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The Use and Usefulness of Forensic Archaeology and Forensic Anthropology in Great Britain

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Abstract

This thesis explores the extent to which forensic archaeology and forensic anthropology are utilised within Great Britain and to what extent they aid, or do not aid, medico-legal investigation of death. Chapter One introduces the topic and considers the need for an exploration of these issues.

In Chapter Two, the differences between the American and British situations are examined and an explanation for the differences proposed, based on the development of the academic 'parent' disciplines during the last century.

Chapter Three explores issues around accreditation and registration in the UK. The role of the courts in maintaining standards of expert evidence is examined. National and European schemes are considered.

After considering the practitioners in this way, Chapter Four looks at the methods, and how the practitioners' experience informs their choice of method. One specific topic for each discipline is discussed in depth and the complexity of choice illustrated.

The difficulty in assessing the full scope for use of forensic archaeology and forensic anthropology are detailed in Chapter Five, with the marked lack of available research data. The problems inherent in media-derived data are considered. The scope for use of the two disciplines is discussed and illustrated with examples from the Media Derived Case List

In Chapter Six, a complex multiple-burial multiple-murder case is discussed; and interviews across one police force area are discussed. These illustrate the use and usefulness of forensic archaeology in practice.

Conclusions are drawn in Chapter Seven, and radical recommendations are made.

Chapter One

Introduction

1.1 How questions arose from years of casework

Recent years have seen an increasing awareness of forensic archaeology and forensic anthropology in the Great Britain, both by the public and within the realms of medico-legal personnel. This has been driven partly by popular and news media, and also by the recognition by the medico-legal profession of casework carried out by these practitioners.

Over fourteen years as a practising forensic archaeologist and forensic anthropologist, the current author has worked in investigations of death in a number of countries, alongside specialists from even more countries. This gradually started a train of questions regarding the situation in Great Britain in both forensic archaeology and forensic anthropology. There seemed no published explanation for why the two disciplines are combined in the United States but practised largely by two separate groups in the Great Britain. The use of practitioners by police forces across this country seemed oddly ‘patchwork’ with some forces using both

disciplines as a matter of routine, others using one but not both, and some seemingly never using either forensic archaeology or forensic anthropology. From that realisation arose more questions around the problems encountered by police in locating the right 'expert' to bring into a case; accreditation and registration seemed more problematic than for other professions. Again, a chain of questions grew from the difficulties of defining an 'expert', this time around whether forensic archaeology and forensic anthropology have acceptable standards of replicable accuracy in their methods. Exploring the standards applied to practitioners and practices led directly to efforts to assess the number of cases in which these could be of use. Those efforts grew into a major search for data and the eventual compilation of a limited but useful list of cases which were in the news media between 2002 and 2006.

The literature has been extensive for many years for forensic archaeology and forensic anthropology in the United States (Morse, Duncan et al. 1983; Sigler-Eisenberg 1985; Krogman and Iscan 1986; Bass 1987; Bass 1987; Haglund 1993), and markedly less so for Great Britain. There is at present no great body of literature to explain, discuss and evaluate recent developments in this country, although the British literature is increasing (Hunter, Roberts et al. 1996; Hunter and Cox 2005; Ruffell 2006).

As a consequence of this, it has been necessary to make more use of my own observations and experience than would normally be the case for a thesis of this kind. What was initially intended to be a discussion drawing on published sources has itself become part of the research for this thesis. Some accounts and assessments

of recent and ongoing developments have been specifically drawn from the author's meetings and interviews with those involved in, or closely aware of, these developments. In collecting and discussing information on ways in which the specialist areas have emerged, attempts were made to seek out possible alternative sources of information and to cross-check accounts and views, when possible, with others working in the same field in a number of countries. However it is, of course, a rapidly developing situation and so this thesis can only reflect the current position.

