

An Introduction to Dactyloscopy:

Dactyloscopy: (*dak til os kop e*) (Noun):

*The examination of fingerprints in order to establish identity.
(Greek dactylos – finger, skopein – to watch)*

Few pieces of evidence can be as conclusive as to identity, as to presence and occasionally as to action as can a finger or palm print. Once found they, almost invariably, must be explained. That is, with few exceptions, a suspect cannot remain silent when their prints are found at a crime scene; either it was them who did it or they know something about it!!

What are fingerprints?

“Fingerprints” are the patterns visible on human fingers, palms and the soles of feet.

More technically they are ridge patterns on friction ridge skin that are created by the arrangement of various elements (such as sweat glands, nerves, blood vessels and fat cells) within the dermis. These Friction ridge prints are the results of accidental arrangements that occur during gestation. They are unique and individual (even between identical twins). They are also unchanging save for serious physical damage to the relevant area of skin.

Some other animals have also evolved to have their own unique prints: these include many primates, such as gorillas and chimpanzees, koalas and aquatic mammal species.

According to one study, even with an electron microscope, it can be quite difficult to distinguish between the fingerprints of a koala and a human.!!!

What are Latent Fingerprints?

The formation of latent marks (that are ultimately enhanced and presented as “fingerprint evidence”) occurs through the deposition of material from the fingers/ palms/ soles.

The “mark” left depends upon the particular physical and chemical interaction between the surface (where the material is deposited) and the skin (the origin of the deposit).

The “print” developed by an investigator and ultimately presented as evidence is an enhancement of the pattern discernible within the material deposited using various processes that are appropriate to the particular surface.

The discernible pattern is of course a physical “negative” of the friction skin ridge patterns of the finger, palm or sole of the human who contacted the surface.

[NB: “Patent” and “Plastic” prints are also able to be used for identification purposes. See Glossary]

What do these “deposits” consist of?

"The latent fingerprint, deposited by the fingertip pattern, is a complex mixture of natural secretions and contaminations from the environment." –Feckleton +Selby

"Natural secretions"

The natural secretions referred to as being present in fingerprints (that is, deposited onto the surface FROM the finger / palm / sole) are produced by three types of glands: the *eccrine* (sweat) glands; the *apocrine* glands; and the *sebaceous* glands.

Eccrine glands are found all over the body and produce sweat; sweat itself is 98.5% water, the remainder consisting of mineral salts, organic acids, urea and sugar.

Apocrine glands are also sweat producing glands but are located only in the groin, Arm-pits and the perianal regions.

Sebaceous glands are found on the chest and back, on the forehead, the lips of the vagina, the glands of the penis and the mammary areolae. These glands secrete non-water soluble oil (the sebum) that acts as a lubricant and helps to absorb fat soluble substances.

As the ridges of the hands are covered exclusively by eccrine glands, these glands secretions are present to some degree in all latent fingerprints. The presence of sebaceous secretions is very common given the contamination of the hands by everyday contact with the forehead, the nose and the eye regions. Contamination by apocrine secretions is much less common but may become relevant in sexual crimes.

"contaminations from the environment"

Latent marks can also result from contaminants that are not ordinarily found upon the hands. Eg: blood in violent crime scenes; workplace contaminants such as oil, grease, dust. These deposits may be much more readily seen and importantly may have a much greater lifespan.

How and why are prints classified?

Assuming that an investigator is able to enhance the patterns left by the material deposited such that a “print” is said to be found, the print is “classified” as part of the process to establish the identity of the person who deposited that print. This first step of “classifying the print is done to simplify the search for identity by excluding persons whose friction ridge skin could NOT have caused the patterns found.

Prints may initially be classified into “classes” of prints. This simply involves the grouping together of prints into classes according to common characteristics that they possess. That is, each individual print possesses “*class characteristics*”. The recognition of these class characteristics narrows the field of possible matches down enormously.

The logic is simply as follows: if the sample print (the print lifted from the crime scene) does NOT contain a particular class characteristic then any prints (comparison prints: eg: those of a suspect) where that particular characteristic IS present can be immediately excluded as a possible match.

“class characteristics”

The broad Classification patterns or Ridge formation classes of prints used are:

