practices.

Herschel was the first man to realise the persistency of fingerprints throughout life.

The Principle of Persistency

Sir William Herschel carried out tests and experiments over a period of sixty years to establish the principle of persistency.

The principle of persistency states that fingerprints are formed during early foetal life, they remain constant throughout life and are one of the last recognisable features to disappear after death.

Early Foetal Life

Ridges begin to form on the human foetus between the third and fifth months of pregnancy when the foetus is approximately 3” – 4” in length.

Remain Constant

Ridges, patterns and ridge detail grow simultaneously with the general growth of the body but they persist without change throughout life.

After Death

Ridges possess the peculiar property of remaining intact after death, outlasting most other features of the body and may remain recordable until the flesh reaches a state of advanced decomposition.

However, although Herschel advocated the use of fingerprints for personal records of prisoners, he never formulated any method of arriving at a system of classification. The Bengal Government failed to grasp the potential of fingerprints in Herschel's report to them and it was not introduced until later.



Dr Henry Faulds

- In 1880, Dr Henry Faulds, a Scottish Physician, wrote an article in the journal “Nature” suggesting that fingerprints would be useful as a technique for investigation of evidence left at a scene of crime.

When bloody fingerprints or impressions on clay, glass etc exist, they may lead to the scientific identification of criminals. Although I have had experience in two such cases There can be no doubt as to the advantage of having, beside their photograph, a copy of the forever unchangeable finger furrows of important criminals.

“Nature,” October 28th 1880

Faulds used fingerprints to eliminate an innocent suspect and indict a perpetrator in a Tokyo burglary in one of the first ever recorded uses of fingerprints to solve a crime.

Today Henry Faulds is known as the “father of fingerprinting”, however he went to his grave without receiving this recognition, and was not given the credit due him until the late 20th Century.

- Alphonse Bertillon, a clerk in the Prefecture of Police of Paris, devised a system of classification of measurement of various parts of the body. The system was known as **ANTHROPOMETRY** and was taken into use in 1882.

In 1888 Bertillon was made chief of the newly created Department of Judicial Identity where he used anthropometry as the main means of identification. He later introduced fingerprints but relegated them to a secondary role in the category of special marks.

Anthropometry, however, was flawed as it was possible to have almost identical body measurements and dissimilar fingerprints. Although Bertillon was involved in the first recorded case of a conviction using fingerprints in Paris in 1902, he still maintained that anthropometry was the superior system and refused to accede long after other countries abandoned it in favour of fingerprinting techniques.



Sir Francis Galton

Sir Francis Galton published several works on fingerprints during his lifetime (1822-1911), and took great interest in establishing their uniqueness. His most important book, published in 1892, was the first comprehensive account of the nature of fingerprints and their use in solving crime. In it he attempted to calculate the improbability of two people having the same fingerprints and defined the basic patterns used in present day methods of fingerprint classification. He identified the minutiae in fingerprints and they have since been referred to as GALTON DETAILS or ridge characteristics.

■ First Fingerprint Bureau 1892

In 1892 Juan Vucetich of the provincial police in Buenos Aires, was ordered by the Chief of Police in La Plata to establish a “Bertillonage System” and at the same time to study Galton’s ground-breaking work on fingerprints. Subsequently Vucetich set up the world’s first Fingerprint Classification Bureau.

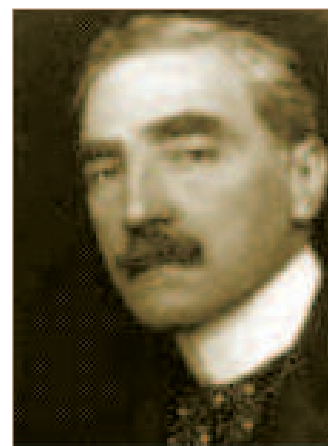
■ First Criminal Identification Using Fingerprints, 1892

In 1892, Francesca Rojas of Buenos Aires was found in a house with neck injuries, whilst her two sons were found dead with their throats cut. Rojas accused a neighbour but despite brutal interrogation he would not confess to the crimes.