1.2 Exclusion of Northern Ireland

A decision was taken at the outset to exclude the medico-legal systems of Northern Ireland from this thesis. The author has worked within the Scottish legal, forensic and police systems, and has worked with those of England and Wales (for example, the forensic work in Kosovo was run by British police as though it were an English crime-scene). Northern Ireland has a different legal code, as well as different policing and forensic structures, of which the author has no experience or knowledge. The situation is further complicated by its specific recent history of conflict and paramilitary activity. It was decided that it would not be practical to include Northern Ireland merely 'in passing' as it were, and to include it further would require a much deeper understanding of its medico-legal system and recent history than this thesis permits. The use and usefulness of forensic archaeology and forensic anthropology in Northern Ireland would make a thesis in its own right. Therefore, this thesis is limited to Scotland, England and Wales: Great Britain.

1.3 Definitions

For the purposes of this thesis, forensic archaeology is considered to be the extrapolation and adaptation of techniques and skills from field archaeology into a forensic context; in order to locate, excavate and retrieve concealed or buried objects of forensic interest, most usually human remains but also including weapons, drugs or money, and to interpret the events at and around the time of deposition. Forensic anthropology is used to mean the examination and assessment of human remains in almost any state other than a fresh intact body in order to identify the deceased by name if possible, to assess peri-mortem trauma and to interpret the events at and around the time of death.

Two other phrases could usefully be clarified here. 'Concealed human remains' is used where remains may be buried, but may also be concealed in other ways. Bodies may be inserted into drains, covered with vegetation, concealed by stones – it is useful to have a descriptor which includes, rather than excludes, a wider range of situations. 'Disrupted human remains' is a similarly inclusive descriptor to indicate any condition other than a fresh intact body: skeletonised, decomposing, partial, burnt, blast-damaged, gnawed by scavengers or dismembered, for example.

1.4 The investigation of sudden death in Great Britain

The investigation of sudden death is similar in all parts of Great Britain, but responsibility and some details vary between England and Wales with the Coroner system, and Scotland with its Procurators Fiscal.

In England and Wales, the investigation is the responsibility of the Coroner; this is an appointed public official, usually from a legal or medical background. All newly-appointed Coroners will now be required to have a legal background, although those with only a medical background may continue in post (The Coroners' Society 2014). Each Coroner is appointed locally, but operates independently of local police or local authority. This autonomy has its obvious strengths but is also recognised as a problem in some ways, such as the resulting lack of consistency at national level (Thornton 2012). The basic investigation of a sudden death is carried out by the Coroners' Officers; they produce a report about the death, which is submitted to the Coroner who will then decide whether to order a post-mortem examination of the body or not. In some circumstances, an inquest may be held, with or without a Coroner's jury. The final part of proceedings is the determination of the cause and manner of death. At present, about one-third of all deaths in England and Wales are assessed in some way by a Coroner (The Coroners' Society 2014). The Coroners and Justice Act 2009 has only just come into force in the last year, and will implement a number of changes, but for the purposes of this thesis, the explanation here given will suffice (Coroners and Justice Act 2009).

In Scotland, the initial investigation is carried out by uniformed police. They will establish the identity of the deceased if possible, take witness statements where applicable and carry out initial assessment of whether the death appears suspicious in any way. The police report is submitted to a specialist unit within the Office of the Procurator Fiscal – there are in fact multiple Procurators Fiscal and Fiscals Depute, although they are frequently referred to in the singular as though there is only one.

All Fiscals must be legally-qualified. The Procurator Fiscal will then order any required level of post-mortem examination, such as a single-doctor, or double-doctor, depending on whether there may be a legal requirement for corroboration; under Scots Law, certain evidence requires two witnesses to present it, thus each corroborates the other's work and opinions and conclusions. A forensic post-mortem requires to be certified by two forensic pathologists, and is thus known as a 'double-doctor PM' as opposed to the single-doctor PM in non-suspicious deaths. At the end of the Procurator Fiscal's investigations, the cause and manner of death will be determined. If criminal charges are to be brought, this is within the powers of the Procurator Fiscal to order. Fiscals deal only with deaths for which a death certificate is not issued – if a GP or hospital doctor is willing to sign a death certificate, then that death is normally not referred to the Procurator Fiscal (Crown Office & Procurator Fiscal Service 2014).

