Body modifications as a tool to aid human identification

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Abstract

Forensic human identification draws upon a plethora of information from various investigatory techniques. Body modifications are identifiable characteristics that have received mention in the field of human identification, but which have not been explicitly investigated. This research was conducted in order to highlight the potential body modifications have to aid the identification process, and to demonstrate the information that can be retrieved from common modifications such as tattoos and piercings.

In order to demonstrate the pertinence of body modifications to the field of forensic human identification a survey was distributed nationally (UK) to determine the incidence of body modification practices. These surveys were novel in their application as they did not target any sub-group of the population. 880 viable responses were collected both digitally and on paper. Results included; 89% of female respondents displaying bi-lateral earlobe piercing, 38% of female respondents reporting at least one piercing at a location other than their earlobes, and 28% reported at least one tattoo. 17% of male respondents also reported at least one piercing and 24% at least one tattoo. Inferences can be made that every fourth or fifth male and every third or fourth female will have at least one modification requiring recording. 69 modified respondents took part in a second survey which detailed their experiences of becoming modified, enabling an insight into the considerations and motivations the process of acquiring a piercing, tattoo or other modification involves.

A 28 month taphonomical study of both surface and buried deposits was undertaken in order to investigate the location of trans-dermal artefacts such as earrings in relation to the skeletal elements and their original location after decomposition occurred. Artefacts moved to a depth of at least 6cm below the confirmed base of the grave, and to a distance of at least 120cm from the original location.

Jewellery and tattoo inks are internationally produced and traded. Tattoo inks are manufactured without specific guidelines ascertaining or requiring disclosure of their ingredients. 88 tattoo inks were investigated, completing the most extensive investigation of tattoo inks to date. The successful implementation of investigatory techniques such as Fourier Transform Infrared Spectroscopy (FTIR), UV-spectroscopy and Microspectrophotometry (MSP) along with statistical analysis using Principal Component Analysis (PCA) enabled the successful discrimination between manufacturing companies. It highlighted the inconsistency in production of inks from batch to batch by each manufacturer, and the ink's own instability over periods of storage. This significantly compromises the ability to determine conclusively an ink's manufacturer from its chemical composition, though inferences of manufacturer can be made after ratio and PCA analysis are conducted.

Body modifications are therefore considered significant possible aids to the identification process.

Key words:
Body modifications, human identification, forensic anthropology, forensic archaeology, tattoos, piercings.

Declaration

I declare that all work submitted here is the work of the author alone and any collaborations are appropriately noted.

Alexandra Starkie

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“...you didn’t mark yourself for life if you weren’t sentimental.” (Irving 2005)

Chapter 1

1. Body modifications as a tool to aid human identification.

„Identification“ is an ever evolving, constantly challenging, multi-disciplinary process, applicable to numerous aspects of life and death. As such, new and pioneering research must constantly be undertaken in order to broaden and perfect the suite of techniques that can be utilised in the identification process.

Almost twenty years ago, the potential of body modifications, such as tattoos, to aid the forensic human identification process was acknowledged by Haglund and Sperry stating that:

> “Tattoos are distinctive, potentially important acquired identifying features that last for the life of the bearer, and persist into the post-mortem period.” (Haglund and Sperry 1993)

Despite this initial recognition, however, body modifications have received little focus in the forensic arena pertaining to their potential for aiding human identification. In recent years more studies have focused upon body modifications in disciplines such as social sciences and medical health care provision (Armstrong and Murphy 1997, Mayers *et al* 2002, Brooks *et al* 2003, Bone *et al* 2008, Ferreira 2009, Abiona *et al* 2010 and Koch *et al* 2010), but their significance to human identification remains to be fully realised. This research is one such novel investigation, focusing on the relatively untapped, yet potentially significant, resource of body modification practices.

1.1 Identification

The process of identification is paramount in multiple settings both in life (ante-mortem) and after death (post-mortem).

In life, proof of identity can be sought to ensure legal and monetary responsibilities and for proof of eligibility to restricted products (e.g. alcohol purchase and consumption). The concept of „identity‟ is also relevant in cases concerning the elderly, mentally infirm or unstable, such as Alzheimer‟s syndrome suffers, or those unable to convey detailed information, such as children.

Modern society relies upon individual identification for such commodities as bank accounts, legal cover or international travel. It is often quoted as being „a valuable commodity‟ (CIFAS 2011). Identity theft and identity fraud are ever-present threats, enabling access to bank accounts, credit cards and fraudulent legal and insurance cover. Identity fraud is in itself not a crime, but the process of profiting from ownership or utilisation of such acquired information is (National Identity Fraud Prevention Week 2010). Statistics published by CIFAS, the UK‟s fraud prevention service, are collated in table 1, demonstrating the prolific nature of this crime.

Table 1. Incidences of identity fraud 2006-2010 (data published by CIFAS 2011)

Type of fraud	Jan-Dec 2006	Jan-Dec 2007	Jan-Dec 2008	Jan-Dec 2009	Jan-**Sep**[4] 2010
[1]Identity fraud	80,377	77,593	77,642	102,327	79,871
[2]Facility takeover fraud	4,665	6,272	19,275	22,387	16,042
[3]Victims of Impersonation	67,406	65,066	62,957	85,402	70,276

[1]Identity fraud relates to the unlawful retention of an individual‟s details without their consent or knowledge.

[2]Facility fraud concerns the hijacking of accounts, as opposed to the impersonation of an individual.

[3]Impersonation denotes the deceptive use of unlawfully acquired details to acquire goods or services.

[4] Figures for the complete calendar year of 2010 not yet published at the time of writing.

It is interesting here to note the substantial difference between the numbers of individuals affected by identity fraud and impersonation, and those of facility takeover; it suggests that where banks, building societies and other services emphasise the need for protection of personal details to deter customers from falling prey to such fraudulent activities, other such services are less stringent in their emphasis of this, allowing a disproportionate number of individuals to be targeted by such criminals. However, the trends displayed here indicate that facility takeover is increasing despite such measures, and that whilst significantly more individuals are subject to identity fraud or impersonations, these occurrences had remained relatively stable in their frequency, until a significant peak in 2009 and indications that 2010 would follow suit given the figures produced by September 2010. Consequently, with the frequency and indicated increase in such fraudulent activities, the need for indisputable proof of identity is now more pertinent than ever.

After death, positive identification of an individual is sought for the cessation of the responsibility of the aforementioned monetary and legal commitments, as well as to assist the grieving processes of the family and friends of the deceased.

Legal requirements for proof of identity post-mortem prevail in Western countries, and those of Christian denominations. Internationally, the process of identifying an individual can be in contention with religious practices- in Islam, for example, it is dictated that an individual be buried 24 hours after death, regardless of confirmed identity (Levinson and Granot 2002:144). Other faiths require specific treatment of the dead, which should be adhered to and practiced in all cases, where possible.

In a paper by Paulozzi *et al.* (2008) the rate of unidentified deaths in the USA was studied. Alarmingly, in 1987, 691 deceased were unidentified. This declined by 2004, however, probably as a result of greatly improved identification techniques and the technologies they employ (Paulozzi *et al.* 2008). The honing of multiple and varying techniques to aid the identification process in such cases as these is, therefore, clear.

The practice of identification has long been studied and debated, with a peak in interest in the early nineteenth century thanks to such academics as Alphonse Bertillon and his methods of measuring the limbs of individuals for identification purposes (Cobb 2003). Fingerprinting was used throughout the twentieth century as the primary method for conclusive identification. The discovery of DNA (deoxyribonucleic acid) and the genome provided identification scientists with another source for conclusive identification in the absence of fingerprint evidence.

The unique nature of fingerprints was first demonstrated by Sir Francis Galton with the publication of his paper „Finger prints" in 1892 (Jackson and Jackson 2004) and was later used as the basis of Sir Edward Henry"s work in 1901 with his research facilitating the cataloguing and classification of fingerprints (Cobb 2003). Fingerprinting is a unique characteristic of an individual; even in identical twins who share the same DNA, their fingerprints do not match. Previously, in the UK, only individuals convicted of criminal offences had their fingerprints entered into the national fingerprint database- presently however, any individual arrested, charged, reported or summonsed to the court is required to provide fingerprints for the national fingerprint database (*ibid.*).

Bodyfluids have long been employed in cases of identification, with the initial detection of blood, followed by developments enabling the discrimination between animal and human blood, then the ability to categorise the blood into „blood groups" A, B, AB and O, and now the ability to extract DNA from even the smallest of blood samples and smears. With the acceleration of developing technology, all methods employed in the forensic arena have benefited, with increased speed of techniques, greater quantities of samples to be analysed, increased sensitivity of instruments and the ability to store vast amounts of data and related information on an accessible data network, mirroring the national and international scale of lifestyles (and therefore crimes or disasters also) in the twenty-first century. These improvements have also led to the increased competence of the practitioners.

Often, however, identification of individuals is challenged by external events. In mass disasters, for example, the remains (sometimes in various stages of decomposition or even various levels of dismemberment) of many individuals are often retrieved from mingled contexts challenging the practitioners to not only identify the victims, but also to identify fragmented remains to ensure individuals are returned to their families in as complete a state as possible.

In war crimes situations, identification may be equally challenging when the crime committed has been against a particular group or culture, as it is their biological or cultural similarities that led to their persecution. Because of this there is limited information to provide a biological profile (age, sex, height, racial affinity, trauma or prolonged illness resulting in detectable markings on the skeleton).

It must be borne in mind, however, that the circumstances in which identity is being sought may have different requirements. In criminal cases, for example, the identity of both the victim and the perpetrator may be being sought. In international crimes, such as war crimes detailed here, identification may take the form of identifying that a crime was committed, by recovering evidence such as the use of restraints (Skinner 2007) or debilitating mutilation (Ferlini-Timms 1997) to prove targeted and systematic killing (Haglund 2002), or to prove that the targeting was of a specific sector of society, helping to support claims of „genocide" (Schmitt 2002).

Jensen discusses three main categories of identification that can be awarded an individual, to which most practitioners agree and adhere.

- First, „positive or confirmatory" identification requires the matching of ante- and post-mortem records from such sources as DNA, fingerprinting or dental records.
- Second, „possible, presumptive, or believed-to-be" utilising multiple factors, including skeletal and medical markers, the combination of which points greatly to one individual over others. Scars, tattoos, piercings and other features occurring on the skin are considered „secondary identification features" as they cannot be proven unique in their occurrence, but can indicate possible identity.
- Third, the process of „exclusion" (Jensen 1999). Exclusion can occur in closed settings- when a comprehensive list of all those affected can be produced; if all other victims have been identified and one individual remains, their identity is confirmed by process of elimination. Exclusion can also be used in open cases

when a biological profile does not match the information provided by a missing person‟s report.

1.1.1 Methods of identification

The process of identification is multi-disciplinary. Methods most commonly employed to this end are fingerprinting, odontology (dentistry records) and DNA. However, while none can be disputed if proven, each has benefits and caveats for its application.

Fingerprinting, for example, is only applicable where fingerprints can be taken; post-mortem decomposition may be too far advanced for fingerprints to remain and in life, fingerprints can only be used unequivocally where a database holds the matching fingerprints.

Odontology relies on the individual frequenting a dentist for treatment, and also upon the dentist‟s storage of accurate dental records. Internationally this is of significance as countries differ greatly in their dental healthcare provision, as well as their legislation detailing the length of time for which dental records of individuals should be stored (İşcan and Olivera 2000).

DNA is more abundantly sourced than fingerprints and can even be retrieved from surfaces and materials a person is known to have been in contact with, rather than the body itself. It provides extremely high statistical probability of identity, but it is an expensive and somewhat time consuming technique and while used as a matter of course in modern cases, remains less conclusive than fingerprinting. It also relies on the availability of comparative material for confirmation of identity- though with the analysis of mitochondrial DNA, familial links can be proven where absolute identity cannot.

In certain instances, such as international discrepancies regarding storage and access to dental records, coupled with the consideration that individuals concerned may not have access to a dentist (İşcan and Olivera 2000, Sprogøe-Jakobsen *et al* 2001), the lack of fingerprint database for comparison or lacking DNA testing capabilities, the use of dental records, fingerprints and DNA analysis becomes implausible as a method for identification (Schmitt 2002, Baraybar 2008). The destruction of such records during conflicts may also render them useless (Klonowski 2007).

While the most commonly implemented and favoured identification techniques are DNA and fingerprinting for their proven success and provision of indisputable evidence for identification, the potential for alternative sources of information pertaining to identity and identification may prove to be of great help throughout the identification process. It is entirely within the remit of the various forensic disciplines tasked with human identification to investigate alternative methods of identification in order for initial presumptions to be made, narrowing down the possibilities, or even to provide evidence for identification where the other three methods prove impossible.

1.2 Forensic anthropology and forensic archaeology

„Forensic" as a term relates to any practice used for the purposes of upholding the law (Cobb 2003).

The disciplines of anthropology and archaeology are varied, with a specific forensic discipline in each. Trained in biological anthropology or archaeology initially, later practitioners receive specific training for employment in forensic settings. The principal role of the forensic anthropologist is traditionally the identification of skeletal trauma and dentition. The role of the forensic archaeologist is the recovery of remains and excavation of the scene utilising archaeological techniques specifically developed for forensic scenarios. The remit of both is in fact wider. Forensic anthropology and forensic archaeology both consider all aspects of the human body after death, including the process of decomposition. It is for these reasons that forensic anthropologists and archaeologists have been employed in the international arena.

Forensic archaeology and forensic anthropology are relatively recent in their inception, and differ somewhat in their applications whether in the UK and Europe, or America. In the UK and Europe as in America, however, both professions are well equipped and suitably trained for employment within any element of the whole scenario.

Stewart"s traditional American definition of forensic anthropology in 1979 was to facilitate the identification of human remains (Stewart 1979). Forensic anthropology prevailed as a discipline in America, with developments in taphonomic studies and the implementation of archaeological techniques later contributing significantly to the discipline"s ability to aid forensic scenarios (Dirkmaat *et al.* 2008).

In the UK the situation of biological anthropology as a sub-section of archaeology led to the utilisation of archaeological techniques in forensic settings, aided by biological anthropologists, allowing for the development of the discipline of forensic anthropology later. Both disciplines, however, came to the fore of British forensic investigations much later than in America. The first real instance of utilising specifically archaeological techniques within a forensic setting in the UK was as recently as 1994 in the infamous „25 Cromwell Street" case concerning serial killers Fred and Rosemary West and their eleven young female victims. This is long after the first employment of forensic anthropologists and archaeologists in the international arena in 1984, where they were called to attend the exhumation and identification of victims of the Argentine military regime from 1976-1983 (Steadman and Haglund 2005:1).

Utilisation, internationally, of forensic practitioners such as forensic anthropologists and archaeologists has in recent years, as reported by authors such as Haglund (2002), Nafte (2002) and Ferllini (2007b, 2003), increased as global conflicts and disasters have necessitated their involvement in both the recovery and identification of victims, as well as the collection of evidence for prosecution in cases of war and civil crimes. In cases such as these, the aims of the investigation may differ greatly from those relating to, for example, accidental death or homicide, impinging upon the methods employed by the forensic practitioners. In cases pertaining to homicide, or suspicious deaths, the investigation involves the proving of illegal activities, as well as the identification of both the victim(s) and perpetrator(s). In deaths resulting from accidents, such as transport disasters or building collapses, the investigation focuses upon proving civil liability and legal responsibility, often for insurance purposes, as well as identification of the victim(s) (Schmitt 2002).

In cases of war crimes, proof of wrong-doing is paramount, but may be limited to the ability to confirm the fact that numerous victims shared common traits (and, as mentioned above, often evidenced in the similar biological profiles produced, such as was the case in Srebrenica, as reported by Komar 2003) supporting claims of „ethnic cleansing" or genocide.

The ability to prove systematic killing was of significance to the Rwandan investigation in 1996, where cut marks on the talus was frequently exhibited- evidence that the victims were immobilised by their killers by severing the Achilles tendon, leaving them unable to walk or run to safety. Here also extensive cranial and facial wounds were exhibited, disputing claims that the high numbers of deceased individuals was as a result of a cholera epidemic (Ferllini-Timms 1997). Investigations were also carried out in 1997 after alleged human rights abuses were reported in Afghanistan. The recovery of restraints positioned around the arms of the Taliban fighters supported these claims (Skinner 2007).

With regard to identification of individual victims, in the genocide cases of Rwanda and Srebrenica, individual identification was aided somewhat by the displaying of personal effects and clothing of the deceased for recognition by survivors (Ferllini-Timms 1997, Komar 2003, Thompson and Puxley 2007). Whilst in these instances clothing proved useful as an aid for identification, the possibility of swapping clothes to prevent identification, or infer alternate identity such as military rather than civilian dead, must be considered. An example of the opposite being practiced by perpetrators, of direct concern to this study, is the process of prisoner identification in the Auschwitz concentration camp of the Second World War. Initially registered numerically and identified by the serial numbers stitched upon their uniforms, prisoners were liable to swap clothes- either by accident or for intentional confusion of the authorities. This led to the enforced tattooing of each prisoner- the further implications of which will be discussed in Chapter 2.

Time pressures and constraints may be experienced by the investigatory team also, hindering and further challenging the identification process. The public, journalists and police often urge the faster recovery of a scene than is feasible or recommended, as a result of their limited understanding of the lengthy and complicated processes which scene recovery and victim identification entail (Jensen 1999). Political constraints in international investigations may also dictate inappropriately fast or incomplete recovery as was experienced in certain locations in the aftermath of the 2004 Asian Tsunami (Rohan *et al* 2009). The UN may also only be granted access to a site for a limited period due to political unrest as was, for example, the case in Rwanda (Ferllini-Timms 1997, Koff 2004).

The application of forensic anthropological and archaeological techniques to the international arena requires cultural consideration in locations not suffering war or natural disaster. For example, in the UK the Human Tissue Act (revised 2010) applies to all scientific and medical uses of human samples; in New Zealand, however, no such legislation is dedicated to human tissue (Hudson *et al.* 2008) leading to the establishment of alternative protocols and methods for post-mortem investigation. This may be of significance if professionals from either country are employed in the other, requiring alteration of methods of practice, or may lead to discrepancies in the international field if both are employed simultaneously but conducting their work and themselves in different manners. It is for these reasons that protocols and methods are agreed in the international employment of such professionals, preventing any such issues from occurring.

Also of consideration in modern populations are the multiple cultures that inhabit certain locations and their possibly conflicting cultural ideals. Using New Zealand as an example again, the proliferation of Māori culture in recent years is as a result of a more accepting and celebratory modern population, enabling the re-establishment of the Māori belief systems and customs. Of forensic consideration, however, are their customs dictating the burial of the deceased three days after death (Hudson *et al* 2008) presenting a similar complication to the 24 hour burial practices of Islam mentioned previously. Whilst not reported presently, it will be of interest to note how this will be dealt with in the current recovery efforts in New Zealand in the devastating aftermath of the recent earthquakes in July 2010.

The forensic investigators‟ ability accurately to identify and record elements of significance at the scene must also be mentioned. For example, in cases of mass graves, as discussed by Schmitt (2002) and Wright *et al.* (2005), the arrangement of the bodies can be indicative of the method of deposition, which may in turn allow for the identification of those responsible for, or who carried out, the killings, or to support assumptions that a particular event (genocide or other targeted killings) was carried out. In cases where individuals were murdered „en mass‟ it may be the case that the bodies are left *in situ* and buried at a later date by survivors, relatives, or those not involved with the event, in an attempt to „clear up‟; in such cases it is to be expected that the bodies will be buried with some care or order (Schmitt 2002).

Conversely, where multiple deaths necessitate the need for immediate burial, the bodies may be distributed intermingled, in any direction. The recovery of victims exhibiting extreme limb contortion and co-mingling of remains, can be indicative of mechanical help being sought for the deposition of the remains, such as a bulldozer (emphasizing the gross lack of respect awarded these individuals by the perpetrators (Wright e*t al.* 2005)), or may indicate the burial of bodies after decomposition has begun (Brothwell 1981). In these cases, it is the evidence surrounding the individuals and the identification of events that prevail in the forensic archaeologists‟ and anthropologists‟ employment- individual identification is a secondary aim, as discussed previously.

Complications in the field may also occur as a result of language barriers. In a multi-disciplinary and international profession such as forensic anthropology, the attendance of professionals from various countries at mass disasters is commonplace, but one example of misinterpretation occurred in the recovery work of the 2004 Asian Tsunami, reported by Lessig *et al.* (2006). A man‟s remains were recovered and revealed during the post-mortem a tattoo of a shark, located on the left thorax. Simultaneously the ante-mortem records of a missing man, thought to be the recovered individual, detailed his age and the presence of a tattoo in the correct position, but the design was described as being a dolphin, not a shark. Thankfully, direct contact to the head quarters allowed the provision of a photograph of the tattoo for identification by the relative and this way identification was confirmed. Had an image or accurate description of the tattoo been provided initially, the confusion and delay in identification would have been avoided.

Forensic anthropologists and archaeologists can be employed at any stage throughout the decomposition process, then. This study‟s pertinence to the field is easily demonstrated as tattoos are still evident and recordable after skin slippage has begun, and piercing jewellery can be recovered after extended post-mortem periods.

<u>1.3 Body modifications</u>

Body modifications are potentially an important aspect of human identification. The reasons for this include: their perceived increasing prevalence in society, their impacts on other methods of human identification (such as visual, pathological or trauma-based identification), the presence of jewellery and associated artefacts within the identification context and the presence of potentially unique identifiers (e.g. osteological implants). Body modifications have significantly aided forensic anthropological cases in recent years, including 9/11, the Asian tsunami of 2004 and the London bombings. In the case of the Asian tsunami, body modifications were reported as greatly aiding the identification process, given the environmental and international scope of the disaster often resulting in rapid decomposition rates (Thompson and Puxley 2007).

The practice of „body modification‟ is widespread and varied ranging from the seemingly inconspicuous, temporary application of make-up, to the more obvious, permanent alterations such as amputation or gender change. For the purposes of this research, the body modifications being investigated are elective modifications to the human phenotype that will not (as a matter of course) appear on a person‟s ante-mortem medical records. Tattooing, for example, does not require registration of either the application or image of the tattoo. The lack of official documentation pertaining to such a significant alteration, but which may be recorded post-mortem, means that post-mortem identification must then rely solely on unofficial, anecdotal accounts from friends and family.

„Tattoo‟ is hailed as a phenomenon instigated by the various colonies of the South Pacific, with the word „tattoo‟ stemming from the Tahitian word „tatau‟ meaning to tap or strike (van Dinter 2005, Goldstein 2007). The multiple definitions and histories of „tattoo‟ are discussed by Goldstein, who demonstrates the inception and global phenomenon of the practice. It will be demonstrated here too, that tattooing evolved globally in local isolation, as did body piercing practices.

In Kayan (Indonesia) tribal legend the beginning of tattooing is explained thus-

> "Long ago, when the plumage of all birds was dull and sober, a pheasant and a crow decided to tattoo each other. The crow began, and made a beautiful job of it. The pheasant, a stupid bird, failed miserably. To disguise his bungling, he threw black ink over the crow and quickly flew away. This is why to this day the pheasant has beautiful markings and the crow is black as coal."
> (www.mundurucu.com 2010)

In this legend is steeped the significance of tattooing as a valuable aesthetic quality- an important quality manifested in many other unconnected tribes and cultures globally.

Another example of the mythological beginnings of the practice include the unrelated Marshall Islanders, whose legends tell of the instruction by two gods for the people to tattoo themselves with designs identical to the scales of the fish. This would protect them from drowning, allow them great harvests of fish, prevent their skin from shrivelling with age, and it was believed that the patterns would survive long after the body had gone (www.mundurucu.com 2010).

The folklore of the Arctic peoples told of the appeasement of the spirits by the practice of tattooing reciting a poem whilst stitching the design:

> "Come now child, if you won‟t let yourself be tattooed,
> terrible things will happen to you after you die.
> Evil spirits will take you and make a drip-tray out of your skull
> to catch the fat that drips from their oil lamps."
> (www.mundurucu.com 2010)

Demonstrated in these three disparate examples are the common beliefs that tattooing held a mystical power and was rooted in spiritual conception. The importance of this practice in so many cultures globally and the devastating consequences on such cultures of their later eradication will be demonstrated (Chapter 2).

Tattooing in Europe and America has a vibrant history, but experienced exponential growth in the late nineteenth century alongside the popularity of circuses. In order to satisfy the public‟s appetite for exotica, sideshows, displaying individuals considered grotesque, bizarre or fascinating became commonplace, travelling with the circuses. Sword swallowers, contortionists and those displaying congenital deformities were observed alongside the rare vision of completely tattooed men.

fig. 1. Nora Hildebrandt. The first tattooed lady to be part of a circus and sideshow act. (www.yasni.de 2010)

As the public grew used to such exhibitions, the demand grew for ever more extreme displays, resulting in the introduction of fully tattooed women- a marvel in a male-dominant society. The first tattooed woman to join the circus was Nora Hildebrandt in 1882 (fig. 1). Her fully tattooed body was accompanied with the story of her forced tattooing by her father. This story she later conceded to be untrue, but it was considered to add to her attraction by emphasizing the brutal nature of her body art.

Frequently, individuals displaying their tattooed bodies as curiosities regaled the audience with stories of far-flung travels and enforced tattooing rituals, when in fact the sideshows often employed tattoo artists to accompany the show for the travelling months (www.vanishingtattoo.com 2010). The exotic and dangerous nature of tattoos, as perceived in Western culture, could, therefore, be argued to have been further supported by these stories and claims, ensuring their position as a peripheral activity for decades.

The introduction to the industry of Samuel O"Reilly"s electric tattoo machine in 1891 is arguably the single most influential development in tattooing history. The machine enabled the increased production of tattoos, allowing for speedier completion of larger designs, giving the tattooist capacity for more clients. Tattooing became a financially viable occupation as a result.

Artistically the introduction of the machine had great impact. Initially penetration depth was not of concern as the permanence of the applied image was the primary motivation. However, with modern competition being based upon artistic skill, clean, precise lines are desired and only possible when ink is deposited either between the epidermis and the dermis in the epidermal basement membrane, or when high in the dermal layer (fig. 2). If penetration and deposit of ink is too deep, capillary action blurs the image as the body tries to rid itself of foreign material. If not positioned deep enough, however, the ink will be rejected as the epidermis renews itself and simultaneously ejects the ink, resulting in mottled, partially incomplete images.

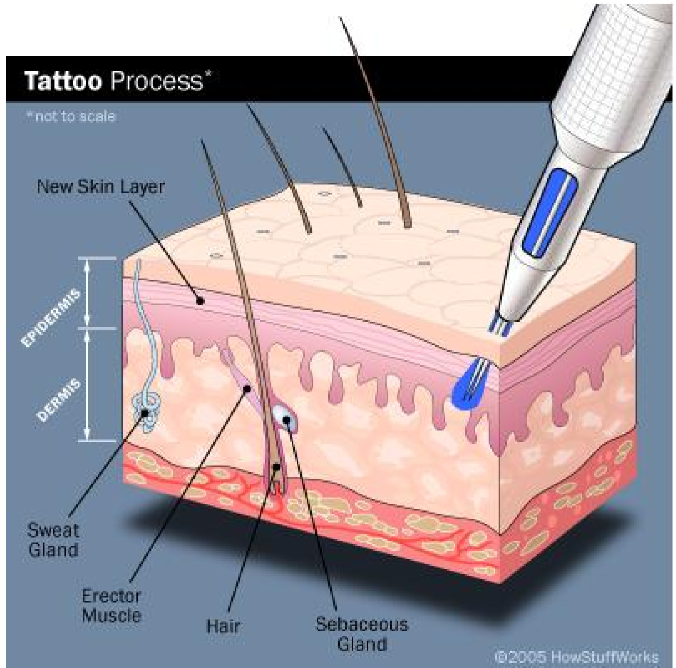


fig. 2. Location of tattoo ink within the structure of the skin. www.sustainablenorcross.org

Body modifications also have a significant history within the Western medical realms, specifically with regard to „implants" in their myriad forms. Prostheses have long been employed and significantly increased in use after the first World War in which many soldiers were maimed, but survived thanks to the associated advances in medicine. As the employment and availability of life-preserving medicines (such as antibiotics after their discovery in 1928 by Fleming) became increasingly commonplace, the success of surgeries previously considered too traumatic to survive were more frequently carried out (Porter 2003).

Osteologically, the ability to remove and replace diseased bone was an important development. The ability to remove femoral bone without mortal blood loss (given the location and interruption to the femoral artery) providing the patient with a functioning replacement joint is of significance. As such surgeries became more commonplace (Clarkson and Schaefer (2007) report the completion of 40,000 joint replacements by the NHS annually) legislation was introduced requiring manufacturers to provide serial numbers for each implant produced, in order that malfunctions or recalls could be carried out where necessary. This proved to be a very significant development for the identification sciences as now most implants provided for human application (including breast implants, pace makers, replacement joints, etc.) bear unique serial numbers, registered to the recipient, the surgeon responsible for its placement, the hospital or facility in which the procedure was carried out, and the manufacturer. Breast implant serial numbers have been successfully utilised in identification cases in recent history (Happe *et al.* (in press)).

In recent years, cases where serial numbers of breast implants specifically have proven crucial in the identification of individuals include the 2003 case of London-based serial killer, the „Camden Ripper", Anthony Hardy, whose victims were prostitutes. The dismembered and mutilated remains of Elizabeth Valad were discovered by chance in a wheelie bin in Camden, North London. Her hands and feet were never recovered, and the biological profile the remains provided was not detailed enough to match any missing person"s report. It transpired that no such report was filed as she had a truant history. It was the recovery of the serial numbers on her breast implants that led to her identification (Judd 2003).

A second example concerns the identification in 2009 of the murdered Playboy model Jasmine Fiore. Her remains were recovered mutilated beyond recognition (her fingers and teeth forcibly removed to prevent identification), resulting in the use of the serial numbers of her breast implants to identify her (www.telegraph.co.uk 23/08/09).

A relatively rare procedure involves the replacement of diseased knuckle joints (from arthritis, for example) with „Swanson"s arthroplasty implants" (Clarkson and Schaefer 2007), which warrant mention here as these implants do not carry serial numbers. Their comparatively infrequent use lends them well, however, to indicate possible identity of an individual who has undergone the procedure, so their presence, even without serial numbers, is still significant in relation to inferring identity.

As medicine has evolved and developed, so too have methods of treatment. The recent increase in knowledge about, and treatment of, cancer is pertinent to this study. Tattoos are utilised in radiation therapy as pinpoints to mark the edge of the field of treatment a patient has received. This is important in ensuring accuracy of repeated treatments, and in indicating the prior use of this treatment in any future circumstances (www.oncolink.org 2010, www.essortment.com 2010). While only very small in size, their presence is no less significant than tattoos of any other description and it is their small size that emphasizes the need for scrupulous inspection of a body, ensuring recognition and reporting of tattoos even of these dimensions. Similarly, the acquisition of an accessory nipple following mastectomy is often practiced. Whilst it may be assumed that their presence may be obvious on examination, the post-mortem investigator is gently reminded that the artistic skill demonstrated by some tattoo artists could lead to the oversight of such tattoos.

As the use of body modifications becomes more popular in modern society, their increased acceptance encourages those who undertake the practices for their „extreme" nature to seek new methods of modifying their bodies. Presently, one location experiencing popular experimentation is the eye. The insertion of jewellery into the conjunctiva (the transparent outer membrane of the eye) is a procedure about which body piercers are increasingly asked. Increasing numbers of enquiries are also being made regarding the pigmentation of the eye by way of tattooing the conjunctiva, after widespread publicity of its having been undertaken by body modification enthusiast and volunteer „Pauly Unstoppable".

It is of interest to note here, however, that a variation of this seemingly extreme form of body modification has been practiced widely by ophthalmologists for over a century. Its introduction as a practice to correct „leucomata" (white spots that form on the iris after disease or injury) in patients was proposed by De Wecker, a „practical technician", in 1869 (Ziegler 1922). This practice of tattooing the iris was demonstrated to aid not only the aesthetics of the eye, but also to benefit the patient by correcting vision impaired by the condition (Khan and Meyer 2005, Sekundo *et al.* 1998).

Modern ophthalmologists have expressed grave concern about the undertaking of modification tattooing of the eye, resulting in legislation being passed in Oklahoma, in 2009, banning the practice (www.koco.com 2009). Oklahoma, specifically, is renowned for its strict guidelines pertaining to body modification practices, having only recently (2006) repealed laws prohibiting the practice of tattooing as a whole. The practice of prohibiting body modifications has a history as long as the undertaking of the practices themselves, as shall be discussed in Chapter 2.

Tattoos are also acknowledged for their ability to identify individuals in life, as demonstrated by work occurring in the USA recording gang and prison-related tattoos (Hall and Stratton 1997, Valentine 2000, Savelli 2006) and „SMT‟ (soft biometric traits) as detailed in the 2008 Biometrics Symposium by Lee *et al.*, pertaining to the creation of the NGI system (next generation identification) by the FBI (Lee e*t al.* 2008, Jain *et al.* 2007). With the successful utilisation of such markings as tattoos increasing in arenas such as crime prevention, it is surprising that the post-mortem identification discipline is slow to follow suit.

Recognition of the post-mortem alteration of remains is also pertinent to this study and may be demonstrated in many ways. Dismemberment of a body would be considered post-mortem alteration, but so too would the decoration or tribal use of human remains as illustrated in such publications as Bonogofsky‟s collection of papers “Skull Collection, Modification and Decoration” (2006), which details the global instances of post-mortem skull modification, including instances in Papua New Guinea (Stodder) and accounts of the practice in the Moche (Hill).

The modern preoccupation with the skull is well demonstrated in the recent (2009) seizure of a human skull from the online auction site eBay, which demonstrates the involvement of forensic investigators in the illicit trade of human bones. Seidemann *et al.* were alerted to the item and responded by carrying out non-invasive osteological observations in order to determine the potential identity of the individual. During their investigations the morphology of the skull and accompanying craniometric measurements indicated a Native American population affinity, but their findings were supported by the recognition of „tabular intentional cranial modification‟ (Seidemann *et al.* 2009). Here we see demonstrated the significance of the amalgamation of information the forensic investigator can supply, with particular regard to body modification practices, in helping to support or strengthen conclusions.

Whilst the cranium and skull feature predominantly in post-mortem modification practices, other elements of the human skeleton have received focus. In Buddhism, for example, Tibetan worship has long employed the „*kangling*‟- a trumpet formed from the distal end of a human thighbone (fig. 3). The sound emanating from the Tibetan *kangling* is said to produce a sound "pleasing to the wrathful deities, but terrifying to all evil spirits" (Beer 2003:110). The human sources preferred for „donation‟ of the femora are 16 year old Brahmin boys or victims of murder or execution; their remains are said to be most effective. Conversely the least effective and almost powerless remains were considered to be from those who died of frailty and old age (*ibid.*). The cranium features in Tibetan Buddhist rituals also, however, in its formation of skull-cups „*thodpa*‟ or „*kapala*‟, used for offerings or consumption during ceremonies, and the hand-drum, „*damaru*‟ also used in ceremonies (*ibid.*). Often presently substituted by animal bone or man-made fibres, those made from human remains are highly prized, fetching high prices in the Asian art-market (*ibid.*).

fig. 3. Tibetan *kangling*. This example was auctioned in Singapore (amount unknown). Image from www.adoos.sg 2010

Another example of illicit trade in human bones is reported by Holland *et al*. They highlight the alarming trade in human remains evidenced in Vietnam (Holland *et a.l* 2006). Here they report the apparent value of remains of American Soldiers and Airmen from the 1955-‟75 conflict. So valuable are authentic remains that often local burials are exhumed and the bones altered to appear more „Western‟. Alterations frequently take the form of extended femora by the joining of two separate bones, each cut at different points down the shaft, then „fused‟ with a metal rod internally and the resulting join camouflaged (*ibid.*).

Here, then, we see demonstrated the alteration post-mortem of the human femur for two very distinct purposes- the former for spiritual and religious purposes and the second for financial gain.

<u>1.4 Forensic case studies</u>

Successful identifications of individuals as a result of their body modifications have been recorded throughout the twentieth century, and these early years of the twenty-first also. Some examples will be presented here for discussion and to further emphasise the necessity for the undertaking of work such as this research.

In the twentieth century, a well documented case (Coppleson 1962, Rathbun and Rathbun 1984) referred to as the „Shark Arm Murder‟ occurred in Australia. In 1935 a tiger shark was captured off the coast of Sydney for inclusion in the Coogee Aquarium. A period of some fourteen days passed without remark and without the shark feeding. On the fifteenth day the shark was reported as suffering a frenzied fit resulting in regurgitation of its stomach contents. Found floating among the debris was a disarticulated forearm. Upon inspection the arm was in good condition, still exhibiting usable fingerprints and a slightly faded tattoo of two boxers squaring up to one another. A Sydney newspaper published a description of the tattoo which prompted the approach of a man claiming to be the victim‟s brother. He positively identified the arm from the tattoo, stating it belonged to his brother James Smith, a former amateur boxer. However, while the arm had been successfully identified as belonging to James Smith, the coroner ruled that a death certificate could not be issued or a murder enquiry instigated as it was medically possible to survive the loss of an arm (Coppleson 1962). Neither James Smith nor his remains were ever reported thereafter.

Another, more recent example, of identification by tattoo concerns the 1999 Ladbroke Grove train disaster, also known as the Paddington train crash. Of the 31 victims, 26 year old Matthew Macaulay, a New Zealander who lived in Clapham, was identified by a tattoo on his back (http://news.bbc.co.uk 1999a), as he was recovered apparently travelling with no identifying documentation. A second victim, Venezuelan Elaine Kellow, resident in Paddington, was identified by her „distinctive leg support" (http://news.bbc.co.uk 1999b). This is a good example of the appropriate use of personal effects, particularly relating to „body modification" in the identification process (as discussed previously).

An example of unfortunate but understandable mis-use of personal effects concerns survivor of the same accident Evelyn Player. Upon leaving the scene she was confronted with a dying woman. In a moment of compassion she draped her coat around the woman and exited the scene, mistakenly leaving her work pass and season tickets in the pockets of her coat. Investigators retrieved the dead woman"s body, recovered the work pass and season ticket and contacted Ms Player"s family warning them to „fear the worst" (Carter 1999).

In this single transport disaster we see demonstrated the importance of appropriate association of personal effects and the effective use of tattoos to identify an individual in the absence of any other indicators of identity.

An example of appropriate dissemination of images post-mortem with particular reference to tattoos is demonstrated as recently as 2008. A description of a young adult female, accompanied by an image of a tattoo showing the word „Mum", was distributed throughout the global press on the discovery of a torso in a suitcase from the outskirts of the Brazilian city Goiania. Upon recognizing the tattoo and knowing her daughter had travelled to Brazil with a friend, Anne Burke contacted the police. The remains were confirmed to be those of 17 year old Cara Burke, from South London, who had been murdered by her friend in a drug fuelled attack in which she was decapitated and her limbs severed (Brown 2008).

The effective utilisation and distribution of the image of Cara‟s tattoo was the initial clue in this case that ultimately led to her identification. In today‟s digital age, images of tattoos and modifications post-mortem are appropriate for widespread dissemination where other images of the deceased are not (Thompson and Puxley 2007). Even in cases where decomposition has begun, resulting in distasteful images of skin slippage, digital enhancement of the image can be performed to produce an image appropriate for publication (Blythe and Woodforde 2007). This method of recording is more efficient than the current widespread practice of sketching the tattoos, which can be hindered by the investigators‟ own artistic abilities (for examples see Manhein 2005).

An alternative, but no less pertinent, use of tattoos for identification purposes can be observed in the context of the war on terrorism. After losing his life in a firearms battle with NATO-led International Security Assistance Forces, a Muslim insurgent was recovered bearing an Aston Villa tattoo (www.telegraph.co.uk 2009). The finding came not long after RAF radio spies had identified, with the help of linguistics specialists, West Midlands accents, alerting the British Foreign Office to possible British involvement in the Taliban. The discovery of the tattoo, while not specifically confirming the insurgent‟s identity in this case, is aiding the investigation in its fight against British Muslim involvement in the conflicts.

1.5 Introduction to research

Forensic human identification, therefore, is multidisciplinary and pertinent in many scenarios. This research aims to demonstrate how body modifications can aid the identification process and the other traditional identification techniques. While body modifications‟ potentials have already been acknowledged (Haglund and Sperry 1993, Thompson and Puxley 2007, for example), they have not previously been exclusively investigated. This research will demonstrate the information that can be retrieved from different modifications, at various post-mortem intervals, which could significantly assist the identification process.

Chapter 2 will discuss the history of modification practices, the attitudes and opinions towards them and their evolution. It will demonstrate the numerous cultures who share a history of body modifications practices, investigating the similarities and differences between them and their experiences of colonisation and celebration or suppression. It will also demonstrate how the historical practices are emulated in modern cultures and how international trade and contact has affected the related beliefs and tribal customs.

Chapter 3 shall discuss a nationally distributed survey aiming to indicate the prevalence and trend of body modification practices in the UK. The potential of body modifications as human identification tools cannot be fully realised until a sense of the natures, scope, diversity and popularity/frequency of modifications are known. Whilst tattoos and piercings are frequently quoted as increasing in prevalence (Muldoon 1997, Koenig and Carnes 1999, Mayers *et al.* 2002, Farmer *et al.* 2005, Thompson and Puxley 2007, Bone *et al.* 2008), these claims are infrequently investigated and supported. The survey executed as part of this research will aid in redressing this imbalance.

Chapter 4 shall detail the relationship between decomposition and trans-dermal body modifications (piercings). After a significant post-mortem interval, modifications involving implants such as piercing, micro- or sub-dermal implants can remain, giving some indication of an individual‟s appearance in life. The retrieval of small jewellery items from a scene, and the ability to detect from which piercing site it originated, may be of significance to the investigation. When found at the scene, however, it may not be retrieved in its original location, whether as a result of events surrounding death (e.g. a physical struggle) or as a result of taphonomic processes at the site during the interim period. The ability to discern the extent of each, to deter inappropriate interpretation of results, is of paramount importance. It is also thought that the jewellery‟s proximity to the body may result in its harbouring DNA, which would greatly aid the identification process. The ability to accurately associate items with individuals, however, is crucial to investigations, ensuring accurate identification.

Chapter 5 will discuss the chemical composition of tattoo inks. Attempts to evaluate the ingredients of tattoo inks have been rarely undertaken. Tattoo inks are internationally produced and traded, but are not subject to any legislation regarding their ingredients or methods of manufacture or use. Without legislation dictating the inks‟ ingredients, chemicals and substances may be utilised which could present significant risk to health.

It is hoped that any such instances will be discovered by the undertaking of this research. The potential for each ink manufacturer to produce unique inks is high. The ability to retrieve a chemical signature for each ink produced by ink manufacturers would be of great benefit to the forensic disciplines allowing for identification through comparison to those stored in the database (to be compiled as part of this research). With no established protocols for the method of extracting tattoo ink pigment and subsequent chemical signature production, this element of the research is expected to be exploratory in nature.

“Much tattoo history and sociology has been done by tattooed people, tattoo artists, in other words by informed practitioners, not scholars.” (Thomas 2005)

Chapter 2

2. History and global incidence of body modification practices.

> “Since ancient times people all over the world have used make-up to alter their external appearance and express their sense of beauty. The versatility of a made-up face as a medium for self-expression never ceases to amaze- not only because of the way it enhances the various expressions of human mimicry but also, above all, because powder, paint, creams and beauty regimens allow people to „make something of themselves‟.”
>
> (Gröning 1997:242)

As mentioned in Chapter 1, body modifications have enjoyed a long and varied history. Throughout time (and geography), however, such practices have experienced turbulent relationships with public opinion and acceptance. The oldest known European tattoos (of 5,300 year old Ötzi the „Iceman‟ discovered in 1991 in the Ötzal Alps on the border between Austria and Italy) were discovered in isolation, and so information regarding tattooing as a practice within his contemporary population is impossible to relate. However, the type of tattoos exhibited are reminiscent of acupuncture and medicinal tattoos that many cultures have practiced in history given their position over areas that osteologically demonstrate arthritis, and so one can surmise that these tattoos were purposeful and therefore not out of the ordinary within his society.

Extensive tattooing of comparable historical period (c. 5,500 years BP) is evidenced on the mummified remains of a man and woman, recovered in 1993 in southern

Siberia, and referred to often as „the Pazyryk warriors" thanks to their elaborate burial goods and the detailed images adorning their skins. In direct opposition to the tattoos displayed by Ötzi, the tattoos of the Pazyryk couple are decorative and aesthetic in nature, and do not correspond to any detectable areas of disease or injury. To infer that decoration was the primary employment of tattoos within their contemporaneous culture would also be a false conclusion, given their discovery in isolation, though no alternative is apparent physiologically, as in Ötzi"s case.

Skeletal modification has also been thought to have been evidenced in Neanderthal cranial fragments indicating the practice of cranial deformation (Trinkaus 1982). In a culture not renowned for its aesthetic values, such practices are conflicting in relation to their occurrence in Ancient Egyptian (Dingwall 1931), South American Mayan and Incan (Romero-Vargas *et al.* 2010) populations, who utilised the practice to emphasize beauty.

The relationship between public opinion and each cultural region will be discussed briefly below in order to establish and better evaluate the context of modern Western attitudes.

2.1. China and Japan

The oldest tattoos to be found date to 5,500 BC. These tattoos are seen on the remains of Caucasian mummies, uncovered in northwest China. One known as „Cherchen Man" and the others simply as the mummies from the Tarim Basin, little is known of their tattooing practices. The reasons for this lack of information, given that a number have been recovered, has been considered "partly due to lack of access to the tattooed mummies, lack of documentation in the press and scientific community, and perhaps even disinterest in the ancient custom itself" (Krutak 2009a).

In the documented past of China, opposition to body modification practices originated even in Confucian beliefs which state that there is a "strong stigma attached to failing to preserve one"s physical body; by not keeping the body intact and undefiled, one has failed in one of the most important filial duties and has brought shame on one"s family- past, present and future…. Confucius tells his disciple Zengzi that filial piety lies in avoiding injury to the skin, hair and body one receives from one‟s parents" (Reed 2000: 12). Mixed terminology prevails for different types of tattoo (penal versus decorative) throughout Chinese history, creating a possibly mistaken image of perceptions of Chinese tattoos due to inaccurate or confused translations.

What cannot be argued, however, is the use of tattoo in China as punishment. There are some 500 crimes recorded in history as punishable by tattoo (Krutak 2009a, Reed 2000). Though they are deemed as relatively minor in regard to their offensiveness, in a society living by Confucian law, the threat of being tattooed or branded as a punishment for unlawful behaviour must have been an especially appalling reprimand. There is an element of conflict, however, in the apparent abhorrence of the practice of tattooing and its use as a punishment for these comparatively trivial crimes, as discussed by Reed (2000). It is also interesting to note that acceptance of tattoos was dictated by the environment in which it was acquired. „Oath‟ tattoos, for example, received by members of the military to proclaim their strength and valour, were seen as proving an individual‟s devotion to their cause (Reed 2000).

The use of tattoos as a distinguishing feature at autopsy is reported by Reed. Tattoos were to be recorded either as characters, *ci zi*, or as decorative tattoos, *diao qing*, and each was considered distinct from the other in tattoo „genre‟. This use of alternative words for tattoos is thought to account for the difficulty academics have had in being able to determine the prevalence of tattoos in ancient China. Evidence of „moxibustion‟ (the removal of a tattoo by chemical action) was also to be recorded at autopsy as evidence for prior position of a tattoo (Reed 2000).

While some tattoos were employed as elements of tribal customs, or were used aesthetically throughout different periods of Chinese and Japanese history, tattooing represented an „alternative‟ to the state-approved lifestyle and so was suppressed. It was almost always considered to be primarily „outside‟ tribes who practiced tattooing and other modifications: such as the Xiongnu and Uighurs who practiced face cutting during periods of mourning; the Yue people, who decorated themselves with mythical figures to protect themselves from dragons and sea monsters when fishing. When not „tribes‟ as such, the practice seemed most popular with the lower bands of society such as prostitutes, sailors and, as already mentioned, criminals (Reed 2000).

Interestingly, this perceived „threat to the state‟ could be argued as a direct result of the surge in popularity of tattooing after the publication of the illustrated version of *Suikoden* (Japan) or *Shuihu zhuan* (China) at the turn of the nineteenth century. This novel recounts the experiences of 108 exiled criminals, „honourable bandits‟ (akin to Robin Hood) many of whom bore exquisite and extensive tattoos. The tattoos they wore were believed to have magical powers (the power of the dragons depicted, or the stealth of the illustrated tiger, for example) further ensuring their desirability. The publication of the newly illustrated version in 1805 allowed visualisation of the heroes and their tattoos, detailing their beauty for emulation by many tattoo artists.

Just as tattooing in China experienced attempts at eradication by authorities, so too did tattooing practices in Japan. Most notably in 1871 the Hokkaido Development Mission proclaimed tattooing to be outlawed, deeming it „too cruel‟ (Krutak 2009a). Tattooing of internationals continued, however, as it remained a prolific source of income. Peripheral societies and tribes such as the Ainu continued practicing their traditions, however, as they remained a significant element in assuring marriage, as well as safe passage to the afterlife (Krutak 2008a). This tradition evaded abolition until very recently; the last fully tattooed Ainu woman died in 1998 (Krutak 2008a).

Tattooing in Japan has continued, most notably as an adopted practice by the Yakuza- the „gangs‟ of Japan. The full body tattoo was thought most specifically to denote a person‟s devotion to the Yakuza, demonstrating their ability to withstand great pain, and displaying loyalty through its permanence, cost and prior illegality (van Dinter 2005).

Full body tattoos were consequently expected of Yakuza members, but were also very expensive. Those financially unable to complete their body suit tattoos often struck deals with museums, promising their skins for display post-mortem, in return for payment for completion of the design. Many such skins from the nineteenth century can still be seen displayed in the Tokyo University medical museum. It is ironic to note, however, that just as tattooing was becoming widely accepted and appreciated in Japanese society, its indelible ties with the Yakuza damned it once again (van Dinter 2005). In the 21st century, however, Japanese designs adorn the skins of Westerners and it remains one of the most prolific genres of tattooing in the West.

The widespread practice of „foot binding" in China is of significance osteologically. Foot binding, as with other body modification practices in China, is steeped in legend. Two prevailing stories are regaled regarding the conception of the practice. Oldest of the two, an Empress of the Shang dynasty (1700-1027 B.C.) suffered a club foot and demanded the practice be applied to all young girls in her honour (Lim 2007) and the second legend recounts the experiences of Li Yu, ruler of China in the Song Dynasty (961-975 A.D.), who became enamoured with a particular concubine, Yao Niang, whose tiny feet were bound to resemble a new moon and who delighted the King by dancing the „lotus dance" (Lim 2007).

With the history of the practice rooted in regal legend, the practice was most prolific in the wealthy echelons of Chinese society with Rossi 1993 (*The Sex Life of the Foot and Shoe*) estimating close to 100% of upper class Chinese women displaying bound feet, and 40-50% of the overall population). The practice prevailed throughout history, ensuring marriage of a daughter. While reputedly carried out more frequently in the North of China than the South, modern examples of the practice can only be seen conversely in the Southern provinces of China. Lim"s account (2007) for the National Public Radio (USA) details the experiences of one surviving example of the practice- Zhou Guizhen, aged 86 at the time of interview. Reportedly regretting the practice now, she recounts "At that time everybody had bound feet. If you didn"t, you"d only be able to marry a tribesman from an ethnic minority" (Lim 2007).

Implemented initially as a practice of aesthetic merit, a wife with such modifications was viewed as desirable, being unable to carry out manual chores, which necessitated a servant or maid. In practical terms, however, such modifications greatly impinged on family sustainability as servants and maids required funds. Further to this, after the Communist regime of 1949, women with bound feet were required to work to provide for their families, but were often unable to fulfil their quotas due to the effort their modified feet demanded. Opposition to the practice is often quoted from the brutality of the practice (Ko 1997) which entailed the repeated breaking of the metacarpals of the foot, the forced extension of the Achilles tendon and flexion of the arch (figs. 4 and 5).

fig. 4 and fig. 5.
fig. 4 an x-ray of bound feet showing inversion of the calcaneous. (www.librarythinkquest.org 2010)
fig. 5 shows the unwrapped bound foot demonstrating the extent of the deformity (www.danwei.org 2010).

Scars and tattoos undertaken to mark juvenile and pubescent rites of passage are often carried out by tribal elders; in the case of foot binding this also occurs, attributed to the likely sympathetic approach a mother would take to her daughter‟s suffering, necessitating an unrelated elder to carry out the process in order to complete the process most effectively. The process of binding the foot was inherently abhorrent to men, as was the unwrapped foot (often reported as odorous), though in the Qing dynasty, pornographic manuals reportedly recorded 48 ways of playing with bound feet (Lim 2007). In regard to tribal identity, whilst the practice of foot binding was adopted by all tribes initially, the position of a Manchu Emperor in 1644 forbade Manchu women from partaking in the practice, resulting in the ability to distinguish between Han and Manchu women from their bound or unbound feet (www.chinahistoryforum.com).

In China and Japan, we see demonstrated the widespread uptake of modification practices which were later utilised to distinguish between tribes and individual status. With the arrival of the Republic in 1911 the practice of foot binding in China was banned, though not strongly policed, and it was not until the arrival of the Communist state in 1949 that banning the practice proved successful. On both occasions banning was motivated in order to eradicate status and tribal distinction, and to facilitate a successful working population. Through various periods of history tattooing was banned from distinguishing tribal identities, or utilised to the state‟s benefit as a penalty. Body modification practices, therefore, were banned to unify, or utilised to punish, both resulting in the practice becoming illicit or explicitly related to unlawful behaviour.

2.2. India and the subcontinent

Tattooing and piercing practices have evolved throughout Indian history. van Dinter (2005) states that "until only 50 years ago, almost every girl in India had to endure painful tattooing procedure.... mainly to enhance [her] beauty." (van Dinter 2005: 119). Tattoos were often used to mark a person‟s caste (a person‟s position within wider Indian society, into which they are born and remain), formulae of prayers or dedications were often inscribed across the body, ensuring safe passage to the afterlife as they were considered marks their ancestors would recognise, or possessions one could carry with them (van Dinter 2005). Now it is more common to observe these markings applied with Henna, a semi-permanent stain applied for occasions such as weddings and festivals.

Similarly, piercings are now utilised where acupuncture and tattooing once was commonplace. For example, the piercing of the left nostril at a girl‟s marriage derives from the ayurvedic belief that the left nostril is connected to the ovaries and that the resultant stimulation can improve fertility (Clayson 2010). Here, too, extensive tattooing was associated with criminal behaviour, often as a result of the lower caste „wandering tribes‟ renowned for their pilfering and thieving habits (van Dinter 2005). This led to the establishment of a register into which descriptions of offenders‟ tattoos could be entered, aiding identification. The repeated modification of the recognised tattoos, however, resulted in the abolishment of the register (*ibid.*).

It may be considered that the tattooing of prayers, dedications, scripts and other texts indicates that the tattooists, despite their low caste, were literate, but this was not the case. Their skills lay in their ability to copy images and symbols exactly, without the need for understanding (*ibid*). Often populations able to transcribe texts are considered literate- the evidence here highlights the need for this assumption to be re-evaluated.

2.3. Southeast Asia

Southeast Asia acts as a cultural stepping stone between Asian, Pacific and African cultural practices. All modification types were practiced, though tattooing prevailed, being utilised for protection and in warfare. Tattoos acting as talismans can be seen throughout Southeast Asia. Krutak (2008b) has extensively studied the tattoos worn by the elephant mahouts of Thailand, documenting the many designs and (often magical) attributes awarded them.

Throughout Thailand, Cambodia, Laos, Myanmar and Vietnam tattoos based upon mixtures of Khmer texts, Hindu mythology and Buddhist teachings prevail, protecting the wearer from harm or evil, endowing them with strength or courage, or ensuring happy futures (Krutak 2009b). Frequently the tattoos are applied by Buddhist or Theraveda monks, empowered with magic which is transferred through the tattoo to the client, and through the chants the monks recite throughout the procedure (van Dinter 2005, Krutak 2008b, 2009b).

The Mentawai tribe, indigenous to the island of Siberut of Indonesia, honour their complex belief system and its many taboos in order to live in harmony with the jungle. Essential to the Mentawai belief system is the appeasement of souls, both living and dead. As Krutak reports "Individuals, be they male or female, who neglect their bodies by not keeping them beautiful with beads, flowers, sharpened teeth, and especially tattoos will cease to be attractive to their souls. In such cases, the soul may decide to leave its human host and roam about the body free" (Krutak 2008c).

In the Philippines, however, the Kalinga tribe use *batok* (tattoos) to display a headhunter‟s successes in conflict (Krutak 2009c). A tribal custom also on the brink of extinction, the Kalinga *batok* was most recently applied fervently to celebrate and commemorate the bravery of the men who fought Japanese military troops by hand in the Second World War. The pattern of designs applied is specific. Dots behind the ear denote the number of enemy encounters a warrior had survived, or the *bikking* chest tattoo would be applied after killing or wounding two enemies (*ibid.*).

Papua New Guinea"s body modification rituals and practices are akin to Indonesian, Philippine and African customs. Believing strict taboos must be adhered to in order to appease the spirits, the Kanigara of the Blackwater region of Papua New Guinea resemble the Mentawai of Siberut. Their likeness to the Kalinga of the Philippines is demonstrated in their utilisation of body markings to convey prowess and valour in warfare (though this is a common employment of body markings demonstrated globally).

Similarities with African modification practices are seen in the preference for complex scars rather than tattoos, possibly as a result of the darker skin pigmentation. The Kalingara men scar themselves to resemble the crocodile spirit Nashut, to empower them with his strength and stealth in warfare, and to protect them in the crocodile infested waters they inhabit in the Blackwater region of Papua New Guinea (Krutak 2008d).

2.4. South Pacific

Tattooing also enjoyed a long history in the South Pacific. While noted by European sailors, it was Captain Cook"s detailed recollections of his expeditions to the South Pacific that catapulted the practice into Western consciousness. The explicit descriptions, accompanied by the partaking in the practice by some of the seamen, and even the seizure of „Omai", a Tahitian who was displayed by Cook as an example of the traditional tattooing practices he and his crewmen observed (van Dinter 2005) all demonstrated the interest with which the Western world regarded these „barbaric" and yet fascinating practices.

Many have studied the complex geometric and intricate designs found among the various Polynesian, Samoan, Maori and other tribes (see, for example, Robley 1840, Thomas, Cole and Douglas 2005, Ellis 2008).