arch,

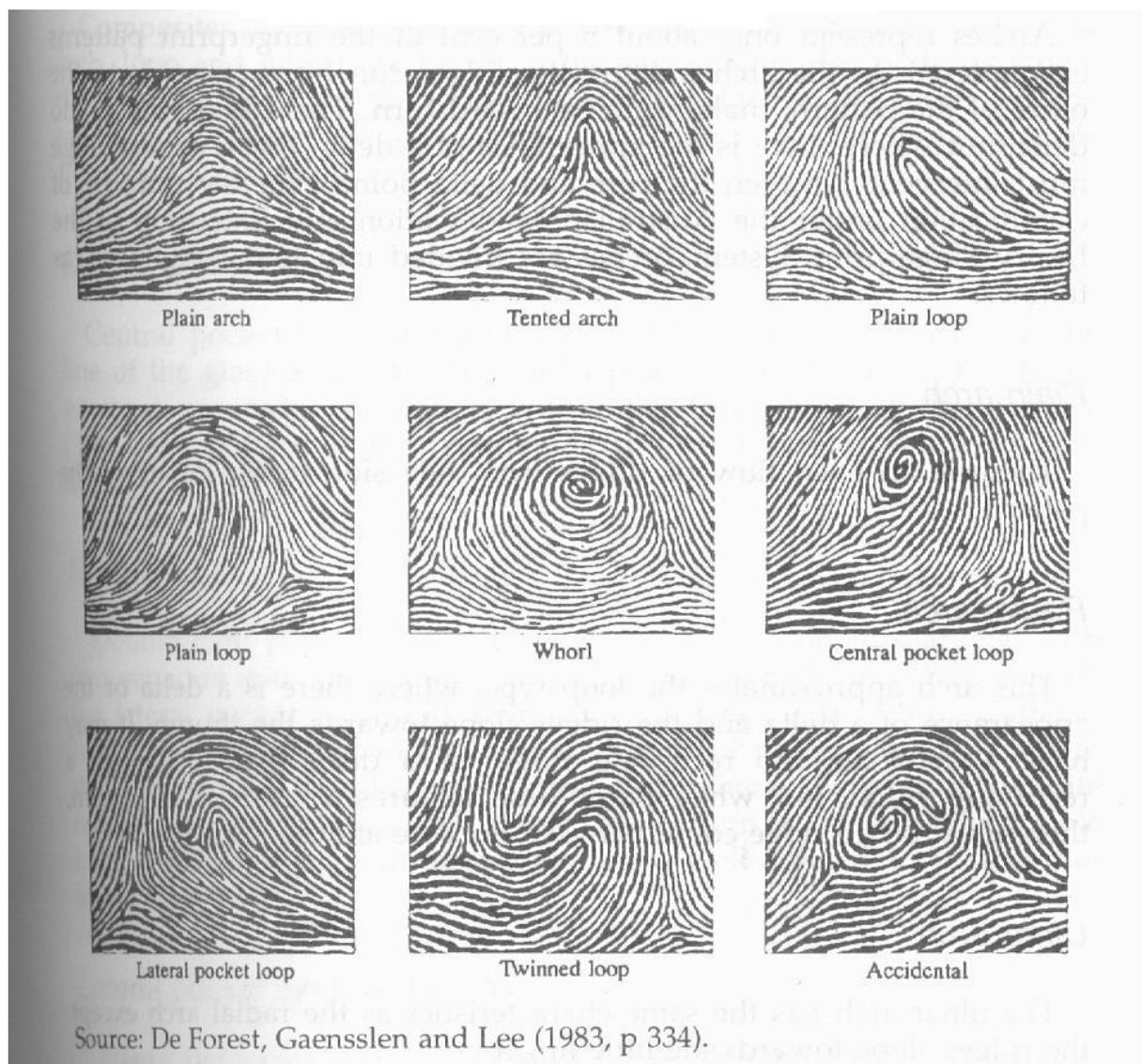
loop &

whorl.

There are many additional "subclasses" that can further assist in the elimination process. These

additional subclasses are simply variations of the three many classes, eg: Plain arch, Radial arch, Ulnar arch, Tented arch.

Diagram: **Classes of fingerprint patterns** (Freckleton + Selby: Expert Evidence in Criminal Law)



How is identity determined from the “print”?

From either the Prosecution or Defence’s point of view, the most relevant process is the “identification” of the print. This can be simply thought of as a process of pattern matching.

That is, it is the detection by an expert of ridge characteristics present and clearly discernible in the sample print and the subsequent comparison of the position of the same characteristics in a reference print. The process therefore is one of exclusion. (Any reference print that contains a ridge characteristic that is not present in the sample print or is present but located in a different spot is excluded!!)

(The reference print will be from a database or from a sample taken from a suspect, or from a print found at another crime scene.)

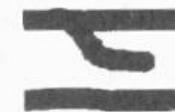
A **ridge characteristic** is a micro- element of the pattern of the print. That is, all classes of prints may contain any or all of the ridge characteristics.

There are three basic ridge characteristics that an expert will seek to detect and then match up against the reference or sample print:

- the ridge ending;
- the bifurcation; and
- the dot (or island).

From these basic characteristics it is possible to create further “composite” characteristics that result form a combination of the three basic characteristics:

Diagram: Ridge Characteristics: (Freckleton + Selby: Expert Evidence in Criminal Law – LBC)

Minutiae	Example	Minutiae	Example
ridge ending		bridge	
bifurcation		double bifurcation	
dot		trifurcation	
island (short ridge)		opposed bifurcations	
lake (enclosure)		ridge crossing	
hook (spur)		opposed bifurcation/ ridge ending	

The matching of the sample print with the reference print is an expert science with national and international standards. The Identification Standards generally refer to the minimum number of "minutiae" points (or detected ridge characteristics) that are able to be compared.

It is the number of the matching minutiae found in any area of comparison that must exceed the standard minimum.

Each minutiae point must be separately indicated and must match the test print both in terms of its positioning relative to other minutiae points AND in terms of the type of minutiae characteristics (lake, bifurcation, ridge ending, etc)

The comparison of the matching minutiae is an issue of expert opinion evidence.

How is one print said to match another?

When the expert considers whether one print matches another, they will be considering both dissimilarities AND similarities.

An expert will compare prints by considering and evaluating the following:

- the likeness of the general pattern type
- the pictorial likeness of the impressions (eg: ridge width, ridge spacing, ridge flow)
- the qualitative and quantitative likeness of the ridge characteristics;
- the likeness of sequence of the ridge characteristics;
- the likeness of any scars or creases present; and
- the absence of dissimilarities.

The process of comparison of fingerprints by an expert can have only three outcomes: Match, Mismatch or Don't know.

How should the expert's evidence be presented to a tribunal of fact?

As dactyloscopy is considered a science; the opinions expressed by the investigator is expert opinion evidence; and extreme weight can be placed upon the evidence by the tribunal of fact a code of ethics has developed about how experts should present their evidence.

It has been suggested by the International Association for Identification that the results of a comparison of a latent impression with a reference print should be expressed in one of the following ways:

"The latent impression was made by that person" (Identification)

"The latent impression was made by another person" (Exclusion)

"The latent impression contained a number of ridge characteristics appearing in true relative sequence with respect to the comparison print, with no unexplainable differences. A conclusive identification cannot be made due to insufficient ridge features; however, it cannot be excluded that the latent impression and the comparison print were made by the same finger."

(Inconclusive)

Factors affecting the “quality” of fingerprints

The following are discernible features of the ageing process of fingerprints:

- dulling of the sweat-grease deposit;
- loss of stickiness;
- narrowing of the fingerprint ridges; and
- loss of continuity along the fingerprint ridges.

Note however that the quality and composition of the Latent print at time of deposition must almost always be unknown.

The following factors are known to affect the endurance of latent prints. (Hence affecting the ease of an investigator to lift a print)

- **Amount of fatty material in deposit:** (Sweaty prints degrade more quickly as the major constituent (water) evaporates), it follows that Greasy prints endure longer (Up to 5 times longer)
- **Temperature:** The higher the temperature the quicker the print will degrade.
- **Relative humidity:** The higher the humidity the more slowly the print will degrade.
- **Air Currents:** The more exposed to currents or the stronger the currents the quicker the print will degrade.
- **Exposure to sun:** The greater the exposure the quicker the print will degrade.

That is, any factor that contributes to the "drying" of the deposit will degrade the print in terms of its forensic value. A decrease in its volume leads to its ridges becoming less defined and an ability to compare and contrast similarities AND importantly dissimilarities diminishes.

Note: If the deposit consists of material other than sweat etc such as blood or oil, then different factors will determine the "life" of the print.

The following table contains the results of a study into the average lifespan of a print on non-porous surfaces.