Around the world, many countries have some version of the Coroner system, especially those countries whose history is closely linked to England or Britain. For example, the United States has coroners in many states, although not in all; further, the required qualifications and even the very definition of coroner varies from state to state, depending on the specific jurisdiction (Jentzen 2010). Countries with markedly different legal systems from the UK still, of course, have a specified public official who takes this role of investigation of sudden death in place of Coroner or Fiscal – for example, France has the *Procureur de la Republique* (Foreign and Commonwealth Office 2014).

1.5 Overview of thesis

Forensic archaeology and forensic anthropology are linked, but operate as separate disciplines, in this country. In other countries they are not so clearly separated, as discussed in Chapter Two. The historical development of academic archaeology and anthropology has shaped how forensic archaeology and forensic anthropology are viewed today, and how they 'sit' within the medico-legal structure of this country.

Across Great Britain, despite increasing police awareness, the use of the two disciplines by police and forensic medicine is inconsistent. In addition there is, as discussed in Chapter Three, no common background or compulsory vocational qualification for practitioners. This is most obvious in forensic anthropology, where practitioners come from a disparate range of backgrounds, but is also observable in forensic archaeology, although most forensic archaeologists start as field archaeologists.

This may create problems for forensic investigation agencies who would like to utilise forensic archaeology or forensic anthropology but have not previously worked with any practitioner. Various solutions include accreditation, registration or certification of individuals. The North American discipline of forensic anthropology, including as it does forensic archaeology, has already been through this process, known in social sciences as professionalisation. In Great Britain, both forensic archaeology and forensic anthropology are currently undergoing professionalisation, and this is examined in Chapter Three.

Accreditation or registration often requires re-registering at set intervals, along with specified hours of continuing professional development (CPD). Chapter Four explores the importance of CPD and keeping up with current peer-reviewed literature across a wide range of topics. By examining a single task for each discipline, it will be shown how complex each task can become, when the full range of factors affecting choice of method are taken into account. In each case the task to be examined is chosen because it is common, something practitioners are asked to do as a routine part of their work, and not necessarily recognised as having so wide a variation in detail. For forensic archaeology, using geophysical survey equipment requires a detailed understanding of the equipment's variations and how signals may be misinterpreted or 'false positives' produced. For forensic anthropology, assessing the sex of an individual from certain bones can involve unexpected changes in probability of accuracy and error, and many factors emerge as relevant. A practitioner of forensic archaeology or forensic anthropology requires a full, and up-to-date, awareness of the complexity of methodologies in order to be of use in a forensic investigation of concealed human remains or analysis of disrupted or unidentified human remains.

Chapter Five details efforts to establish how many cases in Great Britain involve searching for or excavating concealed human remains, examination of disrupted human remains or problems of identification of human remains. This proved impossible to establish using official sources of data; information relevant to this thesis appears not to be recorded officially. As a result, searches were made through online sources of unofficial data. The limitations of this data source are

acknowledged and explored in Chapter Five, but the resulting information, in the form of a Media Derived Case List, has its uses, albeit limited. Forensic cases of a kind that could benefit from involvement of forensic archaeology or forensic anthropology do exist in this country, and it appears that there is a wide scope for the use of the two disciplines.

Despite these cases existing across Great Britain, only some police forces call in a forensic archaeologist or forensic anthropologist when a case might gain from their involvement. There are indications, discussed in the first part of Chapter Six, that some evidence may be misinterpreted as a result. In the second part of Chapter Six, an alternative arrangement is examined: no use of outside specialists, because the skills are present in those already involved. Informal interviews were conducted with a police force with a range of specialist skills among their existing staff. These in-house practitioners mean that the skills and techniques are used at some level but because they are outside academia, it may limit research, improvement and publication.