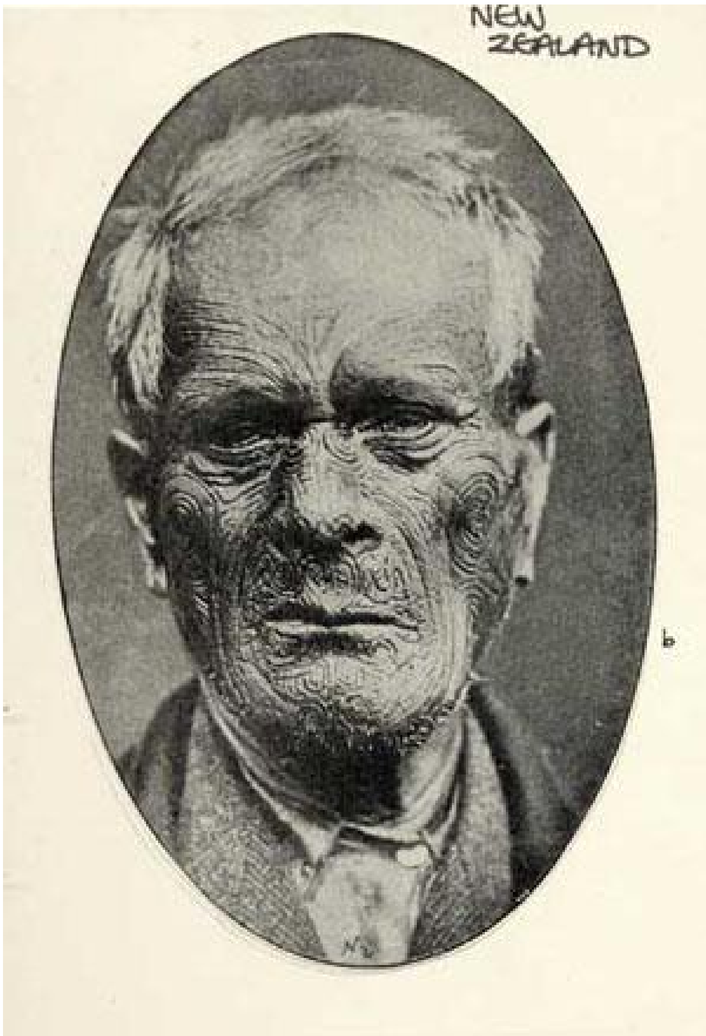


fig. 6. Image showing 'carved', raised, appearance of traditional *mōko* facial tattoos. (www.prm.ox.ac.uk 2010)

Of most note here are the Māori *Tā Mōko*; complex spiral patterns applied to the face using a type of chisel, *uhi*, and mallet, *he-mahoe*, and rubbing the ink under the resulting skin flap, creating patterns unique to the bearer that are both coloured and raised (fig. 6). Each pattern was unique to the wearer, a feature most useful to the European traders who requested the tribesmen to re-draw their *mōko* in place of a signature. *Mōko* itself can be divided into two sub-categories; the traditional *mōko* creating a dark pattern on a pale background or *puhoro* the process of adding pigment as a dark ground, against which the pale skin shows through as the pattern (fig. 7). So astonishing were these tattoos that trade in Māori heads by European explorers boomed in the early nineteenth century (Robley 1840).

fig. 7. Māori elder Kingi Taurau showing his modern *puhoro mōko* design. (www.greenpeace.org 2011)

In Māori culture, upon the death of an individual with *Tā-moko*, often the head would be preserved and would be kept by their families in ornately-carved boxes and brought out only for sacred ceremonies. Successful battles resulting in the taking of an enemy chief"s head warranted its display, exhibiting the valour of the victorious tribe. To return a *mōkomokai* to the tribe was an exercise key to maintaining stability and diplomacy between conflicting tribes.

In the early 19th century, with the arrival of Europeans in New Zealand, traders and settlers became dependent upon firearms, resulting in the Musket Wars. Tribes would conduct raids on neighbours to acquire heads for trade with the Europeans, who were fascinated by the practice and appearance of *Tā-moko*, for firearms. Demand for these intriguing „curios" escalated, and so at times even slaves and prisoners were tattooed with meaningless patterns for trade to meet the demands. The trade of firearms for *mōkomokai* was so prolific that by the 1830s the practice was banned. As a result *mōko* declined in practice, as a result of fear of illicit trade, its new associations with slavery and materialistic culture, and through British colonial suppression in 1840.

European opinion of the practice at the time of discovery was mixed. While the dominant feeling was one of intrigue, underlying opinions oscillated between abhorrence and desire. While Cook‟s men returned with artistic additions to their skins, other observers, such as Banks in 1769, questioned “what can be a sufficient inducement to suffer so much pain is difficult to say” (as quoted by Thomas 2005: 14) and later in 1778 , with specific regard for *mōko* “it has the effect of making them most enormously ugly” though he later concedes “Yet as ugly as it certainly looks it is impossible to avoid admiring the immense elegance” (as quoted by Douglas 2005: 44).

Tattoo was most certainly seen by Europeans as a „curiosity‟ (Thomas 2005). While for many the curiosity was expressed through disbelief, for some, the intrigue was acted upon, especially by sailors of the eighteenth century who collected tattoos as talismans for their voyage home, or simply as a collector‟s piece confirming their travel across international waters and lands (a not solely antiquated opinion as shall be demonstrated later).

The popularity of tattoos among sailors in the eighteenth century is frequently discussed; the popularity is commonly thought as a result of not only contact with indigenous tribes abroad, most specifically in the South Pacific, but also as a result of limited living quarters on board. With shared experiences and little space for personal items, it has been argued that decoration of the self is the natural progression for expressing individuality in such conditions (White 2005). A penchant for tattooing initials in this period is reported by White, aligning them with modern dog tags “offering insurance against an anonymous burial, a particular risk for mobile populations such as sailors” (White 2005: 74). This belief is reflected in modern US Marine ideology where many marines tattoo the information that appears on their dog tags as an assurance against bomb blasts separating body parts from dog tags post-mortem.

Mōko and traditional tribal customs gradually continued to decrease in popularity as Westernised values prevailed in the employment centres of New Zealand. In the twenty-first century, however, tribal customs are being revived globally. Thomas reports that modern *mōko* wearers “find that the tattoo provokes curiosity....

nostalgia, expectations of deep traditional knowledge, and respect" though conventional prejudices are also noted (Thomas 2005:28).

It must also be considered that modification practices are inherently organic in nature, based as they are upon evolving cultures. As emphasised by Nikora *et al.* „new meanings evolve or old meanings are re-presented and begin again the cycle of arrest, objectification, circulation and negotiation" (Nikora *et al.* 2006:478). This consideration must be awarded all modification practices, especially given the modern revival and interest in „tradition". Nikora *et al.* also highlight the need to contextualise such practices, and that only upon doing so can the traditions (here specifically *mōko*) be completely comprehended.

When focusing upon tribal customs or practices, it must be borne in mind that they are living entities. Whilst our fascination often focuses upon an element in isolation, all elements of tribal and cultural life are inextricably linked. The process of *Tā-mōko* cannot be understood or fully appreciated without investigating and understanding the background against which it is set and practised. The same must be observed when investigating any body modification practice, whether of a group, or of an individual.

2.5. South America

In South America body modification practices also proliferated throughout history. Tattooing was not the most common of practices, however. Piercings, tooth filing and inlays, and cranial deformation were much more customary. Whereas such practices as piercing and tattooing are considered „long term" due to their permanent after-effects, cranial deformation must be considered more so due to the prolonged initial process required to coax the cranial bones into the desired shape, often taking two or three years until the juvenile skull either rejects the apparatus, or is sufficiently deformed to prevail into adulthood (Cieza de León 1984). The dedication required for the deformity of juvenile crania was an identifier of the child"s lineage, rather than a proclamation of their own identity, however, a distinction aptly proposed by Blom (2005). Originating from different towns and localities was portrayed through an individual"s costume, often including headdress (Blom 2005).

The headdresses worn often dictated the cranial shape required and desired, influencing the extensive body modification practice.

Tooth filing is commonly seen in ancient Mexican, Mayan and Incan populations- often with semi-precious inlays accompanying the altered shape. These materials (jade, obsidian and gold, for example) were frequently used as piercing jewellery also; their value reflected the wearer‟s position within society.

Tongue piercing and splitting has also been recorded in Mayan writings (van Dinter 2005), thought to be in accordance with the prolific sacrificial practices of blood-letting. These modifications were viewed by Westerners in the same regard as the facial tattooing of the Māori and resulted in the trade of heads between Europe and South America. These heads, however, were „shrunk‟- the cranial bones removed and the skin subjected to tanning procedures, and were often witnessed being used in ritual ceremonies. This trade had a similar effect on the traditional practices of the South American indigenous peoples as the trade in *mōkomokai*, effectively eradicating the practice after European settlement. Once again, however, with renewed interest in heritage, tribal customs such as tooth filing and inlays are observed in the twenty-first century.

With the various South American cultures we see the uptake and celebration of a variety of body modification practices. Post-mortem body modifications were also practiced, including the modification of heads taken of rival chiefs and their warriors, as in South-East Asia and the South Pacific. Here, however, the practice also entailed the longer-term modification practice of head shrinking, allowing for the more practical transportation of the trophies with the victorious warriors as opposed to the domestic display of the trophies as demonstrated in other geographic locations.

Again, as demonstrated in the South Pacific and South-East Asian cultures, the arrival of Western travellers initially encouraging and intensifying the practice with trade of weapons for such curios, but later led to its eradication due to its conflict with Christian values. South American tribes and cultures practiced an array of body modifications, more varied than in other geographic locations which tended to focus upon tattooing, with piercing and other modifications taking a secondary position. In this way they lend themselves to comparison with African tribes and cultures.

2.6. Africa

Scarification and piercings prevail in Africa, along with body painting rather than tattooing. The permanent scars are more visible and therefore more striking on darker skins than tattoos, though some scars are created with the simultaneous application of soot or other pigments and are thus termed „scar tattoos‟ (van Dinter 2005).

Black skin is also more prone to keloiding (raised scars), making the scars better defined and more visible, especially when „irritants‟ are also used (as is common practice in many scar practicing tribes). Scars on men predominantly symbolise valour in hunts and conflicts, or in overcoming periods of serious illness. Women‟s scars are obtained at specific intervals in their lives and have predominantly aesthetic values. An element of valour is seen in some women‟s scars and seen as proof of her ability to bear children, and aesthetically men‟s scars make them more attractive to women; but the primary reasons for the scars remain.

When tattoos are encountered in Africa, they are seen most frequently as talismans; protection from evil and thus are found situated near orifices such as the eyes, nose and mouth (locations of entry into the body). Most frequently these tattoos are found on lighter skins such as the Berber of the Atlas Mountains (van Dinter 2005). Scarification and tattooing, along with other tribal practices (e.g. female circumcision), have been outlawed at various times throughout the 20th century, and so when these customs are not practiced illicitly, substitutions are often made in completing them with paint patterns and stains in their place. As Gröning (1997) highlights, these practices can only be appreciated fully in respect to their cultural significance and aesthetic values when viewed in their cultural and societal context (a reflection of the discussion above in regard to *Tā-mōko*).

Many African tribes practice these substituted customs (of body painting as opposed to scarring or tattooing), though the original scars and patterns can still be seen on the faces of some surviving older generations; those considered lucky enough to have acquired their facial and body markings prior to its outlawing. Such affected tribes include the Makonde of Mozambique (facial scarification), the Bétamaribbé of the Atakora mountains (facial and body scars), the Hamar of Ethiopia (body scars from ritual whipping) and the Kaleri of Nigeria (extensive decorative body scars); are just a few of those affected by the outlawing of such customs (Gröning 1997, Krutak, 2008e, 2008f, 2009d, 2010).

fig. 8. Bust of Queen Nefertiti, 18th Dynasty Queen of Pharaoh Akhenaten. Crown shape and position indicating possible occurrence of cranial modification in the period. (www.archnews.co.uk 2010)

Africa, like South America, has a rich history of body modification practices, equally as rich in its variation. Cranial modification practices were demonstrated in Africa, as in South America, most prolifically in Ancient Egypt. Discussed at some length by Dingwall in 1931, Ancient Egyptian head-binding practices are thought to have derived from the 18th Dynasty and the reign of Akhenaten (formerly Amenhotep IV).

Artistic styles changed dramatically throughout the 18th Dynasty and have received much attention from Egyptian historians and archaeologists.

The bust of Akhenaten‟s wife, Queen Nefertiti (fig. 8), is famously housed in the Egyptian Museum of Berlin. The shape of her crown, along with artistic representations of the royal family (fig. 9), all indicate elements of cranial shaping possibly being practiced in this period.

Repeatedly we see the dwindling of such tribal customs discussed here after the colonisation by European settlers (most frequently after an initial bout of curiosity and partaking). This can be argued as the result of missionaries. In many of the principal faiths, tattooing and body modifications are forbidden. European settlers spread the Christian faith to these newly discovered lands, preaching the Old Testament, Leviticus chapter 19, verse 28 "ye shall not make any cuttings in your flesh for the dead, nor paint any marks upon you: I am the Lord!".

What is most interesting to note here, however, is the proliferation in the middle ages of tattooed pilgrims- harbouring indelible marks indicating their successful completion of a pilgrimage (van Dinter 2005). This is the first time we see opinions shifting from focusing upon the act of tattooing itself to the image and iconography displayed and the meanings behind them.

fig. 9. Artwork from the 'Amarna Period' of 18th Dynasty Egypt, depicting two princesses demonstrating possible cranial deformation. (www.ancientegyptonline.co.uk 2010)

Some have considered the banning by these religions to be as a result of the opposition to other religions (such as the Egyptian pantheon and the cult of Isis) that allowed their practice (Scheinfeld 2007). In modern times, Ethiopian Jews adopted the custom of tattooing Christian symbols either as a marker of their conversion to their new faith, or to disguise their origins. However, upon emigration to Israel, many have sought to remove these acquired symbols, in order to conform to the customs of their new society (Lapidoth and Aharonowitz, 2004). This modern occurrence echoes the ancient Chinese tattoo acceptance being dependent upon its reasoning and environment.

2.7. 19th century to present day Western attitudes.

In medical history the skin was deemed an outer casing for the more intriguing organs within. The subject of dermatology was only established in the nineteenth century, though most frequently studied solely in relation to the study of venereal disease. The skin thereafter was often seen related to the exotic and erotic; the flaying of the skin of a woman reminiscent of her undressing.

The skin was considered intricately linked to emotions and cultural views, given its ever-presence visually. Its ability to „express" was further investigated in the late nineteenth century with the apparent spate of „dermatographism"- the ability for the conditions suffered by hysterical patients to appear inexplicably impressed upon their skin (Wellcome Trust „Skin" exhibition 2010).

This epidemic was simultaneous to the eminent psychologist and criminologist Cesare Lombroso"s claims in 1878 that tattoos and criminality were intrinsically linked. It is interesting to note that his infamous claims of physical facial features linked to criminal behaviour have widely been disputed, but that his claims regarding criminality and tattooing have not; must we therefore assume there to be some truth in this argument? Further, in 1907 tattoos and the sexual psyche were linked; in men, power and cruelty were symbolised, attractive features to women and; in women, submissiveness and erotica were symbolised. Tattoos were also deemed entirely aesthetic at this time as they were considered associated with individuals of lithe and athletic proportions; those most likely to reveal their bodies (van Dinter 2005).

Despite its tumultuous history, tattooing in Europe experienced Royal approval at various times, including Japanese style tattoos on the bodies of King George V, Danish King Frederik IX (who sported multiple tattoos), Russian Czar Nicolas II and Prince George of Greece. A religious tattoo from Jerusalem was favoured by King Edward VII.

Body piercing has famously been advocated by Prince Albert who reportedly wore a piercing ring through his penis to aid his dressers in disguising any unsightly bulges in his breeches that may offend female onlookers of a delicate disposition. Many references can be found relating to Victorian dressers relying on such piercing practices to aid in the dressing of gentlemen (Koenig and Carnes 1999, Muldoon 1997, for example), but much to the disappointment of many scholars and piercing enthusiasts, this transpires to be no more than a modern myth, created to „glorify‟ and popularise the practice of body piercings (Ferguson 1999). The origin of myths particular to piercings has been traced to one Doug Malloy, a piercing enthusiast and personal friend and financier of the 1970s piercer, and jewellery maker and distributer Jim Wards.

The creation of myths and stories pertaining to body modification practices of the past serves only to inhibit the accurate recording of opinions and incidence of such practices in history. Whereas body modifications, primarily in the form of intimate piercings, have been widely believed to have been commonplace in Victorian England, with no evidence to support this belief, this too may simply be the result of myths used to „glamorise‟ and justify such practices, as well as to influence our traditional beliefs that the Victorian period was especially conservative and demure.

The resurgence of „penal‟ tattooing has been demonstrated in recent history both in the Second World War and in Iraq. Penal tattooing in the Second World War resembled livestock branding, enabling the cataloguing and overall „maintenance‟ of prisoners. The only camp to utilise the system, however, was Auschwitz, employing serial numbers as a way of regulating the high numbers of prisoners housed in the camp.

The serial number system, at its inception, involved the application of the individual‟s serial number to their clothing. Later the practice of writing the prisoner‟s unique number on their chest with indelible ink was used, followed by the final enduring practice of tattooing the left forearm, or some in 1943 receiving it on the inside of the left upper arm (www.ushmm.org 2008). Only those destined upon arrival for the gas chambers were excused registration and designation of a serial number.

Introduced in 1941, the first series of numbers was assigned to male prisoners, beginning at „1‟ and concluding in 1945 with „202,499‟. Soviet prisoners of war constituted the second series of numbers and the arrival of women to the camp in 1942 instigated the third series. Jewish prisoners were often also marked with a triangle below their serial number.

New sequences were introduced in May 1944 to account for the excessively high numbers of Hungarian Jews arriving at the camp. Serial numbers were now limited to 20,000 utilising a prefixed letter to distinguish the series („A1‟-„A20,000‟ ,B1‟-„B20,000‟ etc.). Roma Gypsy prisoners were awarded their own series prefixed by the letter „Z‟, standing for „Zigeuner‟, the German word for „Gypsy‟. (*ibid*).

In total, it is estimated some 400,000 serial numbers were assigned the Auschwitz prisoners, the majority applied as tattoos with stamps; wooden blocks with interchangeable pins that were dipped in ink before puncturing the skin.

The simple serial process enabled not only the identification of individual prisoners, but also the SS camp authorities to monitor the overall representation of each targeted group. Another motivation for the application of tattoos was its anti-Semitic undertones, in light of the forbidding of tattooing and piercing under Jewish law, ensuring religious as well as cultural distress to the tattoo recipients.

Tattooing was also undertaken by Nazis in the Second World War as a form of medical aide. Members of the SS were tattooed with their blood group under their armpit ensuring blood of the correct group could be administered, if necessary, even if the patient was unconscious (Annas 1991).

Interestingly, however, in a time when tattoos were perceived as punishment, humiliation or medical necessity, those in the upper echelons of the Allied forces also sported tattoos; Montgomery wore a butterfly on his forearm, Churchill an anchor on his left arm, and Stalin reportedly wore a skull, in an unspecified location.

Even in the most recent history punitive tattooing was practiced in the Iraqi regime under Saddam Hussein. Upon defeat in the Gulf War, Hussein ordered that a tattoo in the form of a cross be applied to the foreheads of all deserters, conscientious objectors and criminals (van Dinter 2005).

2.8. Modern Western attitudes to body modifications.

It is frequently stated that body modifications are increasing in prevalence (Muldoon 1997, Koenig and Carnes 1999, Mayers *et al* 2002, Farmer *et al* 2005, Swami and Furnham 2007, Thompson and Puxley 2007, Bone *et al* 2008). Certainly, they are becoming more commonplace in the public psyche, as evidenced by the numerous television programmes documenting the tattooing process (MiamiInk, LAInk, LondonInk, for example), the proliferation of literature dedicated to body modification practices, predominantly tattooing (Skin Deep, Total Tattoo, *Body Art*, for example) and increasing numbers of tattoo conventions (27 in Britain alone in 2010).

However, this seeming rise may actually indicate simply an increase in public *interest* in body modifications and not, perhaps, an indication of the uptake of body modifications. This is a significant distinction. It is interesting to note that the practices of body modifications in the form of piercing, branding and scarification, do not warrant exclusive publication in magazines, or the production of television programmes. This indicates that it is tattooing that is increasing in public interest, and therefore, possibly acquisition.

In publications such as the annual *Body Art* magbook, however, while photographs of tattoos are published as submitted by the readership, the articles themselves deal with practices such as piercing, scarification, branding, sub-dermal implants and other, often considered more „extreme" forms of body modification practices (elective amputation, robotic implants, for example). Carrying a warning to those „easily offended" it is clear that the publication is intended to display these procedures peripheral to society, a form of „shock and awe", but the reportage is somewhat contradictory, this approach implies the preservation of exclusivity of such body modification practices.

Given this, albeit minority, view that certain modifications be maintained to shock, it is unsurprising to learn that in Swanger‟s investigation of the American hospitality sector, 87% of the human resource managers who responded stated they viewed visible tattoos or piercings on employees negatively (Swanger 2006). This is surprising, however, when contextualised within the apparently more frequent uptake (and therefore „normalisation‟) of piercings and tattoos.

Two films deserve mention here with regard to their respective focuses of tattooing. "The Tattooist" relays the story of a Western tattoo artist imposing himself upon the traditional Polynesian and Samoan tattooing practices, resulting in his utilisation of cursed instruments. This film suggests the implicit relationship between South Pacific tattooing and superstition. A German film "Tattoo" documents the illicit trade in tattooed human skin. The emphasis of this production is the artistic quality of tattoos created by renowned tattoo artists, worthy of collection, valuable enough to warrant murder for possession. While both films are entirely fictional, the underlying themes they represent are of significance when considering modern opinions of tattooing practices, most specifically when we consider these opinions must be sufficiently widespread to justify the films‟ productions and distributions.

A documentary series entitled „Marked‟ investigates tattooing practices in relation to certain groups. With episodes dedicated to American prisoners, American Hispanic gangs, Russian prisoners, the Yakuza and the American military, the interviews given relate to tattooing within subcultures. It is interesting to note the justification for the practice by individuals within these groups, and their experiences and opinions regarding tattoo culture.

In respect of artistic value, David Orpeza, a gang member says

> "Even though I wear the tattoos that‟s all I am, I‟m a keeper, it‟s their art".

Another variation of motivation and justification for acquisition of tattoos is given by Senior Chief Tom Crimmins, a former US Navy Seal

> "I use tattoos much like others put stickers on a travelling trunk. Everywhere that I have gone in the Navy for 21 years that had a decent tattoo parlour, I like to get a tattoo there so I have a stamp from that country or place."

reflecting the aforementioned motivations expressed by eighteenth century sailors.

The ability to assess the opinions of those within these sub-groups is equally as valid to investigations regarding tattoo and body modification practices. They often disprove the preconceptions those of us outside the cultural unit may have, based upon „evidence" presented to us by academics and investigators who are also „outsiders" with regard to their subjects of investigation.

Another informal documentary claims to investigate the world of tattooing; "Tattoos: a scarred history". However, the opening statement "I"m going to delve into the dark, dangerous world of tattoos and body modifications to discover their appeal" is loaded with opinion and expectation, further supported by opening credits displaying images of more extreme forms of body modification such as suspension (the practice of lacing a series of piercings on a person"s body and attaching the ribbon to a fixed elevated point, thus „suspending" the individual in the air by their piercings). The opinions expressed by the editor of a popular body modification magazine „Skin Deep" are interesting when he states that "the stigma related to tattoos is falling away as it becomes celebrated for its artistry rather than as a marker of deviance" and emphasising that the subject matter of a tattoo is not the main consideration in choosing to publish certain examples of work, rather the technicality and execution of the work itself.

In this documentary, the journalist, Sousila, wears an eyebrow piercing and yet she states that she „fears" facial tattoos- or rather, those that wear them. At no point in the documentary is a distinction drawn between the acceptability of facial piercings as opposed to facial tattoos. As the documentary progresses the presenter and researcher states her changing opinion of tattoos from being on the peripheral, dangerous edges of society, or a fashion-driven commodity, to a lifestyle and an ability to express. This is contradicted, however, in her closing statement likening „tattoos in the 00"s" to the „miniskirts of the 60s" and the „platforms of the 70s".

Other documentaries recently broadcast worthy of mention here include "the 50 greatest plastic surgery shockers" and "The World"s Strangest Plastic Surgery and Me". These documentaries are aired as dealing with the subject matter of „plastic surgery", commonly regarded as procedures carried out by qualified medical professionals. However, both programmes detail such practices as tongue splitting, suspension piercings, full body tattoos, sub-dermal implants and tooth filing; practices not traditionally carried out by medical professionals, nor traditionally considered plastic surgery.

The effect of each programme is that the viewer sees collaboration between body modification practices and plastic surgery, both apparently undertaken in a frivolous manner, and both depicted as unorthodox and unusual.

This portrayal directly continues the European historical and traditional view of tattooing and body modification practices as being frivolous, exotic and unnecessary, a seemingly outdated opinion when we consider the apparent prevalence of practices often quoted by academics (Farmer *et al.* 2005, Swami and Furnham 2007, Bone *et al.* 2008, for example). What must be borne in mind in regard to these programmes, however, is the extent of modification practices undertaken. Individuals such as „Catman", „the Enigma" and „Leopard man" are all depicted, all of whom have devoted their entire bodies and lifestyles to their modified selves; an uncommon undertaking not representative of the „modified masses".

We see here a blurring of boundaries between body modification practices and plastic surgery, and it is therefore considered here that the umbrella term „elective modification" be utilised to refer to all practices undertaken by an individual to significantly alter their physical appearance. In comparison it is considered therefore that „body modification practices" be defined as presented in Chapter 1; the alteration to the phenotype not apparent in official ante-mortem records as a matter of course.

Tattooing has not only become the subject of many media projects, however, but it has also recently enjoyed much focus in the academic world. Exhibitions at the Wellcome Trust („Skin" 2010), the Anthropology Museum of Cambridge (2010) and the Captain Cook birthplace museum in Middlesbrough (2010) have all displayed various elements of tattooing. The perception that modern opinions towards tattoos is rooted in their artistic skill can be seen demonstrated in such exhibitions as the recent "Under the Skin: Tattoos in Japanese Prints" exhibition at the Boston Museum of Fine Arts (April 2010- January 2011). Renowned for its collection, the presence of works whose subject matter is tattoos reinforces the modern perception of their artistic qualities. The collection of prints described as portraying the „visual splendour of Japanese tattoos" (www.mfa.org 2011) was an extremely popular exhibition, complimenting the museum"s other oriental exhibitions.

Tattooing and body modification practices have equally been the focus of medical and scientific literature, some highlighting the health risks associated with tattooing and piercing practices (for example López-Jornet and Camacho-Alonso 2006, Kazandjieva and Tsankov 2007a, Tse *et al.* 2007, Maheu-Robert *et al.* 2007, Kaatz *et al.* 2008 or Doremus 2009).

Recent academic studies focusing upon the psychology of body modification practices have resulted in the publications of books such as Lemma"s *Under the Skin* (2010) and Atkinson"s *Tattooed* (2003). Atkinson"s study focuses principally upon the modification practices undertaken and displayed by Canadians, questioning the apparent influx in popularity of tattooing and piercings when "a plethora of less permanent and more normative methods for manipulating bodies" is available (Atkinson 2003:4). Further to this, consideration is also given to the interrelated elements of modification acquisition and personality, focusing upon "the ongoing „psychogenic" development of individuals, and how the experience of being tattooed is grounded in fundamentally interdependent, highly rationalized, and deeply affective structures of interpretation." (Atkinson 2003:5).

Lemma"s work is also rooted in psychological aspects of modification practices, discussing issues such as body-dysmorphic disorder, appearance anxiety and body image disturbance. Taking an explorative, rather than accusing, stance, Lemma"s work highlights to the psychoanalyst the issues that may be encountered in individuals preoccupied with body modifications, exhibiting underlying psychoanalytical conditions, rather than assuming all modified individuals to be suffering similar conditions.

Recent examples of investigating the association between the undertaking of tattooing and discrepancies of behaviour and personalities include Koch *et al.* (2010). When studying American College students, they "propose that individuals with increasing evidence of body art procurement will also report higher levels of deviant behaviour" (Koch *et al.* 2010: 151) which they term to be cheating in their academic work, not participating in college-level sports and comparatively higher levels of sexual activity.

In this paper, multiple tattoos or piercings, as well as intimate piercings (nipple and genital piercings) are termed „extreme‟ body modification and are considered to express „commitment to a sub-cultural identity‟ (Koch *et al.* 2010: 156). It is the opinion of the author, however, that while genital and nipple piercings are frequently considered more „extreme‟, the only justification for this assumption is the increased sensitivity of these particular physical locations, denoting „extreme‟ behaviour to be the withstanding of pain, or the use of piercings as a sexual stimulant. With regard to the proclamation of sub-cultural identity through the acquisition of these piercings (better termed „intimate‟ piercings) it could be argued they are less of an outward statement of sub-cultural identity, given their private location and the ability to see them only in moments of undress.

With regard to medical contemplations of body modification practices, Armstrong and Murphy (1997) relate that since the 1970s physicians have been concerned with tattooing and its links to „embarrassment, shame and social disgrace‟ (Armstrong and Murphy 1997: 182) implying the stigmatisation of the practice within the medical profession (Armstrong and Murphy 1997). Often the potential for air-borne viruses and infections are quoted as the primary concern for medical practitioners, but here they concede that no cases of human immunodeficiency virus (HIV) or acquired immune deficiency syndrome (AIDS) have been recorded. However, their negative opinions pertaining to the practice of tattooing is evidenced in their conclusion when stating that better education regarding the risks associated with the practice may dissuade people from participating in it.

It is pertinent to highlight the apparent favour of investigating and questioning the practice of tattooing in preference to piercings or other modifications. This is highlighted by Mayers *et al.* (2002) stating “we were unable to discover any studies of piercing prevalence.” This is most interesting when we consider that in many medical studies piercings have proven to be more problematic than tattoos (Fisher *et al.* 2005). In their own survey of 106 tattooed students, none reported experiencing medical complications. They also call attention to the lack of viral infections reported by any of their respondents, but remain focused on the potential risk factors surrounding these practices, clearly demonstrating the deep-rooted belief within the scientific and medical professions, despite lack of evidence.

In 2008 a survey was conducted by Bone *et al.* investigating the occurrence of medical complications experienced by individuals with body piercings. The report was undertaken in order to provide numerological data to support the concerns within the medical professions. Rightly, the increased procurement of body piercing will increase the risk for infection, which in turn could impact significantly upon medical health care providers (e.g. NHS). While not frequently recorded, when complications are reported to medical health care providers the presence of a body modification on that particular individual will be available to post-mortem identification investigators.

Another common theme for medical attention to tattooing concerns the issue of removal. While the method and some motivations for removal will be discussed in Chapter 5, here it is worth highlighting the assumed motivations for removal applied to those seeking removal by the medical professions.

In a report published in the Nursing Mirror in 1984, the subject of self-tattooing amongst adolescents is discussed (Thomson 1984). In this report the resounding opinion is that the practice of self-tattooing by adolescents creates anxiety for their parents, partnering their own “shame, embarrassment and social disgrace” (Thomson 1984:41).

A letter submitted and published in the 1991 issue of British Journal of Plastic Surgery also discusses the regret some patients seeking tattoo removal experience, quoting depression and discrimination both at the workplace and in hospitals, and attributed these feelings to the acquisition of tattoos under „immature mental state“ (Balakrishnan and Papini 1991).

Further to this, Nicoletti claims that tattoos are “worn to express „the self", as a religious or political statement, to challenge society, as satanic symbolism, to imply bondage or ownership by another or as a form of expressive therapy” (Nicoletti 2004:215).

While these motivational factors cannot be discounted entirely, they are proposed without basis or evidence and as such should not be considered dominant themes as general motivations for acquiring tattoos or piercings. Again, the alliance between body modification practices and risk-taking behaviour is made, reinforcing this assumption within medical literature.

The most extreme opinions expressed by medics, however, are demonstrated by Kazandjieva and Tsankov. In their 2007 published comment the dermatologists state that “People with tattoos are often unbalanced and impulsive, with a twisted sense of independence and a rebellion toward the society” (Kazandjieva and Tsankov 2007b:361). This somewhat outdated, and certainly unsupported, claim is followed later by “The erotic and sexual suggestion that the tattoos of the twentieth century have is unquestionable” (*ibid.*). While it is true that some acquire tattoos for sexual motivations, this cannot be applied to all individuals exhibiting body art. While they concede that “Tattoos are not a symptom of mental disturbance” (*ibid.*), their opinions are potentially extremely damaging, especially when considering their medical profession and their apparent basis of opinion on conjecture rather than evidence.

The opinions of health care workers to modified individuals has been the subject of study by Stuppy *et al.* (1998) revealing that trained individuals all share negative attitudes towards those who partake in such practices. This implies that their training includes an element of disregard for modification practices and practitioners, which could be potentially damaging as to the extent and quality of health care modified individuals are awarded.

Constituting „modern opinion" awarded body modification practices, the issues of legislative cover of premises and practitioners should also be given some consideration. In part fifteen of the House of Commons Hansard Debate on May

12th, 1999, the Minister for Public Health (Tessa Jowell) referred to the powers of local authorities over piercing practices;

> "Local authorities have powers under specific and general legislation to regulate cosmetic body piercing businesses.....The licence conditions may cover matters such as the cleanliness and hygiene of the premises and equipment, and the safety of equipment...." (Column 287-288)

However, the inconsistency of legislation between locations inside and outside London Boroughs was also highlighted and addressed:

> "Local authorities outside London do not have specific powers to regulate cosmetic body piercings businesses. That is because when the legislation governing skin piercing businesses outside London was introduced in 1982, cosmetic body piercing was not included as it was not widely known about or practised.... However, many, perhaps most, cosmetic body piercing businesses also carry out tattooing or ear piercing, which local authorities outside London have powers to regulate by registration and byelaws." (Column 288).

Item eight of the 2005 Health and Safety Executive/ Local Authorities Enforcement Liaison Committee (HELA) details that:

> "there is an existing legal requirement for businesses involved in ear piercing and *permanent* tattooing to register under the Local Government (Miscellaneous Provisions) Act. Previously, some LAs had added a memorandum of understanding to byelaws under this Act, to include cosmetic body piercing, micropigmentation and similar activities." (LAC number 76/2)

What is alarming to the researcher is the irregularity of legislation applied to the body modification industry. The cleanliness and hygiene of a practice and its facilities is of concern to some local authorities, but seemingly not the competence of the practitioner, the source of materials, jewelleries or implants or, as shall be discussed in Chapter 5, the ingredients and chemistry of tattoo inks.

While mention is made of the „good-practice‟ and „guidelines‟ produced by the industry in certain locations (Column 288), the frustration the industry must experience through the lack of concise and consistent legislative cover is unsurprising. The industry has survived thus far without strict guidelines on how best to conduct business, demonstrated by the commonplace refusal to pierce minors, despite its lack of legal restriction where consent is given (Bewtra 2003).

However, even the infrequency of complications highlights the need for some individuals to be regulated in their involvement in the body modification business. The opinions of the authorities regarding body modification practices appear, therefore, conflicting. Regulations are employed in order to deter the damaging of an individual‟s immediate health through negligence, but no strict criteria are employed in covering long-term health complications (specifically seen investigated in relation to piercing complications and tattoo ink ingredients) or the apparent psychological complications medical literature propose (see, for example, Gittleson and Wallfn 1973, Thomson 1984, Balakrishnan and Papini 1991). A resolution to this conflict in opinion of, and occupation within, the industry will not be found until consistency in legislative cover is achieved.

2.9. Conclusion.

Body modifications have received much academic attention throughout history, though frequently cultural and geographic groups are investigated in isolation. The demonstration here of the global patterns of body modification, the influence of colonialism and the spread of religion upon global tribal customs, has allowed a vision of body modifications on a global scale, not exhibited previously.

Studies continue to focus upon modifications in cultural and geographical locations, but only upon viewing practices in a global manner can the overall influences and disparate cultures be suitably discussed, revealing worldwide trends, stimuli and the effects of external influences. The perceived act of colonialism eradicating cultural and tribal customs has been reported in each colonised location, but the global impact has gone unrecognised as it has not been studied on a global scale previously. It is only by doing so that we are able to distinguish between the act of colonialism and the spread of Christianity.

We can see here, therefore, due to the global presentation of information, body modification practices initially experienced periods of celebration and intrigue with the arrival of the colonialsts, in some areas even intensifying the practices for financial gain (South Pacific, South America, Africa.) Only upon settlement and the establishment of the Christian faith did the tribal customs wane, a pattern which continues to prevail even in the modern world.

What has been demonstrated here, then, is the longevity of all body modification practices and their gradual suppression by, but also introduction to, Western cultures. With the advent of consumerism in the 1950s body modifications followed suit and became „commodities" that could be more readily purchased and resultantly became more „mainstream". With this transformation from a peripheral activity to one in the mainstream, however, opinions of those who did not partake did not alter, and seemingly remain unaltered today.

The necessity for rational and informative research into the motivations for partaking in modification practices is pertinent to post-mortem studies as it may enable a more complete picture of the individual"s life, lifestyle and experiences to be surmised by the investigating parties (Thompson and Puxley 2007).

"The only reason we think of something as unusual is that we have not noticed how ubiquitous it really is." (Reed 2000)

Chapter 3

3. Survey of body modifications.

3.1. Introduction

When investigating the significance of tattoos, piercings and body modifications in the forensic context it is important to consider their prevalence within the general population. It is often quoted that body modifications are becoming more popular and that there has been a growth in their general acceptance (e.g. Muldoon 1997, Koenig and Carnes 1999, Mayers *et al.* 2002, Farmer *et al.* 2005, Swami and Furnham 2007, Bone *et al.* 2008). This claim has never been broadly or thoroughly investigated however, as surveys pertaining to body modifications have tended to focus on specific sub-sections of society, such as juvenile delinquents (Muldoon 1997, Carroll *et al.* 2002, Ferreira 2009), drug users (Watts and Wright 1990, Armstrong and Murphy 1997, Brooks *et al.* 2003), prison inmates (Abiona *et al.* 2010), the mentally ill (Gittleson and Wallfn 1973), military personnel (Armstrong 2000) and undergraduate university students (Mayers *et al.* 2002, Koch *et al.* 2010).

More general surveys, where they have been carried out, have tended to be concerned with the health complications of body modifications (Bone *et al.* 2008). There is a more general association between body modifications and „unsavoury" echelons of society which tends to mitigate against a more dispassionate analysis of their occurrence and popularity.

In order to try and provide a more generic understanding of body modifications within the general population an 18 month national survey was conducted, collecting responses digitally as well as on paper. A pilot study was undertaken and modifications were made to the survey as a result. The results and their implications for the survey will be discussed in detail below. The second survey delved into the personal opinions of the modified respondents, the overall survey itself (both parts) was constructed to try and tap into the experiences of the British public.

3.2. Previously conducted surveys relating to body modifications.

Often the subject matter of criticism and disapproval, few surveys relating to body modification practices have been undertaken with the aim to determine the prevalence of such practices in general society. Frequently body modifications, specifically tattoos, are investigated in those convicted of criminal behaviour, drug use, displaying anti-social behaviour, or with cases of mental instability. Published, and therefore commonly believed, research in the 1950s demonstrated the commonplace nature of tattoos on prison inmates, concluding that tattoos were inextricably linked to anti-social and criminal behavioural tendencies (van Dinter 2005).

In 1973, a paper entitled "The tattooed male patient" (Gittleson and Wallfn 1973) was published seemingly linking the practice of tattooing to mental instability and criminal behaviour. Stating that "the overall incidence of tattooing among male patients in a Special Security hospital for aggressive subnormals and psychopaths was 15%" (*ibid.*: 295) along with reporting that while the incidence of tattooing was no higher in the general ward than in the psychiatric ward, the tattooed men housed in the psychiatric ward were significantly worse afflicted than the non-tattooed men. When recalling the motivations quoted for acquiring tattoos, "Sixty-two per cent (48 men) were conforming to and/or following a contemporary group craze or fashion, 17% (13 men) were tattooed on impulse whilst in a state of boredom, 17% (13 men) described a purposive wish of some duration" (*ibid.*: 297). This paper goes on to state that "in a general hospital population the tattooed man is three times more likely to have been criminally convicted than the non-tattooed man"(*ibid.*: 299). These figures were gleaned from questioning the men on their behaviour and criminal records, not on official documentation regarding each patient, and so in fact one should read the final conclusion to state that “the tattooed man is three times more likely *to admit* to having been criminally convicted”.

Of the publications to date, the majority relate to American populations including prisoners (Abiona *et al.* 2010), juvenile delinquents (Muldoon 1997, Carroll *et al.* 2002, Ferreira 2009), gang members (Valentine 2000), military personnel (Armstrong 2000) or undergraduate students (Mayers e*t al.* 2002, Koch *et al.* 2010). British research is more limited. One widely distributed survey is reported, focusing primarily on piercings, the impact on health and the impact resultant complications may have upon the National Health Service (Bone *et al.* 2008).

Estimating the prevalence of piercing at sites other than the earlobes, this survey provides useful data against which to compare the results gleaned from this study. However, with the focus being to unveil complication rates in pierced females, aged 16-24 only, while the number of respondents was high (10,000) the forensic value of the results is minimal as it is not a representative sample of the wider British public. Within the study, however, the intentions of the researchers is clear; reference is made to „professional help being sought‟ in the event of complications arising, though the reference is explicitly in regard to health care providers and not piercers, inferring their unprofessional status by comparison to their health-care counterparts.

Bone *et al.* discuss concerns in much the same way as Gittleson and Wallfn stating that “serious complications requiring admission to hospital *seem* uncommon” (Bone *et al.* 2008: 1) (italics author‟s own). The aim of the article is to alert health care providers to the potential for complications with piercings to arise, but their findings suggest minimal evidence of this. Forensically, complications resulting in medical attention are of value as an individual‟s piercing(s) will therefore be reported in medical ante-mortem records.

We see that even apparently objective surveys can reveal the investigators‟ own opinions regarding them, influencing the information retrieved. Therefore it is not so much the proliferation of such practices that prevails in these studies, as the attitudes and opinions towards them. The survey conducted as part of this research has no aim other than to document the prevalence of body modification practices among a cross-section of the general public and to later reveal the motivations, rationalizations and considerations given to the practice of becoming modified.

3.3. Methods of implementation of the survey as part of this research.

A nationally distributed survey was conducted in order to ascertain an indication of the prevalence of body modifications within the modern British public. It was also constructed to investigate motivations for becoming modified, to make recommendations or highlight considerations, and to relay any notable experiences that are of significance to this field of enquiry.

Initially a Pilot study was conducted (at the University of Dundee), in accordance with academic recommendations (Shennan 2001) so as to determine the best course of action for the main study. With a total of 155 respondents, analysis highlighted certain areas for reconsideration: the wording of particular questions, the limiting of open-ended responses, and also the method of distribution.

While the surveys conducted as part of this research were national in their distribution, they cannot be considered indicative of a „representative‟ study. To facilitate such a survey would have been beyond the resources of this research as it would had to have utilised official government records (such as voting registers) or confidential medical records for systematic selection of participants. Consequently a large number of individuals would have to have been contacted, of which only a proportion would be expected to reply (Robson 1993).Given the seemingly „obscure‟ subject matter of this investigation it can be considered that the response rate would have been significantly lower, negating the representative approach.

Therefore, the survey was assembled in such a way as to be of interest to as many participants as possible and was distributed as widely as possible aiming for respondents from all strata of society. This was further pursued by the posing of particular questions (religion, occupation, for example) and the circulation and distribution of paper copies of the surveys at certain group meetings to target individuals who otherwise were unlikely to have been represented (Rotary clubs, Probus clubs, Women"s Institute).

Whilst not, therefore, a representative survey, the distribution and response to this survey can be used as an indicator of trends and proliferation in the British public. Awareness of the types and incidence of body modification practices in the British public is vital for efficient forensic interpretation and practice in the future.

An internet based survey was constructed for distribution digitally. The survey designer "survey monkey" was employed thanks to its simple format, personalisation and instant distribution. In addition, a paper version was compiled, allowing for the collection of responses from those not contactable via the internet. The online survey was „live" collecting responses for a period of 18 months, through which time paper surveys were also circulated. By utilising the internet, responses were collected and stored instantaneously, allowing for patterns to be identified and omissions or over-representation to be monitored also. This was important in the assurance of unbiased results- if a particular age group or geographical region appeared over-represented, the distribution of paper copies could be utilised to redress the balance. In total, 880 adults responded in a usable manner to the survey (discounting those not resident in the UK, repeated responses from technical failure or incomplete responses, totalling 43).

3.4. Pilot Study Results

Table 2. Summary of pilot study results

	Total Respondents	Piercing totals	Tattoo totals	Both	Neither	Tattoos only, no piercings	Piercings only, no tattoos
Female	114	90	36	31	17	7	53
Male	41	18	15	8	17	6	9

Table 3. Tattoos in pilot study.

Age group	% of females	No. of females	% of males	No. of males
18-21	16%	7/44	0%	0/12
22-31	39%	16/41	50%	7/14
32-41	50%	10/20	57%	4/7
42-51	37.5%	3/8	57%	4/7
52-61	none	none	none	none
62+	0%	0/1	none	none

Table 4. Piercings in pilot study.

Age group	% females	No. of females	% of males	No. of males
18-21	75%	33/44	17%	2/12
22-31	76%	31/41	57%	8/14
32-41	90%	18/20	71%	5/7
42-51	87.5%	7/8	43%	3/7
52-61	none	none	none	none
62+	100%	1/1	none	none

Table 5. Both piercings and tattoos in pilot study.

Age group	% females	No. of females	% males	No. of males
18-21	14%	6/44	0%	0/12
22-31	29%	12/41	17%	2/14
32-41	50%	10/20	57%	4/7
42-51	37.5%	3/8	29%	2/7
52-61	none	none	none	none
62+	0%	0/1	none	none

It would be wrong to utilise these findings as a representation of the population as a whole, as discussed above, but they do raise some interesting findings. For example, according to the results from the pilot study, less that ½ of the respondents aged 18-21 are tattooed and less than ½ of the respondents aged 22-31 are tattooed. It also reveals that ½ of the respondents aged 32-41 are tattooed, a similar figure for those aged 42-51. This seems to discount the common opinion that tattoos are young commodities. No-one, according to these results, over the age of 52 is likely to be tattooed- however, this is misleading as in fact only one individual over the age of 52 responded to the survey, therefore not representing the population over 52 years of age at all.

These results also infer that those individuals aged 18-21 that are tattooed are all female. However, over the ages 22-31 and 32-41 men are more likely to be tattooed than women. Further to this, significantly more men than women aged 42-51 are tattooed. These results show not only a sex bias, but also a significant age bias; 75% of all females 18-21 are pierced, whereas less than 20% of their male counterparts are pierced. 75% of all women aged 22-31 are also pierced, and over 50% of the males of the same age group are pierced too.

90% of the women aged 32-41 who responded to this survey are pierced, showing it a rarity to not be pierced. In the same age group 75% of men are pierced- again, this age group dispelling the myth that piercings are a younger phenomenon exclusively for women. Piercings in women aged 42-51 are just as popular, and almost 50% of the men of the same age are pierced.

Initial analysis of these results indicated that re-wording of certain questions, and the re-ordering of subject material would provide more useful results in regard to the prevalence of piercings and tattoos. It was also thought that the title of the survey and its outline would simply deter those who considered themselves to be without modifications from responding- already biasing the results. Therefore, the title was re-worded from "Body Modification Questionnaire" to "Leverhulme Body Modification Survey" emphasising the funding body, the Leverhulme Trust, in order that professional association with the academic institute would enthuse and reassure people to take part. It was also thought that „questionnaires" were commonly distributed among people who partake in the activity being investigated, whereas „surveys" are more commonly distributed to all individuals, often seeking overall representation of the subject matter being investigated.

The first page was re-written as an official introduction to the research outlining aims, purposes, contact details of the researchers, the rights of the participants and, most crucially, gaining consent immediately upon production of all this information. It was then considered that in order to engage all individuals, whether „modified‟ or not in their own opinion, questions regarding the more „simple‟ and „socially acceptable‟ modifications such as ear-lobe piercing were put first. Personal questions about age, sex and race were seen by some as a deterrent for completion of the questionnaire, even though answers were optional. By positioning them at the end of the questionnaire the more critical information regarding body modification practices themselves were already collected and the optional questions positioned last after collection of the crucial data.

It is by conducting such pilot studies that we can see the importance of ensuring even distribution, throughout sexes, age groups, professions, locations and other variables, to ensure un-biased distribution can be facilitated. It was therefore decided that a significantly larger survey be undertaken, to reduce the possibility of bias and omission. Second to this, it was also determined that two surveys should be conducted in order to capitalise upon the two distinct areas of interest- firstly the prevalence of modifications in the modern British public, and secondly to investigate various aspects of the modification procedure from those who had experienced it.

It was also decided that the website used (surveymonkey.com) would continue as a result of its simple implementation and personalisation, but that circulation of paper copies also be used, to target the less digitally competent in particular. By attending such events as Rotary Clubs, Probus Clubs, Womens‟ Institute and other such coffee meetings, responses from both sexes across Britain from the older generations (who, it transpired, were less represented online) was achieved. Paper copies were also distributed and returned through hairdressing salons and barber shops, where people were likely to have time to complete the questions and it was thought to be equally likely that all generations and various occupations could be represented.

Internet address lists from such bodies as BABAO (the British Association of Biological Anthropologists and Osteologists), BAHID (British Association for Human Identification), Teesside University and companies, friends/families of the researchers allowed for instant distribution of the survey to the wider British public.

3.5. National Survey 2008-2009.

Rationalization for the questions asked in each survey can be found in Appendix 1.

3.6. Results

Those with and without piercings, tattoos, scarification, branding and other types of modifications were all represented in this survey. Individuals of each sex, age group, religion, region of the UK and multiple professions were all well represented also. A slight bias towards those within 18-36 age bands as well as a large representation of those from the North East was noted, but was most likely due to the geographic base of the study at Teesside University, though this bias became less significant as the study continued.

Results from both surveys can be found in Appendix 9.

Table 6.

sex * age category * earlobe piercing Crosstabulation

Count

earlobe piercing			age category								
			16-17	18-25	26-35	36-45	46-55	56-65	66+	Undisclosed	Total
yes	sex	female	6	167	206	53	55	19	7	15	528
		male	1	16	16	11	5	0	0	2	51
		Total	7	183	222	64	60	19	7	17	**579**
no	sex	female	0	17	26	5	6	5	3	1	63
		male	1	57	97	14	17	18	23	11	238
		Total	1	74	123	19	23	23	26	12	**301**

All respondents were questioned initially about earlobe piercing as it is a commonplace piercing not considered a „modification" by many. Overall 579 of 880 respondents reported earlobe piercing. As may be expected, we see a clear sex bias towards women exhibiting earlobe piercings-528 (89%) women to just 51 men (18%). Those age groups where men exhibit earlobe piercing most frequently are from 18-25 and 26-35 (63% of all men with earlobe piercings; though this figure itself underscores that 37% of men with earlobe piercings who responded to this survey were over 35). Females with earlobe piercings are proportionately demonstrated in all age groups in this study.

Table 7.

sex * age category * other piercings Crosstabulation

Count

other piercings			age category								
			16-17	18-25	26-35	36-45	46-55	56-65	66+	Undisclosed	Total
yes	sex	female	0	92	99	14	7	1	1	12	226
		male	2	11	26	7	1	0	0	2	49
		Total	2	103	125	21	8	1	1	14	275
no	sex	female	6	93	133	44	54	23	9	3	365
		male	0	62	87	18	21	18	23	11	240
		Total	6	155	220	62	75	41	32	14	605

When questioned regarding „other" piercings (piercings at locations other than the earlobes), the sex bias is much less significant- 226 women (38%) to 49 men (17%). Again, piercings at sites other than the earlobes proliferate in the age group 26-35 (53% of all men with piercings were in this age group). It is interesting to note the significant difference between the sexes in the youngest age group of 16-17, where the females all display earlobe piercings, but no other piercings, and the male respondents both display body piercings (one of whom also has his earlobes pierced). Note the similar numbers for men between those with earlobe piercings and those with piercings in locations other than the earlobes. According to these findings they are just as likely to have their earlobes pierced as any other body part, seemingly counteracting the traditional view that earlobes are predominantly a female-only location for piercing.

Table 8.

sex * age category * tattoos Crosstabulation

Count

tattoos		age category 16-17	18-25	26-35	36-45	46-55	56-65	66+	Undisclosed	Total
yes	sex female	0	61	77	21	8	0		6	173
	male	1	11	34	12	7	1		4	70
	Total	1	72	111	33	15	1		10	243
no	sex female	6	124	155	37	53	24	10	10	419
	male	1	62	79	13	15	17	23	9	219
	Total	7	186	234	50	68	41	33	19	638

Here, we see that women are less likely to be tattooed than pierced with only 173/591 tattooed (29%) compared to 226/591 pierced in locations other than earlobes (38%). Men, however, are more likely to be tattooed than pierced with 70/289 tattooed (25%) and only 49/289 pierced in locations other than earlobes (17%). Again, the age bias is notable with almost two thirds (64%) of the men with tattoos being 18-35. This age bias is reflected in the female respondents also, with 80% of the tattooed female respondents being aged 18-35. We see that none of the females aged 16-17 bear tattoos, but one of the males does.

In older groups, such as 46-55 only one male has a body piercing, but there are 7 men with tattoos. 8 women in the same age group have tattoos, and only 7 have a piercing in a location other than their earlobes.

Table 9.

sex * age category * number tattoos Crosstabulation

Count

number tattoos		age category 16-17	18-25	26-35	36-45	46-55	56-65	66+	Undisclosed	Total
0	sex female	6	124	155	37	53	24	10	10	419
	male	1	62	79	13	15	17	23	8	218
	Total	7	186	234	50	68	41	33	18	637
1	sex female		31	36	10	5			2	84
	male		4	19	2	3			3	31
	Total		35	55	12	8			5	115
2	sex female		13	19	5	2			2	41

		male		3	5	4	1			0	13
		Total		16	24	9	3			2	54
3	sex	female		6	9	4	0	0		2	21
		male		0	4	1	1	1		1	8
		Total		6	13	5	1	1		3	29
4	sex	female	0	5	2	1	0				8
		male	1	3	2	1	1				8
		Total	1	8	4	2	1				16
5	sex	female			2	0					2
		male			3	1					4
		Total			5	1					6
6	sex	female		2	3	0					5
		male		1	0	1					2
		Total		3	3	1					7
7	sex	female		2	2					0	4
		male		0	0					1	1
		Total		2	2					1	5
8	sex	female		1	1	0	1				3
		male		0	0	1	0				1
		Total		1	1	1	1				4
9	sex	female			1						1
		Total			1						1
10	sex	female		1	1						2
		Total		1	1						2
11	sex	female			1						1
		Total			1						1
13	sex	male			1						1
		Total			1						1
15	sex	female				1					1
		Total				1					1
17	sex	male				1					1
		Total				1					1
20	sex	male					1				1
		Total					1				1

It is most common that individuals have only one tattoo (115), but multiple tattoos still proliferate in descending popularity. Men and women are both represented as the number of tattoos increases, neither more significantly represented than the other.

Table 10. Overall piercing and tattoo prevalence in each sex.

Age	Females with piercings **%** (actual values)	Females with tattoos **%** (actual values)	Males with piercings **%** (actual values)	Males with tattoos **%** (actual values)
16/17	0 (0/6)	0 (0/6)	100 (2/2)	50 (1/2)
18-25	50 (92/184)	33 (61/184)	15 (11/73)	15 (11/73)
26-35	43 (99/232)	33 (77/232)	23 (26/113)	30 (34/113)
36-45	24 (14/58)	36 (21/58)	28 (7/25)	48 (12/25)
46-55	11 (7/61)	13 (8/61)	5 (1/22)	32 (7/22)
56-65	4 (1/24)	0 (0/24)	0 (0/18)	5 (1/18)
66+	10 (1/10)	0 (0/10)	0 (0/23)	0 (0/23)
Undisclosed	80 (12/15)	38 (6/15)	15 (2/13)	31 (4/13)

Half of all females aged 18-25 display piercings, a third also display tattoos; twice as many as their male counterparts who are just as likely to be tattooed as pierced (15%).

Under half of the female population aged 26-35 have piercings, and only a third again have tattoos, almost equal to their male counterparts, though tattoos are more common for men of this age group than piercings.

Significantly more tattoos than piercings are undertaken in both sexes aged 36-45.

Tattoos and piercings are almost equally as common in females aged 46-55, whereas men are significantly more likely to be tattooed than pierced (32% tattooed, 5% pierced).

Piercings are infrequently worn by women aged 56-65, and no tattoos were reported. Men of the same age group show the opposite, with no piercings recorded, but a few tattoos still apparent.

Over the age of 66 no tattoos were reported and only 10% of women reported piercings in locations other than earlobes. No men in this age group displayed body modifications of any description.

Those unwilling to reveal their ages in the „undisclosed" group were 80% likely to be pierced if they were female, though only 15% if male. Tattoos were less than half as popular in women (38%) but almost a third of the men in this group were tattooed.

The most common single piercings were: lip (10 individuals), nose (16 individuals) ear cartilage (45 individuals), and navel (61 individuals). Of these, sex biases can still be seen; 7/10 lip piercings were females, 14/16 nose piercings were females, 37/45 ear cartilage piercings were female, 60/61 navel piercings were female. Nipple piercings were biased in opposition, however, with only 1/5 being females, and tongue piercing being almost equal- 5/9 being females.

Combinations of piercings showed clear sex biases. Male-only combinations included; ear cartilage with genital piercings; ear cartilage with nipple piercings; ear cartilage with lip, nipple and genital piercings; ear cartilage with lip, tongue, nipple and genital piercings; ear cartilage with tongue and nipple piercings; tongue with nipple piercings; and nipple with genital piercings. Female-only piercing combinations included: ear cartilage with eyebrow and lip piercings; any combination of ear cartilage with nose piercing; any combination with navel piercing (with the exception of one male respondent who sported a navel piercing „after losing a bet"); ear cartilage with tongue and genital piercings; nose with lip piercings; nose with lip and nipple piercings; and nose with tongue piercings.

3.7. Discussion

Table 11. Showing comparison of results gleaned from this study with those of studies conducted previously.

Study	Respondents	Findings
Mayers et al 2002	American university undergraduates	51% pierced 23% tattooed
Carroll et al 2002	12-18 year olds	26.9% pierced
Laumann and Derick 2006	18-50 year olds	13.2% pierced 24% tattooed
Bone et al 2008	16-24 year old British females	46% of females pierced
Koch et al 2010	American university undergraduates	37% pierced 14% tattooed
Abiona et al 2010	American prison inmates 18 years and above	60% pierced 67% tattooed
Own research	British nationals, 16 and above	38% of females pierced (48% females aged 16-25) 28% females tattooed 17% males pierced 24% males tattooed

The previous studies displayed here demonstrate the prevalence of body modification practices within certain targeted groups. When comparing the results from Mayers *et al.* and Koch *et al.* we see significant differences in frequency despite both surveys having been undertaken on University undergraduates (Mayers *et al.* report 51% pierced and 23% tattooed, whereas Koch *et al* report 37% pierced and only 14% tattooed). This difference can probably be accounted for as each survey was undertaken at different universities.

The proliferation and popularity of tattooing and piercing is demonstrated by Abiona *et al.'s* research pertaining to prison inmates in the American penitentiary system. What is interesting to note, however, is the comparative results gleaned by both this study and the study conducted by Bone *et al* with regard to females aged 16-24. These studies were carried out contemporaneously in the UK and so it is unsurprising that such comparable results be collected.

Comparative results are also seen in the tattooing figures quoted here from this study and from Laumann and Derick (2006) in the USA, demonstrating 24% prevalence of tattooing overall (here we see 24% of men tattooed and 28% of women). Laumann and Derick, also noted equal results between men and women, whereas the results of this study indicate a slightly higher prevalence of tattooing in women than men. Great variation can be seen, however, when comparing the results of these two studies in regard to piercing prevalence- an overall quote of 13.2% (Laumann and Derrick) to 38% of females and 17% of males in this research. Whilst the prevalence for men is almost comparable to the value quoted by Laumann and Derick, the anomaly of the prevalence of piercing cannot be explained, especially given the corresponding results of this study and Bone *et al.*, except in that Laumann and Derick"s work was conducted in the USA, whereas Bone *et al*, as here, conducted their research in the UK. What is detailed in the study by Laumann and Derrick, however, is the confirmation that piercing is more commonly practiced in women than in men.

<u>Survey 2</u>

Those respondents with modifications who had supplied contact details and who had accepted to be contacted again in the future were sent the second survey for completion. The second survey acquired 69 respondents.

There is a clear difference in attitudes towards becoming tattooed and pierced, as evidenced by the results gleaned from this second survey. The novelty of the information this survey has retrieved provides the opportunity to access the modern British public in a way that has not been investigated previously, and is of great significance to many disciplines as a result, not only the forensic disciplines as detailed specifically in this research, but also the social sciences, medical sciences and interrelated disciplines.