	Outdoors (days)			Indoors (weeks)		
	glass	metal	plastic	glass	metal	plastic
sweaty fingerprints (high eccrine content)	5.8	4.2	3.3	12.2	10.1	7.5
greasy fingerprints (high sebaceous content)	25.8	20.5	19.5	73.2	47.6	28.2

NOTE: For outdoor prints the life is measured in DAYS. For indoor prints the life is measured in WEEKS!!

Also prints on porous surfaces (i.e.: woody or fibrous materials) will be legible for a shorter time than non-porous as the surface will itself result in a “drying” of the print. Note: however that paint or other finish can effectively seal a porous material)

As previously indicated most latent prints are a mixture of sweaty and greasy prints. Most commonly the majority of the mixture is sweat. However from the above figures it can be seen that a print found on glass indoors can last between 3 and 18 months!!!!

It flows logically that many factors will affect the legibility of a latent print. Other factors affecting legibility would include:

- Presence of dust or atmospheric pollution

- Precipitation
- Bacterial action
- Oxidation and Decomposition of deposit; and
- The diffusion of finger-print material through surface

How does the criminal lawyer deal with fingerprint evidence?

From the Prosecution's point of view the strength and utility of fingerprints derive from the following principles:

- The individual friction ridges of a person are so highly variable that their characteristics are not duplicated either in another region of that person or in any region of a different person.
- The configurations and characteristics [of the friction ridges] are permanent and unchanging.
- The configuration types vary within limits which allow for systematic classification.

It is the comparison of a print found at a location or on a particular object to a reference or sample print that provides probative evidence to a court. Examination of a crime scene for example may reveal a number of separate prints, from prints of people legitimately there to the print(s) of persons unknown. It is through the exclusion of some (the persons authorised to be there) and the matching of others (the person(s) unknown) with a sample print or prints taken from databases that the print found becomes relevant evidence.

Criminal lawyers will almost invariably come across fingerprint evidence where a Police expert will be saying that an accused's print was found in an incriminating location. It is evidence that establishes the identity of a person who has had contact with the surface from which the print is lifted.

Thus the utility of the evidence will vary greatly from one case to another.

In *Parker v R* (1912) 14 CLR 681 at 683, Griffith CJ said:

"The fact of the individuality of the corrugations of the skin on the fingers... is now so generally recognised as to require very little, if any, evidence of it... A fingerprint is therefore in reality an unforgeable signature.... If that is so, there is in this case evidence that the prisoner's signature was found in the place which was broken into, and it was found under such circumstances that it could only have been impressed at the time when the crime was committed. It is impossible under those circumstances to say there was no evidence...."

Other potential uses of "fingerprints"

The secretions, skin oils and dead cells in a human fingerprint will contain residues of various chemicals and their metabolites present in the body of the owner of the print (not to mention the owner's DNA). These chemicals can potentially be detected and used for forensic purposes. For example, the fingerprints of tobacco smokers will contain traces of cotinine, a nicotine metabolite; they will also contain traces of nicotine itself.

Researchers have already developed methods of identifying users of marijuana, cocaine and methadone from their fingerprint residues. It logically flows that similar methods could be used to suggest the prints were left by heavy coffee drinkers, cannabis smokers, and users of numerous other drugs.

Practical advice for the criminal law practitioner

At least the following questions should be asked by a diligent legal practitioner about fingerprint evidence:

"Is the fingerprint evidence admissible?"

"Can the expert's opinion be attacked as to the match?"

"Accepting the match to be valid, are there hypotheses consistent with innocence available on the Prosecution's case?"

"Is the fingerprint evidence admissible?"

The fingerprint evidence is prima facie admissible if:

- 1) the purported expert is appropriately qualified to express their expert opinion; and
- 2) the fingerprints used to match the offender were lawfully obtained.

The obtaining of fingerprints from a citizen of the state of NSW is controlled by statute.

See in particular Part 10 of LEPRA (Law Enforcement (Powers and Responsibilities) Act 2003. See also Part 2 Crimes (Forensic Procedures) Act 2000.

A close examination of the interaction between these pieces of legislation results in the following conclusions:

Requirement to provide fingerprints:

- Any person over the age of 14 years lawfully in police custody can be required to provide their fingerprints; (s133 LEPRA)
- A court who finds an offence proven against any person that is an indictable offence (and a raft of traffic offences) may require that person to provide their fingerprints; (s134 LEPRA)
- Any child under 14 years in lawful Police custody can be required to provide fingerprints but only by an order of the children's court; (s136 LEPRA)
- Any person serving sentence of imprisonment for a serious indictable offence (and not fingerprinted at the time of arrest or conviction) can be required to provide fingerprints by a senior police officer (if they don't consent) or by court order; (s62 Crimes (Forensic Procedures) Act)
- Any person over 18 served with a Court Attendance Notice may be required to give their fingerprints (s138B LEPRA)
- Any person over 18 served with a penalty notice may be required to give their fingerprints. (s138A LEPRA)
- Any person over 18 who is an "untested" Registrable person (Part 3 Child Protection (Offenders Registration) Act) may be required to give their fingerprints. (s75W Crimes (Forensic Procedures) Act)

Voluntary provision of fingerprints:

- Any person over the age of 10 years can give informed voluntary consent to the taking of fingerprints. (s76 Crimes (Forensic Procedures) Act)

Destruction of lawfully obtained fingerprints:

- Any child whose fingerprints were taken upon arrest or charge and are ultimately found not guilty of an offence or the Police have not proceeded with any charge

within 12 months MAY ask a court to order the destruction of their fingerprints. (s137 LEPR)

- Any person whose fingerprints were taken upon arrest or charge and are ultimately found not guilty of an offence or the Police have not proceeded with any charge within 12 months MAY apply IN WRITING for the destruction of their fingerprints. (s137A LEPR)
- Any prints taken from a person whose prints were taken due to the service of a penalty notice are to be destroyed when the penalty is paid or the penalty notice is withdrawn or dismissed by a court. (s138A LEPR)

It follows from the above powers that it is easy for a citizen to have their fingerprints “lawfully” upon the NAFIS database. However practitioners should be especially diligent when dealing with offenders who are under the age of 14 years, or who have no prior criminal history.

That is, query the position where a person whose prints should have been destroyed are “matched” using the NAFIS database. They are then suspects justifying the taking of “identification particulars” (s133 LEPR). The prints taken at this time can then be used to “lawfully” compare against the crime scene prints!!?? Would a court exclude the “lawful” evidence on the basis that it only came into existence because of an illegality?

Interplay between the CFPA and LEPR:

In the very recent decision of **R v SA, DD + ES (NSW CCA 28th March 2011)** the CCA was asked by the Crown to review the exclusion of photographic and fingerprint evidence.