Finally, in Chapter Seven, conclusions are drawn, from each chapter in turn, and then overall. This resulted in a somewhat unexpected, radical conclusion, presented here as a recommendation, which was far from the author's mind at the start of this thesis research twelve years ago.

Forensic archaeology and forensic anthropology in Great Britain are only now emerging to become accepted as forensic disciplines in their own right. Throughout

the thesis, the questions arise: does the use of forensic archaeology or forensic anthropology improve the quality and quantity of evidence? Are forensic archaeology and forensic anthropology used, and are they useful?

Chapter Two

History and Development of Forensic Archaeology and Forensic Anthropology

2.1 Introduction

The United States has traditionally dominated forensic archaeology and forensic anthropology across the world, and this chapter will look at why the use of the two disciplines differs in Great Britain and the United States, despite broadly comparable medico-legal and academic systems. It is necessary first to follow the development

of the two forensic disciplines from what might be termed their 'parent disciplines' in the 19th century. The emergence of archaeology and its development into forensic archaeology is traced, and then a similar review is taken of forensic anthropology's origins.

From these two paths, differences emerge in the two countries and conclusions are drawn that seek to explain the different development in this country to that in the United States.

In Great Britain, the casework of forensic archaeology is largely carried out by forensic archaeologists and forensic anthropology is carried out by forensic anthropologists. Individuals in either group have a variety of backgrounds, including archaeology, geology, anatomy or medicine. In the United States, the casework of the two disciplines is largely done by a single group of practitioners, within the wider setting of 'anthropology'. Further, in the United States, forensic anthropology has been organised for many decades, and underwent 'professionalisation' in the 1970s (Bass 1987). Professionalisation is the term used in social sciences for the process of a professional group developing and identifying skills, identities, norms and values. It enables "recruits […] to acquire both substantive and methodological knowledge and develop understandings of their roles that permit them to function as professionals in their fields" (International Encyclopedia of the Social and Behavioural Sciences 2001). In Britain, both forensic archaeology and forensic anthropology are currently undergoing this process.

2.2. Archaeology to forensic archaeology

2.2.1 The emergence of archaeology

The discipline of Archaeology developed from the older 'hobby' of antiquarianism. Tradescant's Ark, at Lambeth in London, is generally considered to be the first public museum in Britain, started in the 17th century by a father and son both named John Tradescant. The collection was catalogued in 1656 under the title *Musaeum Tradescantianum: Or a Collection of Rarities preserved at South Lambeth neer London* (Tradescant 1656). Tradescant's Ark later formed the main part of the Ashmolean Museum, opened at Oxford in 1682. The 'rarities' ranged from natural history through to archaeological artefacts.

In the 18th and 19th centuries, gentlemen of independent means enjoyed spending their time collecting ancient artefacts, sometimes of their own country and sometimes of other countries. The disputed curation of the 'Elgin Marbles' is the result of this kind of souvenir-hunting, in which any interesting or beautiful ancient object was seen as a perfectly legitimate souvenir to bring home to Britain from one's 'Grand Tour' or other stay overseas (Fagan and Beck 1996, p.281). Museums developed from individuals' private collections and Cabinets of Curiosities – obviously by those who were wealthy enough to travel and to buy up decorative 'souvenirs' on their travels and transport them back to Britain so that they might display them in their own homes.

Anything and everything could be, and was, collected and displayed in an early museum – with the collector sometimes giving fair payment, but sometimes giving unfair payment or none. In some cases, items were 'collected' from, and payments made to, individuals or bodies without a legal right to sell the items. This is partly why some museums are still involved in the lengthy and delicate legal discussions necessary for the return of items which may be of great cultural significance to the population of their original region (Simpson 2002; Thorleifsen 2009). Indeed, in some cases, the items are literally the population of that region, such as shrunken heads from South America, mummified remains from Ancient Egypt or the skulls or heads of aboriginal peoples of Australasia (Kelly and Gordon 2002; Davies 2005). In addition to the removal of artefacts of cultural or historical significance, and preserved human remains, precious stones and metals were removed to Britain by people who can at best be described as 'treasure-hunters' (and at worst as 'thieves' or 'looters'): some of these people mounted expeditions specifically to locate and retrieve treasures of gold, silver or jewels. The fascination (lasting well into the 20th century) with the tombs of Ancient Egypt had less to do with a deeper understanding of the Dynastic Egyptian culture and more to do with a ghoulish love of mummified remains and a greed for the fabulous riches with which the wealthy were often buried.