Both surveys indicate useful future implementation in each of these disciplines by deliberately separating the information pertaining to proliferation and uptake of modifications (survey 1) and then analysing the motivations, considerations, influences and attitudes to modification practices, crucially from those who partake in them, rather than from the standpoint of observing professionals (survey 2).

The ability to underscore the attitudes of those involved in such activities is also novel, as previous studies have asked question regarding proliferation (Bone *et al.* 2008) but attitudes and opinions awarded them have only been studied and proposed by external audiences (for example Mayers *et al.* 2002, Swami and Furnham 2007), therefore detailing the opinions and motivations of those not partaking in the practices, as opposed to those that are.

3.7.1. Piercings

It is of particular interest to note that of earlobe piercings, only two individuals reported unilateral piercing, both of the left earlobe. No-one reported amateur piercings, with all piercings investigated being completed by professional piercers. 76% of pierced respondents would have another piercing. Only one regretted their piercing, but as a result of imperfect positioning reporting "my belly button piercing is wonky!" Of those without a piercing (and therefore with a tattoo), 27% stated that they were interested in getting one.

Table 12. Motivations for choosing a particular practice for piercing acquisition.

Practice location		
Local/Close proximity	Recommended	Cost
23	15	3

Particular quotes regarding choice of practice included "I was on holiday there" implying the extra-curricular nature they regard piercings with. Only one mention of hygiene was retrieved by this study, in particular regard to a genital piercing (clitoral).

Table 13. Motivations and explanations for acquiring piercing.

Motivation						
Liked look on others	Fashion	Impulse	Rebellion	Friendship	Emotional	Cultural
17	13	7	6	3	2	2

Quotes relating to motivation to become pierced included: admission of „addiction‟; the argument that piercings are „now accepted socially and professionally‟; the desire for „physical change‟; „expression of individuality‟; one instance of parental implementation for „gender identification as a child‟; and also „clitoral stimulation during intercourse‟. One individual also stated „I took into consideration my parents‟ wishes‟. One individual who also opted for clitoral piercing stated their motivation as being for the „sexual stimulation of my partner- then later for myself‟. This is interesting when related to an element of Juno and Vale‟s 1989 research which included interviewing a piercer who‟s own opinion was “I won‟t pierce a woman who‟s obviously come in because her husband or boyfriend wants it- to me that‟s violation” (Juno and Vale 1989). Only two individuals stated that alcohol was a factor in their choice to become pierced- and one of these was as a result of a „drunken bet‟.

3.7.2. Tattoos

Table 14. Demonstrating frequency of anatomical location of tattoos.

Tattoo location (anatomical)			
	Total	**Male**	**Female**
Head	1	0	1
Neck	1	0	1
Upper Back/Back of shoulder	17	9	8
Middle Back	4	2	2
Lower Back	10	0	10
Chest	3	2	1
Upper arm (L)	5	4	1
Upper arm (R)	6	4	2
Lower arm (L)	5	2	3
Lower arm (R)	5	3	2
Hand (L)	0	0	0
Hand (R)	0	0	0
Stomach	5	2	3
Hip	4	0	4
Upper Leg (L)	0	0	0
Upper Leg (R)	1	0	1
Lower Leg (L)	2	0	2
Lower Leg (R)	2	0	2
Foot (L)	2	0	2
Foot(R)	9	2	7
Other:	Left ribs/torso Bottom Armpit	0 0 1	2 1 0

We see in this table a clear sex-bias from this survey"s respondents for certain tattoo locations, most notably the lower back- 10 females reported a tattoo in this location, and no males. There is also some female bias towards locations such as the hip, lower legs and side of the torso (ribs).

Conversely, there are no tattoo locations exclusively reserved for men, with the exception of the armpit, though with only one respondent bearing a tattoo in this location, no bias can be reported categorically.

Table 15. Motivations for choosing a particular practice for tattoo acquisition.

Practice location					
Local/Close Proximity	Recommended	Artist‟s Reputation	Cleanliness	Cost	Friendliness
17	16	7	5	2	1

One individual reported that a friend tattooed them. While alarming on face value, further analysis of the respondent‟s answers revealed their friend to be a professional tattoo artist. One individual reported their desire to receive a tattoo in Asia. Of great significance also, however, was one individual‟s (aged 18-25) choice of practice being determined for their first, underage tattoo, being because it was „the only place that didn‟t ask my age‟. This is an interesting reflection of the motivations of the male respondent aged 16-17 who has a total of four tattoos, especially considering the illegality of tattooing minors. While it is not illegal to become tattooed under the age of 18, it is illegal to tattoo a minor.

Table 16. Motivations and explanations for acquiring tattoos.

Motivation	
Liked Imagery	16
Positive Commemoration	8
Personal Imagery	7
Impulse	6
Addiction	4
Fashion	4
Memorial	3
Group Affiliation	3
Physical Decoration	2
Collection of artist‟s work	1
Rebellion	1

It is important to note here that a larger number of issues are considered and contemplated when deciding to become tattooed- indicating that tattoos are considered a more significant alteration to the body than piercings. Just as common as with piercings, two individuals became tattooed after losing a bet with a friend (not the same two individuals). And one other response of note was one individual‟s decision to become tattooed as a result of „outside factors- I‟m getting old!‟‟ indicating this respondent‟s opinion that tattoos are an activity participated in by younger individuals. A common preconception as we have seen.

No individuals quoted „boredom‟‟ as a motivation to become tattooed or pierced. Similarly, „addiction‟‟ and „rebellion‟‟ were not dominant explanations- directly conflicting with proposed motivations by academics (Gittleson and Wallfn 1973). Only two individuals cited alcohol as being a factor in their decision making- both in regard to piercing, not tattooing. „Group affiliation‟‟ was only quoted by 3 individuals in regards to getting tattooed. The practice of physical adornment or decoration was only considered in motivations towards becoming tattooed. Those who quoted becoming tattooed or pierced after losing bets suggest the significance of body modification practices as they are considered „high stakes‟- tattooing is therefore seen as a „costly‟‟ thing to do.

The one example of a man getting a navel piercing for losing a bet is also revealing in indicating that navel piercing is seen exclusively as a female-only piercing location. „Expression of individuality‟‟ was only quoted in regard to piercing- this is surprising because imagery in tattooing is limitless, whereas piercings are limited in variation to location, type and size of jewellery. The responses in this survey pertaining to motivations support arguments proposed by such authors as Wohlrab *et al.* in their perception that motivations to become tattooed or pierced, or to add to one‟s collection, are variable (Wohlrab *et al.* 2007). They, too, highlight the distinction between wishing to collect „artwork‟‟ and wishing to maintain „self-identity‟‟.

Whilst not specifically investigated by this survey, no indications of deviant or criminal behaviour were expressed by respondents. Responses given indicated reasonable consideration and thought that could be applied to the acquisition of many materialistic items, indicating the „normalisation" of the uptake and partaking in body modification practices in all generations, but more frequently the younger cohorts (aged 18-35). This observation is in direct correlation with those of Atkinson and his sociogenesis argument regarding tattoo acquisition (Atkinson 2003:4).

Whilst the utilisation of the website „surveymonkey" allowed for the aforementioned ease of data collection and storage digitally, it proved an ineffective method for data analysis due to its incompatibility with the statistical software package „SPSS". This resulted in the coding and inputting by hand of all 13,993 responses these surveys collected, which proved timed consuming and risked human error. This method proved successful in this research, but it is underscored here as an incompatible element in the hope that such time-consuming work need not be carried out in any future studies.

3.8. Health complications

When considering the incidence of health complications experienced by modified individuals, we see much devoted literature, as cited previously. However, the results seen in this survey seem to contradict the apparent feverish nature with which the health complications of tattoos and piercings are viewed by the medical profession. This is especially the case with tattooing- where Armstrong and Murphy (1997) denote that "informed decision making could be promoted in health education by incorporating information about the possibility of blood-borne diseases, permanent markings, and themselves as growing and changing people....this will produce dissuasion" (Armstrong and Murphy 1997: 187) our results can prove the insignificance of this with the reported single individual experiencing complications that were relieved by the tattooist"s professional help. It is piercings that result in more reported complications here, in accordance with findings by Greif *et al.* 1999.

Seven individuals in this study reported complications with their piercings. Of these complications, two were dealt with personally, three ended in seeking help from family and friends, the same number of individuals that returned to their piercer for advice and treatment, and four were reported to health care professionals for treatment. Forensically this is of significance because in this sample alone, only four of the seven piercings would appear in official ante-mortem records which could be accessed by identification investigators.

Conversely only one individual with a tattoo reported complications. He first sought help from friends and family before returning to his tattooist who provided sufficient „aftercare" advice to alleviate the symptoms. Again this modification would therefore not appear on medical ante-mortem records.

When we consider the mechanics of tattooing and piercing it becomes clear why piercings may be more prone to infection. While tattoos are produced by the repeated puncturing of the skin, creating essentially large grazes, piercings are penetrating punctures that create a tunnel of flesh, leaving the inner surfaces open to the surrounding environment as well as both ends of the puncture. Therefore it is unsurprising that infections of piercings and rejection of the inserted jewellery is apparently more frequently reported than complications with tattooing which almost exclusively is as a result of sensitivity to the type of ink used, discussed in Chapter 5.

Those respondents with tattoos but no piercings replied negatively overall to wanting piercings, only five stating they would be interested in becoming pierced and eleven stating it was of no interest. Conversely, those with piercings but no tattoos responded relatively equally with seven quoting they would be interested in acquiring a tattoo and six stating they would not.

In regards to the number of tattoos an individual possesses, one individual with a half-sleeve tattoo counted each element of the sleeve as separate tattoos, whereas another individual with a full-sleeve considered it to be "just one very large one!" Is this difference accountable because each sleeve was completed in different ways, such as individual tattoos applied at different times, resultantly producing a complete „sleeve"? Our own perceptions of coverage may differ, which may result in conflicting reports.

Considering concealment of modifications, mixed responses and emotions were described, varying between piercings and tattoos. When receiving their first tattoo, seven respondents applied them in positions visible in their everyday clothing, whereas

35 hid their first tattoo. Of those that continued to acquire more ink, 13 positioned them so they were visible in everyday clothing and a relatively equal 15 still hid them.

Concerning the general knowledge about their tattoos, all respondents reported that someone knew of their tattoos- predominantly close friends. The most common group to be kept ignorant of the individual"s tattoo was parents. In piercing, however, all individuals reported that at least some of their piercings were common knowledge, the only ones to remain furtive being „intimate" piercings such as nipple and genital piercings. One individual"s opinion was "yes [everyone knows] as what"s the point in having them if you"re going to hide them!" whereas another"s was "yes, I told people when I had them done but only trusted friends. Don"t feel the need to tell strangers or brag about it". The difference here being the type of piercing these individuals displayed- the first being facial, the second being genital.

Some questions were posed in order to provide a system of monitoring the sample as discussed above (occupation, geographic location, for example). Some questions were also asked as a way to educate and emphasise to respondents the wide-ranging subject of „modification" (use of hair dye, facial hair styling, for example) and as a demonstration of all participants being in some way modified themselves.

However, some questions were asked with the assumption that they would reveal interesting patterns or associations. This was the case in asking the skin colour and the religion of participants. It was expected, in light of the traditions discussed in Chapter 2, that those with dark skins were more likely to partake in scarring and piercing practices rather than tattooing practices. Only eleven respondents reported being dark skinned, and whilst three reported piercings (both of earlobes and „other" locations), six reported no tattoos, piercings or scars, and the remaining two both reported solely tattoos.

Religion was also expected to be related to modification practices, also after considering the traditions discussed in Chapter 2. An overwhelming majority reported no religious beliefs (493) followed by a substantial 386 Christians. Within these two groups modification practices were equally well represented indicating no religious association, despite the historic relationship between Christianity and tribal oppression (see Chapter

2). Only six individuals reported being Jewish, five of whom were women. Of these five women, all reported having their earlobes pierced and one reported piercings at locations other than her earlobes. Again this proves inconsistent with the proclamation in Leviticus chapter 19 (see Chapter 2).

Hindus and Buddhists were equally represented with ten believers each. Eight Hindus were women, all of whom reported earlobe piercings, and six of whom reported nose piercing also. Marital status was not questioned in this survey, however, so the nose piercing customs practiced as part of marriage ceremonies discussed in Chapter 2 could not be discerned.

Many participants mis-read the question relating to „tooth filing‟ assuming it to read „tooth filling‟. This resulted in false data and so the results to this question were disregarded. This may have been avoided if a description or explanatory diagram had accompanied the question.

It is interesting to note, therefore, the changing phenomenology of modification practices within society. Previously linked to religious and cultural practices, we see evidence here that these links are no longer as rigidly enforced. Where society has evolved, conforming to consumerism, internationalism and multi-nationalism, associated activities, such as modification practices, have followed suit.

Many non-tattooed express shock and concern that someone wears a tattoo stating that „it is for life‟ but secondly are concerned with the tattoo‟s „meaning‟ as if a respectable meaning for acquiring the tattoo can justify its presence. Tattoos used as expression of, for example, commemoration, celebration etc. are often considered acceptable, but when the „meaning‟ of a particular symbol does not conform to their ideas of justification, it is deemed a „stupid decision‟ or „ill advised‟. This is a further example of how tattoos are often deemed such „high stakes‟. To one person, „physical adornment‟ may extend as far as jewellery or a new hairstyle, however, for another, a more permanent decoration may be necessary.

It is also conflicting that something that „is for life‟ must be rooted in a single meaning- not allowing the wearer to change or develop as an individual throughout life. It would be an interesting social-anthropology study to determine the intrinsic element that results in such opposition to body modification practices. Mothers have been reported as disapproving of the „massacre‟ of their offspring‟s bodies (*pers. comm. Women's Institute meeting 23/06/08*).

Perceptions and opinions are ever evolving, but are also being more frequently questioned. Maccormack (2006) aptly states that "the question could be turned from „Why does one tattoo one‟s body?‟ to „Why do we want to know why we or another tattoos?‟" (Maccormack 2006: 2). Our obsession with the practice is never abating, but it is rarely questioned as to what it is about such practices as body modification that fires our inquisitive natures. We have seen here that throughout history body modification practices have experienced equal measures of celebration and curiosity. In the twenty-first century, however, it appears that even with increased investigation, partaking and observation, these trends will continue.

3.9. Conclusion

Modifications are most notably seen here in age groups from 18-45, with a steady decrease in prevalence with increasing age. Both sexes partake in tattooing and body piercing, with women having a predilection for piercings more so than men. Tattooing in younger age brackets remains relatively equal for both sexes until the age bracket 36-45 at which point men report tattoos far more frequently than women.

What must be considered as a result of the undertaking of this element of research, then, is that it is not only the presence of body modifications that must be noted, but equally the absence. If 89% of women respondents to the survey have pierced earlobes, it is certainly more significant a characteristic for a woman <u>not</u> to have her earlobes pierced.

What is equally important, however, is the proper recording of modifications- a scar from an old piercing may look like an „active‟ piercing site, but may not have had jewellery worn in it for a number of months or years, possibly confusing the appearance of an individual in recent life. The practice of scarification, branding and sub-dermal implants is also of significance here- elective scarring and other such modifications will not appear in documented ante-mortem records but may easily be confused for evidence of medical procedures or trauma. The retrieval of a dermal implant jewellery item may also be mistaken for an earring or other piercing jewellery to the untrained eye. Confusion may also arise as sub-dermal implants may appear at first to be pathological in nature.

The ability to state categorically a person‟s appearance with regard to body modifications is of significance forensically, and with the demonstrated presence of modifications in the modern psyche, are often features noted by individuals. In the collection of ante-mortem data in post-mortem investigations, it must be borne in mind that certain individuals may not be party to all information regarding an individual‟s „private‟ appearance and so whilst family members are most often the source of ante-mortem data collection, intimate partners are recommended to be targeted for information, given their opportunity to see the individual fully undressed, as experienced at a post-mortem or autopsy investigation. This is supported by the results here indicating that secrecy of modifications is only demonstrated by respondents to this survey with regard to their parents. Equally, for neither tattoos nor piercings did any respondents report that their sons or daughters were modified. Whether this is as a lack of respondents with offspring, lack of their knowledge of such practices or a true representation that none of the respondents‟ children have modifications cannot be known, but would be of interest in future investigations.

Whilst the surveys conducted here as part of this research cannot be considered representative of the British public as a whole, a general picture of the trends of body modification practices in indicated. Similarly, individuals otherwise unlikely to respond to such an optional survey (older generations or those who consider „modifications‟ to only relate to more extreme practices) were successfully included by personal attendance at Rotary club, Probus club and Women‟s Institute coffee mornings or lunches. This attendance also proved beneficial in raising awareness of the popularity of body modification practices, and in demonstrating their general employment by many individuals throughout all sections of society, gradually helping to erase the traditional views that body modifications and delinquent or intimidating behaviour are related.

Completion of these surveys has also demonstrated the importance of official ante-mortem records to forensic human identification investigators, as well as highlighting the vast range of practices that could be considered „modification", such as hair style or colour, for example.

It is recommended that more official documentation of modifications is now implemented. Initially it may seem prudent to introduce an official record in tattooing and piercing studios, though the cash-in-hand nature of the industry does not lend itself to recording activities. While some artists do keep records of their work in photographic form for portfolios, the images are often anonymous and do not provide official documentation of an individual, rather the tattoo itself.

Therefore, it is proposed that upon registration at a medical practice, when an individual provides information regarding medical history, weight, contact details and other confidential information, questions regarding body modifications also be asked. In this way, medical records of an individual"s body modifications can be ensured without adding to the workload of the medical health care professional. Further to this, however, it is recommended that laser removal of tattoos be recorded on an individual"s medical records. This is important not only in providing up-to-date information on each individual, but may be of significance in future health care provision in instances of reaction or long term complications.

"It is the business of archaeology to detect and recover evidence"

(Killam 2004)

Chapter 4

4. Post-decomposition location of trans-dermal artefacts.

4.1. Introduction.

Crime scenes vary widely, as do their perimeters. In cases such as a robbery or personal attack, the scene may be quite immediate in vicinity, whereas in cases such as terrorist bombings or transport disasters the scene may span miles. It must also be borne in mind that not all crime scenes involve the location and recovery of human remains; this is a specialist area of crime scene investigation which should involve the inclusion of a professional forensic archaeologist or anthropologist, to ensure maximum evidence recovery.

The introduction of a forensic archaeologist or anthropologist early in the scene investigation process is now commonplace (Hunter and Cox 2005) and many Scene of Crime Officers (SOCOs) have received basic training in the recognition, location and recovery of human remains. It is a danger, however, that this basic training is considered sufficient for complete recovery and excavation of a site such as a deposition. It is entirely within the remit of the trained forensic archaeologist to fully locate, excavate and record in detail the entire scene, ensuring maximum recovery of information and evidence, with much of this possible even prior to the exhumation of the remains (Dupras *et al* 2006., Fisher 2000). It is the aim of this element of the research to emphasise the importance of complete scene recovery and full excavation by a professional forensic archaeologist to ensure the recovery of all potential evidence at the scene.

Excavation is a destructive method- features such as surface deposits and graves are destroyed as the investigation proceeds and the evidence (human remains, artefacts, vegetational changes, tool marks etc.) is removed. Disturbing even minor elements of the scene can have devastating effects on the ability to completely record and interpret a scene (Brooks and Brooks 1984, Dupras *et al.* 2006) and so it is therefore crucial that sufficient and appropriate recording is undertaken simultaneously- including written descriptions, photographs, plan drawings and section drawings, ensuring a complete 3-dimensional record of the scene.

Determining the events at the scene itself, at the time of death, as well as ante-mortem and post-mortem can be compromised by the interference of, or insufficient recording of, the scene (Saul and Saul 2002). Full excavation involves the prior recording of a scene or site, followed by the systematic recording and removal of grave fill or intermixed detritus and the excavation of the remains and accompanying artefacts, followed by further recording of the fully excavated context. In essence, excavation of a site allows for detailed recording of events that occurred at that site, in reverse. Indications of the most recent events will (in the vast majority of cases) be detectable uppermost at a site- even disturbance to a site can be detected by professional forensic archaeologists by the patterns of interruption and deposition displayed (Spennemann and Franke 1995).

If the excavation is undertaken in a less than professional manner the relationships between (and therefore also significance of) the artefacts and human remains may be lost and potentially crucial data may be brought into question. By following set archaeological protocols meticulously, the contextual information gathered throughout the excavation process, and all related data and evidence, will maintain its forensic value (Burns 1998).

Once excavation is completed and the site vacated any evidence or artefacts found at a later date are almost impossible to align with the information already catalogued- though detailed documentation throughout the excavation process will aid this considerably.

Full excavation and recording of the scene after exhumation of the remains is also crucial as in this final stage any evidence underlying the remains can be retrieved and recorded- including such intangible evidence as tool-marks or shoe prints that may have been left imprinted in the walls or base of the grave or deposit area. It is not uncommon for bullets to be retrieved from below the „base" of the grave as their velocity allows them to penetrate deeper layers of the soil- evidence such as this can confirm a victim was shot *in situ*. „False floors" also have a marked history in forensic archaeology- concealing further remains, evidence or caches. Small objects are commonly displaced at deposit sites by the action of small mammals and invertebrates- the recognition and interpretation of which also fall under the remit of the attending forensic archaeologist as they can have significant consequences in the recovery and understanding of a scene (Haglund and Sorg 2006a, Hunter and Cox 2005, Morton and Lord 2002). It is this phenomenon that we investigate here, focusing on piercing jewellery in the form of earrings.

Another viable argument for ensuring the attendance of a professional forensic archaeologist or anthropologist at a scene is the ability to distinguish instantaneously between human and animal remains (although, admittedly, some red-herrings necessitate further investigation- most notably pig ribs and bear paws being anatomically similar and only distinguishable by an expert with experience in this particular field) and the ability to differentiate between modern and archaeological remains. The ability for such decisions to be made at the site is important when considering the expenditure and man power such investigations call for.

The contextual information retrieved during an investigation can include natural phenomena such as stratigraphy, defined by Killam (2004) as "the continual deposition of discarded things upon the earth"s surface" (Killam 2004: 7). As the forensic archaeologist processes the scene, stratigraphic disturbance can be recognised and recorded, and later presented as evidence of activity and disturbance at a site. With the ongoing deposit of material, pre-existing layers are found underneath modern ones- and so the order of events at a site can be determined.

The process of stratigraphy is not often known by those other than trained professionals (Hunter and Dockerill 1996) and so perpetrators often leave stratigraphic evidence in ignorance. This is of use when trained professionals are employed in the excavation of a scene, but is not so helpful when individuals just as ignorant of the stratigraphic process are employed to exhume bodies and excavate scenes, as often crucial evidence the stratigraphy indicates goes unobserved.

Trained forensic archaeologists are also aware of the effects certain soil types may have upon the evidence and human remains, dictating a specific method for employment prior to the excavation commencing. An example of this would be the acidic soils at the archaeological site of Sutton Hoo, where complete decimation of the human remains occurred (Hunter and Dockerill 1996). In this instance, only „shadows" of the human remains could be observed in the outlines of the bodies being detectable in soil of a slightly different colour from the grave fill- a crucial element of evidence that may be overlooked by an inexperienced eye.

In short, forensic settings, scenes or sites, require unquestioning levels of accuracy and informed interpretation (Hunter *et al.* 2002) which can only be feasibly attained by the involvement of the appropriate professionals.

4.2. Taphonomy.

Not only can human events at a location be detected and recorded, but can also be distinguished from taphonomic factors. The process of „taphonomy" is an occurrence frequently investigated by forensic archaeologists and anthropologists. First introduced as a term in 1940 by Efremov, a Russian palaeontologist, „taphonomy" related to the process of living organisms, and all associated matter, passing from the biosphere to the lithosphere (Efremov 1940: 85, Lyman 2002, Ubelaker 2006).

Fundamentally, therefore, taphonomy is the process of decomposition, as influenced and determined by multiple factors. These factors can include (but are by no means limited to) weather conditions, environmental conditions, floral and faunal factors, human and mechanical interference, and biological or bacterial presence (Marshall 1989). All of these factors can greatly influence and alter the decomposition process human remains undergo, and evidence of any or all of these factors must be sought at the scene.

Comprehension of the technicalities of these collectively termed „taphonomic factors" is essential for the attending investigator to adequately investigate the scene, allowing for its complete reconstruction (Holland *et al.* 2006, Ubelaker 2006) and may be of importance in dictating the recovery process. For example, investigation of a site on a sloped incline may reveal some skeletal elements or personal effects some distance down the slope than the majority of remains- rather than assuming this to be their original position, one could interpret their position as the result of gravity and possible ground subsidence. Water courses may also move remains and evidence some distance from their original location- as may animals.

A case reported by Ferllini (2007a) detailed the recovery of many skeletal elements recovered from various locations within a rabbit warren. At the same site skeletal elements were also found distributed across a chalky outcrop- necessitating a trained eye to distinguish between skeletal elements and chalky fragments for proper recording and recovering. Frequently, upon being called to a site, forensic archaeologists will collect information regarding climate, topography, weather conditions and other factors that may influence the taphonomy acting upon a site in order to ascertain the expected condition of a site, the obstacles that may be present, and therefore also the likely position, condition, appearance and other features of the human remains and associated artefacts (Ferllini 2002). Taphonomic studies are carried out frequently in the forensic anthropology and archaeology fields, contributing greatly to our understanding, and therefore our hypotheses concerning the impacts various environments will have upon human remains. The most famous investigations (to the layman certainly) would include the extended studies carried out on „The Body Farm", Dr Bill Bass" facility in connection with the University of Tennessee.

The effects of scavengers on the dispersal of remains have been the focus of many studies in the USA, where dogs and coyotes are reported as the most common large scavengers to target human remains (Bass 1984, Haglund 1991, 2006a, Rodriguez 1987, Rossi *et al.* 1994). In the UK, however, scavenging remains most prolific in rodents (mice, rats, squirrels, rabbits, moles) and birds, with infrequent reporting of badger and fox activity. While the undertaking of experiments designed to ascertain the extent of movement and scattering of remains are relatively common in America, in the UK it remains a relatively untargeted area of research, possibly as a result of the limited availability of land to carry out such experiments, and also certainly as a result of the lack of a research facility such as the aforementioned facilities at the University of Tennessee. Further to this, however, the effect of the post-mortem interval upon the recovery of personal effects has received little attention from either research group- an imbalance this research hopes to highlight needs addressing.

The order of decomposition specifically relevant to this research concerns the time cranial detachment occurs. The mandible detaches from the cranium initially, followed by the cranium"s detachment from the body (Haglund 2006b). This has been demonstrated in relation to the detection and recovery of disarticulated teeth (*ibid*), but is of significance here in relation to earlobe piercings, but in future studies is of consideration in relation to ear cartilage and facial piercings also.

4.3. Artefacts and evidence

As demonstrated in Chapter 2, earlobe piercings are extremely common in females (here demonstrated as 89% of all female respondents). Piercings other than earlobes are also popular, numbering some 38% of females and 17% of males. With this frequency, therefore, it is reasonable to assume that piercings and piercing-jewellery are likely to be experienced in the forensic setting, and subsequently should be searched for as a matter of course.

Items carried on a person may include wallets, keys, jewellery or paperwork, and are collectively termed „personal effects" (Jensen 1999). The decomposition process, along with taphonomic factors described above, can often result in the body or remains allowing for limited identification means- personal effects often withstand the passage of time better than the body, and so can be of significant use at this stage (Hochrein 2002). Personal effects are not only crucial in the aiding of identification, but can be considered evidence in their own right, and may be retained as such- they may also be displayed to prompt identification in situations where images of the person or remains may be inappropriate for distribution among the general public (Thompson and Puxley 2007).

The recovery of an item of jewellery can also have implications in the identification process when comparing ante- and post-mortem information. The recovery of an earring in association with a person known not to have pierced earlobes could indicate the presence of a second individual at the site. Jewellery can be deemed „site specific"- items intended for insertion through the ears differ greatly from those for navel or eyebrow piercings, for example, and such information can be retrieved and relayed comprehensively without the need for the survival of soft tissue. This, too, has implications when comparing ante-mortem records as the recovery of a navel ring at a scene, in association with remains, can support the claim an individual wore a navel piercing in life.

The ability to recognise a body modification as such, even in the case of partial or skeletonised remains, or at the site of a struggle, can aid identification (of both victim and perpetrator) as body modifications are easily recognisable personal identifying characteristics ante-mortem.

The presence and, specifically, location of personal effects at a crime scene can also aid the deciphering of events at a scene- secondary burials or post-mortem interference of a grave can be indicated by the condition and location of personal effects (Dupras *et al.* 2006, Thompson and Puxley 2007). An individual recovered sporting a single earring, but known to have had bi-lateral earlobe piercings, may have been relocated post-mortem and the second earring recovered at the original site. Equally, the second earring may be located at sites relating to peri- or post-mortem events; at the scene of a struggle, for instance, or in the boot of a car used for transporting the victim.

4.4. Crime scene recovery techniques.

Various methods for site location can be employed, including foot searches, aerial photography, ground penetrating radar, cadaver dogs and others (see Killam 2004). Subsequently, there remain two predominant methods of forensic excavation of a site; the European method where a feature (e.g. grave) is located and recorded, and then is excavated solo in levels („spits") of around 5cm depth; and the American method, where the entire site is excavated in 5-10cm spits. Both are recognised techniques that result in the complete and detailed recovery and recording of a site and are resultantly employed as a matter of preference by each practitioner.

While no two scenes are the same, many practitioners have made recommendations to the field with regard to extent of search parameters and „best practice" once located and identified. Dupras *et al*., for example, report that "In most cases, a 3m by 4m rectangle should be large enough to accommodate a burial feature and allow for a closed-security area in which to work within the larger site limit", but provide no experimental evidence for this recommendation (Dupras *et al* .2006). As a matter of good practice, however, many recommend the detailed recording of a site in prose, photography, plan view drawings and section drawings (Haglund and Sorg 2006b, Killam 2004, Dupras *et al.* 2006) as it will significantly aid the ability to determine relationships between items and remains unearthed during excavation.

Whilst, as detailed above, the forensic archaeologist has sufficient training in all aspects of scene recovery, it is commonplace for a forensic photographer to be present at a scene, allowing for detailed recording of the entire excavation process as it proceeds. At this point, the apt distinction between the processes of „exhumation" and „excavation", made by Connor and Scott (2001) should be discussed. Exhumation regards the removal of the body from its location to a laboratory or morgue for further examination. Excavation, however, refers to this practice, but also includes the recording, recovering, removing and investigating of the entire context in which the body was located (Connor and Scott 2001). It is this second, more complete, method which the expert can provide.

In this regard, Duday (2009) examines and portrays the exact position of recovered remains, revealing the information that can be unveiled by the painstaking examination of a body"s posture, in association with detailed knowledge of the decay process of human remains, a specialism he terms „archaeothanatology". The confusion that can be created by soil pressures and the decay process are discussed underscoring the importance of a comprehensive understanding of the decomposition process of the human body and other factors that may influence the pressures acting upon the body. For example, a void in the matrix situated above the thorax of the body may be interpreted as faunal interference or organic structural presence, but is in fact indicative of the collapse process the skeleton experiences after the decay of the thoracic organs (Duday 2009).

Taphonomic investigations are constantly exploring deposition styles and variations in order to provide the field with comprehensive information regarding the decomposition processes a body experiences. Variations affecting a body"s decomposition are multiple, including: the deposition environment- water, soil, surface discard, concealment within a container, for example; body weight and fat distribution; the health status of an individual at death; temperature conditions; floral and faunal activity; bacterial and invertebrate activity; the use of accelerants- including lime or acid; and any prior treatment of the body- dismemberment or burning, for example.

4.5 Case studies.

The use of forensic archaeologists in cases pertaining to homicide verdicts is now well attested (Hunter and Cox 2005). Cases such as „the Soham Case" of missing schoolgirls Holly Wells and Jessica Chapman, victims of killer Ian Huntley in 2002, and the recovery of Dinah McNichol and Vicky Hamilton"s remains in Margate, found in 2007, victims of killer Peter Tobin (Sturcke 2007), have also highlighted the abilities and benefits of involving forensic archaeologists.

The discovery in October 2009 of skeletonised female remains at the Thornbury junction of the M5 revealed the presence of a distinctive gold coloured ring on a phalange of the remains. This artefact greatly aided the identification of these remains to be Melanie Hall, who disappeared in Bath in 1996. The marriage of information retrieved from the bones by the anthropologist and the presence of the ring, provided an extra level of certainty of identification than either detail could alone (Thompson and Puxley 2007).

It must also be borne in mind, as detailed in Chapter 1, that forensic archaeologists are often attendant at scenes of war crimes, and other scenarios involving mass burials. In such circumstances, the association of personal effects to human remains is especially difficult, though as a matter of course, practitioners commonly package remains with any associated artefacts for confirmation of belonging at a later date in the laboratory, allowing for faster exhumation of remains (Ferllini-Timms1997, Jensen 1999, Haglund 2002).

For the purposes of this investigation, we are comparing deposition sites of human remains in the form of woodland surface deposition and buried remains- relatively „enclosed" crime scene areas.

4.6. Experiment aims.

This study aims to highlight the potential importance of piercing artefacts within the forensic context. Also, to determine the extent of taphonomic interference of remains and artefacts, resulting in making recommendations of distances to be searched from the original location of remains.

4.7. Method.

The site is located at Riseholme, Lincolnshire, and the woodland consists of Scots Pine, Norway Spruce and Beech, with very little under storey. The burials and surface depositions were central within the wooded area. The Department of Forensic and Biomedical Sciences at the University of Lincoln made land available for the experimental purposes of this study, with clearance from the Department of Environment, Farming and Agriculture (DEFRA).

Twelve whole pig carcasses (*Sus scrofa*) were acquired to facilitate the observation of the decomposition process- all were acquired after having died of natural causes. The pigs were of varying sizes, two each at: 1-2kg, 3-4kg, 10kg, 15kg, 25kg and 50kg in order to determine whether the size of the victim seemingly influenced the results. Six pigs (one of each weight) were buried and the remaining six deposited on surface. Pig carcasses have often been used in studies as a substitute for human remains, as their physical ratios of skin:fat:muscle:bone is comparable, as are their digestive systems, skin type and hair. Prior to their deposition, the pigs" ears were pierced with various coloured standard stud earrings (table 17).

A stud earring was chosen as it is a common item worn in pierced ears, and was also the smallest jewellery type of relevance to this investigation inferring that successful retrieval of piercing jewellery of this size should indicate successful retrieval of other, larger items of piercing or other jewellery. Stud earrings are also of comparable size to other small-gauge piercing jewellery such as dermal piercings, some female genital piercings and nose studs, consequently indicating the potential for successful retrieval of these piercing items also. The colour of the studs was significant in this study as it served to indicate the depositional origin of each item, omitting any possible confusion at the time of recovery.

Each deposition was assigned a code, for ease of inputting data and subsequent identification (table 17). Burial depths for each buried pig were also recorded in order that the depth of recovery of any artefact, jewellery or skeletal element, could be related to its original location. It is well attested that small items are liable to movement within burial contexts (Morton and Lord 2002) and so the ability to support this claim would be of significance to this study. The depths to which the graves would be dug was decided as a sufficient depth to deter the excavation by scavengers, but of a realistic depth when considering forensic cases of clandestine burials.

Table 17. Colour of earrings for each deposition, burial depths and reference code.

Weight	**Ref. code**	**Colour of earrings**	**Burial depth**
Burial			
1-2kg	1-2kgB	Blue	30cm
3-4kg	3-4kgB	Pink	40cm
10kg	10kgB	Pink	30cm
15kg	15kgB	Blue	30cm
25kg	25kgB	Pink	40cm
50kg	50kgB	Green	40cm
Surface			
1-2kg	1-2kgS	Pink	
3-4kg	3-4kgS	Blue	
10kg	10kgS	Green	
15kg	15kgS	Pink	
25kg	25kgS	Green	
50kg	50kgS	Pink	

The depositions were all protected from large scavengers such as badgers, foxes and dogs from the outset of the experiment by way of an electric fence (11m x7m) comprising a 50m roll of 8 wire single spike Sheep netting (90cm) and an electrical current powered by a 12v Gallagher Batterymaster B75 Wet Battery Energiser and 12v leisure battery. This supplies 6200v with stored energy of 0.75j and an output of 0.55j.

All depositions occurred on 28/04/07. Disturbance of the remains was recorded on the following dates: 19-23/05/07 15kgS showed evidence of rodent scavenging on the back of the neck; 28/05/07 3-4kgS was discovered with the cranium removed by birds, it was located 1m North and replaced to its original location; 30/05/07 15kgS displayed evidence of general movement by rodents and birds; 25kgS showed evidence of the cranium being inverted by birds. Mole activity was particularly evident at the sites of the 25kg and 50kg surface depositions.

After these significant initial interferences, wire mesh cages were positioned over each surface deposition (02/06/07) in order to limit the extended variables within the study, though their function in forensic scenarios and decomposition is recognised by the investigators here. The purposes of this study being twofold, the femora of all 12 remains were removed 01/06/08 for biological analysis, but each deposit remained undisturbed in total, as the location of the femora alone was targeted and not the remains as a whole. Full excavation of the site was carried out 28 months after deposition.

The surface deposits were photographed in situ, then photographed again once the leaf litter and detritus had all been cleared (fig. 10) allowing for more detailed examination of the surface topography and allowing for any surface features or artefacts to be recognised and recorded (Spence 1999). They were then graphically recorded with a $1m^2$ planning frame, in accordance with well established forensic archaeological techniques (Dupras *et al.* 2006) plotting the location of skeletal elements and the recovered earrings at a 1:5 or 1:3 scale (figs 12 to 17a). The distance and direction of each earring‟s movements was recorded (tables 18).

fig. 10. 50kgS after clearing leaf litter to view skeletal elements for planning. (Photo by Starkie 2009)

Metal detectors were employed in accordance with conventional forensic archaeological techniques (Killam 2004, Dupras *et al* 2006) in order to indicate suspected locations of earrings prior to commencing the destructive excavation process.

The burial depositions were photographed once they had been cleared of leaf litter and detritus also. Clear „edges" could be seen at all the burial deposits, but in all cases these were in fact cracks in the clay soil created by natural weathering processes (Hochrein 2002) and as a result of the prior removal of the femora. The real edges of each grave were all found outside of these cracks. Each burial was excavated in spits of 5cm- their original depths had been recorded, but spits were carried out in order for any alteration and relationship of the depth of skeletal fragments and earrings to be recorded. Metal detectors were to be employed at each spit level to identify the earrings‟ locations prior to disturbance by excavation.

Once excavation revealed the position of the earrings and their relation to skeletal elements in the grave, triangulation measurements were to be taken as a record of associations and to provide a diagrammatical representation of the findings. Triangulation involves the use of a baseline A-B, set throughout the excavation, and the measurement of any evidence or data in need of recording from both points A and B, creating a triangle of measurements for each point, allowing the pin-pointing of each item and its relation to others and to the context as a whole.

fig. 11. Site plan (original drawn to 1:50 scale).

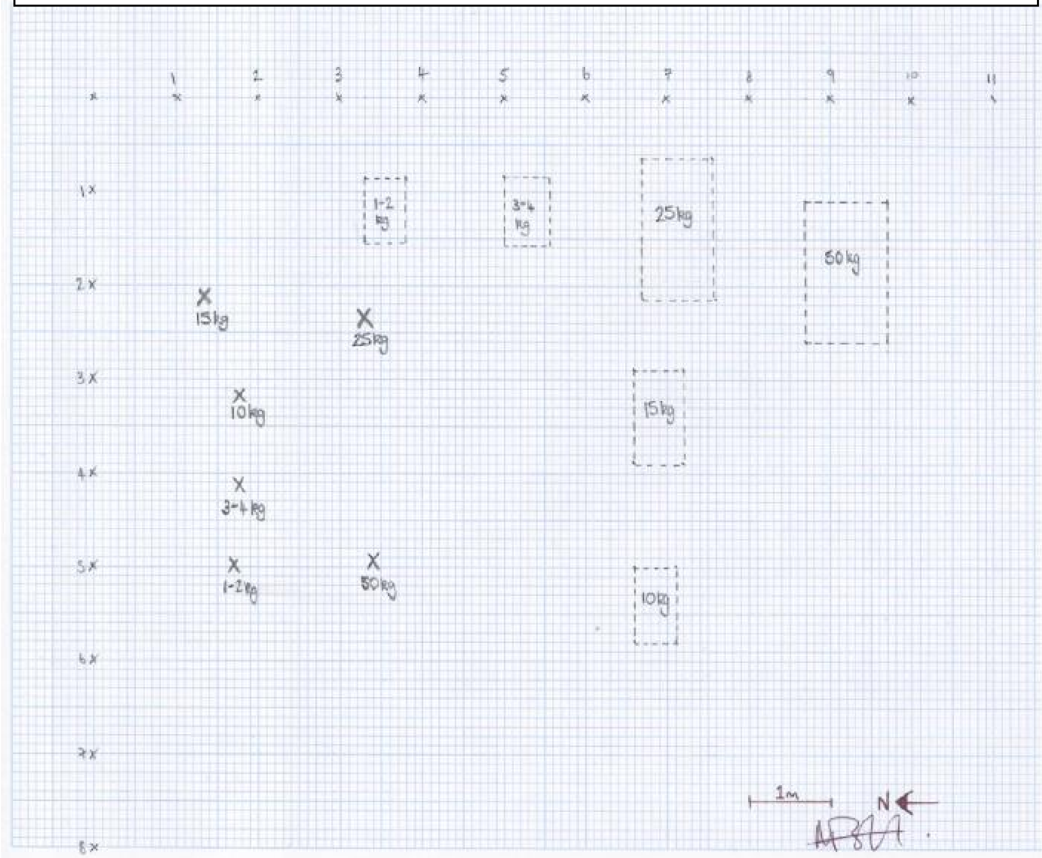


fig. 12. Location of the surface deposited pigs. All pigs were oriented with heads north, legs east. Photo by White 2007.

4.8. Results.

4.8.1. Surface deposits.

Table 18. Direction and distance of artefact movement in surface depositions.

	No. recovered earrings (of 2)	Distance travelled (cm)	Direction of travel of earring(s)	Topographical travel of earring(s)
1-2kg	1	46cm from cranium, (5cm from mandible) **52 cm from originally located remains.**	North West	Flat ground, no obstacles, following tree-line.
3-4kg	2	12cm from cranium, 15cm apart. **12cm from originally located remains.**	North West	Flat ground, towards 1-2kg surface.
10kg	2	12cm from cranium, 12cm apart. **12cm from originally located remains.**	South	Downhill, towards 25kg surface.
15kg	2	34 & 77cm from centre cranium. **119cm from originally located remains.**	South East	Downhill, towards 25kg surface. Furthest recovered minus „butterfly‟ back of earring.
25kg	1	19cm from centre cranium. **19cm from originally located remains.**	North West	Buried 5cm into molehill.
50kg	2	33 & 62cm from centre cranium. **62cm from originally located remains.**	North West	Uphill, towards tree-line, following mole tracks.

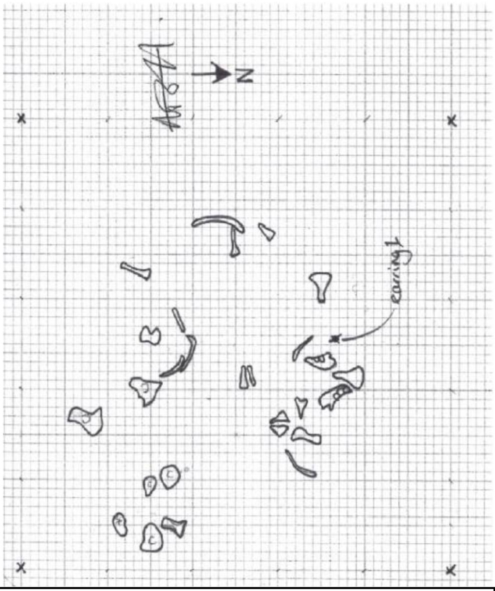


fig 13 and 13a. 1-2kg surface deposit at time of deposition, and plan sketch at time of recovery.
Photo by White 2007.

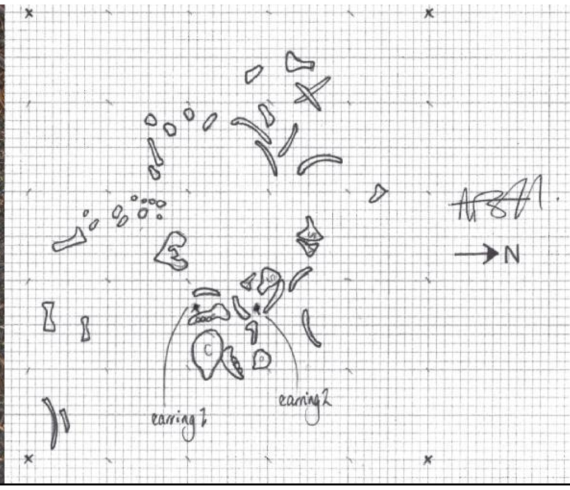


fig 14 and 14a. 3-4kg Surface deposit at time of deposition and plan sketch at time of recovery.
Photo by White 2007.

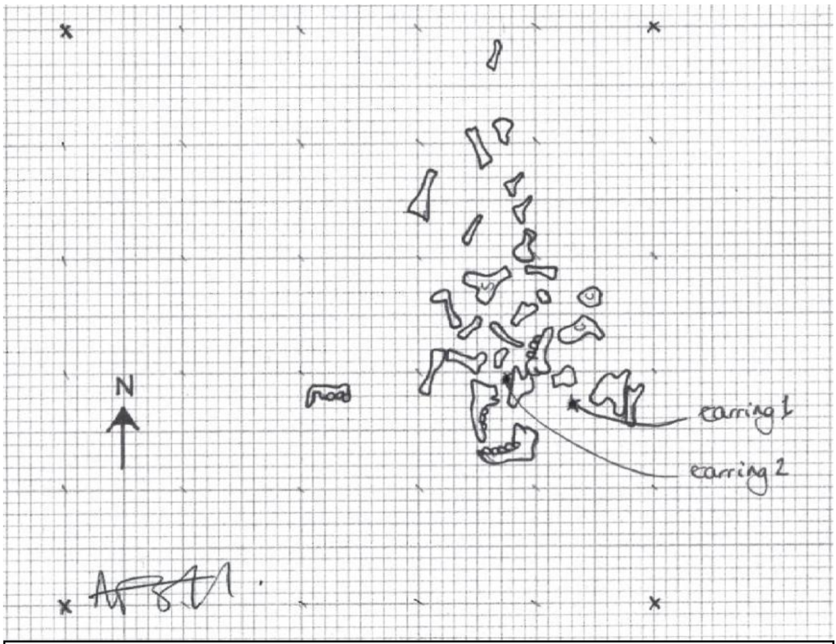


fig 15. 10kg surface deposit plan sketch at time of recovery.

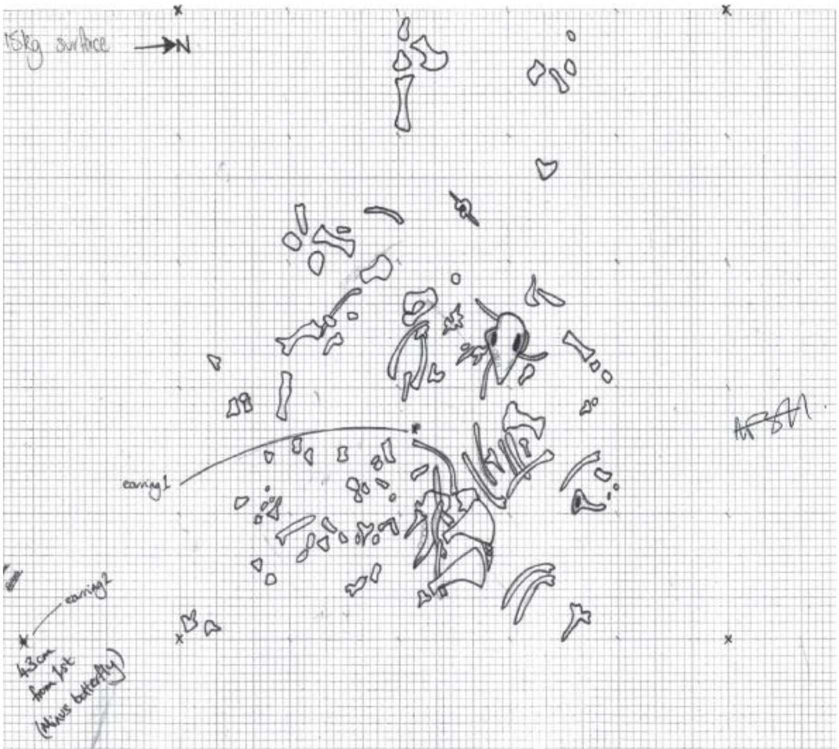


fig 16. 15kg surface deposit plan sketch at time of recovery.

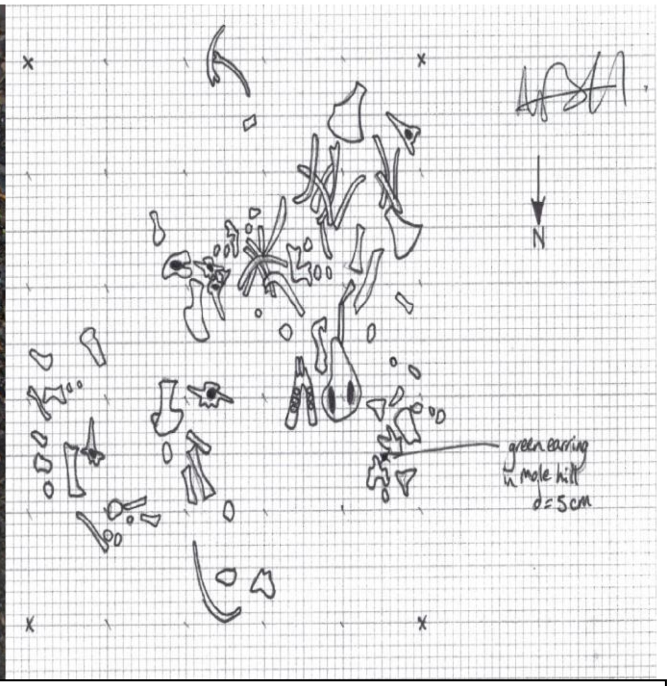
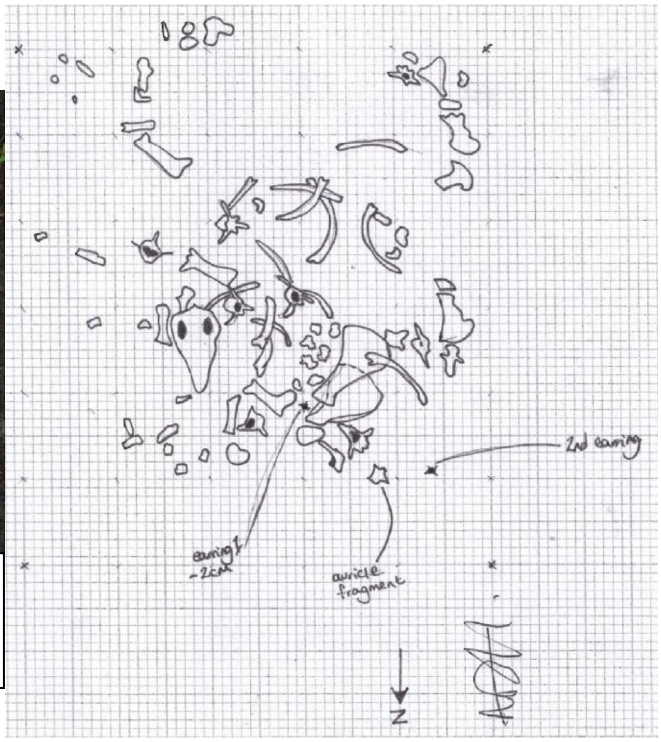


fig 17 and 17a. 25kg surface deposit at time of deposition and plan sketch at time of recovery. Photo by White 2007.

fig. 18 and 18a. 50kg surface deposit one week after deposition and plan sketch at time of recovery. Photo by



A plan of the overall patterns of dispersal and scattering the surface deposits experienced in relation to one another can be viewed in Appendix 2.

4.8.2. Buried deposits.

Table 19. Location of artefact at time of recovery and related observations.

	No. recovered earrings (of 2)	Depth of Burial (cm)	Depth earrings found (cm)	Observations.
1-2kg	2	30	27 & 30	Small areas of adipocere still present at time of excavation.
3-4kg	2	40	34 & 39	None of note.
10kg	2	30	32 & 36	None of note.
15kg	2	30	36 & inside cranium	Excessive invertebrate activity at time of excavation. Patches of hair still present around cranium.
25kg	2	40	29 & 32	None of note.
50kg	2	40	35 & 46	Considerable adipocere still present at time of excavation.

Triangulations.

All measurements taken for production of triangulation charts can be found in Appendix 3.

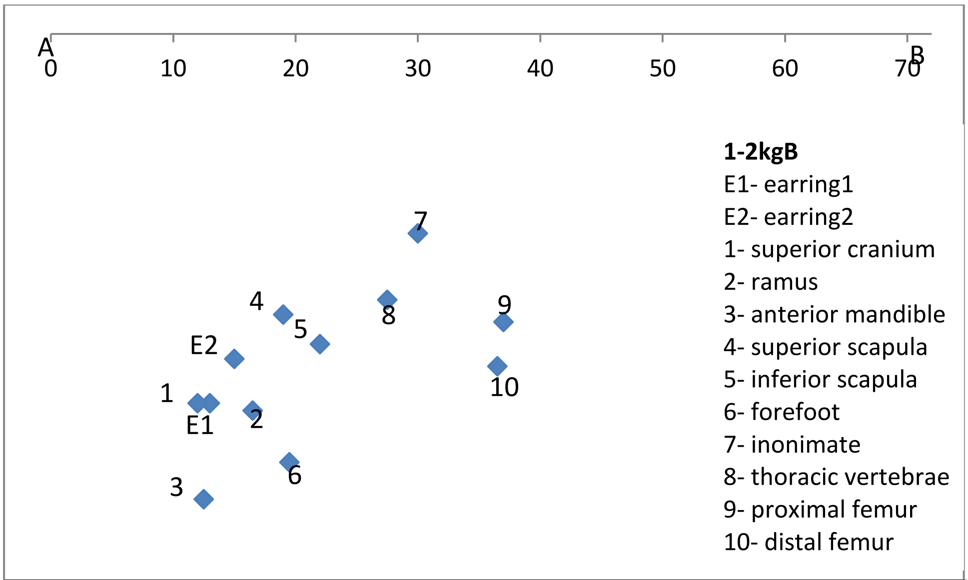


fig. 19. 1-2kgB triangulations plotting skeletal elements and earrings at time of recovery.

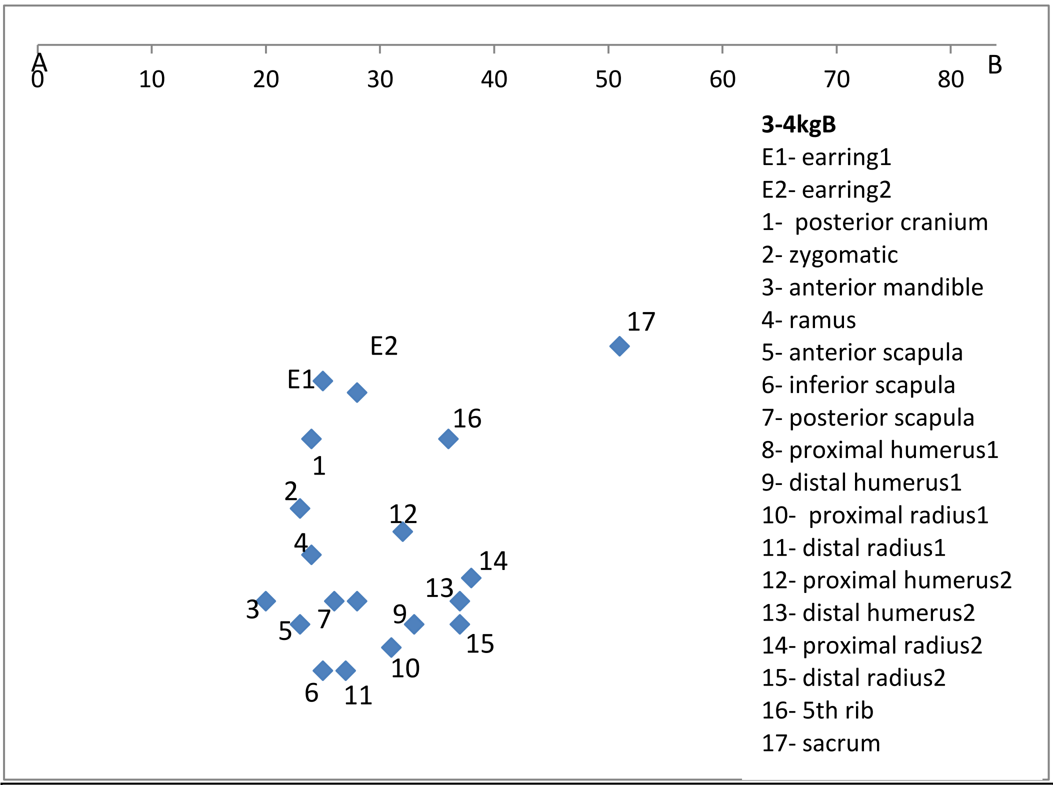


fig. 20. 3-4kgB triangulations plotting skeletal elements and earrings at time of recovery.

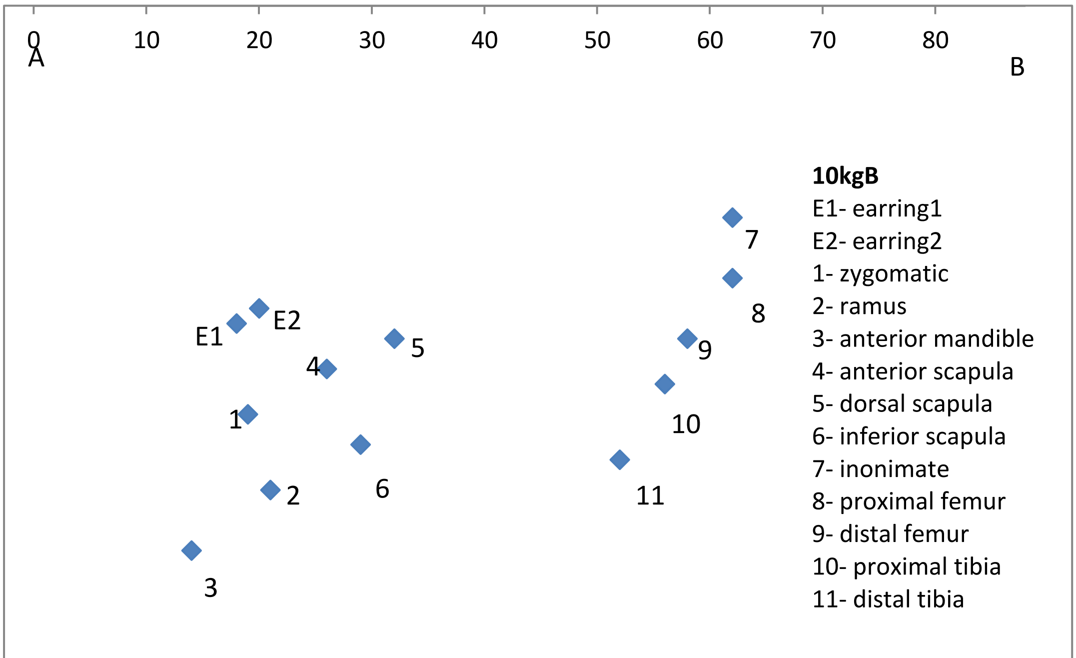


fig. 21. 10kgB triangulations plotting skeletal elements and earrings at time of recovery.