The CCA heard an appeal brought by the Crown pursuant to s5F against a ruling of a District Court Trial judge excluding evidence of photographic identification and fingerprint evidence.

The case involved the serious bashing of a man in his home by a group of youths. ES, SA and DD were arrested soon after the incident and charged. All were under 15 years at the time of their arrest. Whilst the three were in police custody, Police took photographs of each as well as the fingerprints of each. The photographs were subsequently used in a photographic array. The fingerprints were used to compare with prints found at the victim’s home.

The argument raised in the District court was that the Police had not followed the procedures required under the Crimes (Forensic Procedures) Act 2000 (in particular no order of a magistrate was obtained for the taking of the non-intimate samples (Photos and fingerprints). It was argued that the C(FP) Act “*had the effect of modifying the LEPR provisions*”.

The relevant LEPR provision entitling Police to take “identification particulars” is found in section 133. This section replaced s353A(3) Crimes Act which had been the subject of a number of judicial examinations [R v McPhail (1988) 36 A Crim R 390; Carr v Queen (1973) 172 CLR 662; Fullerton V Commissioner of Police (1984) 1 NSWLR 159].

Blanch J (McClellan CJ at CL and Hoeben agreeing) held (that despite there being subtle differences between s353A and Section 133 LEPR):

“Effect should be given to the plain terms of the section of the act and it should be given the same meaning as was given to s353A(3) of the Crimes Act”

The review of the decisions relating to s353A(3) allowed his Honour to conclude:

“... a broad interpretation was accepted in NSW of police powers under s353A(3) of the Crimes Act 1900. It allowed the police to take fingerprints and photographs not only to establish the identity of a suspect but to use that evidence to prove the suspect had committed the crime.”

His Honour then went on to reject the argument that the C(FP) Act provisions “modified” or

otherwise supplanted the LEPR provision (that the Police were relying upon to legitimise the taking and use of the photographs and comparison fingerprints).

“... The power of the police to take photographs and fingerprints of persons in lawful custody to identify the suspect and to provide evidence of the commission of the offence had been in existence since 1951 at the time the CFPA was enacted. That Act [CFPA] clearly indicated in s112 that this power should continue and there is nothing in the LEPR to suggest any change to that policy. Indeed it is unclear from that Act [LEPR] the power remains unchanged.....

.....

..... It is my view that s112 of the CFPA excludes in terms of the operation of the Act the taking of photographs and fingerprints from a suspect in lawful custody as mentioned in s133 of the LEPR.

..In this case the taking of the photographs and fingerprints of each of the respondents was done in accordance with the powers conferred on the police by s133 of the LEPR and those powers are excluded from the provisions of the CFPA by s112 of the LEPR. There was no illegality or improper conduct by the police....”

"Can the expert's opinion be attacked as to the match?"

The reliability of prosecution evidence as to fingerprint evidence can often be difficult for the defence to evaluate. Copies of the actual prints are often not readily made available leaving only statements from Police experts stating authoritatively that a match was made with the accused.

I would suggest therefore that in cases where the fingerprint evidence is a live issue it is essential for the defence to obtain, via subpoena or otherwise, fingerprint examiner documentation of the prints that have been examined from both the crime scene and from the accused person.

These should be examined by yourself and then by an independent fingerprint examiner.

As there is no property in a witness AND the witness is holding themselves out to be an Expert (and therefore have are implicitly putting their professional reputation up for potentially damaging scrutiny) the expert should be spoken to OUTSIDE the court room and if appropriate asked to justify their opinions. The information obtained can if appropriate be used to tailor your examination of them.

Examples of areas that potential cross-examination of experts on fingerprints could focus upon are:

- *the potential for the crime scene prints to have been left at a time other than when the crime was committed - either before or after;*
[Undermining the circumstantial nature of the Crown case]
- *the possibility that the crime scene prints are not in good enough condition to enable definitive identification with those of the accused;*
[Undermining the expert opinion of a match]
- *the potential for there to be doubt about whether there are sufficient points of identification between the crime scene prints and those of the accused;*
[Undermining the expert opinion of a match]
- *the potential for there to be a point or points of dissimilarity between crime scene prints and those of the accused;*
[Undermining the expert opinion of a match]
- *whether there has been proper adherence to standard protocols by crime scene*

examiners;

[Undermining the expert opinion of a match]

- *whether the training of the fingerprint examiner is sufficient for them to be accounted an expert in respect of the particular testing or examination that was undertaken;*
[Undermining the expert opinion of a match AND/OR
providing basis for exclusion of the evidence]
- *whether there is a possibility that the crime scene prints could have be "planted".*
[Undermining the expert opinion of a match AND/OR
Providing basis for exclusion of the evidence AND/OR
Undermining the circumstantial nature of the Crown case]

"Accepting the match to be valid, are there hypotheses consistent with innocence available on the Prosecution's case?"

Fingerprint evidence is ALWAYS circumstantial evidence. Its cogency varies as does its relevance. The ultimate question is of course still: can the Crown prove their case beyond reasonable doubt? Always contained within the answer to that question is the absence of any reasonable hypotheses consistent with innocence.

R v. BARBERA (22nd May 1959) Reported 1972 1 NSWLR 612

Motor vehicle was found stripped after being stolen. The appellant's fingerprints were found on the small trim along the lower edge of the bonnet of the car. No other evidence linked the appellant to the car. The appellant was spoken to sometime later and his fingerprints taken.

Held:

Per Street CJ (Owen & Herron JJ agreeing) Allowing the appeal and quashing the conviction. at 613:

"..... I am satisfied that the evidence with regard to the fingerprints establishes conclusively that the applicant was at some time or other in contact with that car, and in fact other circumstances such as the stripping of the car and the place where the fingerprints were found, and the fact that the car had been cleansed of any other fingerprints, might be regarded as strengthening the suggestion that it was the applicant who stole the car. But I am not confident that it can be said in the present case that there was not a possible and reasonable explanation of the presence of the applicant's finger prints on the car explicable on a hypothesis of innocence"

Per Herron J at 613:

"....The only question which arises is, could the fingerprint in question have been impressed at the time when the crime was committed; that is always the crucial question"

HONG v REGINA [2009] NSWCCA 242

On 14 February 2007 police officers arrested a man named Ricky Thoo. During a search of the garage which Thoo had just unlocked the police found, relevantly, two sports bags each containing a number of plastic bags. Within these plastic bags were 55 packages of methylamphetamine. Some of those packages contained other plastic bags and in total there were 72 plastic bags. The appellant's fingerprints were found on seven bags, of which five were plastic bags which contained other plastic bags and two which did not.