Inspector Alvarez, a colleague of Vucetich, went to the scene and found a bloody thumb mark on a door. When compared with Rojas’ prints it was found to be identical with her right thumb. She confessed to the murders and was eventually sentenced to imprisonment.

This landmark case resulted in Argentina becoming the first country to replace anthropometry with fingerprints.

■ Fingerprint Department, New Scotland Yard, 1901



Sir Edward Henry

In 1896, Sir Edward Henry, who like Herschel, was also a member of the Indian Civil Service, experimented with the anthropometric system and thumb prints and eventually arranged for fingerprints of convicted criminals to be taken and set out to devise a classification system. He was assisted by two of his staff, Azinul Haque and Chandra Bose and in 1897 Henry persuaded the Indian Government to adopt his system nationally.

As a result of public disquiet caused by mistaken identities and wrongful convictions in Great Britain, a Committee was set up under Lord Belper in 1900 to look into the problems of personal identification for police purposes. The Committee evaluated the relative merits of the anthropometric system invented by Bertillon and the fingerprint system devised by Henry. They decided strongly in favour of the fingerprint system and it was subsequently introduced into New Scotland Yard in July 1901.

Sir Edward Henry was recalled from India and later became Commissioner of the Metropolitan Police in 1903. Eventually the system was adopted by the rest of the European countries and the Commonwealth.

■ First Fingerprint Evidence in England, 1902

The first fingerprint evidence involving a scene of crime mark in England was heard at the Central Criminal Court on 13th September 1902. Henry Jackson pleaded not guilty to a charge of burglary of a house at Denmark Hill, South London and stealing billiard balls on 27th June 1902. Detective Sergeant Collins examined the scene and an imprint of Jackson's left thumb was found in dirt on a newly painted window-sill.

A famous barrister of the time, Richard Muir, was appointed to conduct the prosecution case. Collins explained the system and produced photographic enlargements and tracings of both mark and print. Jackson was found guilty and sentenced to seven years penal servitude.

■ Fingerprinting Introduced to Glamorgan Constabulary, 1903



Chief Constable Lionel Lindsay

Inspector Steadman from the Metropolitan Police was first introduced to the Chief Constable of the Glamorganshire Constabulary, Sir Lionel Lindsay, by Sergeant Bingham of Cardiff City. Steadman subsequently visited Chief Constable Lionel Lindsay during the summer of 1903 and persuaded him to introduce the "Henry" fingerprinting system.

■ First Use of Fingerprinting Evidence in a Murder Trial in England, 1905

Fingerprinting evidence was first used in a case of murder in 1905 at the Central Criminal Court. Alfred and Albert Stratton pleaded not guilty to the murder of Mr and Mrs Farrow at their shop in Deptford.

During examination of the scene an impression was found on a cash box. Inspector Collins gave evidence in this case and explained the identification system with the aid of a blackboard and photographic enlargements of the impression from the cash box and the right thumb of Alfred Stratton. The prosecution was again conducted by Richard Muir, and the jury found the Strattons guilty. They were later hanged.



Edmund Locard

■ 1920 saw the publication of the landmark book "E'enquete criminelle et les methodes scientifique" by Edmund Locard, director of the first crime laboratory, in Lyon, France. The book followed on from his success two years previously in 1918 when he became the first person to suggest 12 matching points as a positive fingerprint identification.

In the book, Locard stated his "Exchange Principle," the idea that when contact is made between two items there will always be an exchange. Locard argued that the perpetrator of a crime will bring something into the crime scene and leave with something from the crime scene:

“ Wherever he steps, whatever he touches, whatever he leaves will serve as a silent witness against him. ”

“E’enquete criminelle et les methodes scientifique” 1920

Hence the forensic precept:

“ Every contact leaves a trace. ”

- In 1930, Henry Battley as Chief Inspector in charge of the Fingerprint Branch at Scotland Yard, devised a single fingerprint system, used extensively throughout the world.
- Scientific developments in the 1930s resulted in Cardiff City Constabulary establishing a forensic science laboratory which included a Black Museum. Sadly none of the exhibits have survived, but the laboratory itself moved to Chepstow as the regional centre for forensic investigations.
- 1950 saw the invention of the tape lift method of collecting fingerprint and other trace evidence by Max Frei-Sulzer, founder of the first Swiss criminalistics laboratory.
- In 1952, the Glamorgan Constabulary established a Fingerprinting Department.