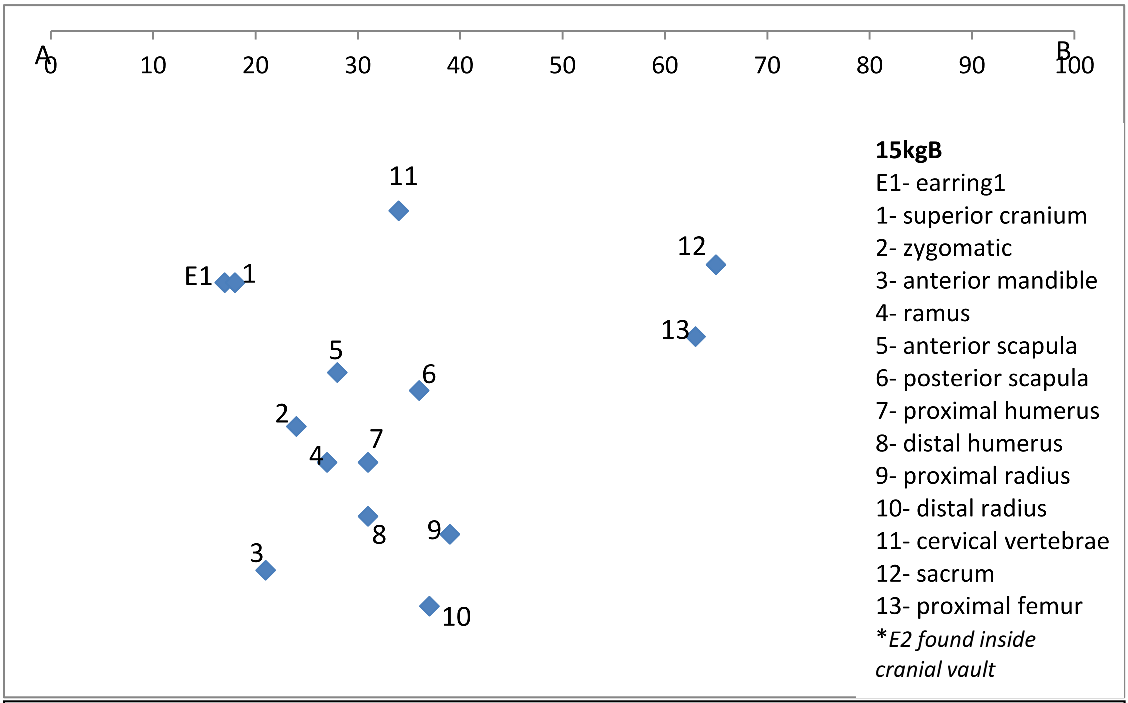


fig. 22. 15kgB. Triangulations plotting skeletal elements and earrings at time of recovery.

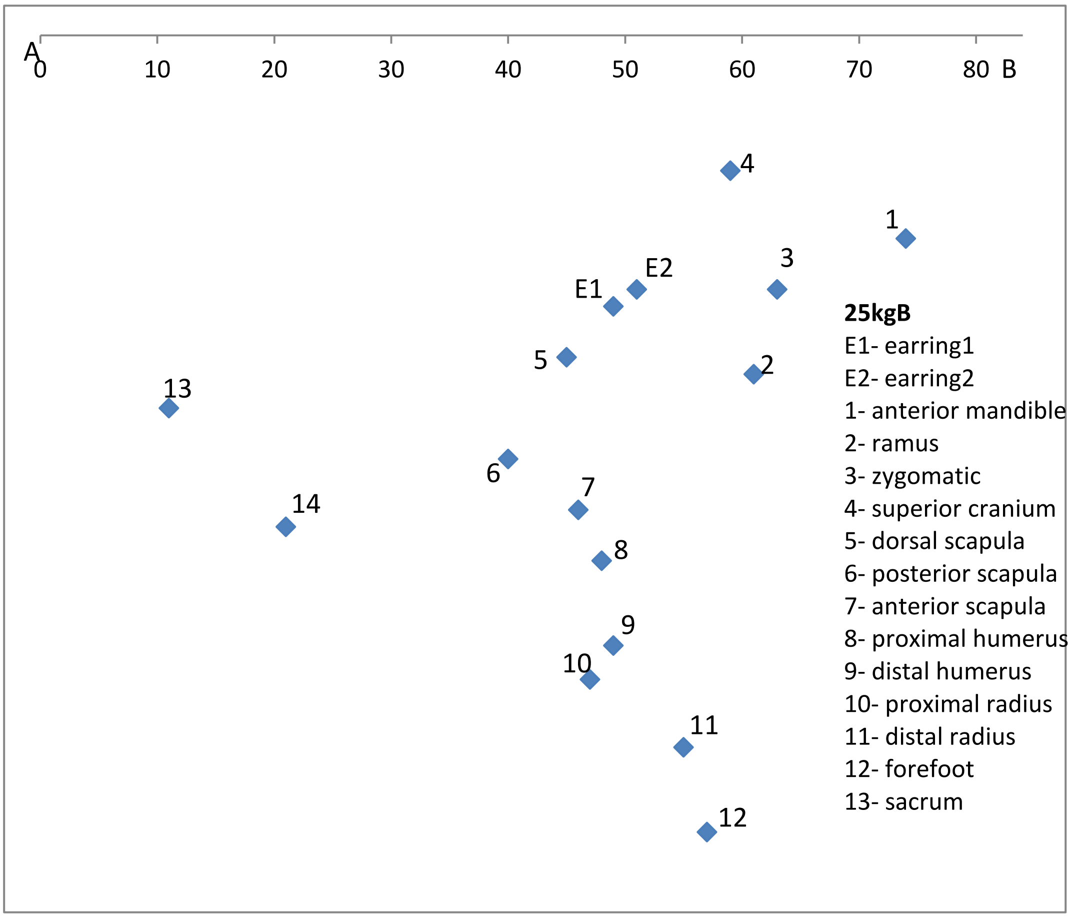


fig. 23. 25kgB triangulations of skeletal elements and earrings at time of recovery.

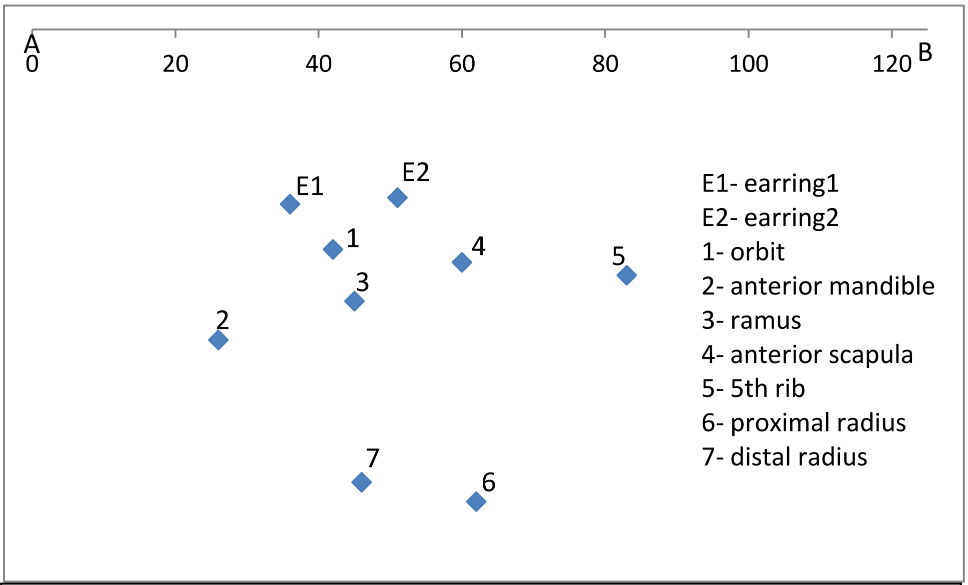


fig. 24. 50kgB triangulations of skeletal elements and earrings at time of recovery.

4.9. Discussion

The metal detectors were found to be unresponsive to the metal of the earrings. This was of significance as their use in many forensic contexts is well attested and is in stark contrast to the express recommendations of many practitioners such as Killam (2004), now questioned here concerning the recovery of standard stud earrings. Even when the earrings were visible, both in the surface deposits and upon excavation in the burial contexts, the metal detectors remained unresponsive and so the excavation and recovery continued without their further employment. It is thought that the lack of detection by the metal detectors may be as a result of the small amount of metal in the stud earrings used in the study, or consideration has been given to the possibility that hypoallergenic metal may not illicit a response from metal detectors. This consideration is recommended as an area for further study. The lack of response must also be noted by the profession as resulting in a possible void in complete artefact recovery in forensic scenes that rely on them solely to recover such artefacts. This void is of significant consideration in both past and future forensic investigations.

Each type of deposit will now be discussed.

4.9.1. Surface deposits

As detailed above, all surface deposits were oriented with heads to the North and feet to the East, allowing for comparison of general disturbance to the deposits. As can be seen in table 18 and figures 12-18a the surface deposits experienced much disturbance.

1-2kgS (fig. 13 and 13a) exhibited few remains and the recovery of only one earring. Being the smallest of all the surface deposits, this lack of recovered material can be explained by the size and immature nature of the bones- younger bones are less „ossified" and therefore less robust, thus unable to withstand the weathering and chemical processes during the decomposition process as well (Scheuer and Black 2000:14, Morton and Lord 2002). Their smaller dimensions also lend them to preferential targeting by scavengers. The recovery of only one earring however furthers this to imply that the remains were disturbed extensively, resulting in the lack of recovered remains. The second earring was not recovered despite the excavation of the context to a depth of 15cm.

3-4kgS demonstrated a 90° clockwise rotation (fig. 14 and 14a). On 28/05/07 it was reported its head had been removed by birds and re-deposited after recovery, so this orientation may be as a result of human error when replacing the cranium to its original location, though the other skeletal elements show this altered orientation also, inferring that it occurred prior to, or at the time of, the cranial movement by the birds. The earrings were located close to the cranial remains, and each other (15cm apart), and so we can infer that they were still on the head at the time of the aforementioned disturbance.

10kgS reported no obvious disturbance prior to the mesh cage placement, however, its remains were found inverted 180° from their original positioning (fig. 15). Both earrings were located in close proximity to each other (12cm apart) and within the fragments of the cranium and mandible indicating minor disturbance post-decomposition.

15kgS (fig. 16) demonstrated the most marked disturbance, including reports of general disturbance by rodents and birds on 30/05/07. Whilst both earrings were recovered, they were some distance from the originally recognised remains (119cm).

The cranium was recovered centrally within the cluster, though no pattern to the distribution of the other remains could be discerned. The first earring recovered belonging to this deposit was found centrally within the cluster of remains, with no obvious relationship to any skeletal elements. The second earring was recovered 43cm from the first earring, most interestingly however, it was recovered without the butterfly (the metal clasp on the reverse of the earring that seals the grip onto the earlobe) and was the only earring within the study to experience this phenomenon. This may have been as a result of the extensive movement of the artefacts- no evidence indicating complete corrosion of the butterfly could be discerned (Janaway 2002). Another possible explanation may be accidental ingestion by a scavenger upon targeting the ear cartilage. The butterfly remained un-recovered.

All of the recovered earrings were found on surface, intermingled with the leaf litter and detritus of the contexts, with the exception of the earring recovered as belonging to 25kgS, which demonstrated „self burial".

This deposition (25kgS) was also inverted 180° (fig. 17 and 17a), resulting in the central location of the cranium within the remains- following its reported inversion by crows 30/05/07.

Of particular note at this deposit site was the extensive mole activity- evident through tracks and hills surrounding the remains. One earring was recovered within a mole hill, at a depth of 5cm, but only at a distance of 19cm from the cranium. The second earring was not recovered despite the excavation of the entire context to a depth of 15cm below surface- including the systematic and complete excavation of the mole tracks to a radius of 1.5m at which point they appeared to dissipate.

50kgS also demonstrated mole activity, though less extensive than 25kgS. The remains (fig. 18 and 18a) showed mixed disturbance levels with the scapulae, some cervical vertebrae and one humerus still seemingly *in situ*- the cranium, however, was located, once again, relatively centrally. In respect of these findings, however, what is most notable is the recovery of one earring anterior to one scapula, and the second superiorly. This might imply the movement of the cranium after decomposition resulted in loss of attachment of the ears and therefore also the earrings.

When we look at the general disturbance and distribution of the surface deposits (Appendix 2), no relative pattern is discernible. The only detectable „pattern" is that of the movement of the earrings themselves- seemingly orienting themselves either downhill or towards other surface deposits.

Initially, it is surprising that an artefact intrinsically linked to the remains would not follow the same pattern of distribution as the skeletal remains. However, when we consider the earrings" position on the body this element is more easily explained. Despite interference of taphonomic factors, decomposition of remains follows basic patterns. Internally the flora of the gut proliferate throughout the venous, arterial and digestive tracts, autolysis and necrosis ensue (see Dix and Graham 2000 or Gill-King 2006).

External decomposition is dictated by bacteria and organisms resulting in the breakdown of warm, moist locations (eyes, nose, mouth and genital orifices). Insects such as flies are attracted to the corpse in strict orders and patterns that can be discerned by forensic entomology, helping indicate time of death (Anderson 1999, Anderson and Cervenka 2002, Haskell *et al.* 2006). Maggot (blowfly larvae) activity can be responsible for considerable consummation of the soft tissues of the remains (Anderson 1999).

The order of insect activity and scavenging remains is well documented by such research as carried out by Bass (1984), Rodriguez (1987), Haglund *et al.* (1989), and Anderson (1999). Once the cartilage and bone is uncovered after soft tissue consumption by maggots, rodents and birds are often next to scavenge the remains. Rodents target cartilage and bone for gnawing, systematically wearing down the teeth of the lower jaw (see Haglund 2006c). The weaker muscle attachments, ligaments and tendons of cartilage such as the ears and nose, and the smaller bones such as in the hands and wrist or feet and ankles (where not contained by clothing or shoes) lend them well to targeting by rodents (Warren and Falsetti 1999), and are often removed from the body as a result. The ears and nose will remain intact with the cranium, even after the cranium has detached from the body, due to their high collagen content (Gill-King 2006). They will remain present until the soft tissues are consumed by maggot or rodent activity. The position of earrings in the cartilage of the ears results in their separation from skeletal elements, and so their distribution is therefore dictated more by the decomposition and consumption patterns of the soft tissues.

With specific regard to the direction of movement of skeletal elements and the earrings of each deposit, while no overall pattern can be discerned (Appendix 2), reasons for the observed movements can be proposed. 1-2kgS showed minimal retrieval of skeletal material and recovery of only one earring, in proximity to the unfused mandible and cranial fragments (fig. 13 and 13a). The remains, however, were scattered along the flat ground following the tree line- implying movement was dictated by the path of least resistance.

3-4kgS showed movement only in its 90° rotation- here, too, the earrings were retrieved in proximity to mandible and cranial fragments (fig. 14 and 14a) indicating this movement of the cranium occurred prior to the detachment of the ears through decomposition.

10kgS (fig. 15) showed much evidence of disturbance (including 180° inversion noted previously) and also showed movement downhill, towards 25kgS. The inversion was as a result of scavenger bird activity, and the movement downhill following the path of least resistance also. The smaller skeletal elements, however, may also have been transported downhill by water currents, as a result of the heavy rains the area experienced in intermittent periods during the 28month experiment.

15kgS (fig. 16) also demonstrated downhill movement of the earrings, and multi-directional spread of the skeletal elements. Both the skeletal elements and the earrings were directed somewhat towards 25kgS also. The indication of movement towards another deposition is also indicative of scavenger behaviour as all deposits were decomposing simultaneously and so scavengers would have capitalised upon the available material for consumption, thus carrying items between depositions.

25kgS (fig. 17 and 17a) showed the most comprehensible evidence for scavenger behaviour retrieving its only recovered earring from within a molehill at a depth of 5cm.

50kgS (fig. 18 and 18a) showed remarkable movement in the retrieval of the earrings uphill from the remains, which showed widespread distribution in all directions, and towards the tree-line. Only upon further investigation was this unusual occurrence of the earrings being transported uphill and towards the trees explained with the unearthing of mole tracks following the same path.

The results retrieved from the surface depositions further support recommendations made to the field to search beyond the primary recovered and clustered remains (e.g. Dupras *et al.* 2006) and culminate in the recommendation for searching to occur to a radius of at least 1.2m of the originally located remains (as demonstrated by 15kgS, Table 18). This is not only for the recovery of personal effects such as earrings, but also for the full recovery of skeletal elements, the importance of which is emphasised manifold (e.g. Dupras *et al.* 2006, Killam 2004, Haglund 2002).

Duday‟s work detailing the precise location of skeletal elements within burial contexts emphasizes the level of detail an excavation can provide the excavator. Of most interest to this study is his discussion regarding the small bones of the inner ear- the incus, malleus and stapes. He argues that the recovery of these small bones can provide the excavator with the knowledge of the head‟s original orientation prior to decomposition, and can also provide confirmation of a skull‟s presence and later removal, in contrast to apparent decapitation (Duday 2009).

The retrieval of an earring *in situ* in relation to other skeletal elements can also infer the prior presence of a skull and its later removal- detailing secondary movement and interference of remains. However, we must be careful not to stick too rigidly to this recommendation; as we see from the results of the buried remains of this study, movement of skeletal elements as well as the earrings themselves in relation to the skeletal remains is not a precise science.

4.9.2. Buried deposits

The femora were removed from all remains on 01/06/08, as detailed above, but all burials experienced only localised disturbance for this element of research to take place with the femora being targeted and the remains as a whole left undisturbed. Each burial demonstrated different levels of skeletonisation at the time of excavation (table 19). All 12 earrings were recovered from the six burial contexts.

1-2kgB displayed small areas of adipocere at the time of excavation- it was recovered articulated including the relative location of both earrings. Disturbance was only demonstrated in the region of the hind legs- demonstrated by the disarticulated recovery of inonimate, thoracic vertebrae and the remaining femur, most likely after the aforementioned removal of one femur from each context (fig. 19). This was the only burial to exhibit evidence of disturbance, however, so faunal activity cannot be ruled out, despite lack of evidence of gnawing or other disturbance on the bones themselves.

3-4kgB also displayed no obvious signs of disturbance to the remains or earring placement (fig. 20). Of particular interest in this burial was the articulated position of the rear right leg, showing the precise nature of the removal of the femur mentioned above and therefore not affecting this experiment.

10kgB demonstrated very different soil conditions with the soil being very adhesive, wet and „lumpy" in comparison. Whilst both earrings were recovered in relation to the skeletonised remains (fig. 21), their depth of recovery was significant- the depth of the burial recorded at the time of deposit was 30cm, and the earrings were recovered 2cm and 6cm below this depth respectively.

15kgB was the most notable of the buried contexts with regard to material movement and recovery. Excessive invertebrate activity was evident at the time of excavation, resulting in wet, viscous soil. The remains were recovered in relative articulation (fig. 22), skeletonised with some hair still present. The first earring recovered superiorly in relation to the cranium, but at a depth of 6 cm below the lowest resting point of the skull which was at the base of the grave at 30cm. The second earring seemed absent, until further examination of the burial context and skeletal elements revealed it within the cranium (fig. 25). The position of the skull in relation to the post-cranial skeleton results in the conclusion that this occurrence was as a direct result of biological and invertebrate activity throughout the decomposition process, and not as a result of cranial movement.

25kgB remained undisturbed (fig. 23) to the extent that the forelegs remained not only in articulation, but also bound by the rope which originally tied the legs together. In direct contrast to the previous two burial contexts, the earrings were recovered at the relatively shallow depths of 29 and 32cm depth, within the 40cm grave. This does, however, crucially highlight the ability for artefacts to move in all directions within a grave.

50kgB (fig. 24) also demonstrated adipocere at the time of excavation- but considerably more than experienced in 1-2kgB due to the larger size and increased fat content of the subject. Buried at a depth of 40cm, one earring was located anterior to the cranium at a depth comparable with the skeletal elements (35cm), though the second further supported the recommendation to further excavate below the grave base being located at a depth of 46cm.

fig. 25. 15kgB. second earring recovered within the cranium (yellow arrow). (First earring can be seen to the right of the cranium in this photo). The green arrow indicates hair still present on the skeletonised remains. Photo by Starkie 2009.

It is surmised that the depth of recovery and condition of the soil are related, and are as a result of invertebrate activity within the burial context. Duday‟s work confirms this possible detailing the extent of worm action that may result in „blurring‟ all the edges, walls and bases of the grave (Duday 2009) furthering the argument for complete excavation outside the perimeters of the burial context also. This bioturbation of the soil can therefore result in the movement of small artefacts within the affected matrix.

With regards to a relationship between earring recovery and extent of skeletonisation there appears to be no correlation- 1-2kgB and 50kgB show presence of adipocere at time of excavation, but the earrings of 1-2kgB were recovered seemingly in their original position, when compared to the position of the undisturbed skeletal material, whereas the earrings from 50kgB were recovered one in apparent original position and the other 6cm below the base of the grave (table 19).

Those that demonstrated complete skeletonisation and no other significant findings (3-4kgB, 10kgB and 25kgB) also demonstrated varied recovery depths of earrings, relative to their original location within the grave. 3-4kgB earrings apparently recovered in their original locations, 25kgB displaying evidence of movement vertically in the grave context and 10kgB recovering one earring from 6cm below the grave base (table 19).

The results from this overall experiment support the assumption that surface deposits will decompose faster, will experience greater interference and will therefore result in more extensive movement of artefacts than the burial deposits, which are likely to remain more intact (Killam 2004). Of the total 24 earrings, 22 were recovered; the remaining two were both absent to within a 120cm radius, and a 15cm depth, of their respective original surface deposit sites. The distance of movement recorded in the 15kg (77cm) and 50kg (62cm) surface depositions, as well as the recovery of only one of the two earrings from both the 1-2kg and 25kg surface deposit pigs and the recovery of all earrings correlating to the burials further supports this hypothesis.

Whilst rodent activity was recorded initially, the bones did not show evidence of gnawing. It can be assumed that the netting used to cover the surface remains acted as a sufficient deterrent, but the fine gauge of the netting would not be sufficient to permanently deter rodents- it primarily deterred the removal of the remains by scavenging birds, ensuring horizontal and depth dispersal of evidence, but preventing vertical movement.

What is most notable as a result of this experiment, however, is the extent to which the earrings in the burial contexts moved, especially with regard to „self burial". This is particularly evident in the depths at which they were recovered in the 10kg, 15kg and 50kg burials (table 19). The recovery of these items at such significant depths below the base of these graves emphasises the extent to which bioturbation (both as a result of bacterial action and invertebrate activity) can affect the relationships between items within a grave.

The order of disturbance of this site is also clear, further supporting the taphonomic assumptions- invertebrate activity is evident even 28 months after deposition (15kg burial) and mole activity at the site was particularly noted from 05/2009 around the surface deposits and was still evident at time of excavation (08/2009). The results from the burial depositions here therefore support the recommendations made to the field to excavate to at least 10cm below the base of the grave (Duday 2009, Dupras *et al.* 2006, Haglund and Sorg, 2002) in order to ensure complete retrieval of all artefacts.

These results, with respect to buried remains, further support the recommendations made in prior publications (e.g. Dupras *et al.* 2006, Haglund and Sorg 2006b) to excavate below the grave"s floor as evidence may be concealed- previously attention has been paid in this respect to the recovery of bullets, bullet casings and chemicals, but we show here that small personal effects may also be recovered below the assumed feature base, and are of just as much significance to the forensic investigation as a whole.

4.10. Conclusion.

Even in relatively controlled experiments such as these, with limited variables, artefacts are still recovered some distance from their original deposition area. The ability to retrieve items from below the „true‟ base of a burial or pit emphasises the need for complete excavation of the site, and not just exhumation of the remains, by a trained professional, as detailed above. Burials are frequently considered „self contained‟, but the evidence presented by this study proves that the parameters of burials should also be extended to ensure complete recovery and recording.

The distance the earrings travelled across the site in the surface deposits also highlights the necessary measures crime scene investigators must employ- namely the search to at least 120cm radius from the originally located remains. The earring leading to this recommendation had travelled from the 15kg surface deposit towards the 25kg surface deposit- 119cm from first identified 15kg remains. However, its recovered location was only 134cm from the centre cluster of remains of the 25kg surface deposit. It was identified as belonging to the 15kg deposit from its colour coding, though it must be borne in mind that in forensic scenarios, such prior information will almost never be known.

The extent to which items may travel is of direct significance to the three dimensional size of search area and site itself. Results and data such as these allows for a better indication of size of area to be searched, both in the recovery of the body to find associated items, and vice versa.

The nature of personal effects implies their close proximity to the body- in the case of jewellery, particularly piercings, the continued contact with the body may result in the presence of DNA, the proof of which is insurmountable in identifications; "Identification of an individual using DNA collected from personal effects can be an extremely significant technique" (Thompson and Puxley, 2007). The potential for their storage of DNA was particularly evident in this experiment as 4 earrings were recovered (1 surface, 3 burials) still with soft tissue and hair attached. This type of further investigation may be critical as it cannot be assumed that an artefact found associated with particular remains means it belongs to them, nor that it confirms their identity (Haglund and Sorg 2006, Jensen 1999, Schmitt 2002), but may provide additional information pertaining to the identity of the deceased, or other individuals involved in the scene.

The extent to which items may travel is of direct significance to the three dimensional size of search area and the site itself. Results and data such as these allow for a better indication of the size of area to be searched, both in the recovery of the body to find associated items, and vice versa. The results here also highlight the potential for retrieval of information pertaining to body modification practices even from skeletal remains. Body modification practices such as piercings, sub-dermal and cosmetic implants can be detected throughout the post-mortem period where piercing jewellery is worn, though epidermal modifications (tattoos, scars, brandings, piercing sites not dressed with jewellery) require investigation sooner after death when skin remains, and form the subject matter of Chapter 5.

"Pigments contribute to the enjoyment and beauty of the world." (Christie 2001)

Chapter 5

5. Chemical analysis of tattoo inks.

5.1. Introduction

As detailed in Chapter 1, tattoos are considered significant features in cases of identification- both of living and deceased individuals and as such provide potentially invaluable sources of additional forensic information. It is essential that this is fully researched in order that we may maximise that potential.

Their permanent nature and subsequent difficulty in removal lend them well for use as identifying characteristics to be noted in forensic cases. Post-mortem, they remain visible even after some initial identification practices may be impossible- such as fingerprinting, for example (McKechnie 2008). At present, the most commonly employed method for highlighting tattoos on skin discoloured post-mortem is the application of 3% hydrogen peroxide solution (Haglund and Sperry 1993).

A paper currently in press (Starkie *et al.* (*in press*) Appendix 4) describe a modern alternative to this technique with the utilisation of infrared imaging techniques. The technique allows for the surveillance of the entire body prior to image capturing, providing high quality images of the tattoo(s) for recording and storing in the digital database of post-mortem information. This technique is considered superior to the application of hydrogen peroxide in its ability to be utilised over an entire body; the hydrogen peroxide technique requires prior suspicion of a tattoo in the specific area- it is impractical to douse the body completely with 3% hydrogen peroxide solution and would be too invasive if applied as such for forensic analysis of other evidence such as contact or trace evidence. Once revealed, however, the vast quantity of information to be garnered from the tattoo(s) must be collected- it is the intention of this investigation to unveil and fully examine the information to be gleaned from tattoos that may be of forensic significance, and to hone the necessary techniques.

Tattoo inks are manufactured and traded internationally. The status of each company that produces them varies widely, from factory production to some even being produced in such informal surroundings as the family home. Despite their continued widespread use, and their position within the skin, no legislation pertaining to the ingredients or the use of such cosmetic materials exists, as evidenced in the Cosmetics Legislation as set out by the European Commission, 1999, Article 1, Annex I. Neither is tattoo ink covered by legislation pertaining to medicine or consumption. Historically tattoo inks have comprised toxic metal salt based pigments, including cadmium, lead and mercury (Massopust 1951, http://www.chemistry.about.com 2008).

It is generally thought that since the early 1990s there has been a shift in the production of tattoo inks to now be primarily based on organic pigments (Wroblewski 1990, Vasold *et al.* 2004), though evidence for this prior to 2004 is limited. Engel *et al.* (2006) conducted experiments that proved the contemporary use of 'azo pigments' in tattoo inks (fig. 26).

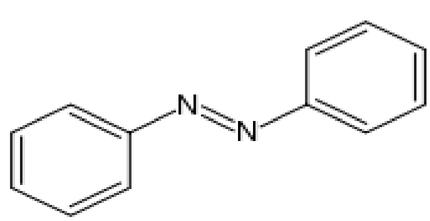


fig. 26. Chemical structure of an azo pigment. http://cnx.org

Azo pigments are a very diverse group of pigments, allowing for great variety of colour, and displaying qualities useful for tattoo inks including low bleed characteristics and good acid and alkali resistance (Kirk 1996) as well as exhibiting good light-fastness qualities. Azo pigments "tend to agglomerate in the skin, forming particles of size ~0.5 to 10 µm" (Vasold *et al* 2008). True organic pigment particle size is as fine as is technically possible, ensuring maximum colour strength while maintaining transparency. It is the inorganic particles that are carefully manufactured at 0.2-0.3µm to provide maximum opacity.

Therefore the use of organic pigments in the matrix of the body maintains the intensity of colour and lightfastness of the organic pigments, but includes the opacity of the inorganic pigments by emulating their particle size. While reactions to modern tattoo inks remain mercifully infrequent, cases of photosensitivity have been reported in relation to MRI scanning equipment and even diet (Tsturuta *et al.* 2004, Burns *et al.* 2004, Kazandjieva and Tsankov 2007a). It is considered here, however, that many professions would benefit from the proclamation of ingredients; medically to eliminate allergic reactions and reactions due to MRI and other investigative procedures (Vahlensieck 2000, Wagle and Smith 2000, Ratnapalan *et al.* 2004, Hudson 2007, Armstrong and Elkins 2005); forensically with the compilation of a comprehensive database of inks for comparison; for laser therapists in their ability to accurately treat areas with prior knowledge of the pigments being encountered and the characteristics they display under laser treatment (Varma and Swanson 2002); and the tattooing community itself allowing for the quelling of rumours that have continued to plague the industry.

It is the competitive and secretive nature of the industry which is most likely to lead to the unique chemical signature of each ink brand and colour- if this is proven to be true, then tattoo ink recovered from a forensic scenario may be traceable to a specific manufacturer, limiting the number of parlours and/or artists that produced the work, further aiding the identification process. It may also allow for protection of each manufacturer in cases where the presence of restricted use materials may be as the result of tampering with the inks' chemical makeup, not manufacturing malpractice or neglect.

It will similarly, therefore, also protect artists from accusations of malpractice. However, with the aforementioned lack of legislation, due to the ink's insertion under the skin as opposed to application on the surface of it, the ink ingredients remain unregulated and unknown to the consumer- the manufacturers are not obliged to reveal the ingredients of the inks (Beute *et al.* 2008), making scientific and chemical analysis more challenging.

Post-mortem, tattoos have been reported as 'fading' in colour (Ferllini 2002). While it is more likely that this effect is as a result of the skin's own discolouration rather than the ink's own colour change and chemical instability, chemical analysis may also help in such cases by identifying the original colour(s) and therefore appearance of a tattoo. As discussed in Chapter 3, tattoos and personal effects can more easily and acceptably be portrayed in the media prompting recognition and ultimate identification in preference to the more emotive and socially unacceptable production of post-mortem images (Thompson and Puxley 2007). However, in cases where images of the tattoo or diagrammatic reproduction alone are considered insufficient (also discussed in Chapter 4), the ability to describe in detail the probable appearance of the tattoo in life is noteworthy.

With more commonplace use of lasers (to lighten tattoos for re-application or covering, as well as for attempts at complete removal), knowledge of the chemical composition of inks is paramount. Presently, laser techniques experience mixed levels of success, dependent upon the colour of the tattoo and the selected wavelength used. Tattoos using black and blue inks respond most positively to laser removal using Quality-switched (Q-switch) lasers. This is due to the frequent employment of lasers which emit light in wavelengths to which blues and black are most absorbent (table 20).

Table 20. Wavelengths of lasers available, and their preferential treatment of certain colours.

Type of Q-switched laser (wavelength)	Colour(s) most effectively removed
Frequency doubled Nd:YAG (532nm)	red, orange
Ruby (694nm)	black, blue
Alexandrite (755nm)	black, blue, green (with persistence)
Nd:YAG (1064nm)	black and dark blue

Legislation, while not concerning production and use aspects of tattoo inks, has been introduced with regard to the distribution of certain brands of tattoo ink. Intenze Ink, for example, is banned within the EU, with the exception of Britain, due to concerns over its chemical composition. However, the international trade and ability to purchase tattoo inks online make this a futile attempt. Powerline Supplies proudly distribute this brand of ink stating:

> "From its inception in the laboratory by Mario Barth, to its home in the skin, Intenze is the world's safest, most sterile and best looking tattoo ink. Intenze features unique blends of scientifically formulated pigments which have proven themselves time and time again. Intenze is the easiest to apply and longest lasting tattoo pigment on the market." (http://www.powerlinesupplies.co.uk).

While it can be considered encouraging that legislative measures are being put in place regarding the tattoo and piercing industry, policing such regulations is impossible given the industry's international and independent nature. It is the view of the author that regulations and legislations put in practice be discussed and drawn up in agreement with those in the industry as it is therefore more likely to succeed in its implementation without damaging the industry or its clients.

At the start of the investigations into the inks in 2008, observation at various tattoo conventions, as well as conversation with prominent tattoo artists, revealed the most popular inks in use in the British tattoo industry to be Vivid Inks, Eternal Inks and New Image. Inks become popular among artists when they show the following qualities:

colourfastness, vividity and consistency. With the ever growing and changing demands of the tattoo artists, and the competition to be the most popular ink of choice, it is believed that each manufacturer, not having to comply to strict production guidelines, will produce unique inks.

5.2 Aim

The aim of this element of the research was to determine the signatures of tattoo inks from different manufacturers. As part of this it is necessary to determine the ink ingredients, as they are not required to be disclosed, but that was not the primary aim of this research.

5.2.1 Hypothesis

It is possible to determine an ink's manufacturer from its chemical signature.

5.3 Literature review.

Given the novel nature of this research, there was limited literature detailing established methods of extraction of pigment from tattoo inks. In 2000 Baumler *et al.* completed the first extensive investigation into tattoo ink composition, investigating 41 inks produced by a single manufacturer in New York. Further to this, the same research team published a paper (Engel *et al.* 2006) reporting the use of HPLC (High Performance Liquid Chromatography) in their investigations. The method detailed was employed to ascertain the concentration of tattoo pigments in the skin, and so the ensuing extraction method detailed was directed at the extraction of tattoo ink pigment from the skin for quantitative analysis. The lengthy process involved the breakdown of the skin using liquid nitrogen and incubation periods with various enzymes, followed by the preparation of the samples in solutions of methanol, methylene chloride and chloroform, before final quantitative analysis of the whole sample by HPLC.

The work carried out previously by Vasold *et al.* (2004) highlighted concerns about the use of azo pigments in tattoo inks, detailing their ability to be cleaved by laser light resulting in potentially carcinogenic compounds. Whilst providing little information of investigative protocol for this research, through their work this research group highlights the significance of and need for the completion of this work.

5.4 Methods

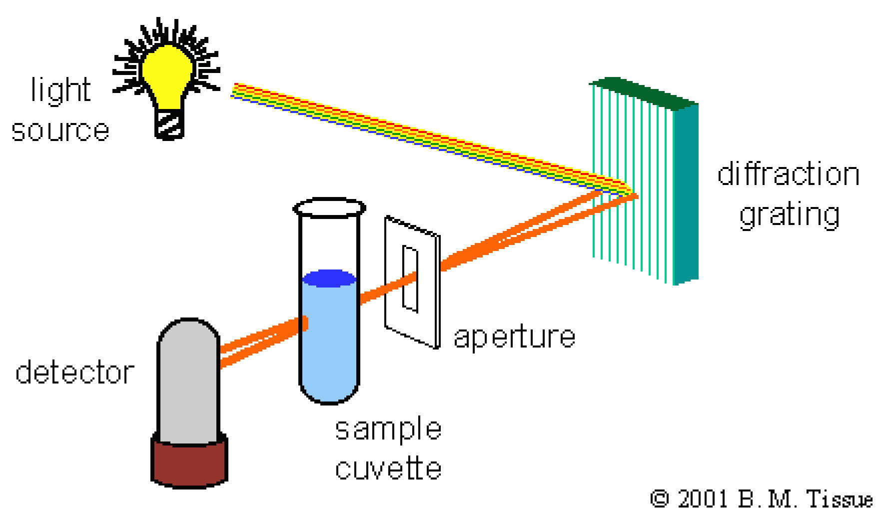
Inks from three main UK based suppliers were acquired for initial investigation in 2008. Each ink brand retailed at different prices, indicating their 'position' in the market; most expensive was 'Vivid Ink', mid-range was 'Powerline', and the least expensive being 'New Image'. ‘Powerline’ Ink was substituted for the aforementioned ‘Eternal Ink’ as it retailed in a mid price-range, and Eternal retailed at a price comparable to Vivid Ink. All price ranges were to be investigated here. Red, black and white inks from each of these brands were analysed- black is by far the most commonly used colour in tattoos- used for outlines, shading, gradation of coloured areas and block colour. Red is the most frequently reported concerning allergic reactions and is a common colour in many tattoo designs. White is a relatively new ink colour, being used primarily for highlighting images and for mixing with other colours either for lightening or increasing their opacity. Once a suitable method for investigation was ascertained and honed (to be discussed below) multiple colours from other suppliers were obtained for comparison and creation of a comparative and working database for forensic tattoo ink analysis. Annual testing of the original inks was also scheduled, for comparison of consistency of production and analysis of the ink's own characteristics over time.

A table detailing the 88 tattoo inks tested in this research can be found in Appendix 5.

In accordance with the aforementioned publications, separation for analysis by UV spectroscopy and HPLC were attempted. Separation of solid and liquid (assumed pigment and carrier) was initially attempted by vacuum- though the particles proved too fine for this to be successful. Centrifugation was therefore trialled- 12g of each ink was subjected to 20 minutes of 3,000rpm. The resulting solid compound was then dried overnight in an oven at 50°C whilst the liquid was diluted 1 part to 5 parts methanol for analysis by UV spectrometry. Separation by centrifuge was only possible for the Powerline and New Image red and white inks, with Vivid Ink remaining a homogeneous consistency. None of the black inks responded to centrifugation, also remaining homogeneous. These inks were therefore subjected to drying overnight in the oven at 50°C for FTIR analysis with the solid compounds of the Powerline and New Image red and white inks.

UV spectrometry (fig 27), refers to absorption spectroscopy in the ultraviolet-visible spectral region. The Beer-Lambert law states that the absorbance of a solution is directly proportional to the concentration of the absorbing species in the solution and the path length. The Beer-Lambert law has implicit assumptions that must be met experimentally for it to apply. For instance, the chemical makeup and physical environment of the sample can alter its extinction coefficient. The chemical and physical conditions of a test sample must therefore match reference measurements for conclusions to be valid. If a sample is too concentrated, the amount of light passed through the sample is significantly too small and so stray light will be recorded by the detector. (Currell 2000).

fig. 27. Schematic image of UV spectrophotometer. (www.files.chem.vt.edu 2010)



Following the methods used by Engel *et al.* (2006) was not appropriate for the purposes of extracting and qualifying the pigment in its neat form. However, it was considered that HPLC would be investigated as a method, given its success in application by Engel *et al* (2006) concerning investigations of tattoo inks. HPLC is a chromatographic technique that separates a mixture of compounds identifying, quantifying and purifying the individual components of the mixture (fig. 28).

Once the solid and liquid phases were separated by centrifugation, the solid phase was diluted by various solvents for extraction of the pigment. Initial extraction was attempted using methanol- 5g pigment in 50ml methanol, heated to 60°C and agitated for a period of 2 hours. Methanol proved unsuccessful. Acetone was trialled following the same method (with the exception of heating to 50°C due to the lower boiling point of acetone at 56°C). This also proved unsuccessful in the extraction of pigment. Dichloromethane was substituted and the same method followed (at 50°C)- indications were that extraction had occurred and so the sample was filtered and injected into the HPLC.

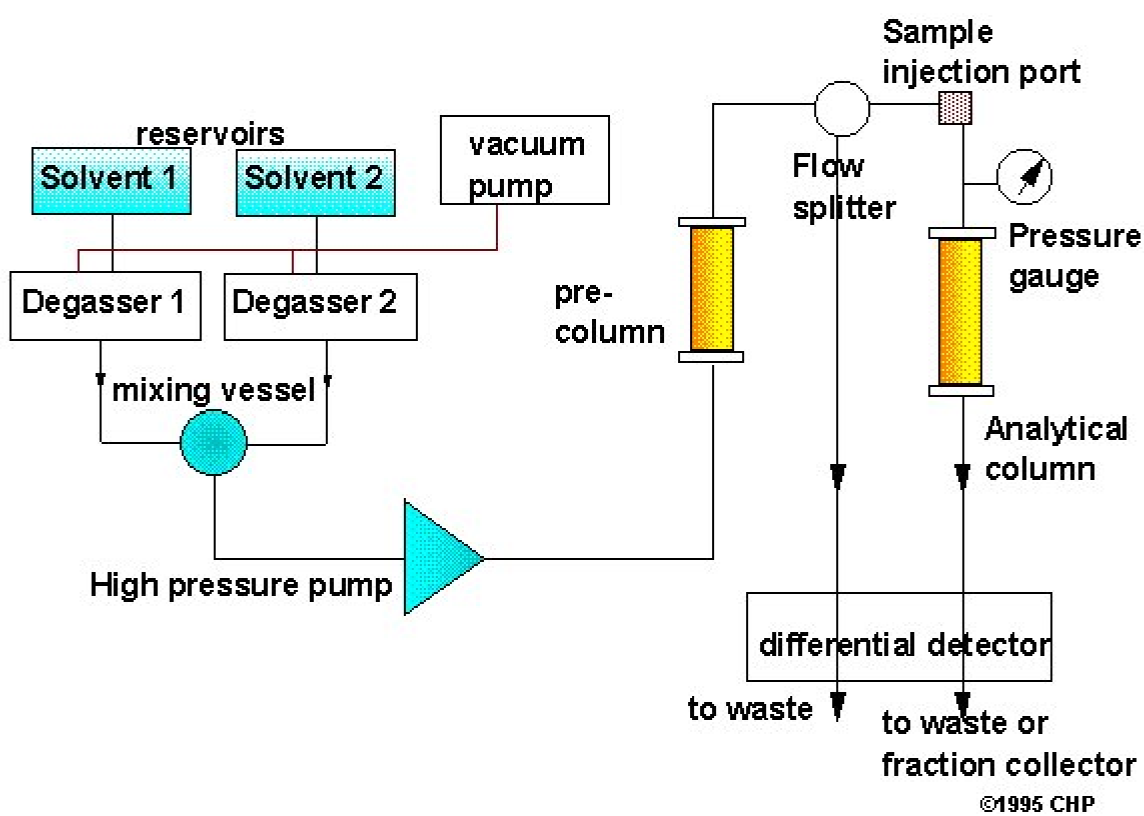


fig. 28. HPLC experiment schematic. (www.chemicool.com 2010)

It was considered that the solid phases should also be subjected to FTIR analysis- Fourier Transform Infrared spectroscopy. With successful use of this technique already established at the University in the analysis of the structural alteration of bone subjected to varying intensities and durations of heat (Thompson *et al.* 2009) this method was considered plausible for the comparative analysis of the chemical analysis of tattoo inks.

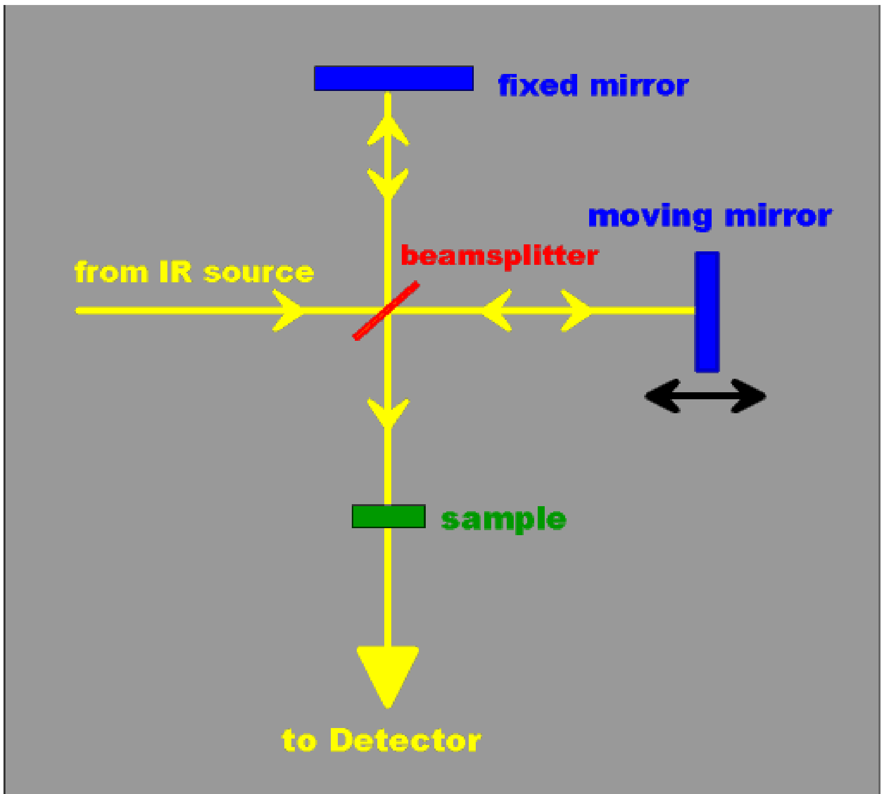


fig. 29. Basic FTIR experiment schematic. (www.biophysik.uni-freiburg.de 2011)

FTIR (fig. 29) is useful for identifying unknown material, determining the quantity and consistency of a sample and determining the amount of components in a mixture. FTIR works by passing infrared (IR) radiation through a sample and recording the absorption and transmittance of the radiation at specific wavelengths. This results in the production of spectra unique to each sample analysed- much like a fingerprint. Reproducibility is therefore "significantly difficult" as even the smallest contaminants can be detected and identified, thanks to the heightened sensitivity of this technique (Thermo Nicolet

Corporation). Therefore we can assume that inks of the same colour (e.g. red) produced by different manufacturers may vary greatly, while only minimal variation batch to batch by the same manufacturer would be expected. FTIR is a non-destructive technique that can provide precise measurements without the need for calibration. The speed and sensitivity can be altered, it is mechanically simple, and therefore very easy and precise to use.

<u>Experiment setup:</u>
FTIR: Nicolet 5700 FTIR
Software: Omnic
Range: Mid-infrared 4000-400cm^{-1}
Spectral resolution: 4cm^{-1}
ATR crystal: diamond 30,000-200 cm^{-1}
Number of scans: 16
Final format: % transmittance
Data spacing: 1.928 cm^{-1}
Correction: ATR
Collect background before every sample

Sample analysis process, as recommended and detailed by Thermo Nicolet Corporation:

- Infrared energy is emitted from a glowing black-body source. This beam passes through an aperture which controls the amount of energy presented to the sample (and, ultimately, to the detector).

- The beam enters the interferometer where the 'spectral encoding' takes place. The resulting interferogram signal then exits the interferometer.

- The beam enters the sample compartment where it is transmitted through or reflected off of the surface of the sample, depending on the type of analysis being accomplished. This is where the specific frequencies of energy, which are uniquely characteristic of the sample, are absorbed.

- The beam finally passes to the detector for final measurement. The detectors used are specially designed to measure the special interferogram signal.

- The measured signal is digitized and sent to the computer where the Fourier transformation [mathematical technique] takes place. The final infrared spectrum is then presented to the user for interpretation and any further manipulation.

- A background spectrum must be measured prior to analysis to provide relative absorption intensity scale.

Further to this, it was considered that analysis of these powdered pigment samples by SEM-EDX (Scanning electron microscope- energy dispersive x-ray) would be beneficial for unveiling the elemental makeup and characteristics (such as size, morphology and composition) of the pigments. SEM-EDX investigates the elemental composition of a sample by firing electrons and measuring the x-rays given off by the sample as a result. The elemental composition of a sample can be determined, therefore, by the signature X-rays retrieved. SEM-EDX is commonly used in the forensic analysis of dust and powders. SEM-EDX lends itself well to this type of analysis and is able to automatically perform analysis to 2µm, even the smallest particles can be imaged and analysed.

By 2010, the method of MSP- Microspectrophotometry was made available to this investigation. It is a technique often used in forensic cases such as hit-and-runs, hair and fibre analysis, and the analysis of questioned documents. MSP investigates the colour of a sample by measuring objectively its emitted visible spectrum. MSP analyses chromatographically a colour on a set, plain white background, through all visible and ultraviolet wavelengths of light and assigning it a specific numerical value, known as 'chromaticity coordinates'. When analysing colours in a scientific (specifically forensic) setting, colour names are insufficient and explanatory terms are equally limited by language and liable to 'wordiness'. Description of colours is also subjective- one person's turquoise is another's aqua-marine. Environment and setting can also influence a person's perception of colour. By implementing an objective technique such as MSP, subjectivity is eradicated. For the purposes of an investigation such as this, however, the ability to assign specific values (chromaticity coordinates) to each ink produced enables us to better identify the level of colour variation between manufacturers and batches.

<u>Experiment set up:</u>

Microscope: Olympus BX51

Software: Onyx

Intensity of Light: 12.0

Mode: Reflectance

Range: 379.221- 680.672 nm

5.5 Results.

All results obtained from each method of investigation can be accessed in Appendix 6. Some examples can be observed in the discussion.

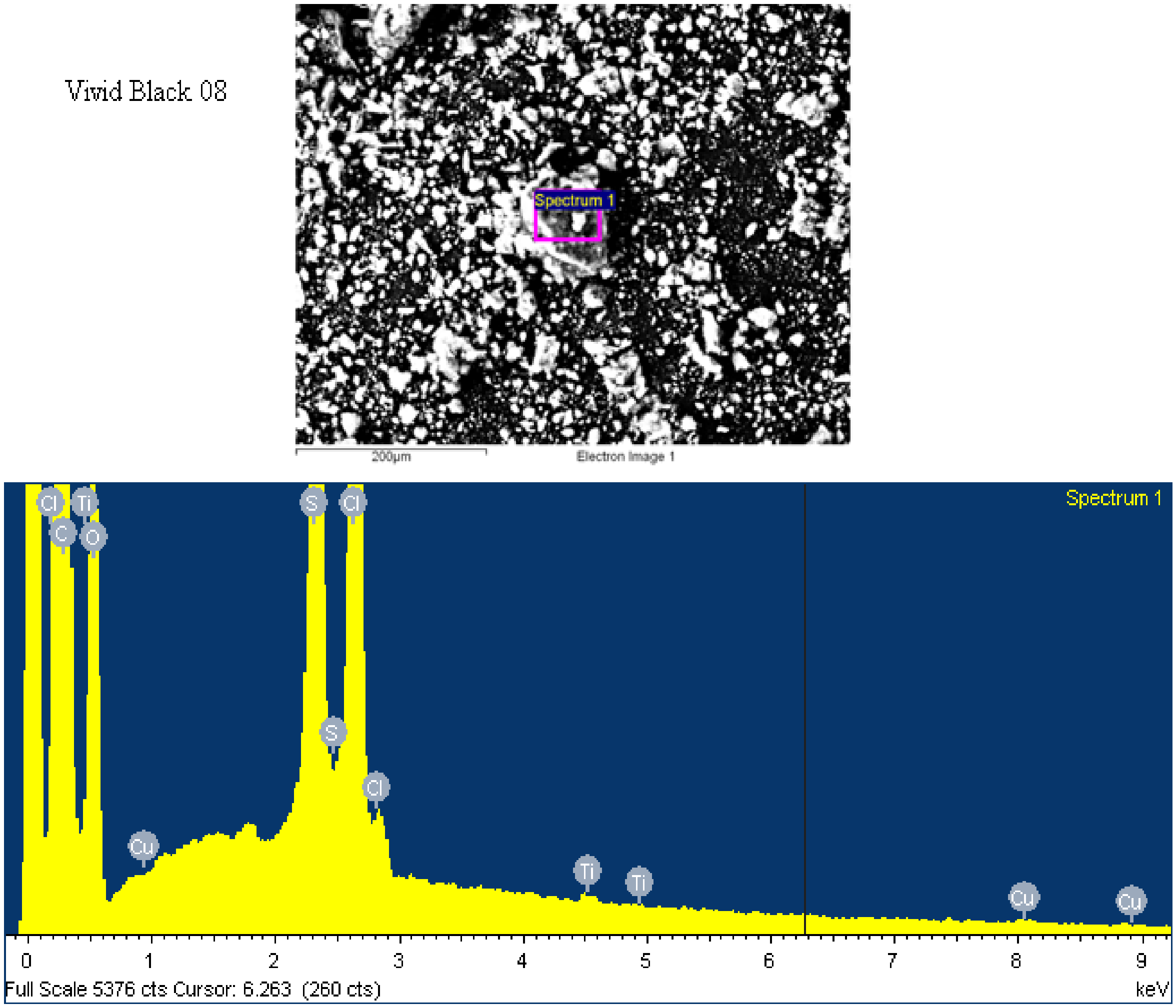
5.6 Discussion

UV spectrometry proved a successful method of analysis, though FTIR results were superior in the analysis of the coloured inks, providing greater specificity of varied wavelengths of peak absorption (figs 31 and 32). However, when analysing the UV inks in 2009, FTIR produced very similar graphs for all the UV inks, despite their 'colour' (fig 33). Therefore these inks were subjected to analysis by UV-spectrometry providing distinguishable results (figs 34 and 35). This occurrence was unsurprising given the deliberate manufacture of UV inks to be visible only under UV light sources as opposed to visible and infrared wavelengths.

The use of HPLC provided no usable results for this investigation, despite initial indications that dichloromethane (as dictated by Engel *et al.* 2006) as a solvent for pigment extraction looked promising. The conclusion from this unsuccessful extraction of the pigment from its carrier compound, therefore, is that the pigment must be strongly bonded to the binder material. In light of these findings, HPLC is not recommended as a method for determining the chemical signature and comparative analysis of tattoo inks from different manufacturers.

All seven of the inks that dried successfully in initial studies carried out in 2008 were analysed with the SEM-EDX (neither Powerline nor New Image blacks dried effectively).

fig. 30. SEM EDX analysis of Vivid Black 2008

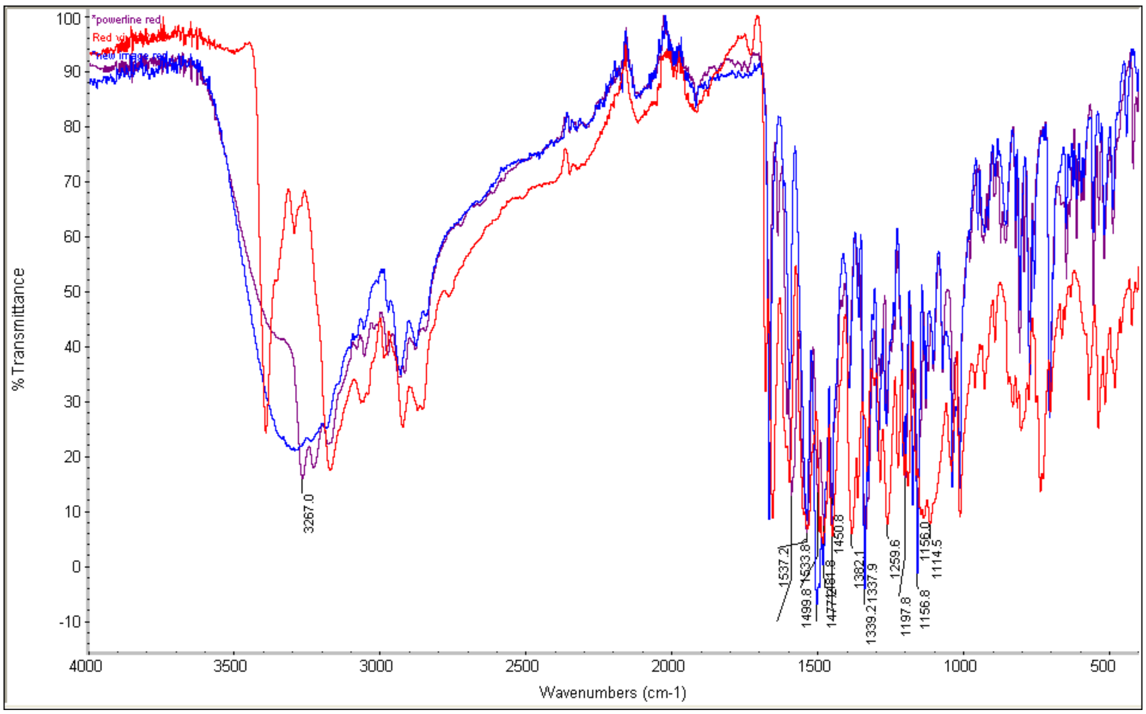


We can observe from the SEM-EDX results, through the elemental analysis of the dried pigments, that while metal salts and other potentially harmful chemicals were disclosed (e.g. titanium in whites and reds, sulphur in reds also), their concentration, as demonstrated by this method of investigation, was not deemed high enough to be of significant risk to health.

FTIR proved the most suitable method of analysis for the purposes of this investigation. The ease of sample preparation, combined with the speed, accuracy and 'user-friendly' data display and management, all combined to prove this method's suitability to this investigation.

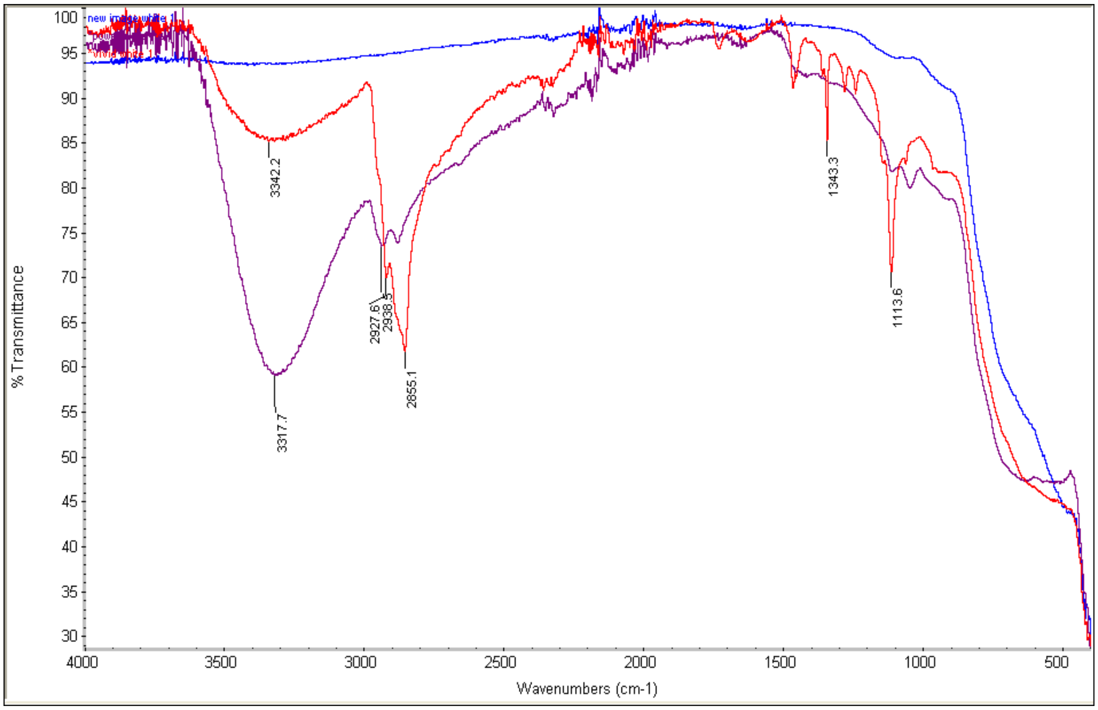
The analysis of the six inks that proved suitable for this type of analysis in 2008 produced the following graphs. These graphs display the results from FTIR analysis. The x-axis shows the wavelength in wavenumber (cm^{-1}) units and the y-axis shows % transmittance ($I/I_0 \times 100\%$) or absorption ($\log_{10} I_0/I$) the sample allows. The curves and peaks represent the absorption or transmittance at a specific wavelength of light, which is dictated by the ink's chemical composition.