The case against the appellant was entirely circumstantial, namely the presence of his fingerprints on the seven plastic bags. There was no other evidence that linked him to the garage or to any other aspect of the supply of the drugs.

The CCA described the issue for the jury to determine was whether this evidence was sufficient to discharge the Crown's onus of proof. The critical factor was a judgment about the number of separate bags upon which the appellant's fingerprints appeared. Out of the 72 bags, his fingerprints were on seven, i.e. about 10 percent.

The Defence argued that there was a reasonable hypothesis consistent with innocence, namely that the Appellant had had contact with the plastic bags at a time and in a manner that was in no way connected to the packaging of the drugs.

They called a witness who had previously managed a mobile telephone company owned by Ricky Thoo. He affirmed that the company was a legitimate business selling mobile telephones and accessories. He gave evidence, confirmed by others, that the appellant was a close friend of Shannon Thoo, Ricky's brother. He also said that the appellant would come to the shop "to pick up repairs that needed to be done, phones or accessories". He said that when he picked up the items for repairs they were packaged in "zip-lock or sort of shopping-style freezer bags".

The defence case was reinforced by cross-examination of Crown witnesses. For example a police forensic officer gave the following evidence:

Q ... it's true, isn't it that there is no way of telling from a surface when the print was applied?

A No. The only thing you can take into effect is potentially the age of the object, but you can't tell the age of the print.

Q Not from the print?

A Not from the print.

Q No, if a newspaper came out today and there was a fingerprint on it and you examined it tomorrow you would be able to say how old that print was within a day?

A Exactly, yes.

Q But a thing like a freezer bag that you've got in front of you no way in the world could you say within a year when the print went on?

A No. If the bag was produced a year ago, sold at a certain time, if you could trace all that information then you could narrow down, but you can't tell exactly when the print was put on there.

...

Q The other thing that you can't advance any opinion [on] is where the bag was when the fingerprint was applied to it?

A Oh no.

Q A third thing you can't advance any opinion on is what was in the bag, if anything, when the print went on it?

A No.

Q The prints you found might have been applied when the bags were empty, correct?

A Correct."

In addition extensive surveillance of the premises where the drugs were found demonstrated that:

- There was no evidence that the appellant had "anything to do with the [premises]".
- None of the appellant's fingerprints were found on any surface within the premises.
- No DNA evidence had identified the appellant as having attended the premises.
- No evidence of traces of drugs was found on the surfaces of the bags where the appellant's fingerprints were found.
- Thoo owned and ran a phone shop at the time of the offences and this was apparently a legitimate business.
- Thoo had told police that the appellant "had nothing to do with the drugs" and also that the appellant ran errands for the telephone business and may have touched the bags in the course of that employment.

Spigelman CJ (with whom the other judges agreed) allowed the appeal; quashed the conviction and sentence and entered a verdict of acquittal.

Within the judgment other cases involving fingerprints were discussed and his Honour stated: (at 24 – 25)

“.....

24 I do not find assistance from these authorities. Each case turns on its facts. It is not helpful to seek to compare the facts of this case with the different range of facts that arose in these other cases.

25 If the fingerprints had appeared on only one or two bags then I have no doubt what the answer would be. Similarly, if the fingerprints had appeared on a significant majority the bags, I have no doubt what the answer would be. The critical issue in this case is whether the fact that fingerprints appeared on seven out of 72 bags was sufficient to tip the scales and enable the Crown to prove its case beyond reasonable doubt, or alternatively, to disprove the hypothesis consistent with innocence.....”

HALMI v R [2008] NSWCCA 259

Two co-offenders I + St travelled from Melbourne to affect a sale of heroin at Bass Hill. Police were aware of this and installed listening devices in motel rooms either side of the room the pair were to use. Another co-offender S telephoned one of the co-offenders and a discussion re meeting in McDonalds next to the Motel is recorded. The co-offender S and the Appellant are recorded by CCTV arriving together. The Appellant enters McDonalds and orders stuff sold as food. S is recorded walking between McDonalds and the Motel. One of the Melbourne offenders I presumably meets S and then proceeds to the Motel room with a black shopping bag, where he and others are arrested with the contents of the bag. S is also arrested and the appellant upon viewing the arrest of S attempts to hurriedly leave McDonalds however he is also arrested.

The black plastic bag is found to contain five blocks of heroin. Fingerprints of the appellant are found on two pieces of the plastic used to wrap the heroin. One print is found on the outer plastic wrapping of one of the blocks. Three further prints are found on the inner plastic wrapping of another block. S's prints are also found on the plastic wrappings.

The Crown asserted that the presence of the Appellant's fingerprints on outer and inner plastic wrappings around the heroin indicated that the Appellant had been involved in the preparation and packaging of the heroin for supply. The Crown contended that it was an irresistible inference that S delivered the heroin to I. The Crown said that the heroin had arrived at Bass Hill via a third party, and that the jury were entitled to infer that that third party was S, with the assistance of the Appellant.

Johnson J (with whom the remaining judges agreed) in dismissing an appeal against conviction said at 93:

“..... The jury was directed, in no uncertain terms, that it was for the Crown to prove beyond reasonable doubt that S brought the heroin to I. S had been transported to Bass Hill in the vehicle driven by the Appellant. In the context of this trial, the issue was clearly enough whether the jury was satisfied beyond reasonable doubt that S had supplied I with heroin which had been conveyed to Bass Hill in the vehicle driven by the Appellant. It is pertinent that the heroin was wrapped in plastic which bore the fingerprints of both S and the Appellant. The absence of any application for a further direction by experienced trial counsel reinforces the conclusion that this issue was clearly left to the jury in the summing up.”

REGINA V CRAIG LAING UNREPORTED NSWCA 20 JUNE 1996
REGINA V CRAIG LAING (#2) UNREPORTED NSWCA 20 JUNE 1996

On 23 June 1993 police executed a search warrant at a property near Rugby, near Crookwell. This property had been bought by Mr Warren Laing in May 1990 and transferred to the appellant on 17 June 1991 for one dollar. Mr Warren Laing and his wife remained in occupation until early 1993. There was no-one present at the homestead on the property on 23 June 1993. The police forced entry and in the homestead found pieces of cannabis leaf on the floor, two brown paper bags containing cannabis seeds and strings hanging from ceiling beams for the hanging and drying of cannabis leaf. In a bedroom a book called "Marijuana Grower's Guide" was found. It was a book of 330 pages. A fingerprint of the appellant was found on three of the pages in positions indicating, according to the expert witness, that the finger was not being used in the way a reader uses a finger to hold or turn a page. A fourth fingerprint was found on the book which was not that of either the appellant or his father.