Small highly specialised cameras were used to copy fingerprints which were made all the more visible by police technicians who dusted them first with aluminium powder.



DC 619 Alan Roberts photographing fingerprints at the British Oxygen plant in Penarth in the 1960s

- Seven years later in 1959, a Criminal Record Office was established in Bridgend where records such as fingerprints were kept.

■ Automatic Fingerprint Recognition (AFR)



Computerised Fingerprinting Revolutionised Policing

In the mid 1960s a Research and Development programme was started to produce an AFR System which could automatically scan fingerprints, recognise the position and relationships of ridge characteristics and store these unique points of comparison for searching purposes. Each comparison made by the AFR system generates a score, with the size of the score reflecting the degree of similarity detected.

The first AFR system was installed in the Scenes of Crime Branch at New Scotland Yard in January 1984, and live working commenced in August of that year.

In 1992, the majority of police forces in England and Wales formed a Consortium to introduce AFR into their bureaux. Each member of the Consortium had the ability to search every other members' fingerprint collection as well as their own.

- In 1976, Fuseo Matsumur, a trace evidence examiner at the Saga Prefectural Crime Laboratory of the National Police Agency of Japan, noticed his own fingerprints developing on microscope slides as he mounted hairs from a taxi driver murder. Matsumur informed his co-worker Masato Soba, a latent print examiner, of this.

Later that same year Soba became the first person to develop latent fingerprints, fingerprints left at a crime scene that are difficult to see, by “Superglue” fuming. Superglue contains a compound known as cyanoacrylate. When fingerprints are placed in a tank containing superglue which is being heated, the cyanoacrylate reacts with the water that is left in the print. This results in the production of a white mark. This mark can then be dyed with Gentian Violet to enhance the fingerprint and aid identification.

■ Police National Computer (PNC)

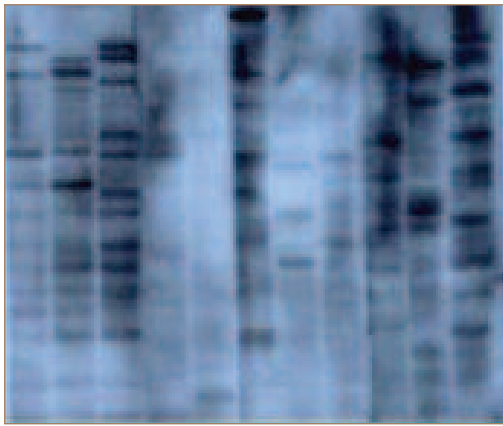
Live working of the Police National Computer Fingerprint Application began in 1976, and the national system for searching crime marks on PNC was introduced in 1980.

■ Genetic Fingerprinting



Professor Alec Jeffries

Genetic Fingerprinting, developed by Professor Alec Jeffries at the University of Leicester in 1984, has been a vital recent development in the fight against crime. Like conventional fingerprinting, it can accurately distinguish humans from one another, with the exception of identical siblings from multiple births. It can be applied to as little material as a single cell.



The First DNA Fingerprint

■ The Cardiff Body in the Carpet Murder, 1989



The Reconstructed Head of Murder Victim, Karen Price

In 1989 builders working in the back garden of a derelict house in Cardiff discovered the badly decomposed body of a female murder victim wrapped in a piece of old carpet.

The skull was used to make a facial reconstruction and the teeth compared to dental records to determine the age of the victim when she died. However there was little other evidence that could be used in identification.