<u>fig. 31. Red tattoo inks 2008 FTIR</u>



It can be seen that each red ink, produced by a different manufacturer, differs from the others, as a result of their varying ingredients. All three inks show high % transmittance between 4000 and 3600cm^{-1} with 'vivid' continuing high transmittance to 3400cm^{-1}. Whilst all three inks show gradual increase in % transmittance from 2800-1700cm^{-1}, peaks and fluctuations are clear enabling us to distinguish between them. The fingerprint region (400-1500cm^{-1}) shows the most fluctuation in % transmittance by all inks, though 'vivid' remains lowest throughout. 'Powerline' and 'new image' demonstrate very similar spectra, with marked differences only detectable between 3500-3000cm^{-1} but almost indistinguishable in the fingerprint region. This similarity in spectra is indicative of their similar chemical signatures, which in turn makes discriminating between these two manufacturers' red inks challenging.

<u>fig. 32. White tattoo inks 2008.</u>

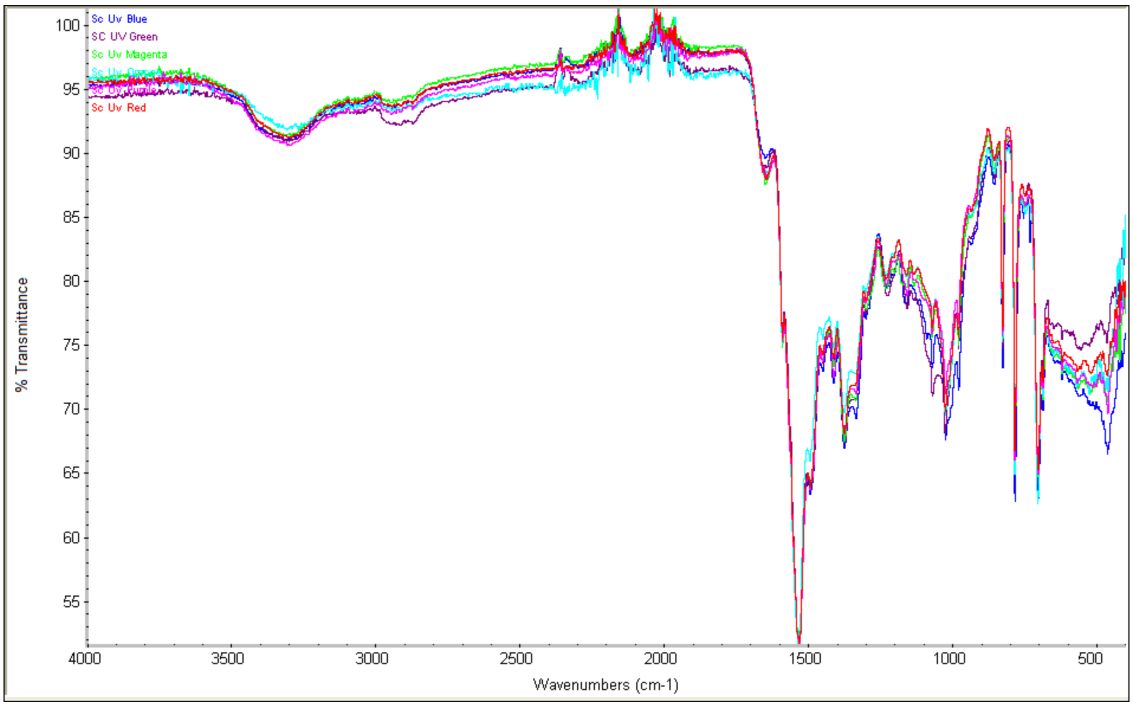


Comparison of the spectra produced for the white inks (fig 32) also demonstrated differences. 'Powerline' shows low transmittance (58%) at 3317.7cm^{-1} and high in the region 2250-1500 cm^{-1}. 'Vivid' shows high % transmittance throughout the 4000-1000 cm^{-1} range with no fluctuation, then a steep drop after 850cm^{-1}. 'New Image' shows low transmittance (60%) at 2855.1cm^{-1} after an initial dip to 85% at 3342.2cm^{-1} and later again at both 1343 and 1113cm^{-1}. Whereas 'powerline' and 'new image' displayed very similar spectra for their red inks, their white inks differ greatly. This proves that distinguishing between manufacturers may be more difficult when comparing inks of certain colours, but others may be easily distinguishable.

The black inks from vivid, powerline and new image did not produce useable FTIR spectra in 2008 and so are not reproduced here.

The analysis of the UV inks acquired in 2009 produced the following graph when analysed using FTIR:

fig. 33. Skin candy UV tattoo inks 2009



The different 'colours' of these UV inks are indistinguishable by FTIR analysis as all show transmittance at the 95% value, with similar fluctuations between 4000-1600cm^{-1}, followed by sharp drops to 0% at 1500cm^{-1} and identical fluctuations again from 1500-450cm^{-1}. This leads to the aforementioned use of UV-spectrometry, resulting in the following spectra for the UV white and pink inks:

fig. 34. UV spectroscopic analysis of UV white ink (New Image) in solution-methanol

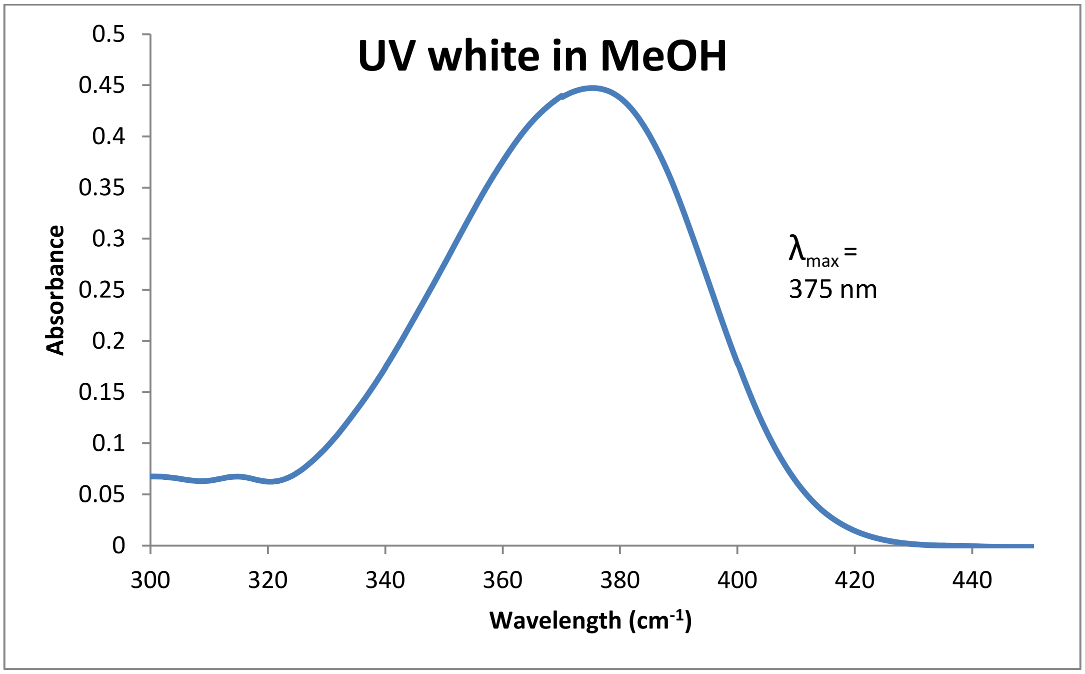
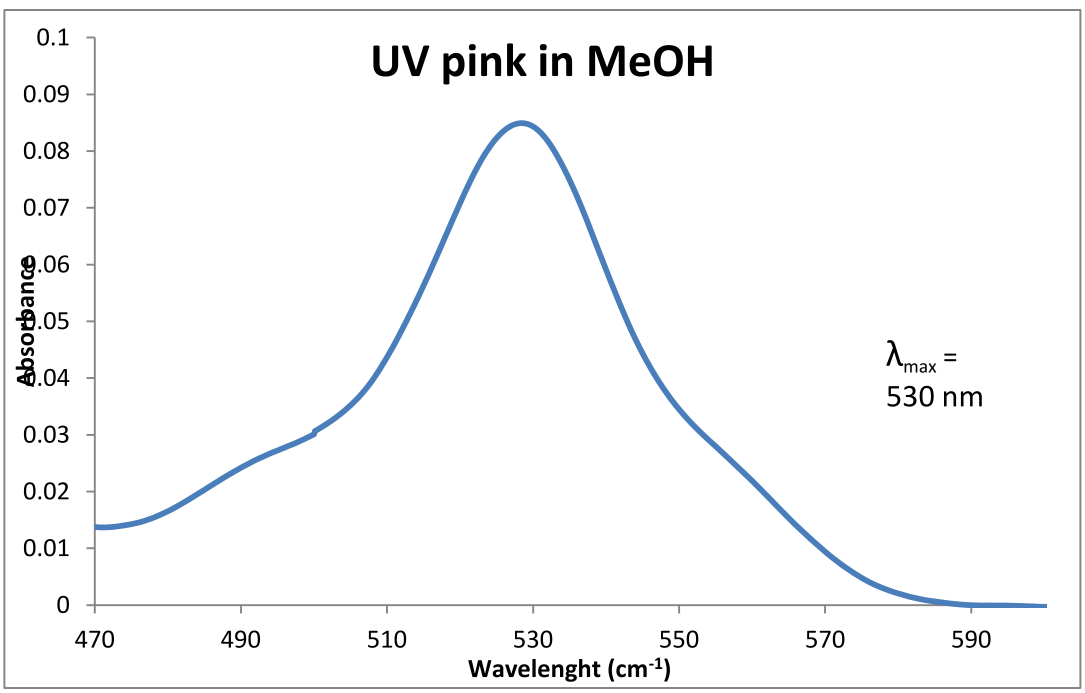


fig. 35. UV spectroscopic analysis of UV pink ink (New Image) in solution-methanol.



Figs. 34 and 35 demonstrated the distinction that can be made between the UV inks when subjected to UV spectroscopy. The maximum absorbance of the white UV ink is 375nm, whereas the pink UV ink’s maximum absorbance is at 530nm. These discriminations cannot be made using FTIR analysis and therefore UV spectroscopy should be used when investigating UV inks.

From these initial overall results we observe the different characteristics of inks of the same colours, produced by different manufacturers. Comparing the spectra visibly, however, is not sufficient in discriminating between manufacturers. Therefore statistical analysis of the results was carried out. Performing principal component analysis (PCA), the results are pared down through statistical analysis. Further to this, PCA was applied to the FTIR results after their separation into two main sections- 400-1500cm^{-1} and 1500-4000cm^{-1}, as a result of the significantly different results expressed in each of these regions. It is for these reasons that the process of Principal Component Analysis was conducted on all retrieved data for all inks subjected to FTIR analysis.

PCA is the statistical analysis of a data set investigating patterns in the data and assessing similarities and differences. PCA converts a large number of possibly correlated variables into a smaller number of uncorrelated variables which are termed ‘principal components’. The primary principal component accounts for as much variation in the data set as possible, with each successive component accounting for as much of the variation in the remaining data set as possible. In this way, where spectra appear to show patterns between them, PCA can demonstrate whether these are true, or simply perceived patterns.

fig. 36. PCA of FTIR data (1500 to 400 cm^{-1}) 2009

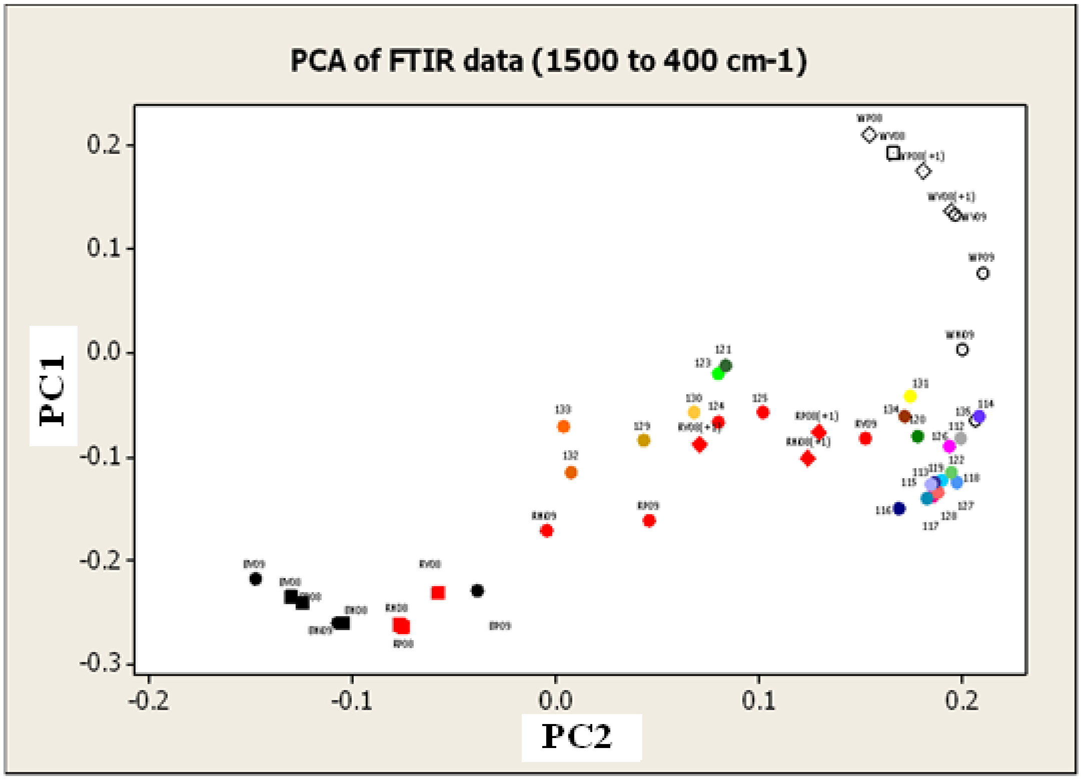
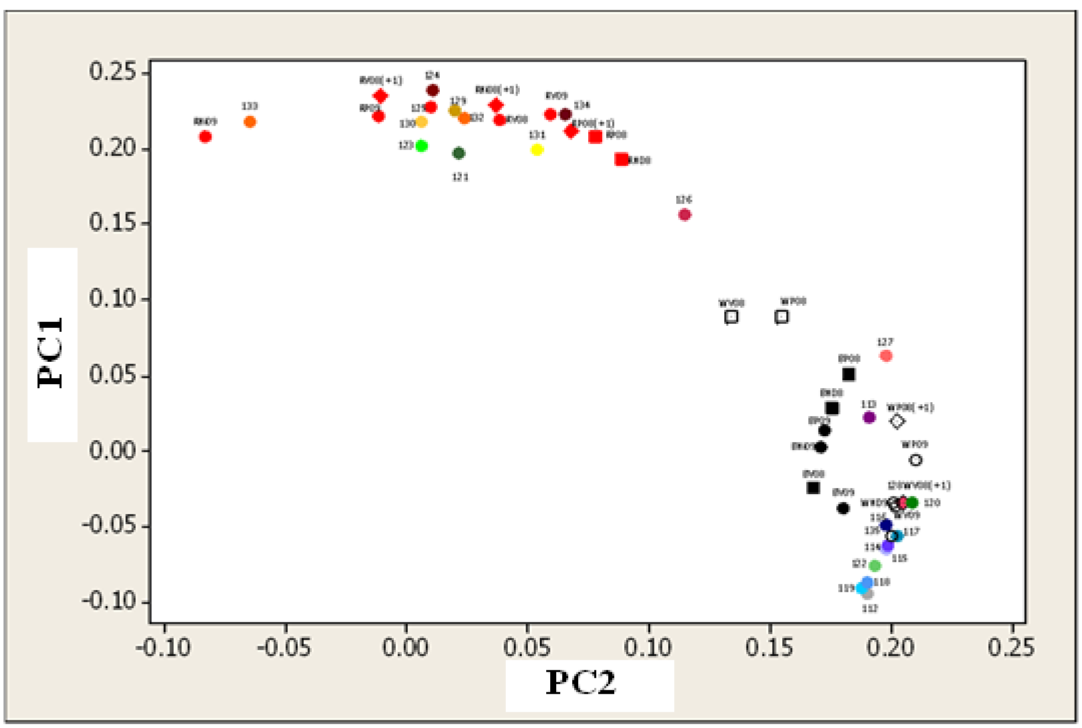


fig. 37. PCA of FTIR data (4000 to 1500 cm $^{-1}$) 2009



It is clear from these graphs (figs. 36 and 37) that most separation between the inks is demonstrated in the 400-1500cm^{-1}, or the 'fingerprint' region FTIR data showing groupings of colours when studied in the functional group regions, 1500-4000cm^{-1} (left) and fingerprint, 400-1500cm^{-1} (right).

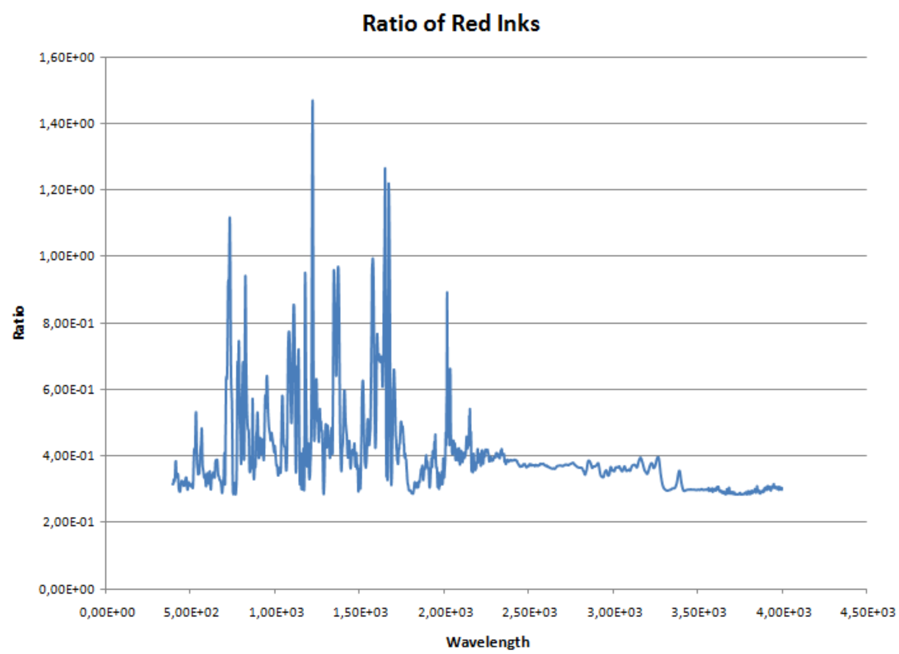
The elements most characteristic to each ink must therefore be most responsive at these wavelengths and are most likely to be the binding agents each manufacturer employs in the binding of the pigment particles, given the dried nature of the samples tested using FTIR. We can see that the black inks and the white inks 'group' together respectively, but the coloured inks refrain from grouping- this is likely as a result of the basis of the black and white inks being inorganic pigments, allowing for limited variation, whereas the coloured inks are composed of a range of organic pigments, expressing greater variation and therefore clearer differences in composition overall. In order to more fully appreciate the 'groupings' alluded to by this type of analysis, PCA was conducted on the 'ratio' aspects of each ink.

Further statistical analysis can aid the PCA results in such large data sets as those demonstrated here, where ratio analysis can be performed. The ratios are calculated providing values from the division of in group variation by between group variation, using the following formula:

$$\frac{\textit{Variation between tattoo inks}}{\Sigma\ \textit{Variation between manufacturers}}$$

When applied to the data for each group of inks, the following graphs are produced:

<u>fig. 38. Ratio- between group variance for red inks</u>



<u>fig. 39. Ratio- between group variance for white inks</u>

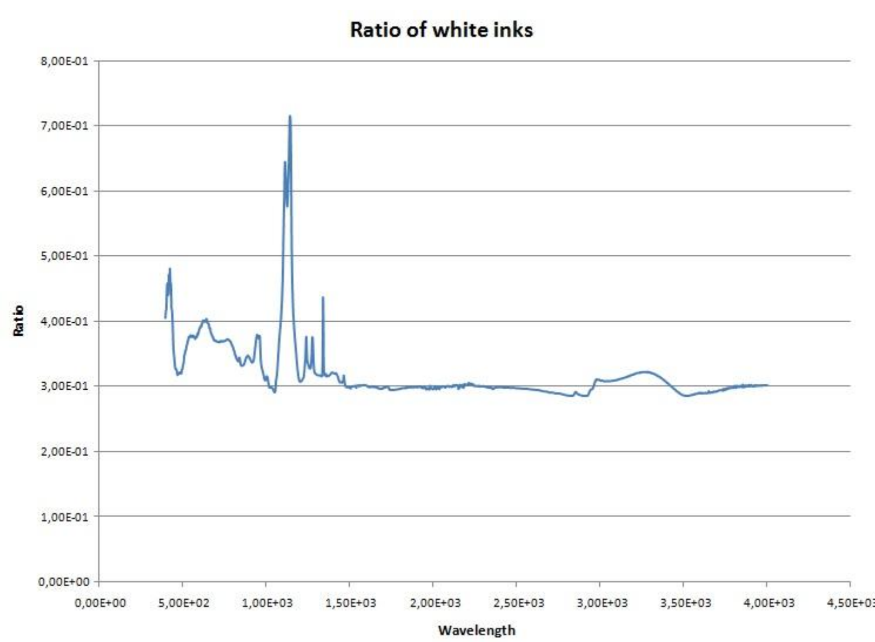
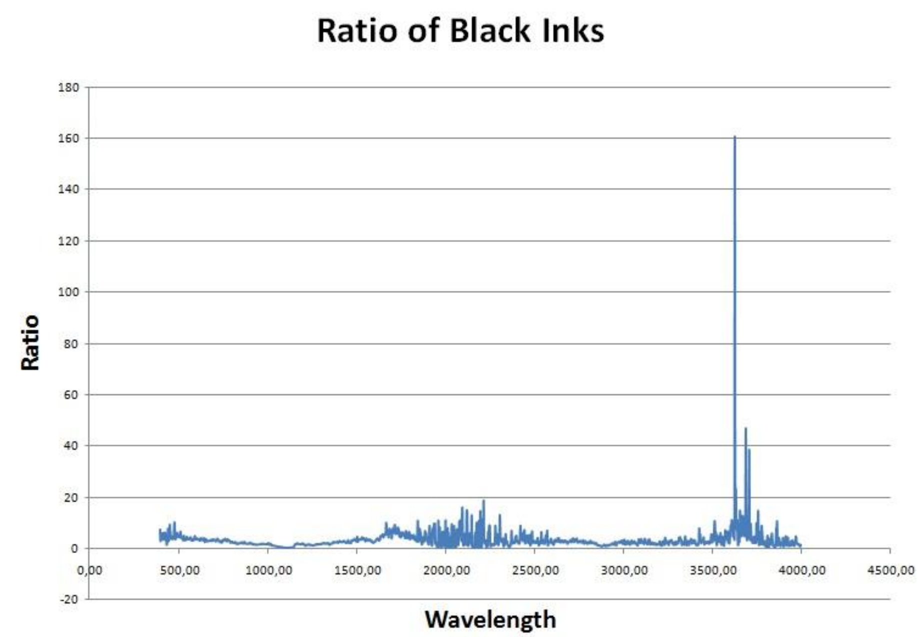


fig. 40. Ratio- variance between black inks.



Demonstrated here are the levels of variation between each analysed ink. The low values represent minimum variation between or within the compared groups. The values of the largest peaks in each of these graphs indicate the wavelengths that express larger ratio values. The difference between the ratio plots for both the black and white inks differ from each other, but differ most significantly from those produced by the red inks. This difference is most likely due to the probable inorganic nature of the black and white inks and the reds being organic, as discussed above.

This data, once inputted and analysed by the software 'minitab' allows this secondary level of PCA to be conducted. The first principal component here accounts for 44.7% of the variation in spectra information and the second for 34.9% of the variation.

The PCA conducted on the ratios for each ink data set produced the following graphs:

<u>fig. 41. PCA analysis of all red ink ratio data (2008, 2008+1, 2008+2, 2009, 2009+1.</u>

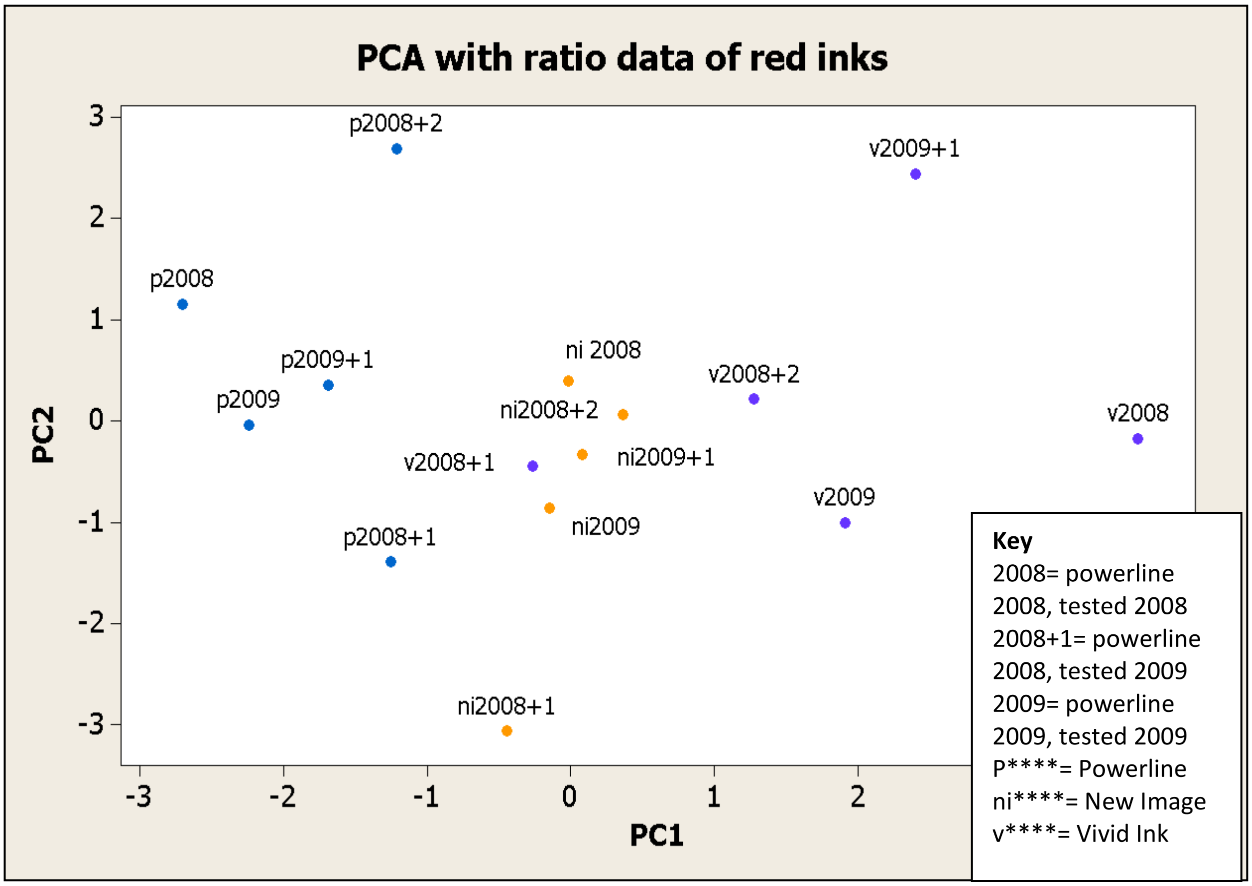
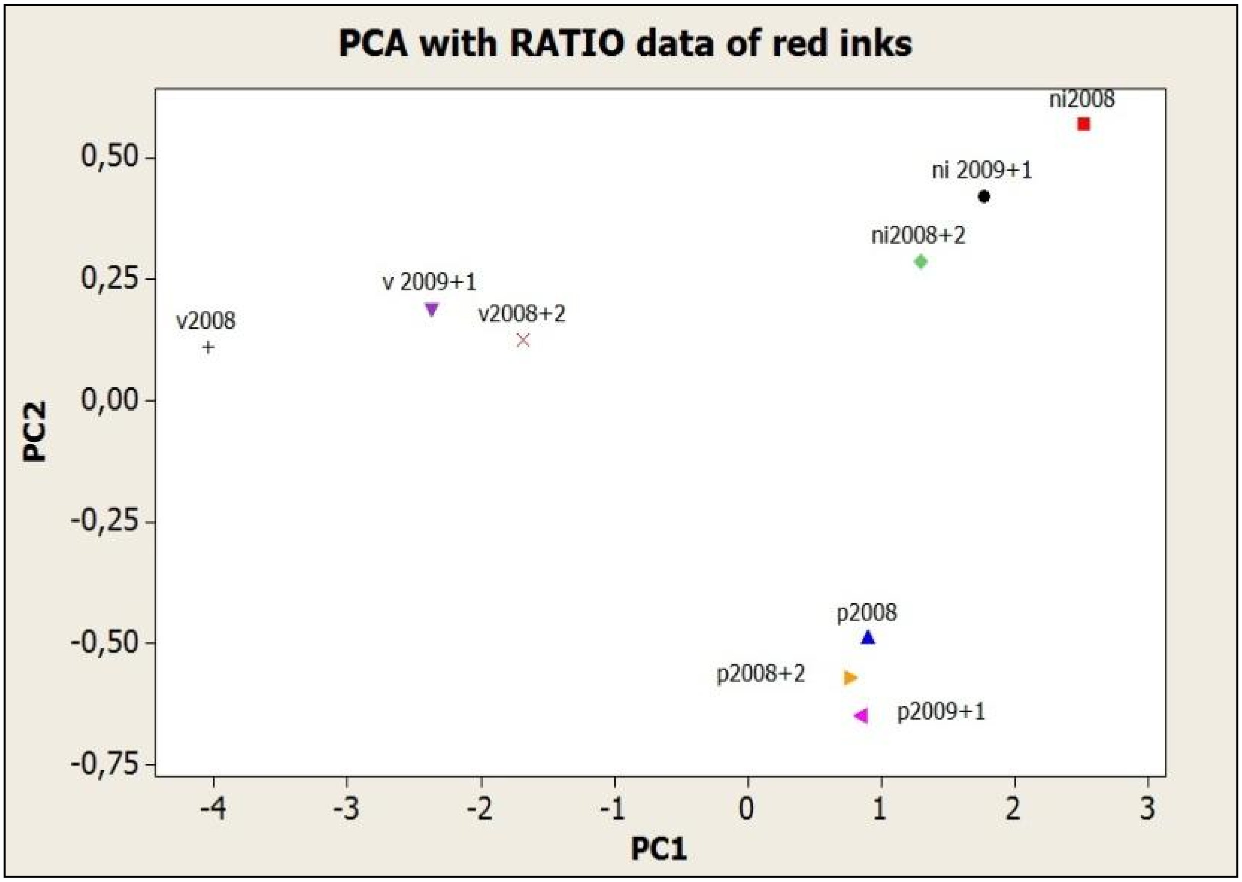


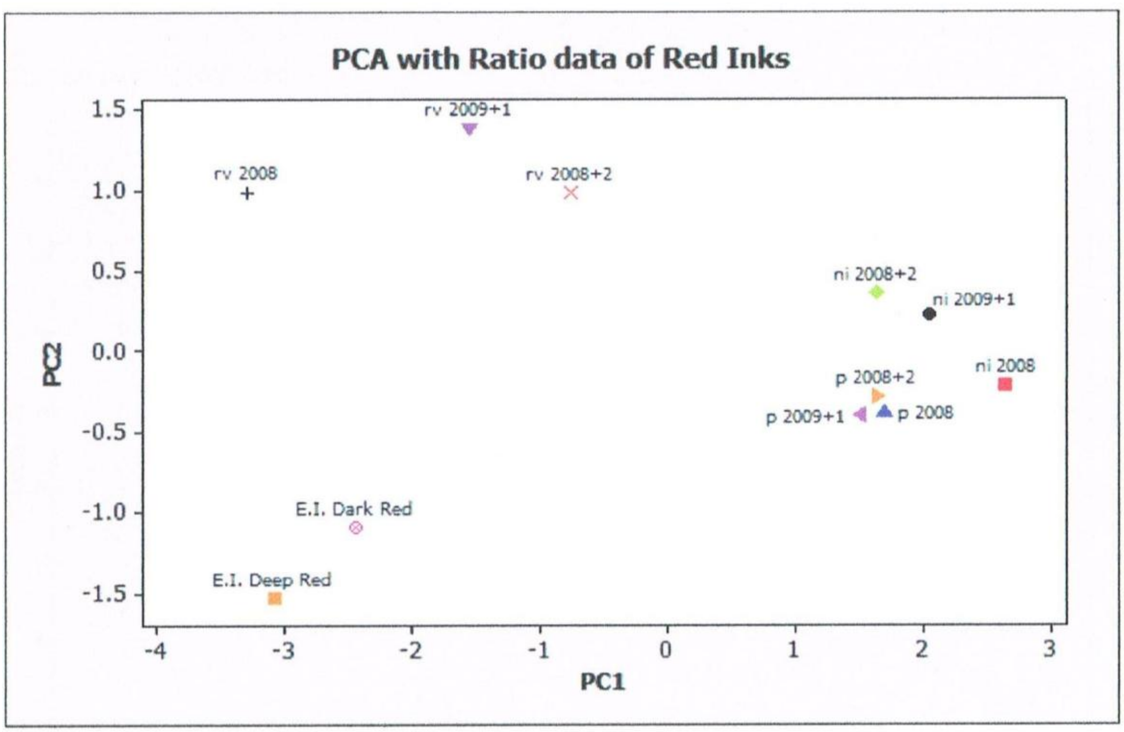
fig. 42. PCA analysis of red ink ratio data of 2008, 2008+2 and 2009+1



We can see from the comparison of these two PCA plots that the grouping together of manufacturers is clearer when discounting the data collected from 2009 (2008+1 and 2009). This is identified as being through the mis-application of baseline correction as a result of user-error in the collection of spectra from FTIR in 2009. Clear grouping of Powerline (p****) and New Image (ni****) red tattoo inks can be seen, indicating limited, though still noticeable, change in the chemical composition of inks of the same colour by the same manufacturer over time, as well as the alteration in the chemical signature of the ink after a period of storage. Vivid (v****) demonstrates the most variation within its own production and the ink's stability over a period of time, which is of interest when considering Vivid Ink was the most expensive manufacturer tested here. It is thought that human error when using the 'correct baseline' function is responsible for the non-conformity of the results from 2009 and 2008+1 to this pattern, rather than significant chemical alteration in composition and instability over time of storage. These changes can still be viewed here, but to a more subtle degree.

More inks were acquired for further investigation into the demonstrated 'groupings' of manufacturers and for insertion into the database now being compiled for forensic and scientific use. Over the course of this research, the company 'Eternal Ink' significantly increased in popularity, and so two samples of red inks were attained for comparison- 'Dark Red' and 'Deep Red'. After FTIR analysis, and after PCA of the ratios were conducted, the following was observed:

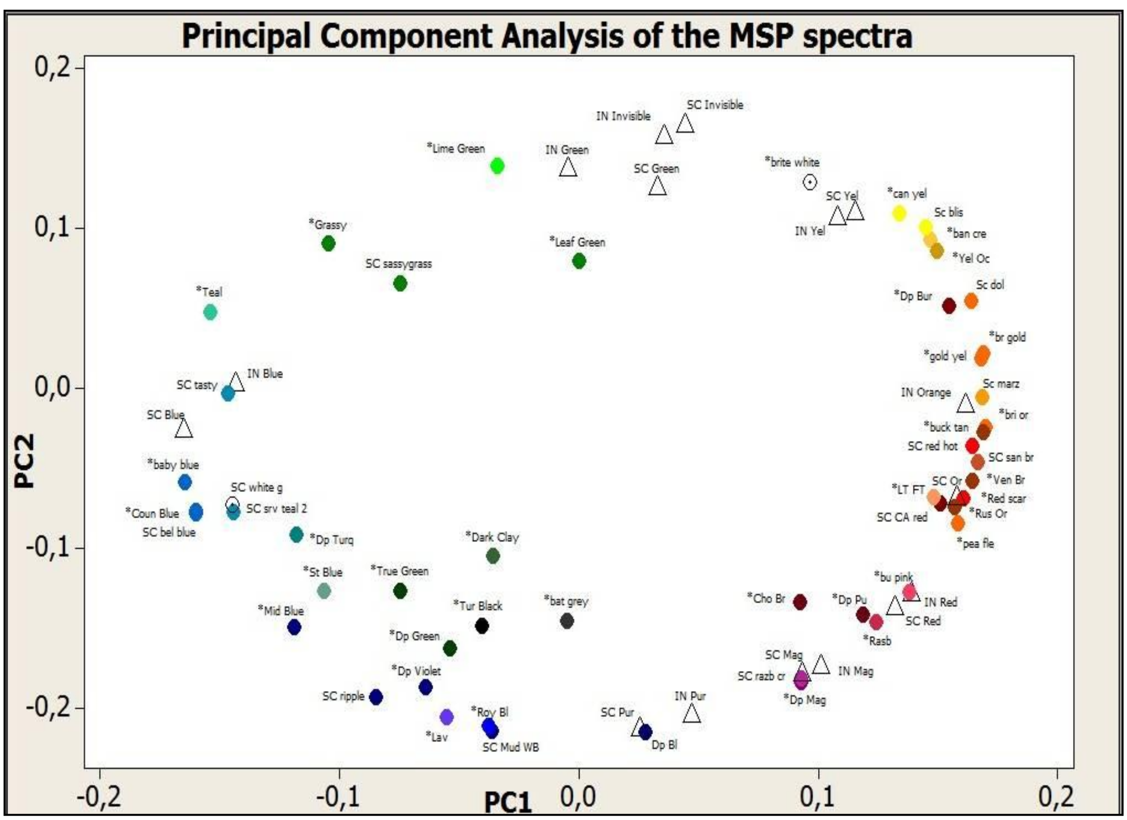
fig. 43. PCA of 2008, 2008+2, 2009+1 red ink ratio data with 2010 Eternal Ink red tattoo inks.



There is clear evidence here that each manufacturer of tattoo inks thus far investigated 'group' together under this process of analysis. The likely reason for these observed clusterings is the binding material used in the production of the pigment, prior to the addition of a carrier solution (given the tests were conducted on dried samples, emulating those to be retrieved forensically from human remains most specifically). These binding agents have already proven to be of importance through their resistance to extraction during the attempted HPLC analysis described above. This inability to extract the pigments may be of significance in the inks' manufacture as it may be central to the pigment's intended use (it must be borne in mind at this point, however, that while the inks are manufactured for tattooing purposes, the pigments used in them may not have been- literature relating to pigments intended for use in car-body painting and printer ink manufacture being used in tattoo inks can be found (Watson 2003).)

The use of MSP on the analysis of the 36 Starbrite, 14 Skin Candy, 8 UV Skin Candy and 8 Immortal Neon inks providing the following graph after PCA analysis of the spectra (for spectra see Appendix 6):

fig. 44. PCA of MSP spectra analysed 2010.



Whilst 'groups' of colours nor inks are especially clear, similar colours inhabit the same area of the graph: reds and magentas cluster together, regardless of manufacturer, as do the yellows and oranges. Greens show the most variation, blues also seem unwilling to group. However, it is the UV inks (represented here with the symbol Δ) which are the most interesting through PCA of the MSP spectra. We can see the close pairings of the yellows, magentas, reds and 'invisible' (white) UV inks from each manufacturer, which is to be expected as on visual inspection the inks appear the same colour.

The purples differ slightly in visual appearance and the oranges appear very different to the eye, which is evidenced in the distance between the UV orange and UV purples displayed in the graph. Significantly, however, whilst the blues and greens of each manufacturer seem indistinguishable by eye, the PCA of the MSP spectra shows them to be distinct from one another, represented here some distance apart. It is also interesting to note the vast differences displayed here between the whites of Skin Candy (SC white g) and Starbrite (*brite white). Whilst visually only slightly different shades of white, here they appear at opposite ends, demonstrating their different colour properties.

Whilst MSP analysis does not segregate the inks into manufacture groupings as can be done with FTIR analysis, it is a superior analytical technique for the analysis of UV tattoo inks and is also a distinct aid in identifying differences not apparent on visual inspection.

The 'tackiness' noted of some inks after attempted drying was probably due to a high glycerol content. 'Washing' of inks with methanol and distilled water prior to drying was attempted for the purposes of extracting such binders, but proved unsuccessful in 2008. Later experiments in 2009 and 2010 did not experience this problem with these specific inks, though similar problems were encountered in 2009 with the 36 Starbrite inks. In 2010 chemical signatures via FTIR and colour comparisons using MSP were obtained, though it must be borne in mind that these results could not be considered absolute, in light of the aforementioned instability of inks after a period of storage.

Clear differences can be seen between manufacturers of the same colours- the basic 'red' produced by one manufacturer differs from that produced by another. With the lack of overriding legislation denoting the ingredients, variation can be expected to be high. Competition between ink manufacturers is high being such a specialist industry, and so ingredients remain 'secret' in the drive to achieve the most desirable inks- it is therefore unsurprising that the inks should vary so considerably. Oftentimes the artists keep their preferred brand of ink a secret, in order that their competitors must find their own favourite through 'trial and error and hard graft, like we all did' (Gray Silva, artist).

Of great interest is the change in chemical composition of inks of a particular colour, between batches produced annually by the same manufacturer (figs 41 to 44). Such information is significant not only in allowing for the decipherment of ingredients of tattoo inks, but also in demonstrating the inconsistency in the production of inks by manufacturers. If this is continually the case, this could potentially result in the inability to match ink retrieved either from source, or from the skin/lymph-nodes, to any particular manufacturer. The total aim of this study has not been met. Whilst groupings have been achieved which will greatly aid the identification of probable manufacturer, an ink signature could not be achieved given the inconsistency of production and the instability of the inks themselves. In such situations where legislation does not dictate the products' ingredients, variation could be due to supply and demand of certain ingredients; whereas the supply of a particular component may be plentiful for one batch, it may be unavailable or too costly for the next, and so alternatives will be sought to produce the desired ink colour.

Even more significant than this, however, is the ink's own instability over an extended period of storage (here tested at annual intervals). Again this is further signified by the lack of legislation with regard to product expiry and recommended storage, though some volunteer this information unprompted, as described below (American brands tested here). The ink an artist receives for use may already be of any age and may be stored until used up. In such a specialist industry inks are costly items and so are not discarded frivolously. Moves are being made for 'single use' inks to be manufactured as a matter of course (e.g. 'Mom's', 'Starbrite', 'New York') which would somewhat allay this concern, though still their storage whilst still unopened could be infinite. The more popular the artist, however, the more quickly the inks are used and the shorter time they are stored. It is unclear, despite our investigations, which elements of the inks are liable to change through storage periods. It can be surmised through the work carried out here that the pigment or bonding agent are responsible, given the dried nature of the samples investigated, but much future work on this element alone should be pursued.

Consideration must also be given to the environments under which these products are manufactured. Uncontrolled environments may be accountable for variation and contamination and so should therefore also be taken into account when contemplating legislative action regarding the production and distribution of tattoo inks. One anecdotal account of an ink producer asking his own mother to aid in manufacture of inks, though when supplies of distilled water ran out, she used tap water- contaminating all the inks produced, but not admitting the mistake until after distribution. Thankfully many recipients of this particular batch of ink were perturbed by its 'unusual smell' and declined to use it, returning it for a refund, but some was still used, risking the health of the recipient clients (Chris Davies, Punctured skin, Frome, UK).

Concern has been expressed over physical reactions to tattoo inks, most frequently red tattoos (Burns *et al.* 2004, Tsturuta *et al.* 2004, Kazandjieva and Tsankov 2007a). However, each of these cases documents sensitivity or reaction to red pigmented tattoo after exposure to a secondary variable- most commonly photosensitivity (most commonly UV exposure) is reported as the catalyst in a reaction (Burns et al 2004), but dietary habits have also been reported as responsible for initiating a reaction in an individual who experienced inflammation of red areas of his tattoo after consumption of large amounts of mercury-contaminated swordfish (Tsuruta *et al.* 2004). Such reactions are frequently deemed to be a result of metal salt based pigments, as are dermatological complications including infection and granulomata (Kazandjieva and Tsankov 2007a). These metal salt based pigments are regularly reported as being removed from most commercially available tattoo inks in favour of more stable and inert pigments such as azo and other organic pigments (Vasold *et al.* 2008). This apparent change has not come without raising concerns too, however- anxiety over the use of certain azo pigments in tattoo inks has arisen as evidence that their degradation/cleavage can yield carcinogenic amines has come about (Vasold 2004). However, the validity of this concern remains to be proven. As Vasold *et al.* highlight, "The particles are usually isolated in secondary lysosomes and there should be no chemical interaction with adjacent tissue" (Vasold *et al.* 2008). Therefore, one must ask 'what would trigger degradation or cleavage of the azo pigments in situ in the skin?' Further to this, if cleavage did occur, what interaction with the body would arise? Kazandjieva and Tsankov report two cases of women experiencing allergic reaction after laser treatment of their tattoos- the only conceivable time when cleavage of amine pigments may be brought about *in corpus,* though neither melanomas nor carcinogenicity of the by-products of this process are quoted as a concern in this case (Kazandjieva and Tsankov 2007a).

Concern with the carcinogenicity of tattoos has a long history in medical literature (Kirsch 1969, Paradisi *et al.* 2006, Doremus 2009, Kluger 2009) though proof remains elusive. It must be borne in mind, however, that limited studies have been conducted regarding tattoos over time, and so, as inks are developing and changing, consideration must be given to the long-term effects of each type of ink used. - "even carbon, long thought to be inert, may be capable of eliciting granulomatous response." (Burns *et al.* 2004).

In addition to the medical and health care professions, practitioners of laser tattoo removal would benefit greatly from either knowledge of tattoo pigments or from the uniformity of production. While frequently reported as a successful technique, many articles detail the successes and failures of laser removal of tattoos (Adatto 2005, Bernstein 2006). Initially laser removal resulted in scarring and residual pigmentation. Gradually the technique was honed, but still some pigments were prone to darkening (whites, greys and flesh tones (Bernstein 2006)). With the advent of the Q-switched lasers, multi-coloured tattoos can be treated with a myriad of wavelengths, specifically researched and designed for each colour wavelength. Still some colours persist- yellow and green being most notable (Adatto 2004, Bernstein 2006) and patients are frequently advised at their initial consultation that full removal of multi-coloured tattoos may not be achievable. However, if either the disclosure or the uniformity of production of tattoo inks was to be achieved, laser tattoo removal would in turn experience heightened success in complete removal of tattoos as the wavelengths of light could be more effectively utilised knowing the specific pigment to be targeted. None of the three UK based inks displayed any information other than the manufacturer's name and the ink's colour: New Image, Powerline and Vivid Ink. In stark contrast, however, the later acquired inks, all derived from America, displayed extensive information:

Table 21. Table showing ingredients and information quoted on the labels of the American manufactured inks.

Skin candy inks e.g. White girl (mixing white): *Ingredients: distilled water, polyethylene glycol, witch hazel, proprietary Cl#77891.* *Lot # WG1012* *Batch # 7.* *Date produced: 2/20/09.* *Best if used by: 2/20/12.* *Do not use after expiration date. Made in the USA.* *Not for eye area use.* *Warning: This product is pure pigment. Application on certain individuals may cause allergic reaction. Skincandy L.L.C. disclaims any responsibility for allergic reactions of certain individuals to whom this pigment is applied. Spot testing or consultation with a dermatologist prior to application is urged.* *Keep in cool dry place away from extreme heat.* *Do not freeze.* *Non toxic.* *Non flammable.*	*Starbrite2: e.g. brite orange.* *Ingredients: distilled water, alcohol, glycerine, cl # 11741 and cl # 74260.* *Lot# BO30004* *Batch # 10.* *Date produced: 06/04/09.* *Best if used by: 06/04/11.* *Made in USA.* *Warning: this product is non-toxic pure organic pigment. Applications on certain individuals may cause allergic reactions. We disclaim any responsibility for allergic reactions of individuals to whom this pigment is applied.* *Important: Keep in a cool, dry area and dispose of any ink that expires.* *Keep out of reach of children.* *Dispose of in accordance to Federal, State, and Local laws*	*Immortal Ink: e.g. neon blue.* *Ingredients: organic pigment, distilled water, glycerine, alcohol and witch hazel.* *Disclaimer: this product is a non-toxic organic pigment. Certain individuals may have an allergic reaction from the product. We disclaim any responsibility for allergic reactions of individuals to whom this pigment is applied.* *Store in a cool, dry area.* *Keep from freezing.*

With 'horror-goth' (fig. 45) genres using vivid, brilliant colours, or the increasing popularity of UV/fluorescent tattooing, tattoo inks are developing and evolving already. We are also seeing increasingly more frequently 'mixed media' pieces; artwork which incorporate a mixture of mediums including tattooing, piercing, sub-dermal implants, scarification and branding. Here, too, each aspect has different demands and so each manufactured element must be made with such uses borne in mind also. Considered

fig. 45. Example of 'horror goth' tattoo genre, with bright, vivid colours (www.mdtattoostudio.com2011)

more 'extreme' in its application and use, tattooing of the eyeball itself is increasing in popularity- as is the insertion of jewellery into the eye, as detailed in Chapter 3. Properties of the structures of the eye differ greatly to those of the skin, and so development of site-specific ink would be beneficial in this respect. While complications of this practice have not been reported, long term implications remain to be seen.

Tattoos at present are increasingly considered 'artwork' demonstrated in myriad genres. As with painted artwork, certain materials lend themselves better to particular mediums- watercolours and oils have very different characteristics and so are used in accordingly different manners. Therefore, with tattoo artists pushing the boundaries and limits of their own artistic styles, should it not be considered that certain inks lend themselves to certain styles better also? The bright, intense colours favoured by the aforementioned horror-goth cohorts will not produce the desired effects of soft-wash, realistic portraiture pieces. However, at present, the tattoo artists themselves employ techniques to achieve these styles, mixing inks for vivid colour, or diluting with water for more muted effects- and altering application techniques and needle use also. This, too, must be borne in mind when dealing with inks in forensic scenarios- the inks produced by the manufacturer may have come under any number of alterations by the artist.

While it is commonly thought that aging and sun-exposure are responsible for the dulling and blurring of tattoos, precision by the artist is just as important. While ink is deposited primarily between the epidermis and dermis (in the epidermal-basement membrane), or within the first 2mm of the dermis, further penetration of the dermis by the ink results in capillary action; the ink is 'absorbed' by the capillary in its attempt to rid the foreign material through the lymphatic system. The capillaries are resultantly dyed, producing a 'bleeding' effect of the original image- here too we see the importance in the size of the pigment particle.

It can be argued as a direct result of the findings in this study that the ink itself is unstable and so behaviour post skin-insertion may be affected also. Further work pertaining to this specifically should be undertaken.

5.7 Conclusion

We have proven here that the colour of an ink, as well as its likely manufacturer can be determined by the 'fingerprint' region of FTIR analysis, but that variation can occur as a result of both chemical instability of the ink itself and inconsistency in production by the manufacturer batch to batch. While the chemical analysis of tattoo inks in corpus remains to be investigated, the importance of these findings forensically could be significant; the original colour of a tattoo could be detected, possibly even from chemical analysis of ink retrieved from the lymphnodes; and potential manufacturer could also be suggested, limiting the potential locality or even establishment from where the tattoo was received.

While it has been emphasised here that tattoo inks remain unregulated in the most part and the tattoo industry resistant to legislative cover, what should also be taken into consideration is the industry's unfailing tradition of following 'good practice'. Artists experiencing problems with particular inks or suppliers are willing to volunteer this information to other artists, as is the case with problems or recommendations of particular makes of materials or machinery used in the trade. The tattoo industry relies predominantly on reputation- and this itself can only be maintained through good practice. In such a competitive industry there is no room for practitioners who refuse or cannot follow this convention- and so the nature and position of tattooing in modern society ensures its self-sufficient maintenance of high standards of practice. It is a subsidiary hope within this element of the research that suppliers to the industry also conform to these strict guidelines of 'best practice' demonstrated by the artists and professionals within the industry themselves. As Christie states- "it is vital that those industries involved in the manufacture and application of colour should continue to be sensitive to any potential adverse effect on the environment in its wider sense, and respond accordingly." (Christie 2001: 198).

"...body modification is an evolving field, much of what we do is experimental" (von Cyborg 2008)

Chapter 6

6. Discussion.

6.1. Implications for the field

6.1.1. Social anthropology and ethnology

The human pre-occupation with and compulsion for body modification practices is highlighted throughout this research and is demonstrated by exhibitions such as those at the Boston Museum of Fine Arts and the collection of tattooed skins housed in the medical museum of Tokyo University (exhibiting tattooed skins donated to and collected by Professor Susumu Kato and his predecessors). Some push the boundaries of acceptability of our desire to decorate our physical selves, producing „biological jewellery" created from epithelial cells (artist Marta Lwin, whose work was exhibited at the Wellcome Trust „Skin" exhibition 2010).

For some time the focus of general medical, anthropological and psycho-analytical studies, the potential aid tattoos, piercings and other modifications can be to the field of forensic human identification has only more recently been acknowledged (for example Haglund and Sperry 1993, Thompson and Puxley 2007), but until now has never been specifically investigated.

The production of biological profiles of individuals is, as demonstrated in Chapter 1, the primary concern of a forensic anthropologist. The limitations of visual recognition post-mortem are well documented (Hill 2007, Komar 2003). Post-mortem the body undergoes a series of natural decomposition processes which can significantly alter a person"s appearance and can be greatly accelerated by environmental conditions such as heat and humidity (Gill-King 2006).

Under suitable conditions, when a person"s appearance has not been greatly affected, visual identification can in fact be a successful method of identification post-mortem (Dix and Graham 2000). However, it remains impractical when accelerated decomposition or the emotional distress of the attending family members is factored in.

In cases such as mass disasters (whether environmental, transport or terrorist) and homicides, the death is untimely, and as such the surviving family and friends are often in a heightened emotional state which can hinder the quality and details of information they can provide for identification purposes (Hill 2007, Komar 2003). In these instances visual identification is not recommended as false-positive identifications can occur (in one instance, recounted by Hill (2007) a bereaved father identified three separate bodies as being his daughter- two were males) or false-negatives in the instance of individuals in denial about the death of their loved one.

The changes and alterations affecting the ability to identify an individual post-mortem are often demonstrated by educators in this field by utilising the autopsy photograph of Marilyn Monroe- who"s face in life was familiar, but in death almost unrecognisable. In cases such as these the necessity for accurate, objective recordings pertaining to biological identification are emphasised, as opposed to the reliance upon the unscientific process of visual and circumstantial identification.

Language can also hinder and limit both the quantity and quality of the information provided- both in the mother tongue and after translation (for example the case of the latter to the mis-translation of „shark" and „dolphin" in the Tsunami investigations reported by Lessig *et al.* 2006).

The use of stature charts (formulae calculating an individual"s height in life from measurements of the long bones of the skeleton) has proven useful (Buikstra and Ubelaker 1994), but in recent years their limitations have been highlighted by professionals working in international scenarios (e.g. Bosnia-Herzegovina and

Rwanda). The application of stature formulae based upon the North American and Western European populations proved inaccurate in comparison to these affected populations (Ubelaker 2008).

It is clear then that all aspects of biological profiling should be more completely investigated, supporting the need for in-depth, coherent research into cultural and tribal practices, such as those conducted by Krutak (2007, 2008a, 2008b, 2008c, 2008d, 2008e, 2008f, 2009a, 2009b, 2009c, 2009d, 2010) and van Dinter (2005). Only when armed with a complete knowledge of the subject can the specialist draw accurate conclusions (both biologically and socially).

The results of the surveys, detailed in Chapter 3, emphasise the necessity for body modifications to become routinely searched for and detailed in the identification process, both ante- and post-mortem.

With this in mind, the results provided by survey 1 carried out in this research demonstrate the importance of recording the presence and, equally as important, absence of piercings. With 89% of females who responded to the survey having pierced earlobes, it is the absence of earlobe piercings (as distinct from lack of piercing jewellery) in a female that is most notable. In males, too, the prevalence of facial and body piercings is significant (17% with body piercings, 18% with earlobe piercings), and so evidence should be sought for such piercings post-mortem- and both the presence and absence recorded explicitly, where the condition of the body allows.

When viewing the statistics relating to piercing prevalence, it is interesting to note that in females aged 18-25, 50% are pierced in locations other than earlobes- in practical terms this requires the successful location and recording of piercings in every other female aged 18-25. This number does not drop significantly with age. In the ages 26-35, 43% of females are pierced in locations other than the earlobes. A surprising 80% of women who declined to provide their age are pierced in locations other than earlobes.

Comparatively, of men aged 36-45 in this study, almost one in three possess piercings in locations other than their earlobes- a greater proportion than their female counterparts (25%), indicating that every third male aged 36-45 will exhibit a piercing warranting recording somewhere other than his earlobes.

Details of the type of jewellery worn should also be taken; clip-on earrings may be worn on un-pierced earlobes and materials such as gold and platinum are more frequently being utilised in piercing jewellery, the value of which may be indicative of significant events in an individual‟s life.

As discussed in Chapter 3, tattoos are demonstrated to be as prevalent in the UK within the 18-25 and 26-35 age groups, as in other demographic surveys carried out in, for example, America (Carroll *et al.* 2002, Koch *et al.* 2010).

With 38% of the respondents with at least one tattoo, again, the absence of a tattoo is almost as significant as the presence. In males, a quarter have at least one tattoo, of whom two thirds are aged in the two younger age brackets (18-25 and 26-35). Therefore, it is to be assumed that in all males, one in five will have a body or facial piercing to record, and one in four a tattoo. Almost one in three males aged 18-25 and 26-35 have at least one tattoo. Almost a third of females sport at least one tattoo (29%), with 80% of them in the two younger age brackets 18-25 and 26-35. In this case, one in three women aged 18-25 and 26-35 will have at least one tattoo.

Of the total population, therefore, the respondents here indicate that regardless of sex, a third of all British individuals aged 18-35 will display at least one tattoo. The results gleaned from this study indicate that, post-mortem, of all individuals aged 18-35 requiring identification, one in three will have a body modification demanding extensive recording. Only upon viewing these results in such a way does the importance of locating such modifications become clear.

While these statistical findings have emphasised the pressing need for body modifications to be considered routinely in the production of a biological profile, it is acknowledged that they are a representation of a portion of the British public, and should not be assumed to represent the entire British population accurately. They are utilised here to demonstrate the issues of prevalence of body modification practices and their practical implications, and not as absolute data pertaining to the wider British public.

In the case of tattoos more detailed recording may be required. Whereas piercings can be considered present or absent, little other information pertaining to them remains- with the exception of jewellery type worn, or gauge of piercing hole. With tattoos, images are limitless, but can harbour meanings that dictate their description rather than the image (an image of a nurse, for example, may relate to a career, the career of a loved one, or may simply be representative of a fantasy holding no tangible association with the wearer).
Consideration must also be given to the artistic abilities of the tattoo artist; predatory cats such as pumas and lions can often be confused when executed with limited artistic skill, as can flowers. Frequently, flower tattoos are referred to as „roses", assumed because of the traditional utilisation of the rose. However, with more widespread practice and influence of tattooing, lotuses, hibiscus, peonies, cherry blossoms and other flowers are often adopted by the wearer to signify any number of subjects.