In outbuildings traces of cannabis leaf as well as fertiliser and plant hormone were found. Police also found a diesel pump connected to pipelines leading to six areas where cannabis plants had been harvested. 440 plant stems and root systems were counted.

The only real issues in the trial were whether the Crown had proved beyond reasonable doubt that (i) Mr Warren Laing and (ii) the appellant had knowingly taken part in that cultivation.

Per Priestley JA (with whom the remaining judges agreed) Appeal allowed. Judgment and verdict of acquittal entered.

"The Crown case against the appellant was a circumstantial one. The one ground of his appeal against conviction was that the jury's verdict was unsafe and unsatisfactory. In the circumstances of the present case, that meant the appellant's submission was to the effect that "(a) reasonable jury ought to have found that an inference or hypothesis consistent with innocence was open on the evidence" (the words come from Knight v The Queen (1992) 175 CLR 479 at 503). "

"One matter relied upon heavily by the Crown both at the trial and in the appeal was the presence of a fingerprint of the appellant on three leaves of the "Marijuana Grower's Guide". Taken by itself, that evidence establishes that at some time the appellant handled the book and, probably did so while at the property. The evidence thus places the appellant at the property, something which he in any event did not dispute. Rejection of his explanation that he was only there on a very limited number of innocent occasions, does not supply any evidence as to how often he was there.

A further aspect of the evidence about the book is that, besides the appellant's three fingerprints, it bore one other which was sufficiently clear to enable examination of it. The examination showed that it was not a fingerprint of either the appellant or his father. It is thus evidence that some other person was present at the property, which is consistent with the alternative explanation which, in the appeal, the appellant relies on as being one both reasonable and not excluded by the Crown in its case.

I agree with the submission made on behalf of the appellant that the Crown case did not justify the jury's verdict against the appellant.

CHAHINE V R [2006] NSWCCA 179

Facts:

Mr N was working as a car park attendant at the Prince of Wales Hospital. The appellant approached the counter and asked where a toilet was. A co-offender enters the office through a window. A struggle ensued with Mr N being beaten by both offenders. A safe and a surveillance

tape are stolen.

Shortly afterwards about 1.5 kms from the hospital a car is found having collided with a parked van, Lights on and motor running. Safe and surveillance tape are found on the floor of the car.

Forensic examination of the crime scene and the get away car find the appellant's left index finger on the sliding glass window of interior front left of the car park inquiry window and his left middle finger on the exterior of the front-passenger door of the get away car.

Mr N gives a description of the appellant to Police that is consistent with the appellant short stature and general appearance. During a Police ID array however Mr N excludes the appellant and selects another person. Notably the person selected is different to his initial description of the appellant.

The Crown case includes a witness of dubious reliability who stated that he had seen the appellant at other times in the vicinity of the car park inquiry window.

The appellant did not give evidence nor called any evidence.

Not surprisingly reliance was placed by the Defence on the positive identification of another person by the victim Mr N during the photographic array. Reliance was also had to the evidence suggesting the appellant had been seen at other times in the vicinity of the window. Thus an innocent explanation may be available for the fingerprint located inside that window. In addition an innocent explanation may readily be available for the location of the appellant's fingerprint on the exterior of the get away car. It was emphasised that no prints had been found inside the car or in the area of the car park office where the safe had been located.

Johnson J (with whom the remaining judges agreed) in dismissing an appeal against conviction said at 96:

“ 96 The Appellant's fingerprints were located at the scene of the crime and on the getaway car. As Gleeson CJ observed in R v Ingvald (at page 10), fingerprint evidence is powerful and cogent evidence of identification. The combination of the location of the Appellant's fingerprints at two distant places located with the crime was powerful circumstantial evidence. It provided a direct link between the Appellant and the crime. There was no reasonable innocent hypothesis arising from the evidence at the trial which could explain the Appellant's fingerprints at these two locations. Properly understood, the evidence of Mr Nicholson assisted the Crown more than the Appellant. His initial description of the first man to the police was broadly similar to that of the Appellant. The photograph selected by him as being the first man was similar to the photograph of the Appellant. Although Mr Nicholson expressed the opinion that the photograph of the Appellant was not that of the offender, it was clearly open to the jury, on all the evidence, to reject that evidence. The man in photograph 12 and the Appellant are very similar in appearance. It is open to this Court to take the same approach.”

KNIGHT v R 1992 175 CLR 495

In a case involving an appeal against conviction involving circumstantial evidence as to the state of mind of the appellant Mason CJ, Dawson + Toohey (at 502 – 503) said:

“The question is not whether the trial judge failed to give an appropriate direction to the jury, but whether the jury, acting reasonably, must have entertained a reasonable doubt about the guilt of the appellant. In his charge, the trial judge instructed the jury to the effect that they should only find by inference an element of the crime charged if there were no other inference or inferences which were favourable to the appellant reasonably open upon the facts. A direction in those terms is often called for where the prosecution relies upon circumstantial evidence. However, it is a direction which is no more than an amplification of the rule that the prosecution must prove its case beyond reasonable doubt and the question to which it draws attention - that arising from the existence of competing hypotheses or inferences - may occur in a limited way in a case which is otherwise one of direct rather than circumstantial evidence. This was such a case where there was direct evidence that Salvo was shot - indeed there was no dispute about that - and the only real issue was the

state of mind of the appellant at the time the shot was fired. The state of mind of the appellant was necessarily a matter of inference from other facts found by the jury.

22. In those circumstances, the reasoning process which must be employed if the onus of proof beyond reasonable doubt is to remain upon the prosecution is well recognized. As Dixon J. said in Martin v. Osborne ((5) (1936) 55 CLR 367, at p 375): "If an issue is to be proved by circumstantial evidence, facts subsidiary to or connected with the main fact must be established from which the conclusion follows as a rational inference. In the inculcation of an accused person the evidentiary circumstances must bear no other reasonable explanation." In Plomp v. The Queen ((6) (1963) 110 CLR, at p 243) Dixon C.J. cited his previous observation in Martin v. Osborne and acknowledged the difficulty found in stating the rule, a difficulty which he said "has not been overcome by employing the expression 'more consistent' as if there could be degrees of consistency". His Honour attempted clarification by citing his further words in Martin v. Osborne ((7) (1936) 55 CLR, at p 375):

"This means that, according to the common course of human affairs, the degree of probability that the occurrence of the facts proved would be accompanied by the occurrence of the fact to be proved is so high that the contrary cannot reasonably be supposed."