Entomologists (insect experts) examined a colony of woodlice and bluebottle fly eggs present within the soil to establish how long the body had been buried and at what time of year the murder had occurred. The results of this concluded that the body had been buried ten years previously.

The response from the facial reconstruction suggested that the body was that of Karen Price, a local 15 year old girl who had disappeared in 1981. Dental records were also consistent with this.

To enable someone to be charged with Karen's murder, identification of the body had to be conclusive. South Wales Police contacted Professor Jeffries and Dr Hagelberg of Leicester University to assist with DNA genetic fingerprinting analysis. DNA was extracted from Karen's skeletal remains and compared with that of her living parents. The tests showed that the likelihood of the body being Karen's was greater than 99.99%.

This evidence together with other forensic and detective work carried out by South Wales Police resulted in the conviction of two men – Idris Ali and Alan Charlton for the murder of Karen Price sometime between 1st July 1981 and 1st May 1982.



Karen Price

■ National Automatic Fingerprint Identification System (NAFIS)

In 1995 the Home Office awarded a contract to the American Company TRW to provide a National Automatic Fingerprint Identification System for all Police forces in England and Wales. This enables every police force in England and Wales to search scene of crime marks against the National Fingerprint Collection.

Interactive with the most recent PNC application known as Phoenix, it identifies criminals and provides intelligence, for example by linking crimes to identify series of crimes.

■ National DNA Library Opened, 1995

1995 saw the opening of the first DNA national database library in Birmingham. Here sophisticated new methods are being developed using DNA technology. One technique can already identify the colour of a suspect's hair, and in the future skin, colour and facial characteristics may become detectable.

■ South Wales Police Legacy Cases solved through DNA technology, 2001

In 2001 Genetic Fingerprinting successfully resolved four high-profile legacy murders in the South Wales Police Force area – Geraldine Palk of Cardiff and Pauline Floyd, Geraldine Hughes and Sandra Newton of Llandarcy.



Geraldine Palk

In the case of Geraldine Palk, her killer had evaded the mass DNA swabbing exercise carried out in Cardiff during the decade after her death in 1989. However random DNA tests on inmates at Dartmoor Prison in 2001 led police to Hampson who was nearing the end of his four-year sentence for assault. Hampson was taken to Fairwater Police Station for questioning, and was eventually charged with Geraldine's murder.

At the time of Geraldine's death scientists would have needed a sample of blood or semen the size of a 5p piece before being able to draw definite conclusions. Dependable results can be obtained today from a single skin flake, piece of dandruff or dab of saliva.

Innovative use of the National DNA Database (NDNA) enabled scientists from the Forensic Science Service (FSS) to help South Wales Police solve a triple murder case dating back 30 years. Teenagers Pauline Floyd, Geraldine Hughes and Sandra Newton had

been raped and strangled in 1973 but any attempts to link DNA samples from the crime scenes to the National DNA Database had drawn a blank.

Given that the killer may never have committed another crime and therefore would not be listed on the NDNAB, had possibly moved abroad or even died, the NDNAB was used instead to look for someone with a similar DNA profile who could be related to the killer. The search produced 100 men. This intelligence, combined with existing information held by South Wales Police, led to one local man becoming a strong suspect. Joseph Kappen, who was deceased, was exhumed in May 2002 and tests on his remains matched his DNA profile with that of the bodies of his victims.



The New Scientific Support Unit at South Wales Police Headquarters in Bridgend

In 2012, some 25 years on from the discovery of DNA Genetic Fingerprinting by Professor Jeffries of Leicester University, South Wales Police opened a state-of-the-art Scientific Support Unit at Police Headquarters in Bridgend.

The decision to construct the building was influenced by the need to bring together three departments with strategically linked functions but which were currently split between Cardiff, Bridgend Police Station and Police Headquarters - the Fingerprint bureau, PNC bureau and the remainder of Scientific Support.

The building placed South Wales Police at the forefront of forensic policing, and symbolised Chief Constable Miss Barbara Wilding's commitment to invest in modern technology as a means to best serve the communities of South Wales.

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