One must also consider the artistic skill of the post-mortem examiner to accurately re-draw the tattooed image (for example see Manhein 2002). With the artistic reputation of the tattoo artist being a major motivation in the acquisition of tattoos (table 15, Chapter 3), the inability to accurately convey the tattoo may result in the inability to identify not only the image, but also the artist. This supports the work of Starkie e*t al* (in press) in honing a technique for accurate recording of tattoos post-mortem.

Opposition to tattoos is steeped in history, initially based upon religious and political grounds, later through the assumed association with peripheral groups of society (see Chapter 2). Modified individuals are reportedly intrigued by the idea of „social deviance" tattoos and piercings represent, disagreeing with those who view modifications as inherently „bad" or „misguided" (Sanders and Vail 2008).

In the second survey conducted here, piercings were explicitly viewed by one respondent as being “more socially acceptable”. No record of deviance or the desire to partake in something regarded as „bad‟ was evident from the responses given to the second survey, with the only response open to this type of interpretation, the respondent stating that they were tattooed as they were „getting old!‟, rather than indicating an expression of juvenile deviant behaviour, this may be interpreted simply as being an activity associated with younger members of society. The limited and isolated nature of this quote cannot, and should not, support or quash either interpretation.

Modern opinion of tattooed individuals is as diverse as the practice itself. When questioned in an online interview with the Japan Times, Horiyoshi III (the prefix „Hori‟ meaning „to carve‟ or engrave, this title is bestowed upon individuals after a successful apprenticeship in the Japanese style of tattooing, „Irezumi‟) explains the conflict in association between Japanese full body suit tattoos and the Yakuza:

> “There are some yakuza or people with tattoos who do bad things, just as there are people without tattoos who commit crimes.” (Ito 2010)

The concise nature of this quote allows us a view of the modified community and the attitudes subjected to it.

Much of the literature pertaining to modifications and their association with deviant behaviour focuses upon specific sections of society, as discussed in Chapters 2 and 3. When reporting on the prevalence of tattoos on prisoners, it is rarely questioned at what point the tattoos were acquired- prior to or after the crime was committed. In this way it is implied that tattooed people are likely to commit crimes, rather than that those who commit crimes are likely to later become tattooed. This distinction is important to those individuals wearing tattoos who have never committed, and have no intention of committing, crimes.

This argument can be applied to the other scenarios in which links between body modifications and deviant behaviour are considered interlinked: piercings, drug use or prostitution, for example. It is interesting to note, however, that even as early as

1933 Parry observes that “only a small portion of the tattooed today are criminals or even semi-criminals” (Parry 2006:1).

The traditional association between tattoos, especially, and gang members or prisoners is unsurprising when viewing the deluge of literature on the subject of gang tattoo designs and their „hidden meanings‟. Books, websites, entire television series and official documentation are dedicated to the messages portrayed within and by tattoos. For example, in an episode of the documentary series „Marked‟, individuals identifying themselves as „Bikers‟ admit that in the 1960s and 1970s they acquired tattoos for their representation of intimidation and brutality.

The documentary series also explains how American prisons experienced excessive overcrowding in the 1960s, leading to the creation of race-based factions, soon becoming gangs competing for power, which in turn led to conflicts. In an environment that inhibited expression of individuality, symbols and images relating to the gang members‟ beliefs and sense of self were tattooed; an indelible mark proclaiming an individual‟s identity and belonging to a specific group, which also doubled in portraying the individual‟s willingness to withstand pain. This reflects the motivations of seamen in the eighteenth century to become tattooed for expression of personal identity in crowded conditions, prison creates a society where personal identification and distinction is minimised, the only outlet for such proclamations of identity therefore being modification of the physical self (Thomas 2005).

The interpretation of prison and gang tattoos has been the subject of study by many (Valentine 2000, for example). Covert observation allows authorities a complete picture of an individual and their past-times without necessarily engaging the individual in question in conversation. However, caution must be exercised and care taken that meanings and interpretations do not stay rigid as variation can occur (as in the above example of a nurse tattoo). For example, the popular „teardrop‟ tattoo positioned by the outer corner of the eye can represent a number of events. It can be representative of a number of years spent in prison (often multiples of five or ten years), or can indicate the death of a loved one, or the sorrow caused to a loved one by the individual‟s incarceration. More sinisterly they can serve as tallies of the number of lives taken by the bearer.

Dominant images in Russian prison tattoos include females, often in provocative clothing and/or stances. Her position on the wearer‟s body, however, can significantly alter her meaning, often through sexual connotations. On the chest she represents a wife or partner, on the abdomen she indicates the wearer‟s dominance and can often be used as the sign of a sexual aggressor. Conversely, if she is found on the lower back she indicates the wearer‟s submissive qualities and low status. Pairs of eyes worn in these locations also harbour similar meanings.

These examples demonstrate the importance for an investigator to record an image accurately, both in its appearance and its location, but to refrain from interpreting or awarding it meaning. Just as one would describe a gold wedding band recovered from the field as a „yellow coloured metal ring‟ (Jensen 1999), one should resist recording a „panther‟ tattoo, for example, and rather report the image as being that of a „large cat, black in colour‟. In this way incorrect inferences regarding the individual in question should be successfully avoided.

The utilisation of specific genres of tattoo and body modification art can be viewed similarly to „gangs‟ in their outward proclamation of group identity and belonging. The revival of South Pacific tribal tattooing customs discussed in Chapter 2 may be interpreted similarly, as may the exclusive artwork of Goethe Silva, a Mexican tattoo artist who specialises in Mayan culture and imagery for Mayan descendents. Again, questions arise regarding modification practices and the appropriateness of their ability to proclaim identity and therefore also to exclude „others‟. Consideration must be given, therefore, not only to the motivation for becoming modified, but also, in specific regard to tattoos, the motivation to acquire certain imagery and any motivating factors in its „employment‟ as an image.

Tattoos for identification purposes have been used throughout history. Sailors in the seventeenth and eighteenth centuries reportedly adopted the practice of tattooing themselves with their names or initials in order to ensure them a proper burial if lost at sea (White 2005). Parry also details a surge of requests for identification tattoos on children after the kidnapping of the Lindbergh baby in 1932 and also after reports of accidental exchanges of babies in maternity hospitals (Parry 2006). The idea of tattooing one‟s child in order to identify him or her sits uncomfortably with modern culture, where marking of this kind is associated with the identification of livestock, but in fact is not so far removed from the piercing of children‟s earlobes practiced by many parents, and reported in the results from the survey, for purposes of gender identification. Again we see how acceptability of a modification practice can be dictated by its purpose.

It is also interesting to note the change in motivation for present acceptance of tattoos which is driven by an appreciation of the artistic skill exhibited and the quality of the design, where previously the driver was the importance of the tattoo‟s symbolic meaning (van Dinter 2005; see also figures 46 and 47 for comparison of artistic proficiency).


fig. 46 and fig. 47 showing comparison between traditional naval tattooing ca. 1950, and modern artistic tattooing by Russian artist Pavel Angel.
(www.charmcitycurrent.com 2010 and www.tattooartists.org 2010)

In the West tattoos and modifications are viewed materialistically as tangible items, commodities that can be purchased. This is a continuation of the „consumerist‟ movement instigated in the industrial revolution but exacerbated in the 1950s when concepts of „leisure‟ and „expendable income‟ allowed for the acquisition of items previously considered too frivolous for everyday consumption (Beck 2002). This

Western, materialistic opinion of tattoos is in direct contrast to their employment within various tribes where "*tatau* is not an art form, but a way of life" (Wendt 1996, as quoted by D‟Alleva 2005:92).

Opinions of body modifications are attributed not to the modification itself but to the wearer. Deep-rooted fascination with the „unusual‟, culminating in the utilisation of tattooed and modified individuals in circuses and sideshows, is demonstrated by this research. The exploitation of such „exhibits‟ is most emphatically illustrated by the nineteenth century exhibition of the „Hottentot Venus‟, an African *San* woman caged and displayed outside Piccadilly Circus (Pitts 2003). Here the boundaries between visual difference and racism were significantly blurred, an argument that could be applied to the present day opposition to certain perceived „gang‟ or tribal tattoos (e.g. those completed by Goethe Silva).

Perceptions of tattooed women have altered little in the interim period between colonial discovery and the present day. At the turn of the nineteenth and twentieth centuries, the photographic representation of indigenous females with tattoos was often eroticised, pictured as they were bare-breasted for the recording of even neck tattoos (see Krutak 2007 p.37). In 1933 Parry reports a court case in which two men were acquitted of rape charges as the victim wore a tattoo on her leg which was considered, by the judge, to be „misleading‟ to the men as to her sexual availability (Parry 2006). And in 2007 Swami and Furnham report the belief that tattooed women are sexually promiscuous and heavy drinkers.

When viewing the role of the tattooed woman within her own socio-cultural context, however, our Western opinions and perceptions are in direct conflict. In his extensive studies of tribes globally, and the women within them, Krutak highlights the crucial role women, their tattoos, their tattooing, sewing and weaving skills play in tribal life; most specifically in ensuring successful hunting missions and general appeasement of various spirits and deities for the welfare of the tribe (Krutak 2007).

It is unsurprising, given the hitherto parochial nature of most cultures that throughout history body modifications have been considered „exotic‟ and „unusual‟. What *is* surprising, however, in light of their modern prevalence, and the peripatetic nature of much of the global population, is that the results of these investigations show that opinions is very recent times remain unaltered.

With the prevalence of body modifications in the British population demonstrated by this research, the negative connotations of body modifications seem contradictory. This contradiction is further demonstrated in the socio-cultural context of body modification practices in Western society and its materialism. One can adorn oneself with an inherently tribal commodity for its aesthetic values alone without complete immersion in the culture and its associated practices. It would be interesting, therefore, to conduct surveys relating specifically to attitudes towards modified individuals in order to ascertain whether the apparent intolerance of body modification is as prevalent as it is assumed to be and whether any patterns are detectable concerning which individuals or groups object. The surveys conducted here quashed the assumptions that only peripheral groups adopt modifications and supported the claims that tattoos and piercings were becoming more frequently adopted. Conducting a survey specifically regarding objections towards modification practices would allow a more complete picture of body modification practices within the wider context of the British public.

While practices such as piercing and tattooing are indeed becoming more commonplace, as demonstrated by the results of Chapter 2, there remain the more „extreme‟ practitioners of body modification who insist on pushing the boundaries of practicality, abnormality and acceptability of body modification practices, as discussed in Chapter 1.

Whilst the variety of body modifications examined in this study is, of necessity, limited (see Chapter 1), as a subject the boundaries can be extended to include make up (as touched upon in survey 1), reading glasses or even, as argued by Featherstone (2009) such technological extensions as cars and planes that allow the greatly increased velocity of the human body. Whilst not an alteration of the phenotype, the influence of technology on body modifications is more pertinent now than ever before.

The first technological advance to greatly influence the body modification genre was Samuel O‛Reilly‟s electric tattoo machine (see Chapter 1). Presently, however, technological advances are responsible for the myriad colours available for tattoo inks, the multiple materials employed in the piercing and tattooing industry, and even in the international trade and influences upon which the industry thrives.

In relation to the ever increasing diversification of the body modification genre, however, consideration must be given to enthusiasts and entrepreneurs such as Rob Spence, Samppa von Cyborg. Whilst initially seeming extreme, even shocking in their conceptions, the implications for the technological, medical, modification and forensic disciplines cannot be ignored. The capacity to provide a blind person with sight (Rob Spence) or a paraplegic with sexual function (Samppa von Cyborg) is of great importance in the advancement of such technologies.

While it is expected that such advances will provoke opposition in their widespread application, their similarities to previous concepts such as the now commonplace joint replacements and breast implants must be recognised. It is considered here that the medical and health benefits awarded such technologies will be the defining factor in their ultimate acceptance.

Throughout history the introduction of new types of modification have met with opposition, as discussed in Chapter 2. At what point, therefore, do certain practices become acceptable and others remain condemned? Consider male circumcision. Reported by Dresner as possibly occurring as early as the stone-age, (Dresner 1995:769), in recent years this well-established medical practice has come under scrutiny, its health and medical benefits being weighed against its cost-effectiveness (*ibid.*). The practice of male circumcision is so widely accepted in Western medicine that we do not question its motivations and implications, but rather accept it as „the norm‟. However, even this seemingly routine religious or health-based practice is a body modification and, as such, has even been linked to sexual motives in the form of the reported female preference for a circumcised penis (Williamson and Williamson 1988).

Why, then, do we apply sexual motivations to other genital modifications and not to male circumcision? Is it as a result of the frequently reported, though now somewhat questioned, health benefits? Or is it simply because of its accepted normality? If this is the case it can be argued, that the prevalence of a practice, with some medical foundation, is the motivating factor in its acceptance into social practice. Practices questioned by medical professions and still only infrequent in their occurrence, therefore, do not enjoy such a position within society.

Tattoos used medically (such as radiographic tattoos mentioned in Chapter 1) do not experience negative opinions, possibly as a result of the individual‟s perceived suffering from so serious a condition as to warrant such treatment. Tattoos applied for any other reason, however, still provoke negative reaction despite the possibility that their application may have been, for example, to commemorate the wearer‟s successful recovery from a similar ailment or to commemorate the untimely death of a loved one.

Genital piercings, are almost exclusively associated with sexual behaviour, despite the possible distinction between those undertaken for sexual arousal and increased sensation with those carried out for aesthetic purposes, for example, when still considering the male genitals, the distinct apadravya and ampallang piercings. Both are positioned in the anterior penis, but are expressed as having different qualities. The former being positioned vertically through the glans of the penis is often quoted as heightening sexual pleasure for both the pierced male and his female partner, and, conversely, the horizontal ampallang, being more commonly associated with tribal customs, such as those of the Dayak of the Philippines and Borneo who utilise the piercing to extend the length of the flaccid penis and to instil fear in their opponents by this expression of their ability to withstand great pain (Flynn 2004). Both these piercing types appear in the Kama Sutra and so are therefore associated with sexual practices, but their utilisation in cultural settings may differ from this. The sexual connotations of genital piercings in Western society can be argued to be a result of Western values and clothing customs where the constant concealment of the sexual organs infers their perverse nature and draws attention to their gender specific roles, any attention given to them being considered sexual in nature.

Another form of penile modification to be considered is the infrequent, but no less significant, practice of the insertion of spherical objects at various locations along the shaft (Rothschild e*t al* 1997). Reportedly rather „specialist‟ in nature (incidences of the practice only reported in the Yakuza of Japan and Eastern European soldiers and prison inmates), this practice is not considered predominantly sexual. Its primary purpose is similar to the full-body tattoos of the Yakuza, demonstrating belonging to a specific group and the willingness and ability to withstand great pain. The sexual benefits of the practice to both the bearer and his (explicitly stated) female partner, is well attested, but also considered a secondary motivation for the modification.

With reference to the opposition of genital modifications the practice of female circumcision, rigorously opposed in developed nations, warrants mention. Viewed in direct contrast to male circumcision, this primarily African practice is brutal and primitive in its occurrence. We must ask, therefore, why the view of female circumcision is viewed so differently from that of male. The answer lies in its motivation. Whereas male circumcision is considered to be a predominantly medical and hygienic practice, with few reported sexual complications (Malone and Steinbrecher 2007), the motivation for female circumcision lies in the prevention of arousal and sexual stimulation in females during sexual intercourse- essentially the removal of their personal rights to enjoy the practice of copulation. This has resulted in political intervention by the World Health Organisation and their publication *Eliminating female genital mutilation* 2008. Why therefore, do some remain opposed to female genital piercings, specifically those located to enhance sexual pleasure? It appears that the removal of one‟s rights to enjoy copulation is considered abhorrent, while a person‟s rights to heighten enjoyment are simply considered „unnecessary‟ or perverse.

At autopsy, pathologists must record external evidence of trauma (Burton 2007). As discussed in Chapter 4, decomposition of the body follows specific orders and patterns. Whilst internally bacteria proliferate, externally decomposition starts in warm, dark, moist locations- orifices such as the eyes, nose, mouth, ears and genitalia. Coincidentally these are also sites most frequently pierced or otherwise modified. Therefore, whilst soft tissues are still present and allow for such distinction, exact recording of piercing location should occur as a matter of priority, in order for complete details to be recorded appropriately. Here too it should be underscored that the absence of jewellery is not conclusive evidence for the lack of a piercing.

Awareness of alternative elective body modification procedures should also be demonstrated to pathologists and other investigators, in order to minimise misinterpretation; this is especially in genital regions, the focus of evidence for abuse. Penile splitting (also known as „subincision‟ or „urethrotomy‟, in which the inferior length of the penis is split open to the urethra, and can be of varying lengths) or implants, for example, may be wrongly diagnosed as evidence of trauma, abuse or pathology.

Complete surveillance of the body is paramount and an open mind should be kept regarding locations for modifications. The inner lip and tongue are both becoming popular locations for tattoos as well as piercings, and one anecdotal account of identification in the Asian Tsunami of 2004 reports the confirmation of identification by the presence of a „scrotal ladder‟ (numerous piercings of the scrotum, ordered vertically to create a visual „ladder‟ effect).

Other modification practices warranting mention include the mercifully rare practice of elective or self-performed amputation, or „nullification‟, discussed in detail in *Body Art 2* (2009). For some, the desire to modify the self becomes so compelling that extreme self-modification is performed. Such instances are often linked to the condition BIID (Body Integrity Identity Disorder). While, as stated, this practice is infrequent at present, its implications forensically are significant. The retrieval post-mortem of evidence of ante-mortem amputation of a finger or toe would imply the presence of such an occurrence on medical records, possibly leading to misidentification, or lack of possible identification, of an individual. Amputation of a digit is also a method for expressing one‟s desire to leave such factions as the Yakuza or Italian Mafia. Where amputation is recorded post-mortem, but void in ante-mortem medical records, such an association with gang practices could be made, with potentially damaging consequences. While it is thought that family and friends would be aware of the circumstances surrounding such a practice as elective or self-performed digit amputation, this cannot be assumed.

While not indicated by the findings of this research to be an issue of great concern to many, the concealment of body modifications from family and friends should still be considered. When collecting ante-mortem information those most often asked to provide information are close relatives. With certain modification practices still being viewed unfavourably, it must be borne in mind that the ability to provide a complete picture of a loved one"s undressed body may be difficult to ascertain, and so it is recommended here that investigatory parties collecting ante-mortem data also seek information from intimate partners or close friends.

It must also be considered by those responsible for the identification and release of the body (where applicable) that the disclosure of information, such as the presence of certain modifications, may be distressing to the surviving relatives and friends. This is expressly considered in relation to genital modifications of offspring, and such emotive practices as penal tattooing, cult markings (for example racist prison gangs) or in such instances as SS officers or Jewish camp prisoners of the Second World War.

6.1.2. Crime scenes and forensic practitioners.

While tattoos are now routinely included in the SMT record made by the FBI in America (Lee 2008), similar attention should also be paid to piercings. Otomorphology (also known as „earology"), for example, has recently been utilised in forensic cases, proving the „earprint" to be as unique as the fingerprint (Abbas and Rutty 2005). Initially reported as one of the eleven features focused upon by Bertillon in his identification system, the modern widespread modification of the ear(s) will result in significantly altered earprints pre- and post-modification. Initially widely used at the time of its discovery, earprinting was superseded by the use of fingerprints once their unique patterns were discovered. Fingerprints have continued to be widely used for identification of victims and criminals alike, though otomorphology experienced a revival late in the twentieth century (Abbas and Rutty 2005; Iannarelli 1989).

Instances in which earprints may be of most help in forensic identification investigations include burglaries or cases of breaking and entering, when burglars have been reported to have left earprints on windows or doors when listening for movement inside the house (Miejerman *et al.* 2007). The height of the print may not allow for conclusive evidence of identity, but may be utilised to infer the height of the individual to whom it belongs.

Abbas and Rutty discuss the alteration to an individual‟s earprint as a result of acquiring ear piercings, but also discuss the potential the location of a piercing, and presence or absence of jewellery in the site, may have upon any resulting earprint, whether a void or a recognisable pattern. Meijerman *et al.* (2007) detail, however, the problems with using earprints in forensic casework as there are no generally accepted protocols in place for their analysis, and as such they are not recognised as a conclusive method of identification (Meijerman *et al* 2007).

For successful and complete recording of all modifications, that uniformity of terminology in regard to piercing locations and tattoo designs is of paramount importance. It is also suggested that in paperwork such as that provided by INTERPOL (Appendix 7) that diagrammatic records should be made rather than literary descriptions of piercings and tattoo sites, to deter terminological (and possibly translation) errors. A table is provided in Appendix 8 to demonstrate the multiple terminologies used for various piercing locations, highlighting the confusion that can result from mis-use of terminologies.

Instances in which the significantly decomposed, or completely skeletonised, body are concerned have also been investigated as part of this research. The training in archaeological and excavation techniques of forensic anthropologists and forensic archaeologists has been discussed in relation to their competence at complete scene recovery (Chapter 4). With particular reference to single-victim cases, this element of the research demonstrates and supports the necessity for not only complete recovery of the immediate context of the deposition, but also the need for extended excavation and search- specifically to at least 10cm below the confirmed base of a grave deposit, and to at least a diameter of 120cm from the initially located remains. With 89% of the female respondents to the survey displaying earlobe piercings (table 6), the pertinence of this research within the wider discipline of forensic anthropology and archaeology is clear.

The nature of this study being twofold (researchers at the University of Sheffield studying decomposition fluids simultaneously), the taphonomic variables acting upon the remains were limited; scavengers were kept to a minimum by the installation of the electric fence surrounding the entire site, and the positioning of wire mesh over each surface deposit. Repeating this study with fewer restrictions would be beneficial in comparing the distance artefacts such as earrings can travel throughout the post-mortem interval. Further investigations pertaining to depositional styles should also be made, including the effect of clothing, body wrapping, dismemberment and other variations on the results. In direct relation to the piercings themselves, it would be of interest to compare piercing locations with movement- especially when considering the issue of clothing. Facial and ear piercings are not constantly contained by clothing in life, as nipple, navel and genital piercings often are. This may have significant impacts upon the distance the piercing artefacts could travel throughout the post-mortem interval; those contained by clothing (nipple, navel or genital) less likely to be recovered as far from the remains as those not contained (facial and ear piercings), for example. The order of decomposition, other methods of body-wrapping and burial or surface deposition may be significant variables also. The differences relating to piercing location and post-mortem interval movement therefore require specific study.

Further support for these findings would be the ability to prove the artefacts recovered to be indisputable identifying evidence. It is thought that the constant contact of piercing jewellery with skin is likely to lend them well to DNA analysis. The advancement of DNA analytical techniques presently enabling the retrieval of even minute quantities of DNA is important in scenarios such as those demonstrated here, where degradation of the DNA sample may occur as a result of time, contamination and taphonomy (Parsons and Weedn 2006).

The successful re-association of remains disarticulated by traumatic deaths (e.g. transport disasters or bomb blasts) is well documented (Kahana *et al.* 1997, Kahana 2000). DNA analysis of remains was also utilised successfully to identify remains of victims in Croatia, Bosnia and Herzegovina (Primorac 1996) and to identify unknown remains through comparison of DNA retrieved from bone with that retrieved from personal articles (Sasaki *et al.* 1997).

Not only is the piercing jewellery"s contact with skin indicative of harbouring DNA, but its structure also lends itself well to storage of DNA. As demonstrated by the excavation research carried out here, hair was found still contained trapped between the earring and its butterfly in four cases. Other jewellery types may also provide this potential; ball closure rings may trap quantities of DNA between the ends of the ring and the ball sockets, but more likely to hold quantities of DNA useful for analysis are screw-fix bars. Bars (or barbells) comprise two ends, anchored with a larger ball that screws onto the bar. The bar therefore is pushed through the piercing with the „thread" exposed, allowing for the trapping of skin cells and debris, which will be encased securely with the attachment of the ball. It is therefore considered that the widespread use of either ball closure rings or barbells for body piercings will be useful in providing DNA samples for testing. The secure nature of barbell thread closures also lends these particular types of piercing jewellery to successful storage of DNA over time periods, though this remains a subject for specific investigation. Despite the single-victim context of this research, the implications for mass grave and multiple-burial excavation is noteworthy. When excavating multiple remains the extent of intermingling is soon evident. The mixed levels of decomposition demonstrated by the remains is often reported (Haglund 2002, Wright *et al* 2005) with those on the edges (termed „satellite") displaying more progressive levels of decomposition than those centrally positioned. Therefore, if artefacts such as earrings have the potential to either self-bury or travel towards the grave surface (table 19, Chapter 4), in relatively controlled settings, then in mass grave scenarios they are likely to be found associated with the remains of another individual.

With the potential such artefacts as piercing jewellery have for DNA retrieval, their recovery is recommended, but in mass graves the potential for DNA contamination must be borne in mind given the widespread recommendation for packaging of associated artefacts with remains in the field (Jensen 1999).

The excavation work carried out here also demonstrated the need for professional forensic investigators to better question common practice. Where metal detectors have been employed previously as a matter of course in recovery of small metal objects including earrings, it is recommended given the failing of the technique to recognise the stud earrings used in this investigation, for reliance on metal detectors to be avoided.

Even in burial cases where piercing jewellery is not retrieved, the skeleton should be studied for evidence of altered bone growth. Bone is an organic compound, displaying plastic qualities; it is responsive to stimulation, both chemical and manual. Bone growth can be manipulated, as demonstrated by re-alignment after a break or fracture, or most pertinent here, by such practices as head and foot binding.

It is thought, therefore, that the constant contact of a hard material such as metal, with bony surfaces, may result in altered bone growth. In locations such as the eyebrow or labret, where piercings are in contact with bone, it may be possible to detect altered bone growth, indicating the wearing of piercing jewellery in that location. Suggestions for the investigation of this would include research into historical skeletal collections of cultures known to wear piercing jewellery in such locations (for example the labrets of the Inuit or upper lip plugs worn by various African tribes, see figs. 48 and 49). It would also be useful to study modern radiographic images of individuals known to wear piercings such as eyebrows and labrets, as altered bone grown may be detectable by such a method also.

fig. 48. (left) showing Inuit woman wearing labret made of bone. (www.royalbcmuseum.bc.ca 2010)
fig. 49. (right) showing African tribeswoman with upper lip plug made of bone. (www.forafricanart.com 2010)
The constant contact of piercing jewellery made of hard material on an individual's skeleton may result in altered bone growth.

6.2. Future work.

The information gleaned from the extensive experiments carried out on the tattoo inks, as discussed in Chapter 4, are of great significance not only in allowing for the decipherment of ingredients of tattoo inks, but also insofar as demonstrating the inconsistency in production of inks by manufacturers. If this is continually the case, this could result in the inability to match ink samples retrieved either from a source or from the skin or body, to a particular manufacturer. However, the progressive application of PCA statistical analysis to the results has greatly aided the distinction between manufacturers as was the aim of this element of this research from its conception. While much work to catalogue profiles of all available tattoo inks remains, the work carried out by the completion of this research with the honing and successful implementation of an appropriate technique has made a significant contribution.

The uniformity of production of inks is of importance to not only the forensic disciplines, however. As mentioned briefly in Chapter 4, laser treatment for the removal of tattoos is dependent upon the ability to match the pigments being treated with the wavelength exhibiting most absorption in that colour range. If multiple colour pigments are mixed to produce one final colour, the effectiveness decreases greatly and can even result in the darkening of a treated area (Varma and Swanson 2002). Consideration must also be given in to patient (or „client") safety. If, as Vasold *et al.* (2004) discuss, the azo pigments used in the tattoo inks cleave when subjected to laser therapy, it must be investigated whether the resultant carcinogenic compounds are of sufficient concentration and quantity to be of significant risk to health. This can only be done through longitudinal studies, but is crucial nonetheless. Highlighting this potential occurrence to both ink manufacturers and laser therapists in order to prevent any such consequences should be pursued.

Some of the newest tattoo inks being produced are hailed as „semi-permanent" (though more accurately are permanent, but removable when subjected to specific treatment). „Freedom-2" tattoo ink has been researched and created in America by Professor Mathiowitz, of Brown University. In an interview with Michael Pollitt, a journalist for the Guardian newspaper, she explains that the idea of a tattoo ink that expressed all the characteristics of contemporary tattoo inks, but with the added benefit of guaranteed removal, was conceived by Dr Rox Anderson at Massachusetts General Hospital and Bruce Kitzman at Duke University. The ink is produced by way of „microencapsulation"- the containment of the tattoo ink"s pigments within microscopic polymer beads that only break open, releasing the pigments for export by the body, under specific conditions. The inks" benefits are described by Professor Mathiowitz thus:

> "Traditionally, black ink absorbs all wavelengths of light. Our particles, however, were engineered to absorb more light at specific wavelengths, focusing the energy better on the beads and allowing the body to remove the tattoo ink" (Pollitt 2007)

However, professionals from other disciplines have, as with traditional tattoo inks, expressed concern about the production of these new tattoo inks. Specifically, Dr Nick Lowe, consultant dermatologist and laser therapy expert, also interviewed by Pollitt, expressed concern after viewing the publicity shots of „before" and „after" laser treatment. He referenced the remaining tattoo pigments still visible on the arm of the volunteer even after the single laser treatment the inks apparently require for complete removal. Of yet more concern, he pointed out, is the apparent loss of natural skin pigment- most notably the absence of freckles. While he stated that he is in agreement with the concept and production of such a regulated tattoo ink, he emphasized the need for continued research and trials to be completed before its release into the consumer market (Pollitt 2007).

In line with this view, it is recommended by this research that all disciplines relating to the tattoo pigment industry (ink manufacturers, tattoo artists, health care professionals, laser therapists) work in conjunction to produce tattoo inks that adhere to all requirements as determined by each discipline. The unification of all professions is, however, an ongoing battle. Often seen in contention with one another, the tattooing and health-care professionals frequently disagree on best practice as preconceptions prevail, the tattooing industry permanently defending itself against perceived criticism of their professionalism concerning hygiene, and the medical profession‟s consideration that lack of legislation of tattoo and piercing artists results in unregulated, unhealthy environments (Mercer and Davies 1991).

Even within each discipline professionals may not agree on best practice. In an interview conducted by Sanders and Vail (2008) an anonymous tattoo artist stated that:

> "You can‟t get the tattoo community together. There are too many factions. This group hates that group. The groups are usually sided with some supplier and, of course, they don‟t get along.... I heard one proposal for a union in which they said everybody should charge the same prices across the country. But that‟s crazy. Why should some hack doing pitiful work charge the same amount as an art school graduate doing the finest work in the country?" (Sanders and Vail 2008:96)

With dissent prevailing within a discipline, unity between disciplines is an even greater challenge, though it is still recommended that well-respected factions of each of the disciplines concerned unite for the sake of producing safe, yet artistically practical, tattoo inks for widespread distribution and use.

Removal is often quoted as desired as a result of „embarrassment‟ or „misguided lifestyle choice‟ (Thomson 1984, Balakrishnan and Papini 1991). However, this research has unveiled that more frequently removal is sought as a result of a change of circumstance after receiving a celebratory tattoo (for example the name of a wife or husband after a divorce) or as a result of poor artistic skill not standing the test of time. Another reason for complete or partial removal (allowing for cover-up or correction work) is after a lack of sufficient research prior to obtaining the design (often reported when acquiring tattoos in a language other than the wearer‟s own e.g. Latin or Chinese and Japanese characters).

One anecdotal account recounted to the author by an artist includes a middle-aged woman having just concluded a divorce seeking a Japanese tattoo to commemorate the occasion. After locating a tattoo artist she repeatedly failed to turn up for her appointments, resulting in animosity between herself and the artist. The resulting tattoo was two symbols reading „short‟ and „fat‟, not „strength‟ and „beauty‟ as requested. It was only upon displaying her newly acquired artwork to a Japanese friend that the true meaning of the tattoos was revealed, resulting in her seeking laser-removal treatment. Whilst a relatively uncommon occurrence this story underlines the necessity for complete research into the requested design and for both parties to maintain a professional relationship.

Laser treatment of tattoos needs investigation and continuing research not only in regard to the motivations for removal and the chemical composition of the tattoo ink, but also in its effectiveness to eradicate all tattoo ink. It has been demonstrated by McKechnie e*t al* (2008) that residues of tattoo pigments can still be seen after laser removal when scrupulously examined under various light sources, which is also supported by the infrared imaging work carried out by Starkie *et al.* (in press).

It has been seen (Kluger *et al.* 2008) that after insertion into the skin, tattoo inks can be detected in the lymphnodes. Whilst still in its conception of theory, the ability to hone techniques for chemical analysis of tattoo ink brands is of direct significance to this type of investigation. Medically, knowledge of this occurrence is important as lymphnodes dyed by tattoo ink mimic metastatic lymphnodes that would warrant extraction (Moehrle *et al.* 2001). The staining of lymphnodes is also of potential significance to forensic anthropology, specifically in regard to the recovery of fragmented and dismembered remains. Investigation should be carried out in order to ascertain the pattern of lymphnode staining upon receipt of a tattoo. If only regional lymphnodes are affected, the retrieval of a torso exhibiting staining of the left axillary nodes (located in the armpit) would result in the search for a detached left arm exhibiting a tattoo.

However, confusion in such a case may occur if the tattoo of the disarticulated limb has been subjected to laser treatment as it is safe to assume that after laser treatment the lymphnodes will continue to exhibit tattoo ink particles, as the laser treatment has not been applied to them to facilitate the breakdown of the inks in this specific location. The re-association of remains may be accelerated by the employment of a technique such as infrared reflectography where the stained lymphnodes of a torso indicate the presence of a tattoo on a disarticulated limb. The chemical investigation of tattoo inks here may also have great impact upon the honing of the infrared reflectography technique as it indicates the wavelengths of most absorbance and transmittance of each ink, allowing for the utilisation of specific wavelengths for better refining the images received. This knowledge would also be beneficial to laser technicians as the wavelengths at which each pigment is most absorbent would enable more successful tattoo removal by this method.

Further to this, the ability to retrieve a chemical signature of the ink, as produced by this research, may unveil the colour of the related tattoo, allow for inference of the ink"s manufacturer, or allow for a chemical match between the inks housed within the lymphnodes and those of the tattoo itself, matching the detached physical elements much faster and less expensively than DNA testing.

Replacing such invasive post-mortem treatment as the application of 3% hydrogen peroxide solution (Haglund and Sperry 1993) may also prove important in individuals who have received either complete or partial laser removal treatment. Where limited tattoo ink pigmentation remains, its visibility even after hydrogen peroxide application will be marred by the laser treatment.

Further to the issue of re-association of disarticulated remains the concept of traumatic tattoos should be considered here. The location and condition of disarticulated remains from such instances as bomb blasts (e.g. London 7/7, Israel (Kahana *et al.* 1997, Kahana 2000)) can aid investigators in establishing victims" locations at the time of explosion. This is crucial in instances such as terrorist attack to determine the identification of the individual(s) responsible, and in transport or aviation disasters to determine the source of fault or initial ignition site. Remains retrieved after explosion and disarticulation may also display „traumatic tattoos".

The explosion of devices close to the body may result in impregnation of carbon particles into the surface of the skin and/or flesh. It is thought that this occurrence will be more marked and more extensive in individuals closest to the source of the explosion. The distinction between traumatic and aesthetic tattoos is, therefore, crucial. While the pattern of traumatic tattoos is likely to be random and non-uniform, distinct from the precise and possibly colourful aesthetic tattoos, the effects traumatic deaths may have upon aesthetic tattoos is undocumented, so the distinction between the two may not as straight forward as could be expected.

Therefore, research determining inks‟ chemical signatures should continue, but focus should now be upon the chemical composition of the ink post-insertion into the skin. Engel *et al.* 2008 detail methods for extraction of ink from skin, although their research concerns ink injected into the skin post-mortem, therefore, not allowing for the interaction between the body and the ink- such as histamine reaction or skin pathology, which may all have significant effects on the ink‟s resultant chemical composition.

It must also be considered that the suggested „aftercare‟ treatment, as provided by the tattoo artist, may affect the ink‟s chemical composition and alteration post-application, given the skin‟s open-wound nature at this stage. It is not expected that the application of creams and ointments will significantly alter the chemical composition of the inks, but given the demonstrated fragile and inconsistent chemical signature of the inks, even small alterations are detectable and recognisable. The database provided by this research enables the comparison between inks prior to their intended use, but can also be utilised in research determining the extent of chemical alteration the inks undergo after insertion into the skin. This is potentially extremely important with regard to the medical disciplines‟ concerns with the inks‟ safety *in corpus*.

One should also consider the potential effects on the ink‟s composition the increasingly popular practice of mixing the ashes of a loved one with tattoo ink may have (Dr. John Troyer *pers. comm.*). Therefore, care should be taken when stating conclusively a match or discrepancy between the ink retrieved from the individual, and inks obtained from source.

Ultimately, inks subjected to various levels of laser treatment and through various stages of decomposition should also be studied to determine the effects these variables have upon the chemical signature of the inks.

Identification and identity are multi-faceted concepts, both in their employment by the individual and in their utilisation by investigating authorities. Determining identity is, therefore, a complex process that requires help and information from multiple sources. Here is presented one such source, namely body modifications, with the potential to significantly aid forensic human identification.

Chapter 7

7. Conclusions

The investigations carried out as part of this research have all demonstrated areas in which body modifications can aid forensic human identification. In isolation each element is of significance to its specific field, but in collaboration they demonstrate that at various stages of the post-mortem identification process, body modifications can greatly aid and support conclusions drawn from utilising more traditional identification means, or by indicating initial possible identity, allowing for confirmation by methods such as DNA analysis.

The novel approach to studying the international nature of modification practices, and the opinions awarded them, employed by this research has gone some way to demonstrating the repetition of celebration and oppression throughout temporal and geographical history. While frequently the elimination of tribal customs is viewed as the result of European colonialism, this study has gone to prove that quite the opposite was true. Europeans met such customs with awe and wonder, though also admittedly trepidation, but oppression and eradication only occurred after settlement and the establishment of the Christian faith. While the spread of Christianity can be viewed as inherently linked to colonialism, the distinction must be made in order to demonstrate the differences between 'Western' and religious opinions of traditional tribal customs.

The two surveys conducted provided rich data pertaining to the incidence of body modification practices demonstrated by the British public in 2008-9. They also have provided unbiased information regarding the motivations and rationalization for some to become modified, or to add to their previous modifications. Evidence concerning the prevalence of health complications was also touched upon by these surveys, highlighting the infrequency of such problems, but also detailing the source of help sought, demonstrating the extent to which medical healthcare was involved which in turn indicates the frequency with which modifications are exhibited in official ante-mortem medical records.

Contribution to the forensic archaeological and anthropological fields has also been made by the completion of the work documenting the post-decomposition location of trans-dermal artefacts. The first investigation conducted specifically to investigate piercing artefacts in this way, the completion of this element of the research has highlighted the need for similar studies to be carried out, focusing upon various depositional styles alternative piercing locations and other taphonomic variables. The ability to support other recommendations to the field regarding the excavation below the base of a grave (to at least 10cm) and the beyond the furthest located skeletal element, for recovery of associated artefacts is significant in all aspects of forensic archaeological and anthropological aspects of scene investigation.

Another element of this research includes the most extensive investigation of the chemical composition of tattoo inks to date. It is also the only reported investigation to analyse tattoo inks over time- both in relation to acquisition and storage of the tattoo inks. The completion of this work has unquestionably contributed to various fields with the production of a comprehensive database of tattoo inks, which can be employed for various forensic, medical, physical or chemical investigations. The obstacles encountered throughout the investigative process, and the findings concerning inconsistent production and instability of the inks themselves has further demonstrated the need for uniform production of tattoo inks.

The completion of the various aspects of this research illustrates the myriad applications body modifications may have aiding post-mortem identification. We can see that through tribal practices, tattoos, markings and piercings have been utilised as markers throughout life and to portray identity of tribes and even individuals. We see repetition of these values in modern uptake of modification practices. Therefore, given the findings of the various elements of this research, modification practices and the information they can provide should be harnessed and capitalised upon to significantly aid the forensic human identification process.

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fig. 47. www.tattooartists.org Pavel Angel tattoo
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fig. 48. www.royalbcmuseum.bc.ca Inuit woman
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Documentaries and Films

Marked: Season One. 2010 [DVD] History Channel

Tattoo 2002 [film, DVD] Peter Burger: Buena Vista International

Tattoos: A Scarred History 2008 [DVD] 4Digital Media

Tattoo 2002 [film, DVD] Robert Schwentke: Studio Canal

The World's Strangest Plastic Surgery and Me 2010 [TV programme] Channel 4 Monday 12th April 2010

50 Greatest Plastic Surgery Shockers 2010 [TV programme] Channel 4 Saturday 4th December 2010

Appendices

All appendices can be accessed using the attached CDs.

Some are produced here for ease of reference.

CD 1- appendices 1-5

CD 2- Appendix 6

CD 3- Appendix 7

CD 4- Appendices 8 & 9

Appendix 1

Rationalisation for survey questions

Survey 1.

Question	**Rationalization**
1. Do you have your earlobes pierced?	Distinguishing between earlobe and other piercing is important in British society as they remain distinct in their perception and are accordingly accepted differently.
2. Do you have piercings other than your earlobes? If YES, what piercings do you have?	See above. A list is provided to deter confusion over 'names' of certain piercings.
3. Have you had any piercings you have let heal over? If so, which?	Scarring may still be visible even if healed.
4. Do you have any tattoos? i) If YES, how many tattoos do you have? ii) Where are they?	Self explanatory. i) and ii) Determining the number can help infer the extent of tattoo coverage- one small discreet tattoo should be considered vastly different from a full sleeve or backpiece, but they are still just one tattoo- respondent's perceptions of coverage will be determined by the marriage of information here. List provided to deter confusion again. Also allows for analysis of popular locations for tattoos and any apparent trends.
5. Please select any other modifications you <u>regularly</u> undertake.	Respondents may practice other modifications they may not have previously considered to be 'modifications' that would be deemed as such post-mortem.
6. Please select any other forms of body modification you have undertaken.	Body modifications can incorporate medical procedures such as cosmetic surgery. They too should be considered by practitioners.
7. Year of birth	To detect any generational or age-based trends.
8. Biological sex	To determine any sex-based trends.
9. County/City of origin	To detect any regional trends or patterns.
10. County/ City of residence	As above, but also to ensure residential British population respondents.

11. Religion	To investigate any religious trends or variations.
12. Skin tone	To detect any variations in modification undertakings dictated by skin tone.
13. Occupation	To ensure a cross-section of the British public is surveyed and appropriately represented.

Survey 2.

Question	Rationalization
1. Do you have your earlobes pierced? Both/ Left/ Right/ Neither	While symmetrical piercing is widely accepted in females, it is thought that unilateral piercing in males is more common than bilateral.
2. What other piercings do you have?	Repetition of question from survey 1 determining prevalence of certain piercing locations.
3. How old were you when you got each piercing?	Piercing requires parental consent under the age of 16. While not illegal, intimate piercings (nipple and genital) are generally only practiced on individuals over the age of 18. Any discrepancies will be displayed here. Also, general age of acquisition patterns will be displayed.
4. Where (country/practice) did you get your piercings done?	Some countries differ in their legislative power over piercing practices. Within the UK this may allow for detection of any geographical trends.
5. Why did you choose this location/practice?	The choice of piercing parlour (or other location) reveals the issues deemed significant to each individual in regard to acquiring their piercing.
6. Was it/ were they done by professionals?	Many academics concern themselves with the apparently high numbers of amateur piercings acquired. The results to this question will reveal how justified these concerns are.
7. Approximately how much did each piercing cost?	Some piercings may be considerably more expensive than others due to their delicate position, or intimate nature. Such speculation will be proved or disproved by the answers given to this question, along with any extreme variation in price.
8. Briefly explain why you chose your piercing, how long you considered it for and whether any outside factors (e.g. alcohol, fashion, friends etc.) influenced your decision.	Many academics report the fashionable nature of piercings. It is often considered that the practice is fuelled by alcohol-hazed decision making in 'risk-taking behaviour' of individuals. Inviting an open ended answer allows for the respondent to give detail without any prompt or limiting their motivations to a choice of factors
9. Do you regret your piercings?	Again, often reported as being the case, but not

	often investigated or supported
10. Would you have another piercing?	Often seen as addictive, indicating the consideration of more piercings may be particularly interesting when aligned with the number of piercings the individual already has.
11. Did you experience any unusual effects from your piercing?	Oftentimes piercings are reported as concerning many in the medical professions as their potential for infection (bacterial and viral) is well attested. However, figures of the number or proportion of piercings to result in such problems is infrequently investigated.
12. If YES, from whom did you seek advice?	The medical professionals concerning themselves with the infection potential for piercing sites also are frequently concerned with the potential strain on the NHS such complications may be responsible for. Determining the prevalence of complications, but also where help was sought is important to support or quash this concern. Of forensic significance also, if complications are reported to medical health care professionals, the individual's body modifications will be recorded on official ante-mortem documents that may be of significance in identification cases and therefore can be accessed.
13. Do other people know about your piercings? Please explain.	Again an open-ended response always allows for the respondent to leave unprompted answers allowing full explanation of their own and others' opinions of their piercing(s), and piercings as a whole.
14. If you do not already have one, would you like a piercing?	In order to fully appreciate a person's opinions concerning piercing, it was considered that reporting a person's present appearance may not adequately reflect their opinions on the practice itself. A person with no piercings may be considered disinterested, when actually they have plans to become pierced even a day after the survey was returned.
15. Do any of your friends/family have piercings? (Other than earlobes)	It is frequently thought that body modification practices occur in groups. By determining a person's exposure to piercing, this assumption can be investigated.

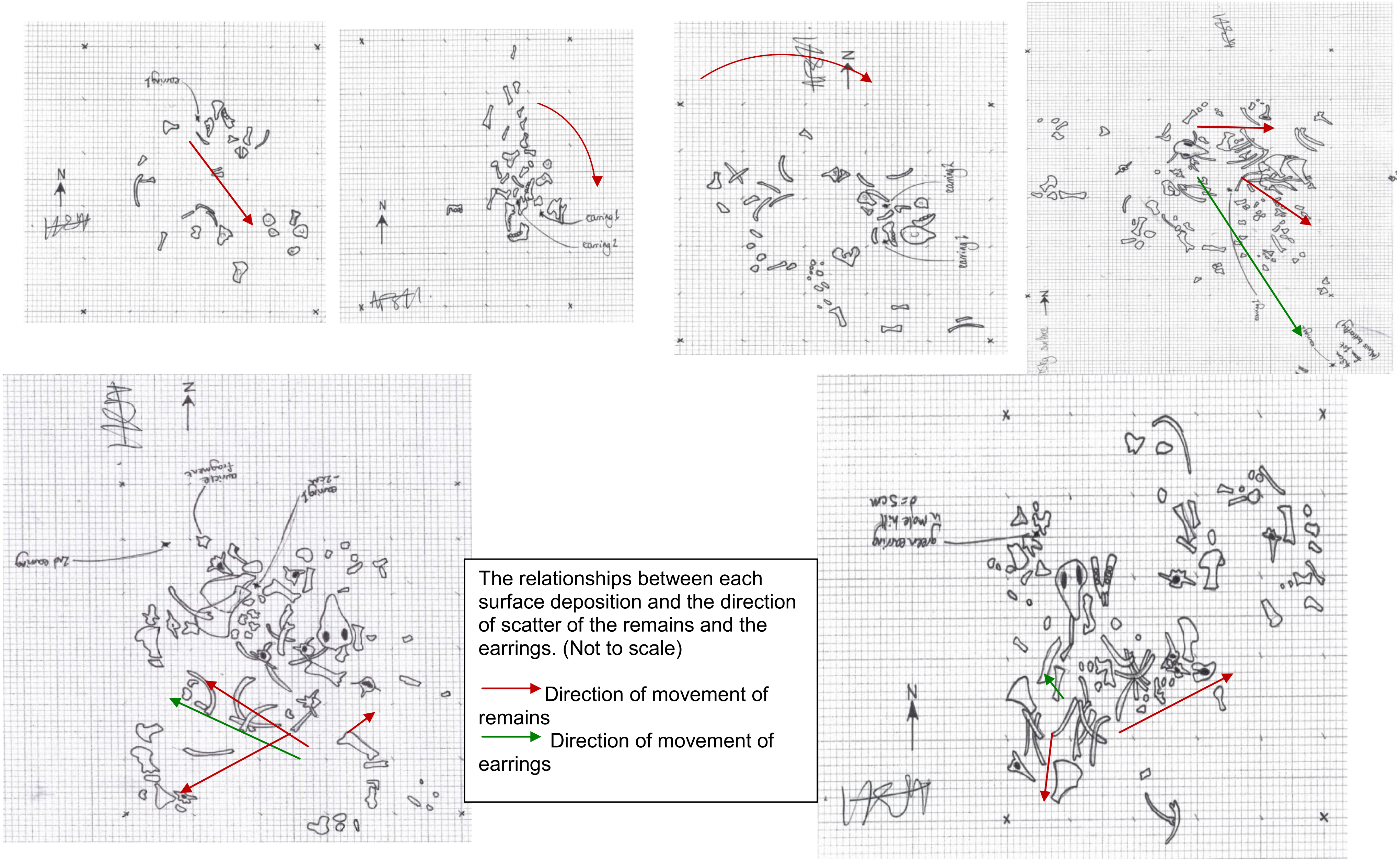
16. Do you have any tattoos?	Repetition of question from survey 1 to determine prevalence of tattoos among respondents.
17. If YES, how many do you have?	Allows for details regarding popularity and frequency in individuals to be assessed.
18. If YES, where are they? (online a list of anatomical locations provided, on paper a diagram)	Detailing locations allows for popularity of certain locations to be detected.
19. Give a brief description of the designs, including colours and rough sizes.	Certain imagery may prove more popular than others. By allowing an open-ended response it is also interesting to see how people identify their own tattoos, rather than how others may view them.
20. How old were you when you got each tattoo?	As mentioned previously, the law only dictates the illegality of tattooing a minor, not receiving a tattoo when a minor. Again, seen as an adolescent past-time, this information will provide evidence for this claim.
21. Where (Country and/or city) did you get your tattoo(s) done?	Legislation varies regarding tattooing practices in different countries. Within the UK, geographical trends for tattooing may be seen.
22. Why did you choose this location/practice?	A choice of tattooing parlour (or other location) reveals the considerations deemed significant to each individual on acquiring their tattoo- whether hygiene, friendliness, artistic ability etc.
23. Was it/were they done by professionals?	As with piercings, many academics concern themselves with the apparently high numbers of amateur tattoos acquired. The results to this question will reveal how justified these concerns are.
24. Approximately how much did each tattoo cost?	It is thought that size only dictates the price of a tattoo, while others consider artistic skill to be the determining factor. Cost itself may influence a person's decision on what to get, or where to have it done.
25. Briefly explain why you chose your tattoo(s), how long you considered it/them for and whether any outside factors (e.g. alcohol, fashion, friends etc.)	Tattooing is often seen as an act of boredom, adolescent rebellion, group affinity, or simply an ill-advised decision made after consumption of alcohol or drugs. Allowing an open ended response enables the respondent to fully relate

influenced your decision.	their motivations without any prompts.
26. Do you regret your tattoos?	Many academics believe tattoos to be frequently regretted, though limited evidence is used to support this claim.
27. If YES, why do you regret your tattoos?	An open ended response again allows for full explanation by the respondent without prompts.
28. If YES, you regret them, have you had or would you consider laser removal?	Regret is the most commonly reported motivation for tattoo removal by laser. It is also thought that with the development of laser removal, tattoos will be sought more frequently with the potential for removal at a later date. Recording the prevalence of laser removal consideration by respondents will help determine the popularity of this practice as a possibility. Forensically, the incidence of laser removal also needs to be borne in mind as this may counteract ante-mortem or prior findings.
29. Would you have another tattoo?	Often seen as addictive, indicating the consideration of receiving more tattoos may be particularly interesting when aligned with the number of tattoos an individual already has.
30. Have/would you cover one tattoo with another?	Laser removal is only one way of altering a tattoo's appearance. Forensically, this is of significance as the appearance of a tattoo can be significantly or completely altered, conflicting with ante-mortem or prior recordings.
31. Did you experience any unusual effects from your tattoo?	As with piercings, tattoos are often cited as a risk for potential blood borne diseases; bacterial and viral infections. Simple complications are also of concern to the medical professions as potentially straining the NHS resources- the true incidence of complications will be reported here.
32. If YES, from whom did you seek advice?	The reporting of complications is significant forensically as medical health care professionals are the only ones required to keep records, which can be accessed in a forensic enquiry. Determining the frequency of complications, but also where help was sought is important to support or quash the concern of reliability on NHS resources.
33. Is your FIRST tattoo visible in everyday clothing?	It is often thought that tattoos are acquire furtively- whether because against the wishes of family or friends, or as a result of perceived

	lacking social acceptance. The position of the first tattoo, therefore, is often thought to be significant.
34. Are any of your later tattoos visible in everyday clothing?	Further to the previous question, it is thought that with more tattoos comes visible display as the wearer sees themselves as a 'tattooed individual' willing to express this persona.
35. Do other people know about your tattoo(s)? Please explain.	Again an open ended response allows for the respondent to leave unprompted answers allowing full explanation of their own and other's opinions of their tattoo(s) and tattooing a whole.
36. If you do not have one already, would you like a tattoo?	In order to fully appreciate a person's opinions concerning tattooing, it was considered that reporting a person's present appearance may not adequately reflect their opinions on the practice itself. A person with no tattoos may be considered disinterested, when actually they have plans to become tattooed even a day after the survey was returned.
37. Do any of you friends/family have tattoos?	It is frequently thought that body modification practices occur in groups. By determining a person's exposure to tattooing, this assumption can be investigated.

Appendix **2**

Surface deposit overall scatter distribution.



The relationships between each surface deposition and the direction of scatter of the remains and the earrings. (Not to scale)

Direction of movement of remains

Direction of movement of earrings

*A*ppendix **4**

Starkie *et al.* (in press) publication.

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An investigation into the merits of Infrared Imaging in the investigation of tattoos post mortem.

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Keywords:	Forensic Science, Body Modification, Tattoos, Infrared, Imaging, Decomposition

An investigation into the merits of infrared imaging in the investigation of tattoos post mortem.

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Abstract

Infrared imaging has a history of use in the forensic examination of artwork and documents and is investigated here for its wider use in the detection of tattoos on the human body post mortem.

Infrared photographic and reflectographic techniques were tested on 18 living individuals, displaying a total of 30 tattoos. It was observed that neither age, sex, age of the tattoo, nor, most significantly, skin colour affected the ability to image the tattoos using infrared imaging techniques. Secondly, a piglet carcass was tattooed and the impact of the decomposition process on the visibility of the tattoos assessed. Changes were recorded for 17 days and decomposition included partial mummification and skin discolouration. Crucially, the discolouration was recorded as greatly affecting the image quality using conventional photography, but was insignificant to the infrared recording of these tattoos.

It was concluded that infrared reflectography was beneficial in the investigation of tattoos post mortem.

Keywords: Forensic science, body modification, tattoos, infra-red, imaging.

Identification of the deceased is a primary concern for many forensic practitioners. Various methods are employed in the course of this work, including odontology, DNA profiling and fingerprinting. In Western societies there must be "identification beyond all doubt" (1) before death can be certified for both humanitarian and legal reasons. Jensen (2) notes that identification techniques, and their results, can be placed into three brackets 1) 'positive or confirmatory' gained by the matching of unique ante- and post-mortem data markers such as fingerprints, DNA or dental records, 2) 'possible, presumptive or believed-to-be' when multiple factors are considered, such as skeletal and medical traits, which, when combined, can greatly aid the production of a unique individual profile, or 3) 'exclusion' which can occur when a process of elimination is possible. Features occurring on the skin, such as birth marks, scarring and tattoos are deemed 'secondary' characteristics (bracket 2 as stated by Jensen above) in that they may not be unique to any one person. Nonetheless, tattoos in particular seem to show great potential as a means of identification due to their increase in popularity (3). Reasons for the uptake of such body modifications are various (e.g. 3,4,5), but it may be the case that successful recognition and recording of them may speed up the identification of an individual, or may allow one to comment upon their life history. Unfortunately, research investigating the potential of tattoos within the forensic context is very limited, despite their reported usefulness in aiding identification of victims in such cases as the London Paddington train crash of 1999 (6) and the South-east Asian Tsunami of 2004 (7).

Before any identification can be achieved using tattoos, the initial challenge of the forensic investigator is to locate these body modifications, if present. This can be severely hindered by the discolouration of the skin during the decomposition process. Currently, one suggested method employed to detect and emphasise tattoos on the discoloured skin of the deceased is the direct application of hydrogen peroxide solution at 3% concentration. While this method has proven successful (8) there are major flaws in its application in modern forensic investigations- it is a destructive technique, there must be initial reason to suspect a tattoo at a specific location, it is a technique limited by time and resources and is also constrained by limited repetitive applications.

Infrared imaging shows promise as a technique to significantly aid the process of identification and is practical both home and abroad. Non-invasive techniques must be investigated and employed where possible in forensic investigations of any manner. This paper examines the possible uses of infrared imaging on decomposed, discoloured skin samples.

Infrared and ultraviolet imaging applications have long been employed in medical and forensic science investigations. At the crime scene, ultraviolet light can be used to detect the presence of a variety of substances that fluoresce only under these specific wavelengths, such as blood, semen and certain drugs (9). Infrared investigation of documents and paintings is employed to aid the detection of forgeries and alterations (10,11). Clinically, ultraviolet photography has been used to study skin pigmentation, including that associated with skin cancers, as well as to aid the detection of bruises and surface damage of soft tissues (12,13). In the same context, infrared photography has been employed to investigate alterations in the venous systems of the breasts throughout pregnancy, as well as the detection of various veins and other venous obstructions (14). UV is ideal for detecting surface alterations of the skin, surface structure and melanin content. Infrared wavelengths, however, are able to image superficial layers of the epidermis and deeper skin structures, as melanin is pervious to wavelengths of this frequency.

Two infrared imaging processes can be adopted. Infrared photography illuminates a subject using all wavelengths of light with a filter attached to the camera allowing only the passing of infrared wavelengths to record the image. Reflectography, however, illuminates the subject only by infrared wavelengths which are retrieved, recorded and interpreted by the camera itself.

Therefore, the aim of this research is to determine whether infrared wavelengths can image the deeper structures of the skin, unaffected by the skin's melanin content, and show the tattoo ink located between the epidermis and the dermis. Once this is established, the effect of skin discolouration during decomposition on the visibility of tattoos will be investigated.

Materials and Methods.

Experiment 1

Eighteen individuals, with a total of 30 tattoos, were photographed using two different techniques. A Nikon D50 digital SLR camera with externally attached infrared filter, accompanied by photography flashes, was used first, followed by a Sony 80x digital video-camera with inbuilt infrared function. All tattoos were photographed by both methods in both visible light and through their respective infrared techniques for comparison and ease. The population consisted of university staff and students, with ages ranging from 19-48 years. Varying skin colours, and almost equal numbers of men and women (eight and ten respectively) were represented.

Experiment 2

A piglet carcass was tattooed so that a full body could be used and observed. The piglet was taken to a local tattoo parlour where the artist tattooed blocks of red, green and black, each accompanied by line-work in the form of the words 'red', 'green' and 'black'. An adjacent area of skin was left blank to act as a comparative control in this decomposition study. The colours were chosen for the following reasons; red is a common colour in tattoos, is photo-sensitive and difficult to remove by laser and has also been seen in the majority of reported dermatological reaction cases; green is also common, but is also notoriously difficult to remove through laser surgery; black is by far the most commonly used ink- alone, as an outliner, and in shading of all designs. The comparison of line and block work would enable the study to test the ability for infrared to record intricate as well as bold designs. Appropriate measures were taken to ensure sterility of the tattooing environment both before and after the piglet's presence. As a consequence, the viscera of the piglet were removed prior to tattooing. To minimise the effect of this on the subsequent decomposition process, replacement viscera were added following application of the tattoos.