Examples of international miscarriages of justice due to fingerprint evidence:

Brandon Mayfield

Brandon Mayfield was a lawyer in the US State of Oregon who was identified as a participant in the Madrid bombing based on a fingerprint match by the FBI. The FBI Latent Print Unit processed a fingerprint collected in Madrid and reported a "100 percent positive" match against one of the 20 fingerprint candidates returned in a search response from their IAFIS— Integrated Automated Fingerprint Identification System. The FBI initially called it an "absolutely incontrovertible match".

Subsequently, however, Spanish National Police examiners suggested that the print did not match Mayfield and after two weeks, they were able to identify another man whom they claimed the fingerprint did belong to. The FBI acknowledged their error, and a court released Mayfield, who by that time had spent two weeks in custody.

In January 2006, a U.S. Justice Department report was released which criticized the FBI for sloppy work but exonerated them of some more serious allegations. The report found that the misidentification had been due to a misapplication of methodology by the examiners involved.

On 29 November 2006, the FBI agreed to pay Brandon Mayfield the sum of US\$2 million in compensation.

Mayfield was an American-born convert to Islam and his wife was an Egyptian immigrant, but Wikipedia politely suggests that these "are not factors that should have affected fingerprint search technology."

René Ramón Sánchez

René Ramón Sánchez, a legal Dominican Republic immigrant to the USA was arrested on July 15, 1995, on a charge of drink driving. During the charging process his fingerprints were erroneously

placed on a card containing the name, Social Security number and other data belonging to a Leo Rosario, who was being processed at the same time.

Subsequently Leo Rosario was arrested for selling cocaine to an undercover police officer. On October 11, 2000, while returning from a visit to the Dominican Republic, René was mis-identified as Leo Rosario at John F. Kennedy International Airport in New York and arrested. Even though he did not match the physical description of Rosario, the erroneously-catalogued fingerprints were considered to be more reliable.

Shirley McKie

Shirley McKie was a serving Detective when she was accused of leaving her thumb print inside a house in Kilmarnock, Scotland where Marion Ross had been murdered. Ms McKie denied having ever been inside the house. She was arrested in a dawn raid the following year and charged with perjury.

The only evidence able to be relied upon by the prosecution was the thumb print found at the murder scene and “matched” to Ms McKie. At her trial two experts testified on her behalf and she was found not guilty.

The Scottish Criminal Record Office (SCRO) would not admit any error, although the Scottish first minister later said it had been an *"honest mistake"*.

Nine years later Ms McKie was awarded £750,000 in compensation from the Scottish Executive and the Scottish Criminal Record Office.

Stephan Cowans

Stephan Cowans was convicted of attempted murder after he was accused of the shooting of a police officer whilst fleeing a robbery in Massachusetts, USA. There was evidence from two witnesses implicating him as well as a match to a fingerprint on a glass mug from which the assailant had drunk some water.

He was found guilty and gaoled for 35 years. Whilst in prison, Cowans earned money cleaning up biohazards until he could afford to have the evidence against him tested for DNA. The DNA did not match his and he was released. He had already served six years in prison.

Real life Case Study # One

Elderly woman alone in her at home watching TV. She surprises an intruder who punches her occasioning actual bodily harm. She gives a description consistent with 70% of Australian youth. She then discovers that her bedroom has been ransacked and that the flyscreen has been pulled off her bedroom window.

Scene of Crime officers examine the house and one latent fingerprint is found on the inside window sill of the ransacked bedroom. This print is subsequently matched to Accused. The Accused maintains his right to silence and there are no other material witnesses.

Is the Prosecution able to exclude a reasonable hypothesis consistent with innocence?

The elderly woman in question made the front page of her local newspaper one month prior to the incident in recognition of her 100th birthday. The article gave her address and noted she was fiercely independent and lived alone. Appallingly her house was subsequently broken into four times. This Accused allegedly committed the fourth bust. No one was ever convicted with respect to the three breaks that occurred earlier in time to this incident.

Even absent any comment by the Accused, can the Prosecution exclude the possibility that our client was there on one of the previous breaks? That is, could he be convicted of the fourth break and related assault where there is this hypothesis consistent with innocence.

But!!

The print was a palm print found on the window sill of the point of entry as determined by related physical evidence. The orientation of the print was also consistent with entry through that window.

Documentation relating to the investigations of the previous breaks was subpoenaed and this material strongly suggested that the other breaks had points of entry different to the fourth break. Also the material indicated this fourth bust had occurred approximately one month after the third bust.

What could an "Expert" say about this?

Despite qualifying their evidence with the disclaimer that they cannot accurately "date" prints the expert would say that would strongly lead to a low probability of the print having been deposited more than one week prior to the date of discovery. Why? Because of at least the following factors:

- the relatively good quality of the latent print (that is, amount of material remaining was sufficient to create a good quality latent print)
- the location; (exposure to sun, dusty, porous surface covered with paint. Therefore a relatively rapid rate of deterioration of the print)
- evidence from the occupier that she kept the window open all the time; (exposure to wind currents, again rapid deterioration); and
- the fact that the print was a palm print and as such has a high content of sweat (as opposed to fat). (Palm less likely to come into contact with greasy bodily secretions; again rapid dehydration and thus deterioration of the latent print)

NB: This opinion could still be open to legitimate attack because the expert cannot know or even estimate the amount of material originally deposited!!

Real Life Case Study # Two

Semi-Trailer and Low-loader with Heavy Machinery on board stolen from holding yard. Driven through fence and away. [Value: > \$500000.] No usable forensic evidence from scene of theft.

A day later vehicle found bogged in isolated location 150 + kms from site of theft.

Good quality latent fingerprints located on interior surface of the window within the vehicle's passenger side door. This door has a quarter panel window in the front part of the door that swings open as well as a main window that is opened and closed by being

lowered and raised.

A number of prints subsequently matched to the fingers of the Accused are lifted side by side on the interior surface of the larger main window. These prints were of the Accused's right hand and the orientation of the prints suggested the fingers pointed towards the rear of the cabin. These prints are the only evidence that linked the Accused in anyway to the vehicle and thus the theft of the vehicle.

As the Prosecution had evidence the Accused had never had a lawful reason to be in contact with the vehicle the Prosecution choose to proceed with charges of Larceny and back-up of Receiving (NB: special Verdict s 121 Crimes Act).

What does the finding of the print suggest?