This study adopted a semi-actualistic approach. Once tattooed, the piglet was positioned on a raised surface and was covered by two layers of wire mesh (¼ and ½ inch squared respectively) to deter rodent activity. Flies were deterred by loosely covering the whole structure with muslin- a tight enough weave to deter insects, but loose enough not to unduly influence the micro-environment. Colour and infrared images were captured using the Sony 80x digital video-camera, mounted constantly on a tripod. Photographs were taken daily, for a period of 17 days, between 16:30-17:30 in order that lighting conditions were as consistent as possible. Weather and temperature were recorded simultaneously, by observation and thermometer, as well as through comparison with local weather records.

Results and Discussion

Experiment 1

The results from the digital SLR camera, when used in its normal colour capacity, showed the tattoos, the surrounding skin and its texture in great detail. While overexposure of images was avoided in most instances, where the skin did appear 'shiny', detracting from or interfering with the visibility of the tattoo, the flashes were re-angled and the photograph retaken. Detail of the skin texture, colour, blemishes and the tattoos' colours and details were recorded in high quality.

The positioning of the infrared filter (attached to the lens of the camera) blocked the photographer's view of the subject through the camera's viewfinder. The picture, therefore, had to be set up before the filter was attached, and the focus estimated. This resulted in many blurred images and the repetition of many shots, until useable images were achieved. Each infrared image appeared very dark, with little subject matter and so the computer's imaging software was used to lighten and sharpen each image, though many still appeared grainy, even after this manipulation. Details of the tattoos and the skin were of far less quality than was seen in the colour images.

Many of the volunteers sported solely black tattoos, though those with colour showed red more frequently than any other colour. However, while the infrared images appear visually in grey tones, all colours are represented in shades of grey, except for red which is sometimes undetectable (fig.1a and 1b). Previous medical photographic research, conducted in 1952 by Massopust, saw red pigment appearing stark white, not apparently invisible (15). One explanation for this may be that whereas Massopust studied the pigment red cinnabar (a mercuric sulphide based pigment (16)) the red tattoos recorded here were all post-1990 and are more than likely, therefore, to have been napthol red, in accordance with the “phasing out” within the industry of toxic metal based pigments (17) . However, further investigation into the ingredients of tattoo inks, and infrared’s sensitivity and representation of different pigments should be undertaken before conclusions are drawn.

The variable anticipated to have the most influence on the results was skin colour, due to the contrast between tattoo and skin seen in normal light being less marked in darker skins than lighter skins. However, the results of this experiment show that images taken through an infrared filter are not affected by the skin’s melanin content (fig. 2a and 2b). Melanin is sensitive and responsive to ultraviolet wavelengths while exponentially insensitive to all other wavelengths through to the infrared spectrum (18) and so it is unsurprising that the contrast between tattoo pigment and skin colour is more pronounced in infrared photography than in colour photography in natural light. Natural light and conventional photographic flashes contain ultraviolet wavelengths which will have been blocked by the infrared filter. It also appears that skin surface blemishes such as pimples and, in one case, a minor burn, are not shown by infrared photography (fig.4a and 4b). Whether this is due to their physiological position in the epidermis, or their pink-red colouration is unclear.

The results from the video-camera were in concurrence with those detailed above. The apparent disappearance of red pigment, the eradication of skin surface blemishes (fig. 3a and 3b) and the inconsequentiality of skin colour or pigment unevenness were all observed using the infrared mode of the video-camera. However, the infrared images from the video-camera were much clearer and the details of the tattoos were represented as clearly in infrared mode as they were in colour, with detail and clarity of image as impressive as the still camera. The ease of use of the video-camera (the ability to view the image captured in infrared, the versatility of the positioning and movement of the video-camera and the change from normal to infrared at the flick of a switch) as well as its excellent quality of recording images in both modes emphasised its overall superiority to the still camera technique for investigations of this nature. It was decided, therefore, that experiment 2 should be carried out using only the Sony 80x video-camera as the still camera's infrared images were of overall inferior quality and its colour images of similar quality to the video-camera's, thus rendering it redundant in this study.

The availability of a larger volunteer group would have been of benefit for studying the effect of skin colour, age and application techniques on the visibility of tattoos. Also, all but one were relatively small in size, with limited colours represented, so a larger volunteer group may also have allowed for more detailed study of the behaviour of different colours under infrared investigation.

Experiment 2.

Pigs are often used as human substitutes within forensic anthropology research due to their comparable fat/muscle body ratio, but for the sake of this study a piglet was preferential not only for its more practical size, but also its skin most closely emulates human skin due to its anatomical structure and lack of formed bristles.

Table 1 displays the time of photograph, temperature and weather conditions and observations made at the time of image capture. Figures 4a and 4b show the visible light and infrared image of the freshly tattooed piglet's skin. Negligible bacterial action was observed and the process of decomposition was dictated almost entirely by larva infestation, despite the measures taken to prevent this, and later through desiccation.

As the mummification progressed, it seemed that the black ink had 'run' permeating the surrounding skin, resulting in a blackened appearance and less definition of the word 'BLACK' when photographed under normal light in colour (fig. 5a). However, the tattoo appears much clearer and better defined when viewed in the corresponding infrared image (fig. 5b) and the surrounding black discolouration is muted. The skin's own discolouration due to mummification is pronounced when viewed and compared in the colour photographs (fig. 4a and 5a) but is not observed so extensively in the infrared images (fig. 4b and 5b).

The presence of maggots was prolific throughout this study, despite the preventative measures put in place (namely the double layer of muslin). Fly eggs were observed on day two. These eggs and maggots were removed until day seven when the numbers of larvae were extensive.

Conclusion

The aim of this experiment was to assess the suitability and sensitivity of infrared imaging to record modern tattoos on skin. Infrared reflectography was useful in visualising green and black tattoo colours, however, red ink was less successfully visualised. The red pigment can be detected on some images and computer manipulation may help with this. Green and black pigments are very responsive to infrared photography, and their clarity is emphasised through recording at this wavelength. The block colours show up clearly throughout the experiment, but it is the detail of each word that shows particular promise for this photographic technique

The long history of infrared photography and the technological development it has enjoyed make it an almost perfect technique for the investigation of victim identity worldwide. Tattoos have received little focus within the field of human identification, despite their popularity and increased occurrence. This investigation has demonstrated, to some extent, their usefulness in the identification of individuals, though much more work is needed into the tattoos themselves and the implications of laser removal for infrared investigation.

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List of images and tables.

Table 1. Record of daily observations and weather conditions.

Day	Time	Weather	Observations
1	17:00	Dry 17ºC	Piglet's skin pale pink, clammy in appearance, finer texture results in clearer image of tattoos than seen in meat. Through infrared 'RED' visible in white tones. Blood around head present from transporting the piglet upside down.
2	16:50	Dry 18ºC	Orange tinge to skin already apparent. Skin less shiny as a result. Tattoos clearly visible with no discernable difference from previous day.
3	16:45	Patchy rain 16ºC	Fluid seepage more extensive. Wire mesh used to discourage rodent activity too close to piglet resulting in marked depressions on skin. Reformed to avoid repeated occurrence. No change to tattoos evident.
4	16:55	Dry 19ºC	Fly eggs present in fluid, majority removed painstakingly using forceps and scalpel, some remained unavoidably. Tattoos appear darker in colour themselves.
5	17:00	Dry 21ºC	Orange discolouration much more acute with clear areas of epidermal loss visible. Larvae of small size amongst unhatched eggs present. Again, majority removed.
6	16:50	Patchy rain 17ºC	More fluid present. Progression in alignment with previous two days. Tattoos showing minor progress of decomposition.
7	16:45	Dry 20ºC	Head, neck and shoulder showing obvious bloating area and more fluid loss. Larva presence more extensive than before, no removal attempted. Epidermal loss in hip and groin area more widespread. 'RED' clear in infrared close-up in white-tones, though distant still invisible.
8	17:05	Dry 19ºC	Larvae prevalent in stomach cavity. Excretory fluids visible and pungent. Head also a focal point for maggot activity. Rear third of piglet continues to show epidermal loss. Tattoos showing stable condition, little change.
9	17:00	Dry 18ºC	Stomach cavity still main focus of larva activity, along with head now showing wider neck aperture. Orange discolouration becoming pinker and more noticeable. Again, tattoos showing no change in themselves, but appearing fainter.
10	16:55	Patchy rain 19ºC	Lighter image at time of photography. Larvae proliferate still in area of stomach, neck and now migrated to anal region. Mouth more open than previously as a result of larva action. Tattoos show little change, though fly eggs laid on tattooed area.
11	16:50	Dry 21ºC	Tattoos now main focus for larva activity. Photographs taken with larvae *in situ* then moved carefully (avoiding contact with skin) to unveil effects this may have had on the skin. Epidermal loss observed.
12	17:15	Dry 20ºC	Heat above head and neck noted prior to unwrapping- main area for larva activity. Area of skin below 'BLACK' showing severe discolouration, possibly resulting from ink spread? Detail clearly seen still

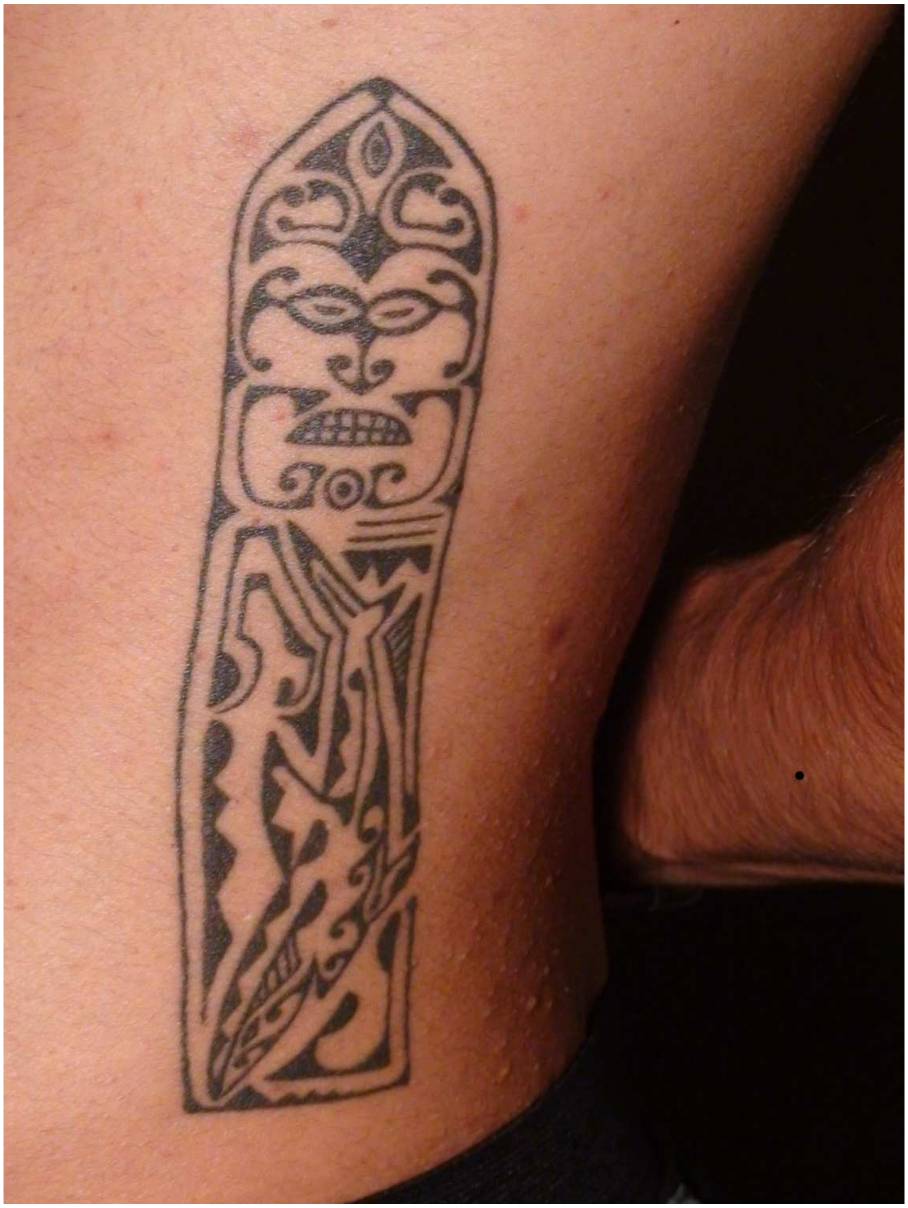
			through infrared photography though and skin discolouration eradicated. Skin appears drier, more 'tan' coloured indicating process of mummification.
13	16:55	Patchy rain 18ºC	Progression in accordance with previous days. 'BLACK' more disturbed, though still showing clearer under infrared imaging. 'RED' lost even in infrared images. Larvae still active on the head- eyes now lost.
14	17:00	Patchy rain 19ºC	Larvae extensive. Area underneath 'BLACK' showing deeper discolouration, writing indiscernible in colour image, but still clear in infrared image. Leathery appearance of skin seen particularly on front two thirds of carcass. Tattoos appear duller in their colouring.
15	16:45	Patchy rain 19ºC	Adipocere positioned posterior to the ear suddenly visible. Mummified nature of tattooed area more clear than previously. Mummified nature of head very clear, still focus of much larva activity. 'GREEN' and 'BLACK' detail still very clear through infrared.
16	16:50	Dry 21ºC	Overall 'shriveled' appearance very marked. 'RED' apparent again under infrared. Skin discolouration still eludes the infrared images. Mummified nature of tattooed skin has halted decay of area. Mummified areas of skin darkening in colour still. Mummification of other areas following. Adipocere behind the ear has spread. Larvae primarily focused upon neck and groin.
17	17:10	Dry 19ºC	Larvae now almost entirely rear portion of carcass. Mummified skin shriveled with no underlying soft tissue remaining. Tattoos show little change from last six days. Red letters are not as clear against background as previously, though no clearer on infrared images. 'BLACK' still lost in colour images, but still visible in infrared. Block colours remained obvious throughout. Unchanged condition of mummified tattooed skin for six days, decided to finish the experiment as results regarding skin discolouration and infrared recording collected.

Colour photograph showing black and red tattoo.
128x96mm (300 x 300 DPI)

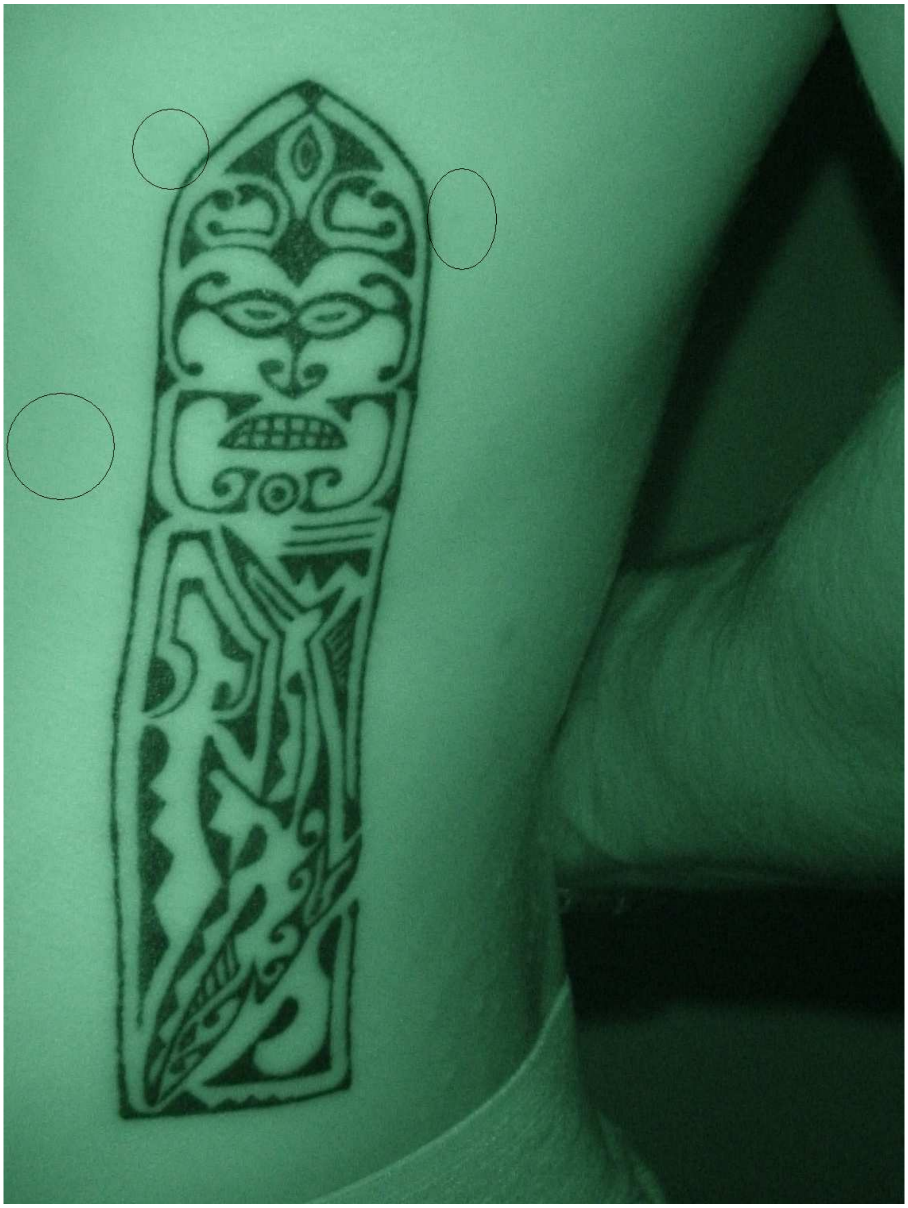
Infrared image showing 'disappearance' of red tattoo
128x96mm (300 x 300 DPI)

Colour photograph showing black, red and green tattoo on dark skin
195x146mm (300 x 300 DPI)

Infrared image showing clear distinction between tattoo image and background skin colour
195x146mm (300 x 300 DPI)

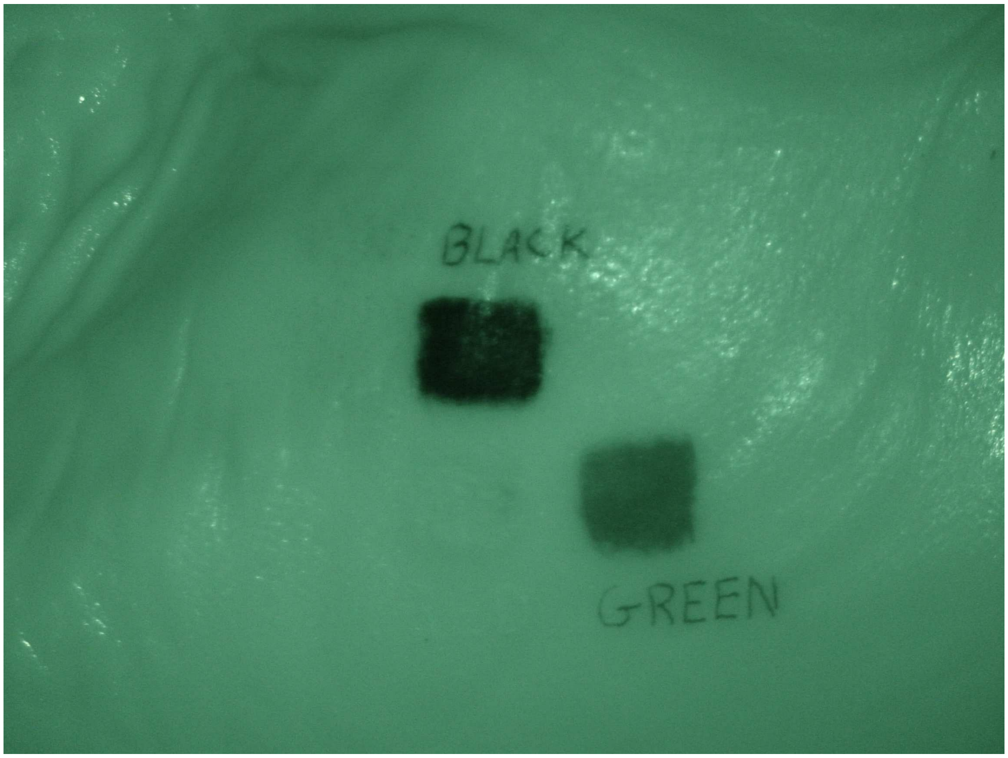


Colour image showing black tattoo and surrounsing skin surface blemishes
96x128mm (300 x 300 DPI)

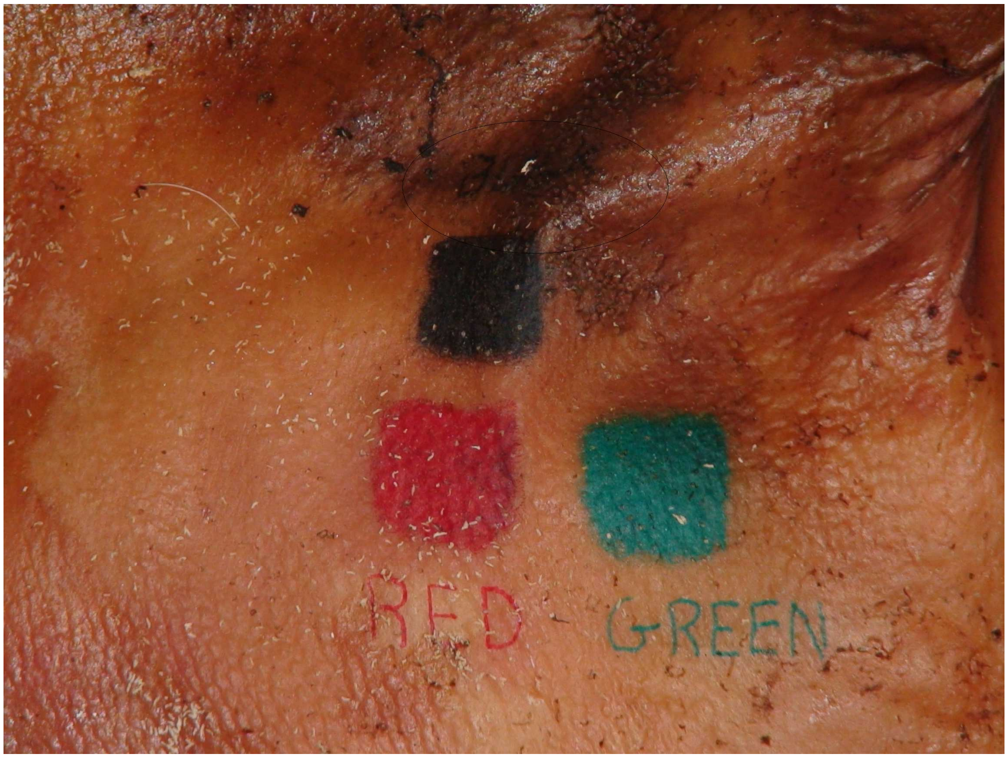


Infrared image showing 'eradication' of skin surface blemishes from the image
96x128mm (300 x 300 DPI)

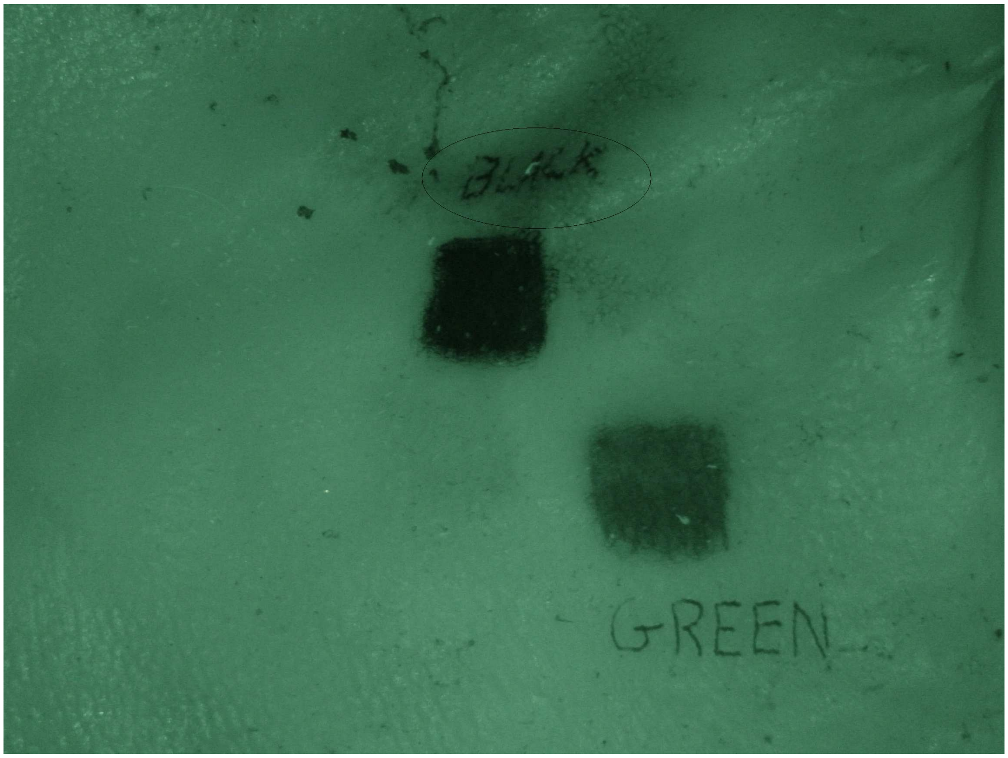
Colour image of piglet carcass on Day 1 showing block and line red, green and black tattoos.
195x146mm (300 x 300 DPI)



Infrared image of piglet carcass Day 1 showing 'disappearance' of red tattoo
195x146mm (300 x 300 DPI)



Colour image of piglet carcass on Day 17 showing marked skin doscolouration and indistinct 'black' tattoo
195x146mm (300 x 300 DPI)



Infrared image of piglet carcass on Day 17 showing 'disappearance' of red tattoo, but much clearer imaging of 'black' tattoo and stronger contrast between tattoos and background skin colour
195x146mm (300 x 300 DPI)

*A*ppendix 5

Table of all 88 investigated tattoo inks.

Table displaying the inks bought for testing, year acquired, year(s) tested, methods used and any associated comments.

<table>
<tr><th>Manufacturer</th><th>Colour</th><th>Year acquired</th><th>Year(s) tested

FTIR</th><th>Year (s) tested MSP</th><th>Comments</th></tr>
<tr><td>Powerline</td><td>Red</td><td>2008</td><td>2008, 2009, 2010</td><td>2010</td><td rowspan="18">All inks used in preliminary studies ascertaining appropriate investigative method.

All inks analysed using FTIR, but not MSP.</td></tr>
<tr><td></td><td>“</td><td>2009</td><td>2009, 2010</td><td>“</td></tr>
<tr><td></td><td>Black</td><td>2008</td><td>2008, 2009, 2010</td><td>“</td></tr>
<tr><td></td><td>“</td><td>2009</td><td>2009, 2010</td><td>“</td></tr>
<tr><td></td><td>White</td><td>2008</td><td>2008, 2009, 2010</td><td>“</td></tr>
<tr><td></td><td>“</td><td>2009</td><td>2009, 2010</td><td>“</td></tr>
<tr><td>New Image</td><td>Red</td><td>2008</td><td>2008, 2009, 2010</td><td>“</td></tr>
<tr><td></td><td>“</td><td>2009</td><td>2009, 2010</td><td>“</td></tr>
<tr><td></td><td>Black</td><td>2008</td><td>2008, 2009, 2010</td><td>“</td></tr>
<tr><td></td><td>“</td><td>2009</td><td>2009, 2010</td><td>“</td></tr>
<tr><td></td><td>White</td><td>2008</td><td>2008, 2009, 2010</td><td>“</td></tr>
<tr><td></td><td>“</td><td>2009</td><td>2009, 2010</td><td>“</td></tr>
<tr><td></td><td>UV Pink</td><td>2009</td><td>2009</td><td>X</td></tr>
<tr><td></td><td>UV White</td><td>2009</td><td>2009</td><td>X</td></tr>
<tr><td>Vivid Ink</td><td>Red</td><td>2008</td><td>2008, 2009, 2010</td><td>2010</td></tr>
<tr><td></td><td>“</td><td>2009</td><td>2009, 2010</td><td>“</td></tr>
<tr><td></td><td>Black</td><td>2008</td><td>2008, 2009, 2010</td><td>“</td></tr>
<tr><td></td><td>“</td><td>2009</td><td>2009, 2010</td><td>“</td></tr>
</table>

	White	2008	2008, 2009, 2010	“	
	“	2009	2009, 2010	“	
Starbrite	Brite white	2009	2009, 2010	2010	Exhibited ‘tackiness’ in initial FTIR tests in 2009, overcome by ‘washing’ with 50% methanol and 50% water
	Canary yellow	“	“	“	
	Banana cream	“	“	“	
	Golden yellow	“	“	“	
	Beer gold	“	“	“	
	Brite orange	“	“	“	
	Rusty orange	“	“	“	
	Peachy flesh	“	“	“	
	Scarlet red	“	“	“	
	Deep maroon	“	“	“	
	Deep magenta	“	“	“	
	Raspberry	“	“	“	
	Deep purple	“	“	“	
	Deep burgundy	“	“	“	
	Deep violet	“	“	“	
	Lavender	“	“	“	
	Royal Blue	“	“	“	
	Deep Blue	“	“	“	
	Midnite Blue	“	“	“	
	Country Blue	“	“	“	

	Steel Blue	"	"	"	
	Baby Blue	"	"	"	
	Teal	"	"	"	
	Deep Turquoise	"	"	"	
	True Green	"	"	"	
	Deep Green	"	"	"	
	Grassy Green	"	"	"	
	Leaf Green	"	"	"	
	Lime Green	"	"	"	
	Bubblegum Pink	"	"	"	
	Light Flesh Tone	"	"	"	
	Yellow Ochre	"	"	"	
	Buckskin Tan	"	"	"	
	Venetian Brown	"	"	"	
	Chocolate Brown	"	"	"	
	Battleship Grey	"	"	"	
	Dark Clay	"	"	"	
	Turbo Black	"	"	"	
Skin Candy	UV Invisible (white)	2009	2009, 2010	2010	
	UV yellow	"	"	"	
	UV green	"	"	"	

	UV orange	"	"	"	None of note
	UV red	"	"	"	
	UV magenta	"	"	"	
	UV purple	"	"	"	
	UV blue	"	"	"	
	White girl	"	"	"	
	Blisterine yellow	"	"	"	
	Dolemite gold	"	"	"	
	Marz orange	"	"	"	
	Blood orange	"	"	"	
	San brownadino	"	"	"	
	Red hot	"	"	"	
	Razberry cream	"	"	"	
	Ripple purple	"	"	"	
	Muddy water blue	"	"	"	
	Bellbottom blue	"	"	"	
	SRV teal	"	"	"	
	Tasty waves green	"	"	"	
	Sassy grass	"	"	"	
Immortal Ink Neon	UV yellow	2009	2009, 2010	2010	
	UV blue	"	"	"	

	UV green	“	“	“	None of note
	UV magenta	“	“	“	
	UV red	“	“	“	
	UV orange	“	“	“	
	UV purple	“	“	“	
	UV invisible (white)	“	“	“	
TOTAL	**88 tattoo inks**				**FTIR-179** **MSP-66** **Total runs= 245 (complete)**

Appendix 7

INTERPOL recording sheets.

INTERNATIONAL CRIMINAL POLICE ORGANIZATION

INTERPOL

DISASTER VICTIM IDENTIFICATION

Version 2002

MISSING PERSON

Family name :

Forename(s) :

No. :

DEAD BODY

No. :

DISASTER VICTIM IDENTIFICATION (DVI)

Instructions for Use of the INTERPOL DVI Form Set :

GENERAL

This DVI form set is intended for use in cases of major disaster as well as in single cases - in particular, when data concerning a known missing person or an unknown dead person are to be forwarded to another country. Provided the same form set is used, simple reference to the item number (e.g. AM/A2 - 18/2 or PM/D2 - 42/02/4) will ensure correct transmission of data. Particular instructions for the use of the AM and PM forms are given on page 2 (inside) of the respective covers.

FILING OF REPORT, WHEN CASE IS CLOSED

Whenever an identification has been made and the Comparison Report filled in (separate white page), the AM and PM forms are to be joined into one report (white cover). All AM pages (yellow) should be punched with holes along the right margin, all PM pages (pink) along the left margin; pages C1 and following should be placed in such a way that corresponding page numbers face one another (yellow-pink, yellow-pink), by which corresponding data can be directly compared page by page.

The Victim Identification Report (white form set cover, page 3) is the final document to be filled in by the experts; it is the prerequisite to issuing a death certificate and releasing the body for burial, thus enabling closure of the case.

(These instructions to be printed on page 2 (inside) of the white form set cover)

COMPARISON REPORT

DEAD BODY

Nature of disaster : ______________ **No** : ______

Place of disaster : ______________ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

MISSING PERSON

Family name : ______________ **No** : ______

Forename(s) : ______________

Date of birth : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

Findings in the unknown DEAD BODY have been compared with information of MISSING PERSON

Conclusion of the police officer (mark with X)		Reasons:
Identity possible	1	
Identity probable	2	*Stamp / Institution* — *Place and date*
Identity established	3	*Signature* / *Signature*

Conclusion of the pathologist (mark with X)		Reasons:
Identity possible	1	
Identity probable	2	*Stamp / Institution* — *Place and date*
Identity established	3	*Signature* / *Signature*

Conclusion of the odontologist (mark with X)		Reasons:
Identity possible	1	
Identity probable	2	*Stamp / Institution* — *Place and date*
Identity established	3	*Signature* / *Signature*

BINDING HOLES

BINDING HOLES

VICTIM IDENTIFICATION REPORT

DEAD BODY		(pink forms enclosed)
Site of body examination **Police Agency Address** **Phone**		*Body No.* *Date*

MISSING PERSON		(yellow forms enclosed)
Family name **Forename(s)** **Street/No.** **Postcode/Town** **Country** **Date of birth**	Day Month Year	*Nationality* *Reported missing*

CERTIFICATE OF IDENTIFICATION

According to the data here enclosed the above dead body has been IDENTIFIED as the above missing person.

Identification was mainly based on (see comparison report)		*Place and date*
Police officer responsible Type the name		*Signature*
Pathologist responsible Type the name		*Signature*
Odontologist responsible Type the name		*Signature*
Stamp / Director: Victim Identification		*Place and date* *Signature*

Stamp / Local authority	*Place and date* *Signature*

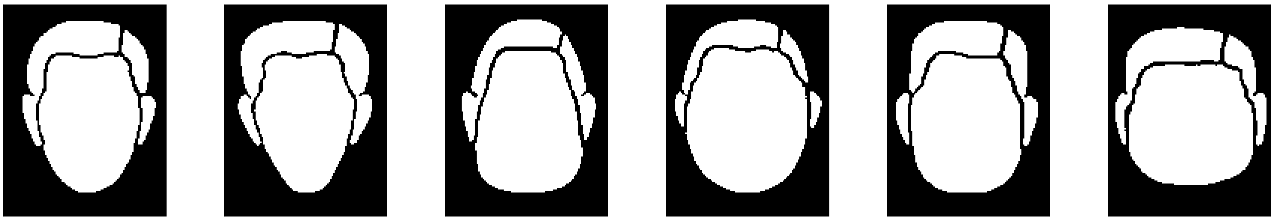
VICTIM IDENTIFICATION FORM

SILHOUETTE SKETCH

Please choose the appropriate sketches and mark items on D1 and D2

34

02 Head form, front (Shape of head from front)



1 *Oval* | **2** *Pointheaded* | **3** *Pyramidal* | **4** *Circular* | **5** *Rectangular* | **6** *Quadrangular*

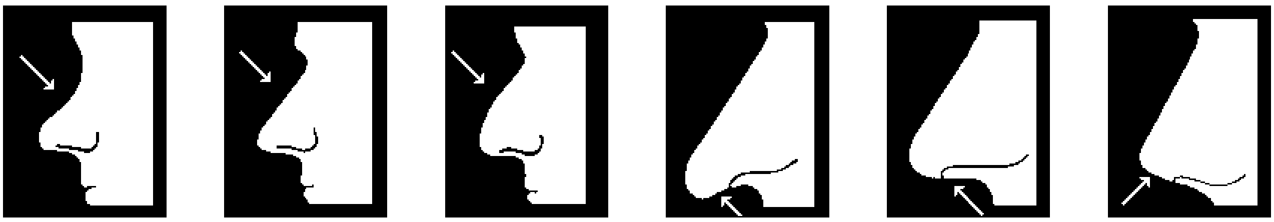
03 Head form, profile (Shape of head from side)

|<->| |<--->| |<----->|

1 *Shallow* | **2** *Medium* | **3** *Deep*

40

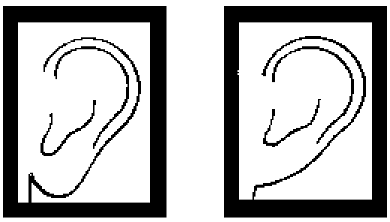
03 Nose - Curve/Angle



1 *Concave* | **2** *Straight* | **3** *Convex* | **4** *Turned down* | **5** *Horizontal* | **6** *Turned up*

42

02 Ear lobes



1 *Not attached* | **2** *Attached*

DISASTER VICTIM IDENTIFICATION (DVI)

HOW TO USE THE YELLOW ANTE-MORTEM (AM) FORM

Please write legibly.

I. GENERAL INSTRUCTIONS

The AM Form is designed for listing any information that may be obtained from relatives, friends and/or physicians of the possible victim or missing person and that may assist in an identification, in order to compare that information with the data obtained from the dead bodies on the disaster site.

IMPORTANT:	Record all information obtainable on the form, since it is impossible to know what data will be obtained from the disaster site.
NOTE:	It is important to obtain and forward detailed information as rapidly as possible.

Where provided, use the appropriate figures for description.

EXAMPLE:	Section C1: Fill in the figures "0203" in the "No." column at item 24 to designate a pullover and describe the material, etc. In the space provided for this information.

Wherever appropriate, boxes that can simply be marked with a cross are provided. Please use as many of them as possible. This will facilitate electronic processing of the information and also make it possible to handle reports compiled in a foreign language without translation (the Interpol Member States all use the same forms). For this reason, the layout is the same for the AM and PM Forms. Because of this identical layout, some numbered spaces are left blank (e.g. item 31 in section D1: This is the space provided for the description of the state of the body on the pink PM Form).

II. SPECIFIC INSTRUCTIONS

Section A1 & A2	Personal data of the possible victim or missing person.
Section B	Not applicable here (section B of the pink form is the report on the recovery of the body from the site).
Sections C1 to C3	Description of effects (clothing, jewellery, etc.).

(This instruction to be printed on verso of the AM-front page)

Section D1 to D3	Physical description.
Section D4	Record any distinguishing marks (tattoos, etc.).
Section E1 & E2	List any medical information that may assist in identification.
Section F1 & F2	Dental information (cf. instructions on the back of Section F1).
Section G	Record any further information that may assist in identification, and/or continue your description from a previous section (C to F) if there was not enough space.

It should be born in mind that photographs of the clothing, jewellery, etc. described in various sections may be of valuable help for comparison with items found on the disaster site. Please attach such photographs, if available.

(This instruction to be printed on verso of the AM-front page)

Ante **M**ortem *(yellow)*

VICTIM IDENTIFICATION

A0

MISSING PERSON

Family name : __ __ __ __ __ __ __ __ __ __ __ __ **No** : __________

Forename(s) : __ __ __ __ __ __ __ __ __ __ __ __

Date of birth : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

B I N D I N G H O L E S

Nature of disaster :

Place of disaster :

Date of disaster :

Police force handling identification:	*NCB of (country)*
	Police file No:

Reasons for assuming that person concerned is victim of disaster:

Police officers evaluation	*Is above person a victim?* ☐ *Possibly* ☐ *Probably* ☐ *Undoubtedly*
DNA	☐ *Reference samples collected* ☐ *Profiles ordered* ☐ *Profiles enclosed*

CHECK LIST OF CONTENTS		*Enclosed complete*	*Enclosed in part*	*Lent to Name*	*Date*	*Returned Date*	*Remarks*
A1	**Info. relating to M.P.**						
A2	**Info. rela. to M.P. cont.**						
C1	**Clothing and Foot wear**						
C2	**Personal Effects**						
C3	**Jewellery**						
D1	**Physical description**						
D2	**Physical desc. cont.**						
D3	**Physical desc. cont.**						
D4	**Body sketch**						
E1	**Medical information**						
E2	**Medical inform. cont.**						
F1	**Dental information**						
F2	**Dental inform. cont.**						
G	**Further information**						

B I N D I N G H O L E S

VICTIM IDENTIFICATION FORM

MISSING PERSON

Family name : __ __ __ __ __ __ __ __ __ __ __ __ **No** : __________

Forename(s) : __ __ __ __ __ __ __ __ __ __ __ __

Date of birth : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

a = Data not available b = Photo c = Further information on page G

	INFORMATION RELATING to MISSING PERSON		**a**	**b**	**c**
00	**Information given by... or:** Name Address **Relationship**	*Date:* 1 ☐ *See item 12* 2 ☐ *See item 13* *Phone/E-mail:*			
01	**Family name**				
02	**Family name at birth**				
03	**Forename(s)**				
04	**Nationality**				
05	**National ID number** Country code	☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ ☐☐☐☐			
06	**Name in Chinese Commercial Code**	☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐			
07	**Date of birth**	☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* ☐☐ *Age at disap-pearance*			
08	**Marital status**	*Single* 1 ☐ *Engaged(date):* 2 ☐ ____ *Cohabiting* 3 ☐ *Married(date):* 4 ☐ ____ *Separated* 5 ☐ *Divorced* 6 ☐ *Widowed* 7 ☐ *Forename of partner:* ____			
09	**Occupation**				
10	**Full address** Street/No. Postcode/Town Country				
11	**Religion**	1 ☐ *No* 2 ☐ *Yes (name of religion):* ____			
12	**Next-of-kin** Name Address Phone/E-mail **Relationship**				
12 A	**Blood relation (DNA)**	*Close relatives known or reference sample for DNA-comparison* 1 ☐ *No* 2 ☐ *Yes - see page G*			
13	**For visual recognition** Name Address Phone/E-mail **Relationship**				

Collected by Duty Title : Name : Address : Phone/E-mail :

Signature / Date

B I N D I N G H O L E S

B I N D I N G H O L E S

Ante Mortem *(yellow)* **VICTIM IDENTIFICATION FORM** **A2**

MISSING PERSON

Family name : _ _ _ _ _ _ _ _ _ _ _ _ **No** : ______________

Forename(s) : _ _ _ _ _ _ _ _ _ _ _ _

Date of birth : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

a = Data not available b = Photo c = Further information on page G

INFORMATION RELATING to MISSING PERSON (cont.)			**a**	**b**	**c**
14	**Ever fingerprinted?**	1 ☐ *No* 2 ☐ *Yes / Where:* *Date:*			
	If not, are prints obtainable?	3 ☐ *No* 4 ☐ *Yes / Where:*			
15	**General practitioner** Name Address Phone/E-mail				
16	**General dentist** Name Address Phone/E-mail				
17	**Distinguishing features**				
18	**Photographs**	1 ☐ *Enclosed* 2 ☐ *Obtainable from:* ______ *Record date:* ______			
19	**Documents**				
	01 Official records	1 ☐ *Enclosed* 2 ☐ *Obtainable from:* ______			
	02 Police records	1 ☐ *Enclosed* 2 ☐ *Obtainable from:* ______			
	03 Practitioners records	1 ☐ *Enclosed* 2 ☐ *Obtainable from:* ______			
	04 Hospital records	1 ☐ *Enclosed* 2 ☐ *Obtainable from:* ______			
	05 Hospital X-rays	1 ☐ *Enclosed* 2 ☐ *Obtainable from:* ______			
	06 Dental records	1 ☐ *Enclosed* 2 ☐ *Obtainable from:* ______			
	07 Dental X-rays	1 ☐ *Enclosed* 2 ☐ *Obtainable from:* ______			
	08 Dental plate ID-numbers	*(specify):*			
	09 Other records	*(specify):*			

Continued item no 24 (Item 20 - 23 in form PM only)

Collected by		Signature / Date
	Duty Title :	
	Name :	
	Address :	
	Phone/E-mail :	

B I N D I N G H O L E S

B I N D I N G H O L E S

Ante **M**ortem *(yellow)* **VICTIM IDENTIFICATION FORM** **C1**

MISSING PERSON

Family name : _ _ _ _ _ _ _ _ _ _ _ _ **No** : ____________

Forename(s) : _ _ _ _ _ _ _ _ _ _ _ _

Date of birth : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

a = Data not available b = Photo c = Further information on page G

CLOTHING AND FOOT WEAR (carried on person or in luggage)

24 **Clothing Items**	No:	**1** *Material*	**2** *Colour*	**3** *Type*	**4** *Label*	**5** *Size*	a	b	c
01 Head and neck 0101 Hat 0102 Scarf 0103 Tie 0199 Other									
02 Upper part of the body and arms 0201 Overcoat 0202 Coat 0203 Pullover 0204 Shirt 0205 Waistcoat 0206 Vest 0207 Dress 0208 Cardigan 0209 Blouse 0210 Petticoat 0211 Chemise 0212 Brassiere 0213 Braces 0214 Gloves 0299 Other									
03 Lower part of the body and legs 0301 Trousers (men) 0302 Underpants 0303 Trousers (women) 0304 Skirt 0305 Panties 0306 Girdle 0307 Corset 0308 Stockings 0309 Tights 0310 Socks 0311 Belt 0312 Belt buckle 0399 Other									
04 The whole of the body 0401 Flying suit 0402 Boiler suit 0403 Trouser suit 0499 Other									
In case of using "xx99 Other" describe the kind of item in column "3 Type.									

25 **Foot wear**	No:	**1** *Material*	**2** *Colour*	**3** *Type*	**4** *Label*	**5** *Size*	a	b	c
01 Light shoes **02** Heavy shoes **03** Boots **99** Other *Describe the kind of Foot wear in column "3 Type", eg Sport shoes, Sandals*									

Collected by

Duty Title :

Name :

Address :

Phone/E-mail :

Signature / Date

BINDING HOLES

BINDING HOLES

Ante **M**ortem (yellow) **VICTIM IDENTIFICATION FORM** **C2**

MISSING PERSON

Family name : ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ **No** : ______

Forename(s) : ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

Date of birth : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

a = Data not available b = Photo c = Further information on page G

PERSONAL EFFECTS (a | b | c)

26 Watch
- **00** Always wearing — **1** ☐ *No* **2** ☐ *Yes*

No:	1 *Material*	2 *Colour*	3 *Design*	4 *Brand*	5 *Inscription*

- **01** Digital
- **02** Analog
- **03** Digital/Analog
- **04** If wrist watch worn on — *Left* **1** ☐ *Right* **2** ☐ *Outside* **3** ☐ *Inside* **4** ☐
- **05** Watch strap/chain — *Leather* **1** ☐ *Metal* **2** ☐ *Other (specify):* **3** ☐ ______

27 Glasses
- **00** Always wearing — **1** ☐ *No* **2** ☐ *Yes*

	1 *Material*	2 *Colour*	3 *Design*	4 *Brand*	5 *Inscription*

- **01** Frame
- **02** Lenses (glass) — *Tinted* **1** ☐ *No* **2** ☐ *Yes (specify):* ______ *Strength - Left/Right* **3** ☐ *L* **4** ☐ *R*
- **03** Lenses/Shape — *Round* **1** ☐ *Oval* **2** ☐ *Square* **3** ☐ / *Half* **4** ☐ *Rimless* **5** ☐
- **04** Contact lenses — **1** ☐ *No* **2** ☐ *Yes (colour?):* ______ *Strength - Left/Right* **3** ☐ *L* **4** ☐ *R*
- **05** Optometrist — ______ *Details page G:*

28 Identity Papers
- **00** Always carrying — **1** ☐ *No* **2** ☐ *Yes*

No:

- **01** Passport
- **02** Driving licence
- **03** Credit cards
- **04** Identity card
- **05** Donor card
- **06** Travellers cheques
- **07** Personal cheques
- **08** Health card
- **99** Other

29 Effects
- **00** Always carrying — **1** ☐ *No* **2** ☐ *Yes*

No:

- **01** Wallet
- **02** Purse
- **03** Money belt
- **04** Badges/keys
- **05** Currency
- **99** Other

Collected by
Duty Title :
Name :
Address :
Phone/E-mail :

Signature / Date

BINDING HOLES

BINDING HOLES

Ante **M**ortem *(yellow)* **VICTIM IDENTIFICATION FORM** **C3**

MISSING PERSON

Family name : _ _ _ _ _ _ _ _ _ _ _ _ **No** : ____________

Forename(s) : _ _ _ _ _ _ _ _ _ _ _ _

Date of birth : [ ][ ] *Day* [ ][ ] *Month* [ ][ ][ ][ ] *Year* *Male* [ ] *Female* [ ]

a = Data not available b = Photo c = Further information on page G

JEWELLERY		No:	**1** *Material*	**2** *Colour*	**3** *Design*	**4** *Inscription*	**5** *Where worn*	**a**	**b**	**c**
30	**Rings, chains etc.** **01** Wedding ring **02** Other finger rings **03** Earrings **04** Earclips **05** Neck chains **06** Necklace **07** Bracelets **08** Other chains **09** Pendant on chain **10** Piercing trinkets **11** Nose ring **12** Anklet **99** Other *In case of using "99 Other" describe the kind of item in column "3 Design.*									

Collected by Duty Title :
Name :
Address :
Phone/E-mail :

Signature / Date

B I N D I N G H O L E S

B I N D I N G H O L E S

Ante Mortem *(yellow)* **VICTIM IDENTIFICATION FORM** **D1**

MISSING PERSON

Family name	: ____________	**No** :	________
Forename(s)	: ____________		
Date of birth	: ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year*	*Male* ☐	*Female* ☐

a = Data not available b = Photo c = Further information on page G

PHYSICAL DESCRIPTION			a	b	c
31					
31 A					
32	**Height**	______*cm* / *Estimated height:* ______*cm* | *Source ?*			
33	**Weight**	______*kg* / *Estimated weight:* ______*kg* | *Source ?*			
34	**Build** **01** Bodily constitution **02** Head form, front (02-03 see Silhouette sketch) **03** Head form, profile	*Light* **1**☐ *Medium* **2**☐ *Heavy* **3**☐ *Oval* **1**☐ *Pointheaded* **2**☐ *Pyramidal* **3**☐ *Circular* **4**☐ *Rectangular* **5**☐ *Quadrangular* **6**☐ *Shallow* **1**☐ *Medium* **2**☐ *Deep* **3**☐			
35	**Race** **01** Group/Complexion **02** Type	*Caucasoid* **1**☐ *Mongoloid* **2**☐ *Negroid* **3**☐ / *Light* **4**☐ *Medium* **5**☐ *Dark* **6**☐ *(specify):*			
36	**Hair of the head** **01** Type **02** Length **03** Colour **04** Shade of colour **05** Thickness **06** Style **07** Baldness **08** Other	*Natural* **1**☐ *Artificial* **2**☐ *Hair-piece* **3**☐ *Wig* **4**☐ *Braided* **5**☐ *Short* **1**☐ *Medium* **2**☐ *Long* **3**☐ *Shaved* **4**☐ *Blond* **1**☐ *Brown* **2**☐ *Black* **3**☐ *Red* **4**☐ *Grey* **5**☐ *White* **6**☐ *Light* **1**☐ *Medium* **2**☐ *Dark* **3**☐ *Turning grey* **4**☐ *Dyed* **5**☐ *Streaked* **6**☐ *Thin* **1**☐ *Medium* **2**☐ *Thick* **3**☐ *Straight* **1**☐ *Wavy* **2**☐ *Curly* **3**☐ / *Parted* **4**☐ *Left* **5**☐ *Right* **6**☐ *Middle* *Beginning* **1**☐ *Advanced* **2**☐ *Total* **3**☐ / *Forehead* **4**☐ *Sides* **5**☐ *Tonsure* **6**☐ *(specify):*			

Collected by	Duty Title : Name : Address : Phone/E-mail :	Signature / Date

B I N D I N G H O L E S

B I N D I N G H O L E S

MISSING PERSON

Family name : ____________________ **No** : ____________

Forename(s) : ____________________

Date of birth : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

a = Data not available b = Photo c = Further information on page G

PHYSICAL DESCRIPTION (cont.)			a	b	c
37	**Forehead**				
	01 Height/Width	*Low* 1 ☐ *Medium* 2 ☐ *High* 3 ☐ / *Narrow* 4 ☐ *Medium* 5 ☐ *Wide* 6 ☐			
	02 Inclination	*Protruding* 1 ☐ *Vertical* 2 ☐ *Receding/slightly or clearly* 3 ☐ *S* 4 ☐ *C*			
38	**Eyebrows**				
	01 Shape/Thickness	*Straight* 1 ☐ *Arched* 2 ☐ *Joining* 3 ☐ / *Thin* 4 ☐ *Medium* 5 ☐ *Thick* 6 ☐			
39	**Eyes**				
	01 Colour	*Blue* 1 ☐ *Grey* 2 ☐ *Green* 3 ☐ *Brown* 4 ☐ *Black* 5 ☐			
	02 Shade	*Light* 1 ☐ *Medium* 2 ☐ *Dark* 3 ☐ *Mixed* 4 ☐			
	03 Distance between eyes	*Small* 1 ☐ *Medium* 2 ☐ *Large* 3 ☐			
	04 Peculiarities	*Cross-eyed* 1 ☐ *Squint-eyed* 2 ☐ *Artificial eye* 3 ☐ *Left* 4 ☐ *Right*			
40	**Nose**				
	01 Size/Shape	*Small* 1 ☐ *Medium* 2 ☐ *Large* 3 ☐ / *Pointed* 4 ☐ *Roman* 5 ☐ *Alcoholics* 6 ☐			
	02 Peculiarities	*Marks of spectacles* 1 ☐ *No* 2 ☐ *Yes* *Other (specify):* 3 ☐ ____________			
	(03 see Silhouette sketch) 03 Curve/Angle	*Concave* 1 ☐ *Straight* 2 ☐ *Convex* 3 ☐ / *Turned down* 4 ☐ *Horizontal* 5 ☐ *Turned up* 6 ☐			
41	**Facial hair**				
	01 Type	*No beard* 1 ☐ *Moustache* 2 ☐ *Goatee* 3 ☐ *Whiskers* 4 ☐ *Full beard* 5 ☐			
	02 Colour	*Blond* 1 ☐ *Brown* 2 ☐ *Black* 3 ☐ *Red* 4 ☐ *Grey* 5 ☐ *White* 6 ☐			
42	**Ears**				
	01 Size/Angle	*Small* 1 ☐ *Medium* 2 ☐ *Large* 3 ☐ / *Close-set* 4 ☐ *Medium* 5 ☐ *Protruding* 6 ☐			
	(02 see Silhouette sketch) 02 Ear lobes/Pierced	*Attached* 1 ☐ *No* 2 ☐ *Yes* / *Pierced - specify number of piercings* 3 ☐ *Left* ________ 5 ☐ *Right* ________			
43	**Mouth**				
	01 Size/Other	*Small* 1 ☐ *Medium* 2 ☐ *Large* 3 ☐ / *Other (specify):* 4 ☐ ____________			
44	**Lips**				
	01 Shape/Other	*Thin* 1 ☐ *Medium* 2 ☐ *Thick* 3 ☐ / *Made up* 4 ☐ *Other (specify):* 5 ☐ ____________			
45	**Teeth** (cf. page F1/F2)				
	01 Conditions	*Natural* 1 ☐ *Untreated* 2 ☐ *Treated* 3 ☐ *Crowns* 4 ☐ *Bridges* 5 ☐ *Implants* 6 ☐			
	02 Gaps/Missing teeth	*Gaps between front teeth* 1 ☐ *Upper* 2 ☐ *Lower* / *Missing teeth* 3 ☐ *Upper* 4 ☐ *Lower* *Toothless* 5 ☐ *Upper* 6 ☐ *Lower*			
	03 Dentures	*Part. upper* 1 ☐ *Part. lower* 2 ☐ *Full upper* 3 ☐ *Full lower* 4 ☐ *ID-number(specify):* 5 ☐ ____________			
46	**Smoking habits**				
	01 Type	*No* 1 ☐ *Yes* 2 ☐ / *Cigarettes* 3 ☐ *Cigars* 4 ☐ *Pipe* 5 ☐ *Chewing tobacco* 6 ☐			

Collected by		Signature / Date
	Duty Title :	
	Name :	
	Address :	
	Phone/E-mail :	

BINDING HOLES

BINDING HOLES

MISSING PERSON

Family name : ______________________ **No** : ____________

Forename(s) : ______________________

Date of birth : ☐☐ Day ☐☐ Month ☐☐☐☐ Year Male ☐ Female ☐

a = Data not available b = Photo c = Further information on page G

PHYSICAL DESCRIPTION (cont.)			a	b	c
47	**Chin** 01 Size/Inclination	*Small* 1 ☐ *Medium* 2 ☐ *Large* 3 ☐ / *Receding* 4 ☐ *Medium* 5 ☐ *Protruding* 6 ☐			
	02 Shape	*Pointed* 1 ☐ *Round* 2 ☐ *Angular* 3 ☐ *Cleft chin* 4 ☐ *Groove* 5 ☐			
48	**Neck** 01 Length/Shape	*Short* 1 ☐ *Medium* 2 ☐ *Long* 3 ☐ / *Thin* 4 ☐ *Medium* 5 ☐ *Thick* 6 ☐			
	02 Peculiarities	*Goitre* 1 ☐ *Prominent Adams apple* 2 ☐ *Collar/Shirt No:* 4 ☐ *Circumference* 6 ☐ *in cm:*			
49	**Hands** 01 Shape/Size	*Slender* 1 ☐ *Medium* 2 ☐ *Broad* 3 ☐ / *Small* 4 ☐ *Medium* 5 ☐ *Large* 6 ☐			
	02 Nail length	*Short* 1 ☐ *Medium* 2 ☐ *Long* 3 ☐			
	03 Peculiarities	*Bitten short* 1 ☐ *Manicured* 2 ☐ *Painted* 3 ☐ *Artificial* 4 ☐ *Nicotine* 5 ☐ *Left* 6 ☐ *Right*			
50	**Feet** 01 Shape	*Slender* 1 ☐ *Medium* 2 ☐ *Broad* 3 ☐ *Flatfooted* 4 ☐ *Arched* 5 ☐			
	02 Condition/Nail	*Bunion* 1 ☐ *Corn* 2 ☐ / *Painted* 3 ☐ *Defective* 4 ☐			
	03 Peculiarities	*(Specify):* ______________________			
51	**Body hair** 01 Extent	*None* 1 ☐ *Slight* 2 ☐ *Medium* 3 ☐ *Pronounced* 4 ☐			
	02 Colour	*Blond* 1 ☐ *Brown* 2 ☐ *Black* 3 ☐ *Red* 4 ☐ *Grey* 5 ☐ *White* 6 ☐			
52	**Pubic hair** 01 Extent	*None* 1 ☐ *Slight* 2 ☐ *Medium* 3 ☐ *Pronounced* 4 ☐ *Shaved* 5 ☐			
	02 Colour	*Blond* 1 ☐ *Brown* 2 ☐ *Black* 3 ☐ *Red* 4 ☐ *Grey* 5 ☐ *White* 6 ☐			

53 Specific details

	No:	1 *Scars/Piercing*	2 *Skin marks*	3 *Tattoo marks*	4 *Malformations*	5 *Amputations*	a	b	c
01 Head									
1A Neck/Throat									
02 Right arm									
03 Left arm									
04 Right hand									
05 Left hand									
06 Body - front									
07 Body - back									
08 Right leg									
09 Left leg									
10 Right foot									
11 Left foot	Indicate specific details on body sketch, page D4.								

			a	b	c
54	**Circumcision**	1 ☐ *No* 2 ☐ *Yes* 3 ☐ *Unknown*			
55	**Other peculiarities**				

Collected by		Signature / Date
	Duty Title :	
	Name :	
	Address :	
	Phone/E-mail :	

BINDING HOLES

BINDING HOLES

MISSING PERSON

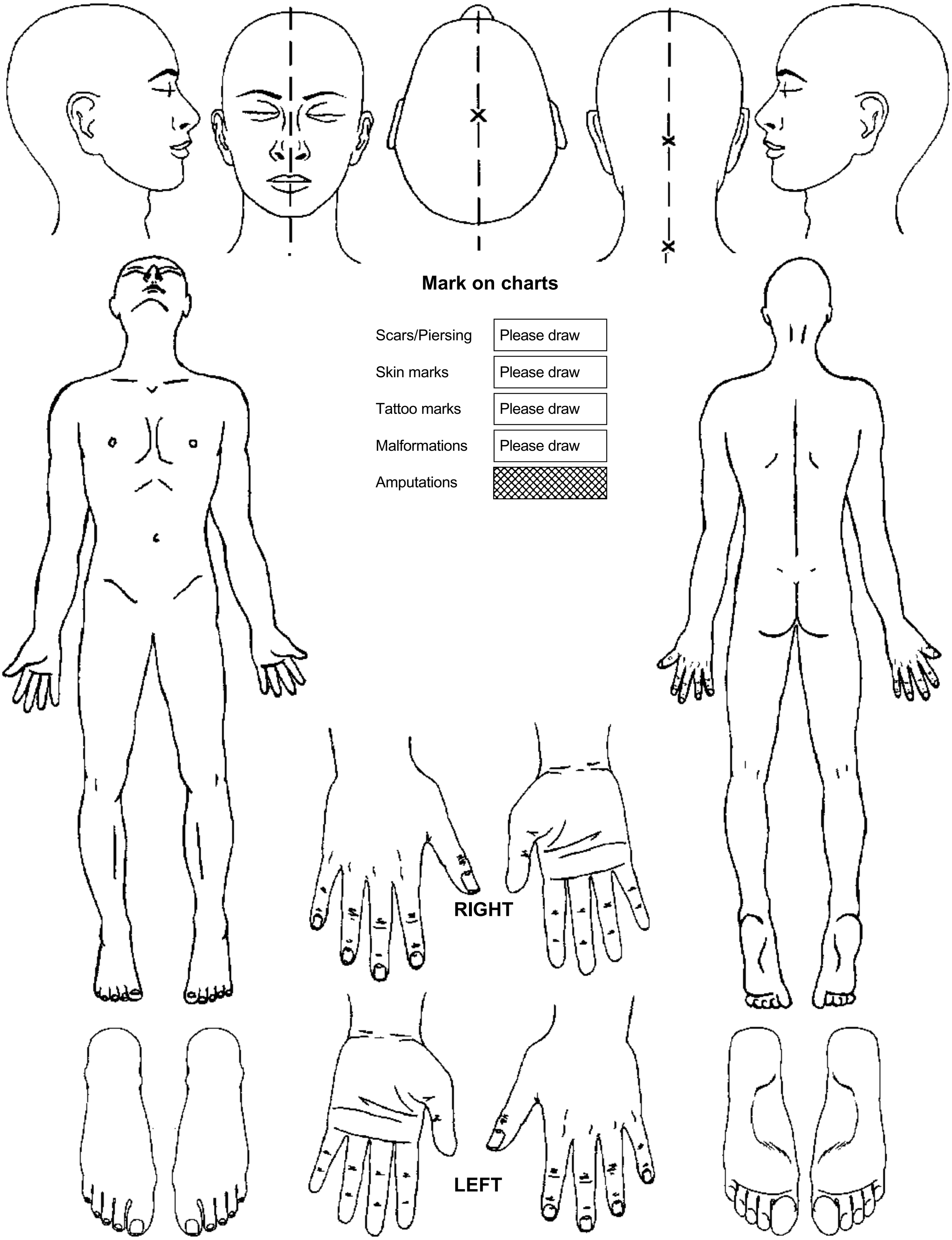
Family name : _ _ _ _ _ _ _ _ _ _ _ _ **No** : ____________

Forename(s) : _ _ _ _ _ _ _ _ _ _ _ _

Date of birth : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

BINDING HOLES

BODY SKETCH **(described in item 53)**



BINDING HOLES

Ante **M**ortem *(yellow)* **VICTIM IDENTIFICATION FORM** **E1**

MISSING PERSON

Family name	:	**No** :	
Forename(s)	:		
Date of birth	: *Day* *Month* *Year*	*Male*	*Female*

MEDICAL CONDITIONS (as known to relatives or others)		
56	**General state of health** (Describe past and present diseases and/or treatment)	
57	**Medication** (What drugs are kept at residence ?)	

MEDICAL INFORMATION (If not given by the general practitioner 'A2-15', then please specify from whom)			
58	**01** Regular/occasional patient ? **MEDICAL RECORD lists:** **02** Symptoms **03** Findings **04** Diagnoses **05** Treatment **06** Prescriptions **07** Ref. to specialist **08** Operation scars **09** Other scars **10** Fractures **11** Organs missing **12** Hospitalization **13** Other **ADDICTED to:** **14** Tobacco **15** Alcohol **16** Drugs **17** Narcotics **INFECTIOUS DISEASE:** **18** Hepatitis **19** AIDS **19A**Tuberculosis **20** Other **IN WOMEN:** **21** Pregnancy **22** Births **23** Hysterectomy	**No:**	
	IMPLANT: **24** Intrauterine contra-ceptive devices **25** Other implants		*Metal* **1** ☐ *Plastic* **2** ☐ *Describe:*
59	**Blood group**		

Continued item no 66 (Item 60 - 65 in form PM only)

Collected by	Duty Title : Name : Address : Phone/E-mail :	Signature / Date

BINDING HOLES

BINDING HOLES

MISSING PERSON

Family name : __ __ __ __ __ __ __ __ __ __ __ __ **No** : ____________

Forename(s) : __ __ __ __ __ __ __ __ __ __ __ __

Date of birth : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

FURTHER MEDICAL INFORMATION		
66	**Forensic pathologist/ medical examiner's extract from medical records** **Medical records provided by:** Name Address Phone/E-mail	
MEDICAL DATA OF SPECIFIC INTEREST		
67	**X-rays showing specific conditions**	
68	**Organs removed**	
69	**Prostheses**	
70	**Other artificial aids**	
Continued item no 76 (Item 71 - 75 in form PM only)		

Collected by		Signature / Date
	Duty Title :	
	Name :	
	Address :	
	Phone/E-mail :	

B I N D I N G H O L E S

B I N D I N G H O L E S

MISSING PERSON

Family name : ______________________ **No** : ________

Forename(s) : ______________________

Date of birth : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

c = Further information on page G

DNA			c
93	**Reference** Missing person	*Type of sample:* *Laboratory reference:*	
	1. Reference	*Name/Address:* *National ID-number:* *Biological relationship:* *Laboratory reference:* *Contact person at the lab:* *Laboratory quality standard:*	
	2. Reference	*Name/Address:* *National ID-number:* *Biological relationship:* *Laboratory reference:* *Contact person at the lab:* *Laboratory quality standard:*	
	3. Reference	*Name/Address:* *National ID-number:* *Biological relationship:* *Laboratory reference:* *Contact person at the lab:* *Laboratory quality standard:*	

94	**DNA profiles**	Missing person		1. Reference		2. Reference		3. Reference		
	D3S1358									
	VWA									
	D16S539									
	D2S1338									
	Amelogenin									
	D8S1179									
	D21S11									
	D18S51									
	D19S433									
	TH01									
	FGA									
	TPOX									
	CSF1P0									
	D13S317									
	D7S820									
	D5S818									
	Penta D									
	Penta E									
	FES									
	F13A1									
	F13B									
	SE33									
	CD4									
	GABA									
95	**Checked by**	Date				Signature				

Collected by
Duty Title :
Name :
Address :
Phone/E-mail :

Signature / Date

BINDING HOLES

BINDING HOLES

Ante **M**ortem (yellow) **VICTIM IDENTIFICATION FORM** **F1**

MISSING PERSON

Family name	: ___________________	**No** : ________
Forename(s)	: ___________________	
Date of birth	: ☐☐ Day ☐☐ Month ☐☐☐☐ Year	Male ☐ Female ☐

B I N D I N G H O L E S

DENTAL INFORMATION		
76	**Missing Persons address** (see A1 item 10)	
77	**Missing since**	☐☐ Day ☐☐ Month ☐☐☐☐ Year
78	**Circumstances of the disappearance**	
79	**Dental information Obtained from family members and/or others** **01** Data in D2 item 45	**1** ☐ No **2** ☐ Yes
DENTAL DATA PROVIDED BY		
80	**Dentist / Institution** Address Phone/E-mail Period covered DOCUMENTS filed with	From ________ To ________ ☐ Records ☐ X-rays ☐ Models ☐ Photos
81	**Dentist / Institution** Address Phone/E-mail Period covered DOCUMENTS filed with	From ________ To ________ ☐ Records ☐ X-rays ☐ Models ☐ Photos
82	**Dentist / Institution** Address Phone/E-mail Period covered DOCUMENTS filed with	From ________ To ________ ☐ Records ☐ X-rays ☐ Models ☐ Photos

B I N D I N G H O L E S

Continued item no 86 (Item 83 - 85 in form PM only)

Collected by	Duty Title : Name : Address : Phone/E-mail :	Signature / Date

The INTERPOL Victim Identification Form, Sections F1 and F2

GENERAL INFORMATION

The INTERPOL Victim Identification Form consists of several sections - divided in two groups:

1) YELLOW FORMS for listing latest known data concerning a missing person;
2) PINK FORMS for listing all findings concerning a dead body.

Identification of a dead body may become possible if data listed on the pink forms concerning this body can be compared with, and shown to match, data listed on the yellow forms concerning one particular missing person. If an identification is made, the experts involved will complete an Identification-Report - as a prerequisite to issuing a death certificate and releasing the body for burial.

The identification of a dead body may be accomplished in several ways, depending upon the type af data used. The INTERPOL Victim Identification Form has been set up in such a way, that sections listing the same type of data are marked with the same capital letter in the upper right-hand corner. For dental identification, the forms to use are Sections F1 and F2 (yellow), and Sections F1 and F2 (pink); because of the specialised vocabulary, they must be fille in by a forensically trained dentist.

INSTRUCTIONS FOR USE - SECTION F1 AND F2 AM (yellow)

These forms are designed for listing all dental information collected from dental practitioners records or other sources.

In Section FI, make sure that the reference number is clearly shown - and that the sex is clearly indicated (boxes at the top). Fill in all the details requested further down. Under "Circumstances of the Disappearance", give the shortest possible extract of the police report. Under "Dental information", list any supplementary information obtained by the police from family members and/or others. Request from the police - and list - exact name, address and telephone number of the dentists/institutions from which records etc. have been obtained; also list the respective periods covered (whole years). Written records should be originals or good photostat copies. Ensure that all record X-rays, models, and photographs are clearly marked with patient's name, dentist's name, and date of exposure or production; if they are not, you must do it yourself.

In Section F2, the missing person's latest known dental status is to be listed. The status can only be established by extraction from - and re-arrangement of - the data listed in one or more dental records - or apparent from X-ray, models, photographs, or other material produced. Start with the latest entry in the written record and work your way backwards; in this way, all previous treatment now covered by later treatment can be left out. Indicate surfaces by using Capital-Letter System: M = mesial, O = occlusal, D = distal, V = vestibular, L = lingual; if other abbreviations are used, please explain them in one of the boxes further down. (NOTE: there will be a notation only for treatment/ conditions actually described or seen in the material) - Next, sketch on the dental chart the location and extent of all fillings and other conditions listed as present according to your re-arrangement of data. For colour distinction, use black for amalgam, red for gold, and green for tooth-coloured material. For teeth extracted or not formed, put large cross (X) over the appropriate tooth square. If the practitioner's record includes an dental chart, compare it with your own and make sure they tally. Do not hesitate to contact practitioner for clarification of dubious points. If X-rays and/ or other material are available, indicate - in the appropriate boxes - type, year of exposure or production, and teeth concerned. Finally, record age at time of disappearance.

Once Section F2 has been completed, type your name, address and telephone number (or use your professional stamp) in the box at the bottom of Section FI. Finally, enter the date of completion above your personal signature. Remember - this is a legal document, so keep a full copy for your own file. Likewise, make copies of all original record material, before returning it to the practitioner.

(This instruction to be printed on verso of the page AM-F1)

Ante **M**ortem *(yellow)* **VICTIM IDENTIFICATION FORM** **F2**

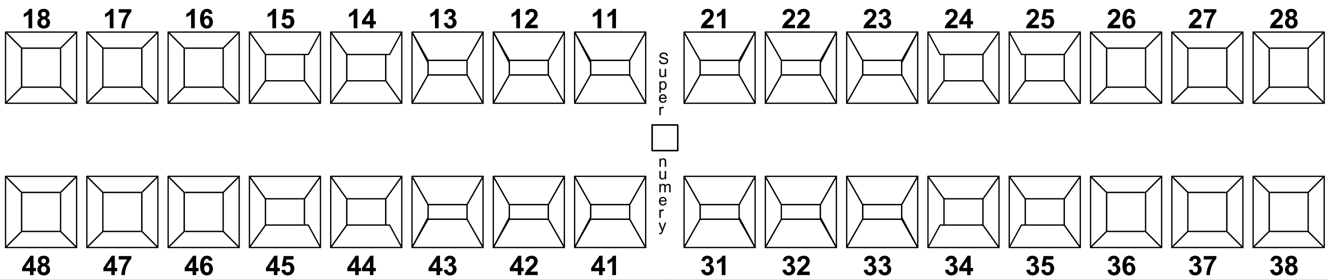
MISSING PERSON

Family name : ______________________ **No** : ____________

Forename(s) : ______________________

Date of birth : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

86	DENTAL INFORMATION in permanent teeth (Notify temporary teeth specifically)		
11			21
12			22
13			23
14			24
15			25
16			26
17			27
18			28



48			38
47			37
46			36
45			35
44			34
43			33
42			32
41			31

87	**Specific data** Crowns, bridges, dentures and implants	
88	**Further data** Occlusion, attrition, anomalies, smoker, periodontal status, etc.	
89	**X-rays available** Type, region and year	
90	**Further material**	
91	**Age at time of disapp.**	

BINDING HOLES

BINDING HOLES

MISSING PERSON

Family name : _ _ _ _ _ _ _ _ _ _ _ _ No : ________

Forename(s) : _ _ _ _ _ _ _ _ _ _ _ _

Date of birth : [ ][ ] *Day* [ ][ ] *Month* [ ][ ][ ][ ] *Year* *Male* [ ] *Female* [ ]

B I N D I N G H O L E S

FURTHER INFORMATION (if referring to data given on a previous page, please indicate item number)

92

B I N D I N G H O L E S

DISASTER VICTIM IDENTIFICATION (DVI)

HOW TO USE THE PINK POST-MORTEM (PM) FORM

Please write legibly.

I. RULES TO BE OBSERVED ON THE DISASTER SITE

No body should be moved before its location has been recorded.

All personal effect that undoubtedly belonged to a deceased individual should be collected and kept with the body or parts of the body of that individual. Any other effects should be recorded as unidentified and kept separately in the first instance.

A moisture resistant number card should be attached to each body or unidentified part of a body to ensure that it cannot get lost.

II. GENERAL INSTRUCTIONS

The PM form is designed for listing all obtainable data about a dead body that may assist in its identification in order to compare that data with the information obtained at the place of residence of the possible victim or missing person and recorded on the yellow ante-mortem form.

IMPORTANT: Record all data that can be obtained, since it is impossible to know what information will be supplied at the victim's place of residence for comparison purposes.

The layout of the form is intended to correspond to the actual sequence of events, and allows a simultaneous examination of effects, body, and teeth.

Where provided, use the appropriate figures for description.

EXAMPLE: Section C1: Fill in the figures "0203" in the "No." column at item 24 to designate a pullover and describe the material, etc. in the space provided for this information.

Wherever appropriate, boxes that can simply be marked with a cross are provided. Please use as many of them as possible. This will facilitate electronic processing of the information and also make it possible to handle reports compiled in a foreign language without translation (the Interpol Member States all use the same forms). For this reason, the layout is the same for the AM and PM forms.

(This instruction to be printed on verso of the PM-front page)

III. SPECIFIC INSTRUCTIONS

Section B	Recovery of body from site: Fill in this form during recovery from the site of the disaster and add the number from the number-board attached to the body or part of the body.
Sections C1 to C3	Photograph the body first, then remove any clothing and jewellery from the body. C1 - clothing and shoes C2 - personal effects C3 - jewellery
Sections D1 to D4	While the effects are examined and described. D1 to D3 - physical description of the dead body. D4 - record any distinguishing marks (tattoos, etc.)
Section E1 to F2	a medical examination is performed E1 & E2 - list all data obtained by an internal examination that may assist in identification. F1 & F2 - dental data (cf. instructions on the back of Section F1)
Section G	Record any further information that may assist in identification, and/or continue with your description from a previous section (C to F) if there is not enough space.

If an identification is made, complete a "Victim Identification Report" in accordance with the instructions.

(This instruction to be printed on verso of the PM-front page)

Post **M**ortem *(pink)*

VICTIM IDENTIFICATION

B0

DEAD BODY

Nature of disaster : _____________ **No :** __________

Place of disaster : _____________ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

B I N D I N G H O L E S

CHECKLIST OF OPERATIONS IN THE MORTUARY			Date	Remarks
Photographs	Full size - front, back	*With clothes* ☐ *Without clothes* ☐		
	Head	*Front* ☐ *From left* ☐ *From right* ☐		
Fingerprints	Finger	☐ *No* ☐ *Not possible* ☐ *Yes*		
	Palm of the hand	☐ *No* ☐ *Not possible* ☐ *Yes*		
Autopsy	Medicolegal examin.	☐ *No* ☐ *Yes*		
	Full autopsy Pathologist name Address/Phone	☐ *No* ☐ *Yes* ☐ *X-rays* ☐ *Photo*		
Dental examination	Completed	☐ *No* ☐ *Yes* ☐ *X-rays* ☐ *Photo*		
	Jaws removed Odontologist name Address/Phone	☐ *No* ☐ *Yes* ☐ *X-rays* ☐ *Photo*		
Samples	(cf. E2 item 73)	☐ *Taken* ☐ *Sent for analysis* ☐ *Result enclosed* ☐ *DNA profiles ordered* ☐ *DNA profiles enclosed*		

CHECK LIST OF CONTENTS		*Enclosed complete*	*Enclosed in part*	*Lent to Name*	*Date*	*Returned Date*	*Remarks*
B	**Recovery from scene**						
C1	**Clothing and Foot wear**						
C2	**Personal Effects**						
C3	**Jewellery**						
D1	**Physical description**						
D2	**Physical desc. cont.**						
D3	**Physical desc. cont.**						
D4	**Body sketch**						
E1	**Internal examination**						
E2	**Medical conclusions**						
F1	**Dental findings**						
F2	**Dental findings cont.**						
G	**Further information**						

B I N D I N G H O L E S

Post **M**ortem (pink) **VICTIM IDENTIFICATION FORM** **B**

DEAD BODY

Nature of disaster : __ __ __ __ __ __ __ __ __ __ __ __ **No :** ______

Place of disaster : __ __ __ __ __ __ __ __ __ __ __ __ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

B I N D I N G H O L E S

a = Data not available/Indefinable b = Photo c = Further information on page G

RECOVERY OF BODY FROM SCENE				a	b	c
20	**Apparent age**	*0 - 1* **1** ☐ *2 - 5* **2** ☐ *6 - 15* **3** ☐ *16 - 25* **4** ☐ *26 - 50* **5** ☐ *> 50* **6** ☐ *Unknown* **7** ☐				
21	**Date -** **and place where the body was found**	☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year*				
	01 Map reference/GPS	*Coordinates:* ______ / ______				
	02 Photographs	**1** ☐ *No* **2** ☐ *Yes*				
22	**State of the body**	*Complete* **1** ☐ *Incomplete* **2** ☐ *Visually identifiable* **3** ☐ *No* **4** ☐ *Yes* *Body part(describe):* **5** ☐ ______				
		1 *Damaged* | **2** *Burnt* | **3** *Decomp.* | **4** *Skelet.* | **5** *Missing* | **6** *Loose*				
	01 Head					
	1A Neck/Throat					
	02 Right arm					
	03 Left arm					
	04 Right hand					
	05 Left hand					
	06 Body front					
	07 Body back					
	08 Right leg					
	09 Left leg					
	10 Right foot					
	11 Left foot					
		Indicate specific details on body sketch, page D4.				
23	**Person - finding the body**					
	If an ID-team is involved - name officer in charge					
	Any other person - Name Address					
	Phone/E-mail Occupation					

B I N D I N G H O L E S

Registered by	Duty Title : Name : Address : Phone/E-mail :	Signature / Date

[(GB) Version 2002]

PostMortem (pink) **VICTIM IDENTIFICATION FORM** **C1**

DEAD BODY

Nature of disaster : _ _ _ _ _ _ _ _ _ _ _ _ **No** : ______

Place of disaster : _ _ _ _ _ _ _ _ _ _ _ _ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

a = Data not available/Indefinable b = Photo c = Further information on page G

B I N D I N G H O L E S

CLOTHING AND FOOT WEAR

		No:	1 *Material*	2 *Colour*	3 *Type*	4 *Label*	5 *Size*	a	b	c
24	**Clothing Items**									
	01 Head and neck 0101 Hat 0102 Scarf 0103 Tie 0199 Other									
	02 Upper part of the body and arms 0201 Overcoat 0202 Coat 0203 Pullover 0204 Shirt 0205 Waistcoat 0206 Vest 0207 Dress 0208 Cardigan 0209 Blouse 0210 Petticoat 0211 Chemise 0212 Brassiere 0213 Braces 0214 Gloves 0299 Other									
	03 Lower part of the body and legs 0301 Trousers (men) 0302 Underpants 0303 Trousers (women) 0304 Skirt 0305 Panties 0306 Girdle 0307 Corset 0308 Stockings 0309 Tights 0310 Socks 0311 Belt 0312 Belt buckle 0399 Other									
	04 The whole of the body 0401 Flying suit 0402 Boiler suit 0403 Trouser suit 0499 Other									
	In case of using "xx99 Other" describe the kind of item in column "3 Type.									

		No:	1 *Material*	2 *Colour*	3 *Type*	4 *Label*	5 *Size*			
25	**Foot wear**									
	01 Light shoes **02** Heavy shoes **03** Boots **99** Other *Describe the kind of Foot wear in column "3 Type", eg Sport shoes, Sandals*									

B I N D I N G H O L E S

Registered by		Signature / Date
	Duty Title :	
	Name :	
	Address :	
	Phone/E-mail :	

Post **M**ortem (pink) **VICTIM IDENTIFICATION FORM** **C2**

DEAD BODY

Nature of disaster : _______________ **No** : _______

Place of disaster : _______________ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

a = Data not available/Indefinable b = Photo c = Further information on page G

B I N D I N G H O L E S

PERSONAL EFFECTS

			a	b	c
26	**Watch** **00** Wearing watch	1 ☐ *No* 2 ☐ *Yes*			
	01 Digital **02** Analog **03** Digital/Analog	**No:** | **1** *Material* | **2** *Colour* | **3** *Design* | **4** *Brand* | **5** *Inscription*			
	04 If wrist watch worn on	*Left* 1 ☐ *Right* 2 ☐ *Outside* 3 ☐ *Inside* 4 ☐			
	05 Watch strap/chain	*Leather* 1 ☐ *Metal* 2 ☐ *Other (specify):* 3 ☐ ________			
27	**Glasses** **00** Wearing glasses	1 ☐ *No* 2 ☐ *Yes*			
	01 Frame	**1** *Material* | **2** *Colour* | **3** *Design* | **4** *Brand* | **5** *Inscription*			
	02 Lenses (glass)	*Tinted* 1 ☐ *No* 2 ☐ *Yes (specify):* ________ *Strength - Left/Right* 3 ☐ *L* 4 ☐ *R*			
	03 Lenses/Shape	*Round* 1 ☐ *Oval* 2 ☐ *Square* 3 ☐ / *Half* 4 ☐ *Rimless* 5 ☐			
	04 Contact lenses	1 ☐ *No* 2 ☐ *Yes (colour?):* ________ *Strength - Left/Right* 3 ☐ *L* 4 ☐ *R*			
28	**Identity Papers** **00** Carrying ID-papers	1 ☐ *No* 2 ☐ *Yes*			
	01 Passport **02** Driving licence **03** Credit cards **04** Identity card **05** Donor card **06** Travellers cheques **07** Personal cheques **08** Health card **99** Other	**No:**			
29	**Effects** **00** Carrying other effects	1 ☐ *No* 2 ☐ *Yes*			
	01 Wallet **02** Purse **03** Money belt **04** Badges/keys **05** Currency **99** Other	**No:**			

B I N D I N G H O L E S

Registered by Duty Title : Name : Address : Phone/E-mail :	Signature / Date

PostMortem (pink) **VICTIM IDENTIFICATION FORM** C3

DEAD BODY

Nature of disaster : ______________________ **No** : ________

Place of disaster : ______________________ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

B I N D I N G H O L E S

a = Data not available/Indefinable b = Photo c = Further information on page G

JEWELLERY

30 **Rings, chains etc.**

01 Wedding ring
02 Other finger rings
03 Earrings
04 Earclips
05 Neck chains
06 Necklace
07 Bracelets
08 Other chains
09 Pendant on chain
10 Piercing trinkets
11 Nose ring
12 Anklet
99 Other

No:	**1** *Material*	**2** *Colour*	**3** *Design*	**4** *Inscription*	**5** *Where worn*	a	b	c

In case of using "99 Other" describe the kind of item in column "3 Design.

B I N D I N G H O L E S

Registered by		Signature / Date
	Duty Title :	
	Name :	
	Address :	
	Phone/E-mail :	

Post **M**ortem *(pink)*

VICTIM IDENTIFICATION FORM

D1

DEAD BODY

Nature of disaster : _ _ _ _ _ _ _ _ _ _ _ _ **No :** ________

Place of disaster : _ _ _ _ _ _ _ _ _ _ _ _ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

B I N D I N G H O L E S

a = Data not available/Indefinable b = Photo c = Further information on page G

PHYSICAL DESCRIPTION (at mortuary)			a	b	c
31	**State of the body**	*Complete* 1 ☐ *Incomplete* 2 ☐ *Visually identifiable* 3 ☐ *No* 4 ☐ *Yes* *Body part(describe):* 5 ☐ ________			
		1 *Damaged* | 2 *Burnt* | 3 *Decomp.* | 4 *Skelet.* | 5 *Missing* | 6 *Loose*			
	01 Head				
	1A Neck/Throat				
	02 Right arm				
	03 Left arm				
	04 Right hand				
	05 Left hand				
	06 Body front				
	07 Body back				
	08 Right leg				
	09 Left leg				
	10 Right foot				
	11 Left foot				
		Indicate specific details on body sketch, page D4.			
31 A	**Estimated age**	______ *year* | *Method used ?*			
32	**Height**	______ *cm* / *Estimated height:* ______ *cm* | *Method used ?*			
33	**Weight**	______ *kg* / *Estimated weight:* ______ *kg* | *Method used ?*			
34	**Build**				
	01 Bodily constitution	*Light* 1 ☐ *Medium* 2 ☐ *Heavy* 3 ☐			
	02 Head form, front	*Oval* 1 ☐ *Pointheaded* 2 ☐ *Pyramidal* 3 ☐ *Circular* 4 ☐ *Rectangular* 5 ☐ *Quadrangular* 6 ☐			
	(02-03 see Silhouette sketch) **03** Head form, profile	*Shallow* 1 ☐ *Medium* 2 ☐ *Deep* 3 ☐			
35	**Race**				
	01 Group/Complexion	*Caucasoid* 1 ☐ *Mongoloid* 2 ☐ *Negroid* 3 ☐ / *Light* 4 ☐ *Medium* 5 ☐ *Dark* 6 ☐			
	02 Type	*(specify):*			
36	**Hair of the head**				
	01 Type	*Natural* 1 ☐ *Artificial* 2 ☐ *Hair-piece* 3 ☐ *Wig* 4 ☐ *Braided* 5 ☐			
	02 Length	*Short* 1 ☐ *Medium* 2 ☐ *Long* 3 ☐ *Shaved* 4 ☐			
	03 Colour	*Blond* 1 ☐ *Brown* 2 ☐ *Black* 3 ☐ *Red* 4 ☐ *Grey* 5 ☐ *White* 6 ☐			
	04 Shade of colour	*Light* 1 ☐ *Medium* 2 ☐ *Dark* 3 ☐ *Turning grey* 4 ☐ *Dyed* 5 ☐ *Streaked* 6 ☐			
	05 Thickness	*Thin* 1 ☐ *Medium* 2 ☐ *Thick* 3 ☐			
	06 Style	*Straight* 1 ☐ *Wavy* 2 ☐ *Curly* 3 ☐ / *Parted* 4 ☐ *Left* 5 ☐ *Right* 6 ☐ *Middle*			
	07 Baldness	*Beginning* 1 ☐ *Advanced* 2 ☐ *Total* 3 ☐ / *Forhead* 4 ☐ *Sides* 5 ☐ *Tonsure* 6 ☐			
	08 Other	*(specify):*			

Registered by Duty Title :
Name :
Address :
Phone/E-mail :

Signature / Date

P ost M ortem (pink) **VICTIM IDENTIFICATION FORM** **D2**

DEAD BODY

Nature of disaster : ______________ **No** : ________

Place of disaster : ______________ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

BINDING HOLES

a = Data not available/Indefinable b = Photo c = Further information on page G

PHYSICAL DESCRIPTION (cont.)			a	b	c
37	**Forehead** 01 Height/Width	*Low* 1☐ *Medium* 2☐ *High* 3☐ / *Narrow* 4☐ *Medium* 5☐ *Wide* 6☐			
	02 Inclination	*Protruding* 1☐ *Vertical* 2☐ *Receding/slightly or clearly* 3☐ *S* 4☐ *C*			
38	**Eyebrows** 01 Shape/Thickness	*Straight* 1☐ *Arched* 2☐ *Joining* 3☐ / *Thin* 4☐ *Medium* 5☐ *Thick* 6☐			
39	**Eyes** 01 Colour	*Blue* 1☐ *Grey* 2☐ *Green* 3☐ *Brown* 4☐ *Black* 5☐			
	02 Shade	*Light* 1☐ *Medium* 2☐ *Dark* 3☐ *Mixed* 4☐			
	03 Distance between eyes	*Small* 1☐ *Medium* 2☐ *Large* 3☐			
	04 Peculiarities	*Cross-eyed* 1☐ *Squint-eyed* 2☐ *Artificial eye* 3☐ *Left* 4☐ *Right*			
40	**Nose** 01 Size/Shape	*Small* 1☐ *Medium* 2☐ *Large* 3☐ / *Pointed* 4☐ *Roman* 5☐ *Alcoholics* 6☐			
	02 Peculiarities	*Marks of spectacles* 1☐ *No* 2☐ *Yes* *Other (specify):* 3☐ ________			
	(03 see Silhouette sketch) 03 Curve/Angle	*Concave* 1☐ *Straight* 2☐ *Convex* 3☐ / *Turned down* 4☐ *Horizontal* 5☐ *Turned up* 6☐			
41	**Facial hair** 01 Type	*No beard* 1☐ *Moustache* 2☐ *Goatee* 3☐ *Whiskers* 4☐ *Full beard* 5☐			
	02 Colour	*Blond* 1☐ *Brown* 2☐ *Black* 3☐ *Red* 4☐ *Grey* 5☐ *White* 6☐			
42	**Ears** 01 Size/Angle	*Small* 1☐ *Medium* 2☐ *Large* 3☐ / *Close-set* 4☐ *Medium* 5☐ *Protruding* 6☐			
	(02 see Silhouette sketch) 02 Ear lobes/Pierced	*Attached* 1☐ *No* 2☐ *Yes* / *Pierced - specify number of piercings* 3☐ *Left* ______ 5☐ *Right* ______			
43	**Mouth** 01 Size/Other	*Small* 1☐ *Medium* 2☐ *Large* 3☐ / *Other (specify):* 4☐ ________			
44	**Lips** 01 Shape/Other	*Thin* 1☐ *Medium* 2☐ *Thick* 3☐ / *Made up* 4☐ *Other (specify):* 5☐ ________			
45	**Teeth** (cf. page F1/F2) 01 Conditions	*Natural* 1☐ *Untreated* 2☐ *Treated* 3☐ *Crowns* 4☐ *Bridges* 5☐ *Implants* 6☐			
	02 Gaps/Missing teeth	*Gaps between front teeth* 1☐ *Upper* 2☐ *Lower* / *Missing teeth AM* 3☐ *Upper* 4☐ *Lower* *Toothless* 5☐ *Upper* 6☐ *Lower*			
	03 Dentures	*Part. upper* 1☐ *Part. lower* 2☐ *Full upper* 3☐ *Full lower* 4☐ *ID-number(specify):* 5☐ ________			
46	**Smoking habits** 01 Stains found	*No* 1☐ *Teeth* 2☐ *Lips* 3☐ *Moustache* 4☐ *Fingers/Hands* 5☐ *Left* 6☐ *Right*			

Registered by		Signature / Date
	Duty Title :	
	Name :	
	Address :	
	Phone/E-mail :	

BINDING HOLES

DEAD BODY

Nature of disaster : ______________ **No** : ________

Place of disaster : ______________ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

a = Data not available/Indefinable b = Photo c = Further information on page G

PHYSICAL DESCRIPTION (cont.)			a	b	c
47	**Chin** 01 Size/Inclination	*Small* 1 ☐ *Medium* 2 ☐ *Large* 3 ☐ / *Receding* 4 ☐ *Medium* 5 ☐ *Protruding* 6 ☐			
	02 Shape	*Pointed* 1 ☐ *Round* 2 ☐ *Angular* 3 ☐ *Cleft chin* 4 ☐ *Groove* 5 ☐			
48	**Neck** 01 Length/Shape	*Short* 1 ☐ *Medium* 2 ☐ *Long* 3 ☐ / *Thin* 4 ☐ *Medium* 5 ☐ *Thick* 6 ☐			
	02 Peculiarities	*Goitre* 1 ☐ *Prominent Adams apple* 2 ☐ *Collar/Shirt No:* 4 ☐ *Circumference* 6 ☐ *in cm:*			
49	**Hands** 01 Shape/Size	*Slender* 1 ☐ *Medium* 2 ☐ *Broad* 3 ☐ / *Small* 4 ☐ *Medium* 5 ☐ *Large* 6 ☐			
	02 Nail length	*Short* 1 ☐ *Medium* 2 ☐ *Long* 3 ☐			
	03 Peculiarities	*Bitten short* 1 ☐ *Manicured* 2 ☐ *Painted* 3 ☐ *Artificial* 4 ☐ *Nicotine* 5 ☐ *Left* 6 ☐ *Right*			
50	**Feet** 01 Shape/Size	*Slender* 1 ☐ *Medium* 2 ☐ *Broad* 3 ☐ *Flatfooted* 4 ☐ *Arched* 5 ☐ *Length in cm:* 6 ☐			
	02 Condition/Nail	*Bunion* 1 ☐ *Corn* 2 ☐ / *Painted* 3 ☐ *Defective* 4 ☐			
	03 Peculiarities	*(Specify):* ______________			
51	**Body hair** 01 Extent	*None* 1 ☐ *Slight* 2 ☐ *Medium* 3 ☐ *Pronounced* 4 ☐			
	02 Colour	*Blond* 1 ☐ *Brown* 2 ☐ *Black* 3 ☐ *Red* 4 ☐ *Grey* 5 ☐ *White* 6 ☐			
52	**Pubic hair** 01 Extent	*None* 1 ☐ *Slight* 2 ☐ *Medium* 3 ☐ *Pronounced* 4 ☐ *Shaved* 5 ☐			
	02 Colour	*Blond* 1 ☐ *Brown* 2 ☐ *Black* 3 ☐ *Red* 4 ☐ *Grey* 5 ☐ *White* 6 ☐			

53 Specific details	No:	1 *Scars/Piercing*	2 *Skin marks*	3 *Tattoo marks*	4 *Malformations*	5 *Amputations*	a	b	c
01 Head									
1A Neck/Throat									
02 Right arm									
03 Left arm									
04 Right hand									
05 Left hand									
06 Body - front									
07 Body - back									
08 Right leg									
09 Left leg									
10 Right foot									
11 Left foot	Indicate specific details on body sketch, page D4.								

			a	b	c
54	**Circumcision**	1 ☐ *No* 2 ☐ *Yes*			
55	**Other peculiarities**				

Registered by		Signature / Date
Duty Title	:	
Name	:	
Address	:	
Phone/E-mail	:	

DEAD BODY

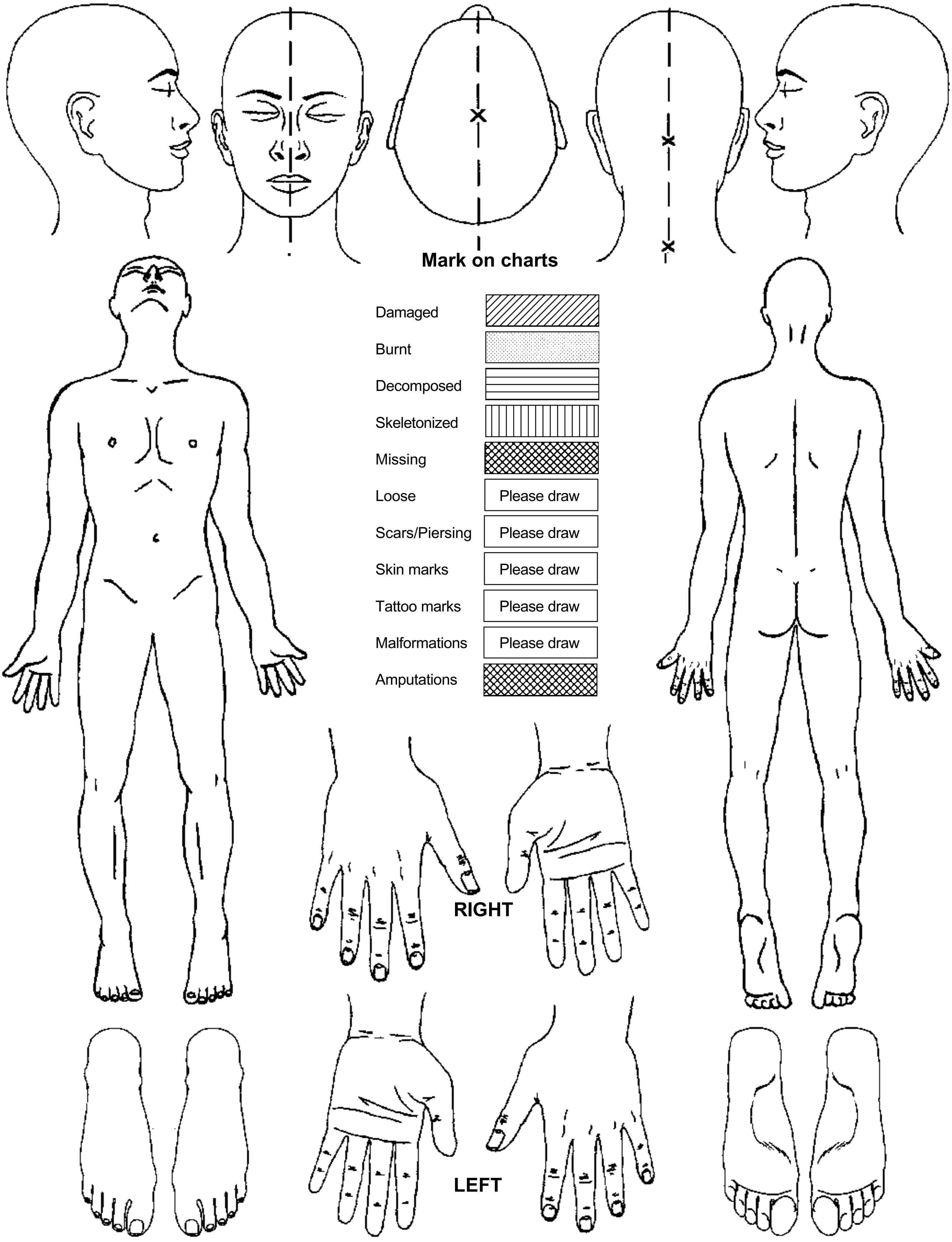
Nature of disaster : _ _ _ _ _ _ _ _ _ _ _ _ **No** : ______

Place of disaster : _ _ _ _ _ _ _ _ _ _ _ _ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

BINDING HOLES

BODY SKETCH (described in item 22 and/or 31, 53)



BINDING HOLES

Post **M**ortem *(pink)* **VICTIM IDENTIFICATION FORM** **E1**

DEAD BODY

Nature of disaster : _ _ _ _ _ _ _ _ _ _ _ _ **No :** ________

Place of disaster : _ _ _ _ _ _ _ _ _ _ _ _ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

B I N D I N G H O L E S

a = Data not available/Indefinable b = Photo c = Further information on page G d = X-rays

INTERNAL EXAMINATION - Full autopsy ☐ *No* ☐ *Yes* No:				a	b	c	d
60	**Head** **01** Head **1A** Skull **1B** Brain **02** Neck	**No:**					
61	**Chest** **01** Thorax/Ribs/Sternum **02** Lungs **03** Heart/Vessels						
62	**Abdomen** **01** Stomach **02** Intestines **03** Appendix						
63	**Other internal organs** **01** Adrenals/pancreas /Spleen **02** Liver/Gall bladder **03** Kidneys/Ureters/Bladder **04** Genitalia-male **05** Genitalia-female **06** Hysterectomy						
64	**Skeleton/Soft tissue** **01** Vertebral column **02** Pelvis **03** Limbs-right arm **04** Limbs-left arm **05** Limbs-right leg **06** Limbs-left leg **07** Other Bones **08** Soft tissue, other locations						
65	**Various** **01** Pregnancies **02** Healed fractures **03** Operations **04** Artificial appliances (pacemaker, hip, etc.)						

B I N D I N G H O L E S

Continued item no 71 (Item 66 - 70 in form AM only)

Registered by		Signature / Date
	Duty Title :	
	Name :	
	Address :	
	Phone/E-mail :	

B I N D I N G H O L E S

Post **M**ortem *(pink)* **VICTIM IDENTIFICATION FORM** **E2**

DEAD BODY

Nature of disaster : _ _ _ _ _ _ _ _ _ _ _ _ **No** : ______

Place of disaster : _ _ _ _ _ _ _ _ _ _ _ _ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

MEDICAL CONCLUSIONS

71	**Sex**	*Male* 1 ☐ *Female* 2 ☐ *Undetermined* 3 ☐	*Reason of decision*		
72	**Estimated age**	____ *years* 2 ☐ *+/-5* 3 ☐ *+/-10*	*Method used*		
73	**Samples taken**		*Purpose*	*Place of storage*	*Result*
	01 Stomach contents	1 ☐ *No* 2 ☐ *Yes*			
	02 Urine	1 ☐ *No* 2 ☐ *Yes*			
	03 Blood-heart	1 ☐ *No* 2 ☐ *Yes*			
	04 Blood-peripheral	1 ☐ *No* 2 ☐ *Yes*			
	05 Blood-elsewhere	1 ☐ *No* 2 ☐ *Yes*			
	06 Bile	1 ☐ *No* 2 ☐ *Yes*			
	07 Vitreous humour L	1 ☐ *No* 2 ☐ *Yes*			
	08 Vitreous humour R	1 ☐ *No* 2 ☐ *Yes*			
	09 Other fluids	1 ☐ *No* 2 ☐ *Yes*			
	10 Symphysis pubis	1 ☐ *No* 2 ☐ *Yes*			
	11 Hair	1 ☐ *No* 2 ☐ *Yes*			
	12 Tissue dry	1 ☐ *No* 2 ☐ *Yes*			
	13 Tissue in formalin	1 ☐ *No* 2 ☐ *Yes*			
	14 DNA-specimens	1 ☐ *No* 2 ☐ *Yes*			
74	**Other clues for identification**	1 ☐ *No* 2 ☐ *Yes (describe)*			
75	**Other medical findings**				

Continued item no 83 (Item 76 - 82 in form AM only)

Registered by Duty Title : Name : Address : Phone/E-mail :	Signature / Date

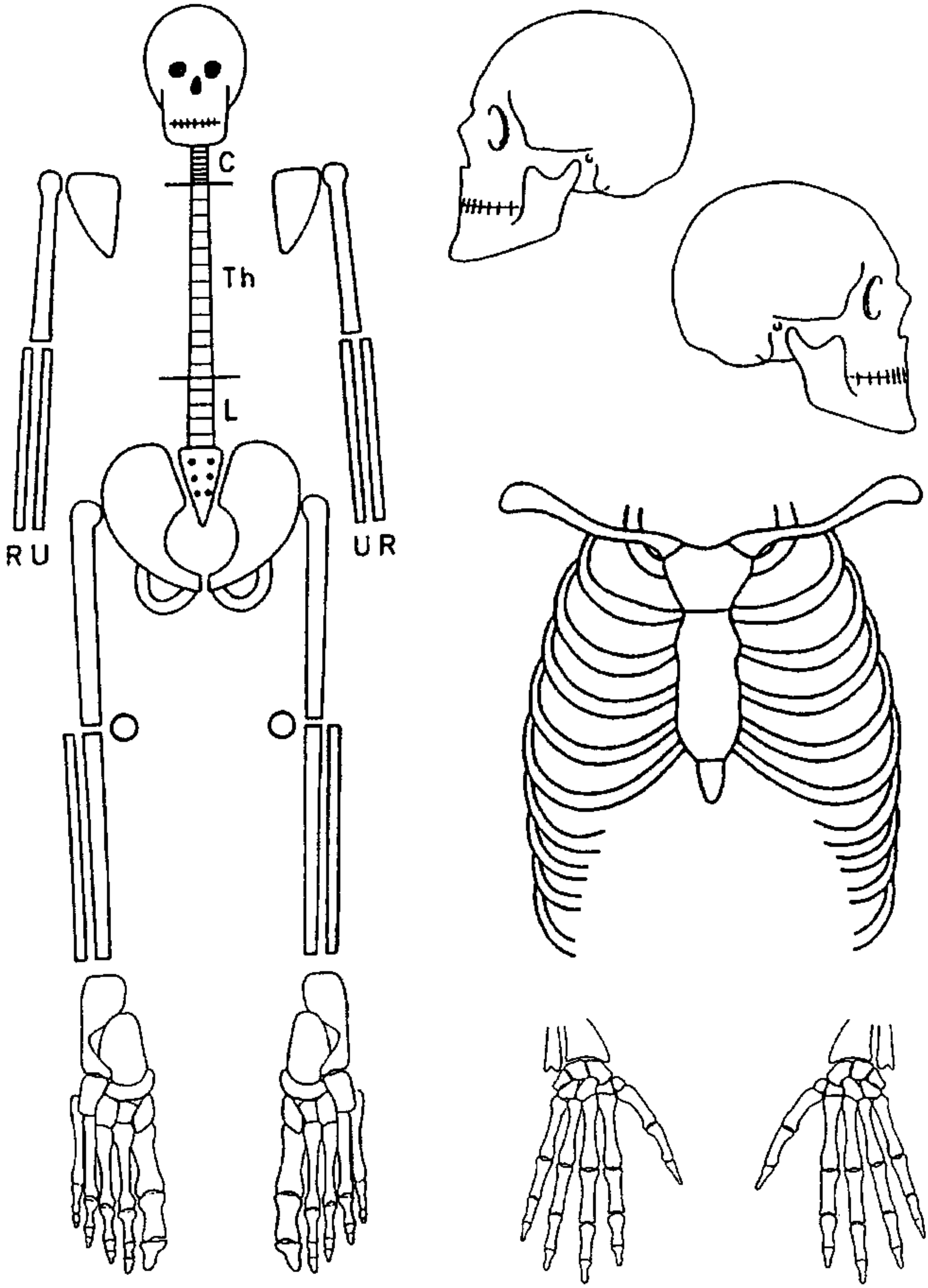
B I N D I N G H O L E S

DEAD BODY

Nature of disaster : ______________________ **No** : ____________

Place of disaster : ______________________ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐



Post **M**ortem *(pink)*

VICTIM IDENTIFICATION FORM

E4

DEAD BODY

Nature of disaster : _ _ _ _ _ _ _ _ _ _ _ _

No : ______________

Place of disaster : _ _ _ _ _ _ _ _ _ _ _ _

Sex unknown ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year*

Male ☐ *Female* ☐

B I N D I N G H O L E S

c = Further information on page G

DNA				c
93	**Sample**			
	01 Received date	☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year*		
	02 Label of sample			
	03 Type of sample			
	04 Condition of sample			
94	**DNA profile**	Dead body		
	D3S1358			
	VWA			
	D16S539			
	D2S1338			
	Amelogenin			
	D8S1179			
	D21S11			
	D18S51			
	D19S433			
	TH01			
	FGA			
	TPOX			
	CSF1P0			
	D13S317			
	D7S820			
	D5S818			
	Penta D			
	Penta E			
	FES			
	F13A1			
	F13B			
	SE33			
	CD4			
	GABA			
95	**Checked by**	Date	Signature	

B I N D I N G H O L E S

Registered by		Signature / Date
	Duty Title :	
	Name :	
	Address :	
	Phone/E-mail :	

P ost M ortem *(pink)*

VICTIM IDENTIFICATION FORM

F1

DEAD BODY

Nature of disaster : ______________________ **No :** __________

Place of disaster : ______________________ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

B I N D I N G H O L E S

DENTAL FINDINGS

83	**In single cases** Site of recovery Recovery No. Date Police Agency Address Phone/E-mail DENTAL EXAMINATION Requested by (date) Performed at (date)	
84	**Material** **01** Jaws present	*Upper* **1** ☐ *Lower* **2** ☐ *Specimen taken?*
	02 Fragmentary remains	*Upper* **1** ☐ *Lower* **2** ☐ *Specimen taken?*
	03 Single teeth	*Specimen taken?*
	04 Other	*Specimen taken?*
	05 Location of specimen	
85	**Supplementary details** Condition of the body Condition of the jaws Injuries to - oral soft tissue - jaws - teeth Possible cause(s) of injuries Other details	

B I N D I N G H O L E S

Registered by Duty Title :
Name :
Address :
Phone/E-mail :

Signature / Date

The INTERPOL Victim Identification Form, Sections F1 and F2

GENERAL INFORMATION

The INTERPOL Victim Identification Form consists of several sections - divided in two groups:

1) YELLOW FORMS for listing latest known data concerning a missing person;
2) PINK FORMS for listing all findings concerning a dead body.

Identification of a dead body may become possible if data listed on the pink forms concerning this body can be compared with, and shown to match, data listed on the yellow forms concerning one particular missing person. If an identification is made, the experts involved will complete an Identification-Report - as a prerequisite to issuing a death certificate and releasing the body for burial.

The identification of a dead body may be accomplished in several ways, depending upon the type af data used. The INTERPOL Victim Identification Form has been set up in such a way, that sections listing the same type of data are marked with the same capital letter in the upper right-hand corner. For dental identification, the forms to use are Sections F1 and F2 (yellow), and Sections F1 and F2 (pink); because of the specialised vocabulary, they must be filled in by a forensically trained dentist.

INSTRUCTIONS FOR USE - SECTION F1 AND F2 PM (pink)

These forms are designed for listing all dental information collected during the dental examination of an unknown dead body (or remains therof).

In Section F1, make sure that the reference number is clearly shown - and that the sex is clearly indicated (boxes at the top). Fill in all the details requested further down. Under "Supplementary Details", list any information at hand that may serve to explain the results obtained from the dental investigation, e.g. where and when the body was found (co-ordinates), its condition (drowned, burned, skeleton), your own working conditions, presumed identity.

In Section F2, all dental findings related to the dead body must be listed. After having etablished full access to both jaws and cleaned all remaining teeth, describe in the spaces provided - tooth by tooth, at the right upper jaw with tooth 18, ending in the right lower jaw with tooth 48 - all treatment and other conditions found. Indicate surfaces by using Capital-Letter System: M = mesial, O = occlusal, D = distal, V = vestibular, L = lingual; if other abbreviations are used, please explain them in one of the boxes further down. (NOTE: there must be a notation for every tooth (or corresponding jaw area) recovered as part of the body!)- Next, sketch on the dental chart the location and extent of all fillings and other conditions found. For colour distinction, use black for amalgam, red for gold, and green for tooth-coloured material. For teeth missing antemortem, put large cross (X) over the appropriate tooth square; for teeth missing postmortem (open socket), encircle the tooth number over/under the corresponding tooth square; for jaws sections not recovered, leave unmarked. Make sure that sketch and text tally. All X-rays taken in connection with the oral autopsy must be listed (type, date of exposure, teeth concerned). Supplementary examination may include photographic, microscopic, scanning electron microscopic (SEM), or metallographic examination of teeth and/or restoration removed from the body. Finally, an evaluation of age should always be given, either your own clinical estimate or, if teeth have been removed for this purpose, the method used and the result.

Once Section F2 has been completed, type your name, address and telephone number (or use your professional stamp) in the box at the bottom of Section F1. Finally, enter the date of completion above your personal signature. Remember - this is a legal document, so keep a full copy for your own file.

(This instruction to be printed on verso of the page PM-F1)

PostMortem (pink) **VICTIM IDENTIFICATION FORM** **F2**

DEAD BODY

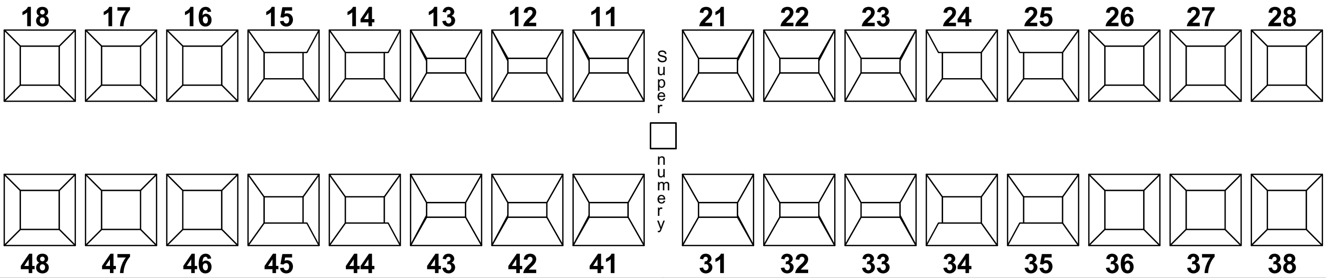
Nature of disaster : _ _ _ _ _ _ _ _ _ _ _ _ **No :** ______

Place of disaster : _ _ _ _ _ _ _ _ _ _ _ _ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

BINDING HOLES

86	**DENTAL FINDINGS in permanent teeth (Notify temporary teeth specifically)**		
11			**21**
12			**22**
13			**23**
14			**24**
15			**25**
16			**26**
17			**27**
18			**28**



48			**38**
47			**37**
46			**36**
45			**35**
44			**34**
43			**33**
42			**32**
41			**31**

BINDING HOLES

87	**Specific description of** Crowns, bridges, dentures and implants	
88	**Further findings** Occlusion, attrition, anomalies, smoker, periodontal status, etc.	
89	**X-rays taken of** Type and region	
90	**Supplementary examination**	
91	**Estimated age**	*Method ?*

P ost M ortem (pink)

VICTIM IDENTIFICATION FORM

G

DEAD BODY

Nature of disaster : _ _ _ _ _ _ _ _ _ _ _ _ **No :** ______

Place of disaster : _ _ _ _ _ _ _ _ _ _ _ _ *Sex unknown* ☐

Date of disaster : ☐☐ *Day* ☐☐ *Month* ☐☐☐☐ *Year* *Male* ☐ *Female* ☐

B I N D I N G H O L E S

FURTHER INFORMATION (if referring to data given on a previous page, please indicate item number)

92

B I N D I N G H O L E S

Appendix 8

Table of piercing terminologies.

Piercing terminologies.

Piercing	Other terms	Comments
Earlobe piercings	Pierced ears	Should distinguish between unilateral and bilateral piercing.
Auricle	Ear cartilage	Outer cartilaginous fold of ear. Mid portion.
Pinna	“	Outer cartilaginous fold of ear. Top portion.
Forward Pinna	“	Outer cartilaginous fold of ear. Top anterior portion.
Rook	“	Innermost superior fold of ear cartilage.
Snug	“	Piercing through lower portion of inner fold of ear cartilage. Often confused with „conch‟ (see below).
Conch	“	Piercing encircling lower portion of ear cartilage.
Scaffold	“	Horizontal elongated bar that passes through two portions of outer ear cartilage.
Industrial	“	Vertical elongated bar that passes through two portions of outer ear cartilage.
Tragus	“	Piercing through anterior prominence of ear cartilage.
Anti-tragus	“	Piercing through lower prominence of ear cartilage.
Weave		Mulitple ear-cartilage piercings connected by one spiralled jewellery piece. If reported as „weave present‟, may be mis-construed as a hair piece.
Eyebrow		Left or right eyebrow should be noted, along with position on the eyebrow: medial or lateral.
Bridge	“Earl”	Skin above bridge of nose pierced
Nostril	Nose piercing	Left or right nostril should be noted. Uni- or bilateral should be noted too (most commonly unilateral)
Septum	Nose piercing	Piercing through the septum of the nose; can be „stretched‟ to various diameters.
Upper lip	“Madonna”	Position on lip should be noted. Multiple piercings can be present.
Cheek	“Dimples”	Most commonly bilateral. Some reports of associated dental trauma.
Lower lip		Position on lower lip should be noted. Often incorrectly termed „labret‟ (see below)
Labret		Lowest border of lower lip, central position.
Tongue		Multiple bars possible. Often associated with dental damage.
Fraenum	“Gum” (infrequent)	Upper or lower fraenum possible. Sometimes mistakenly termed „fraenulum‟ (see below)
Webbing		Piercing of skin between fingers or toes.

		Can also refer to piercing of fraenum under the tongue.
Navel	Belly bar	Upper or lower skin border can be pierced.
Nipple		Male or female. Uni- or bilateral should be noted. Can be horizontal or vertical
Female genital piercings (often (incorrectly) collectively termed „clit“ or „clitoral“ piercings**)**		
Christina		Piercing of anterior base of clitoris.
Fourchette		Piercing through inferior border of vulva.
Clitoris		Piercing through clitoral body.
Clitoral Hood		Piercing of clitoral hood. Can also be referred to as a „little red riding hood“.
Triangle		Through both inner labia and below base of clitoral body.
Inner Labia		Uni- or bilateral piercing should be recorded (most commonly bilateral). Multiple piercings possible, which interlinked can be termed „chastity belt“.
Outer Labia		Uni- or bilateral should be recorded (most commonly bilateral). Multiple piercings possible.
Male genital piercings (often (incorrectly) collectively termed „Prince Albert“ piercings**)**		
Apadravya		Vertical piercing through glans of penis.
Ampallang	Pallang	Horizontal piercing through glans of penis.
Dydoe	Dido	Piercing through corona of penis (circumcised).
Fraenulum		Piercing through fraenulum of penis (inferior surface (circumcised)).
Hafada		Surface piercing through the lateral skin at the base of the penis.
Kuno		Piercing through foreskin. Multiple piercings possible, which when interlinked, can be termed „chastity belt“ or „cock block“.
Lorum	Scrotal piercing	Surface piercing through skin of scrotum. Multiple piercings possible, then often termed „scrotal ladder“.
Prince Albert		Piercing through urethra, exiting inferior side of penis at base of glans.
Reverse Prince Albert		Piercing through urethra, exiting superior side of penis at base of glans.
Staple piercings		„hooked“ metal jewellery that span the outer surface of the skin, reminiscent of paper staples. Can be positioned in any skin-covered location on the body.
Surface piercings		Similar to „staples“ but opposite in nature; the jewellery passes underneath the skin with the extremities protruding to the surface.