Prosecution say the Accused was either the thief or was present when the vehicle was stolen OR that he received the vehicle or was present when it was received. That is, the prosecution seek to prove guilt either directly or through accessorial liability. (They don't care which!) Of course, this can be asserted as the print is located **within** the cabin of the stolen truck! Thus inferentially the Accused has been physically within the cabin (if not in the passenger seat!) of the stolen vehicle!

Is the Prosecution able to exclude a reasonable hypothesis consistent with innocence? Or in the context of this case, does the presence of the print in that particular location allow the prosecution's assertion to be proved beyond reasonable doubt?

Defence case was that the Accused had been contacted by persons he wasn't prepared to name who had bogged the vehicle and were asking to be picked up from the isolated location of the vehicle. The Accused obliged by attending the site and driving the unnamed persons home. Whilst at the scene curiosity got the better of him and he climbed up the passenger side of the vehicle to have a look into the cabin. The Accused was not a tall man and could only "climb" up by reaching up and grabbing onto the strut between the closed main window and the open quarter window within the passenger door. The Defence's explanation (or hypothesis consistent with innocence (of the theft or receiving of the vehicle) was that his fingerprints were left on the inside of the main window without the Accused ever having entered the cabin of the vehicle.

*What could an expert say about the **orientation** of the print?*

"The position and orientation of the prints found are consistent with this explanation."

[Real Life Outcome: Representations made on behalf of Accused. Larceny and Receiving charges were withdrawn and a plea of guilty was entered to Conceal Serious Offence. Accused sentenced to a Non-custodial option.]

Graham LAMOND

Wednesday 30th March 2011

Whilst all care and diligence has been taken with the preparation of this paper, it should in no way absolve you of the need to satisfy yourself as to the accuracy of the matter contained herein!

GLOSSARY of Terms

Epidermis: The outer protective layer of the skin. [Composed of stratified pavement epithelium fused to the underlying dermis of the skin] This layer of the skin is constantly being worn away and replaced by new skin generated by the upper layer of the dermis

Dermis: Medical term meaning “the skin”. Inner layer of the skin fused to the Epidermis.

Glands: Cells or accumulation of cells that elaborate secretions or excretions.

Eccrine glands are found all over the body and produce sweat; sweat itself is 98.5% water, the remainder consisting of mineral salts, organic acids, urea and sugar.

Apocrine glands are also sweat producing glands but are located only in the groin, Arm-pits and the perianal regions

Sebaceous glands are found on the chest and back, on the forehead, the lips of the vagina, the glands of the penis and the mammary areolae. These glands secrete non-water soluble oil (the sebum) that acts as a lubricant and helps to absorb fat soluble substances.

Friction Ridge skin: The ridged skin found on the inner surface of the palms, fingers and soles of the feet, characterised by the absence of hairs and the presence of only eccrine glands

Individual friction ridges: [Also known as Papillary ridges] the flowing ridges found on friction ridge skin. The patterns formed by these ridges are already formed in the foetus (by about the fourth month of pregnancy) and do not change during the life of the individual. As they are formed deep within the dermis, they cannot be altered except by accident, mutilation or serious skin disease.

Ridge characteristic: Is a micro- element of the pattern of the print created by the friction ridges. That is, all classes of prints may contain any or all of the various ridge characteristics. There are three basic ridge characteristics that an expert will seek to detect and then match up against the reference or sample print. They are:

- the **ridge** ending;
- the **bifurcation**; and
- the **dot** (or island).

Classification patterns

or Ridge formations: Are the “patterns” created by the ridge characteristics that are used to then broadly group together patterns observed.

The broad classes are **arch, loop & whorl**.

There are many additional "subclasses" that can further assist in the elimination process. These additional subclasses are simply variations of the three many classes, eg: Plain arch, Radial arch, Ulnar arch, Tented arch.

In addition there may be “composites” of two or more of the broad classes found in the same print. Eg: central pocket loop, double loop, lateral pocket and twin loops and “accidentals” [patterns so irregular that they do not fall within any of the broad classes]

Latent Fingerprints: Is the invisible or barely visible impression of the pattern of friction ridge skin created by the deposition of a complex mixture of natural secretions (eg: sweat, sebum, semen etc) and material from the environment (eg: blood, paint, dust, etc)

Patent prints: Patent prints are chance friction ridge impressions which are obvious to the human eye and which have been caused by the transfer of foreign material from a finger onto a surface. Some obvious examples would be impressions from flour and wet clay. Patent prints can be left on a surface by materials such as ink, dirt, or blood.

Plastic prints: A plastic print is a friction ridge impression left in a material that retains the shape of the ridge detail. Commonly encountered examples are melted candle wax, putty removed from the perimeter of window panes and thick grease deposits on car parts.

“sweaty fingerprints”: Prints that are formed by deposits with a high eccrine (or sweaty) content.

“greasy fingerprints”: Prints that are formed by deposits with a high sebaceous (or fatty) content.

National Automated Fingerprint Identification System (NAFIS)

http://www.crimtrac.gov.au/systems_projects/Fingerprints.html

NAFIS (National Automated Fingerprint Identification System) is a computer system that digitises prints, making a "mathematical map" or algorithm of the print that then permits the automated comparison of prints. The unique ridge characteristics are reduced to algorithms that the computer may compare with thousands of other files per second.

When a sample print is "fed" into the scanner the system will supply a "hit-list" of matches in decreasing order of similarity. The fingerprint files of the hit-list candidates must then be checked against the unknown or sample print.

The NAFIS adopts the international fingerprint identification standard 'grey scale'. Grey scale contains 256 shades of grey from black through to white. The fingerprint system accepts fingerprints taken by a range of methods, including the latest 'livescan' technology. Livescan's inkless process uses electronic and laser technology to scan fingers and palms and to then produce records of the ridge patterns. This process enables police officers to enter the fingerprint records into NAFIS electronically for an immediate search against the national database.

Workstations for the system are based in nearly 40 locations throughout Australia, connected to a central database of 4.4 million "ten print" records and 600,000 prints from unsolved crime scenes. (Each ten print record consists of ten fingerprints and two palm prints.) Police are able to use each of the NAFIS workstations to scan fingerprints from fingerprint cards, upload digital fingerprint images, and assess and verify matches made by the system.

Crime scene officers are now able to use digital cameras for collecting fingerprints, providing faster and more accurate data collection and subsequent matching.

As well as utilising fingerprint scanning devices in police stations across the country, operational police now are using handheld, portable biometric devices. The handheld fingerprint identification devices allow police on the street to capture and process fingerprints taken from suspects they have arrested, without the need to take them back to the police station.