Archaeology emerged as a specific discipline during the 19th century. For the first time, the precise location of an artefact in the ground was considered in three dimensions – its depth from the surface, as well as its position with regard to structures and its position with regard to other artefacts or human remains. This

concept of scientific excavation and recording probably owes its inception to the 19th century interest in the developing science of geology, and the new understanding of how soil is created from geological processes combined with cultural processes. Darwin's 'On the Origin of Species', published in 1859, caused many people in mid-Victorian Britain to at least consider the unthinkable idea that the Earth and all its life was not created in six days, some 4004 years BC, as promulgated by Archbishop Ussher and the Authorised King James Bible; it might be argued that 1859 sees the 'intellectual birth' of the discipline of archaeology (Fagan and Beck 1996, p.281). Suddenly, a new way of viewing the physical world emerged. The general population of the 'civilised' world (i.e., the British Empire's white English-speaking British-educated population) no longer accepted unquestioningly the Biblical teaching of Creation, but started to debate the age of the planet, the evidence that evolution had occurred and many other questions, including the origins of culture and society, both in Britain and elsewhere.

Debate and discussion were crucial to the development of archaeology, and indeed form the fundamental tenets. Daniel gives the Oxford English Dictionary definition and origin of the word 'archaeology' – from a Greek word meaning discourse about ancient things – and goes on to emphasise that the OED's definition of 'systematic description or study' is "not primarily concerned with the antiquities themselves but with using them to explain and illumine man's prehistoric, proto-historic and historic past" (Daniel 1981). This "explain and illumine" role links directly to the mid-Victorian explosion in debate, discussion and questioning, which in turn links directly to the contemporary developments in science.

The methodical approach used across the fields of science started to find its way into archaeology, particularly when the methodical scientific approach was combined with military order. This was particularly exemplified by a professional soldier who changed his name as a condition of inheriting a vast estate in the south of England and became Lieutenant-General Sir Augustus Henry Lane Fox Pitt Rivers (Daniel 1981) – it is his adopted name which is recognised today in Oxford's Pitt Rivers Museum. He developed the typological sequencing which is now a standard means of interpretation of archaeological material. More relevant to this study, he organised excavations of sites on his estate with military order and scientific method. Where previously an excavation had involved the sinking of shafts straight through to where a treasure chamber was thought to be, Pitt Rivers carried out systematic excavations of earthworks, barrows and burials producing detailed diagrams and schematic representations, all drawn to scale; plans and sections which demonstrate the position of each individual find, and the relationship between groups of finds or individual finds, as well as the relationship between finds and different soil or silt types (Pitt-Rivers 1887). These principles underlie archaeological excavations, and are fundamental principles of forensic excavations, to this day.

Archaeology as a discipline became more popular as the 20th century progressed. In Britain, in particular, it gained a presence in many universities, and was regarded by the middle of the century as an academic discipline of great standing, as well as becoming an increasing part of popular culture through archaeologists who were highly-skilled at exploiting both radio and the newly-common television as well as

books aimed at more than the academic library, notably the dynamic Sir Mortimer Wheeler (Hawkes 1982). Wheeler wrote of his contribution to British archaeology's development between 1914 and 1954, "but I was still essentially alone. […] For some years, until the new generation was ready to take over, I held the field, always with an appreciation of the hard fact that my position was the outcome of circumstances, not merit." (p.231, Wheeler 1955).

In the 1960s and 70s, a 'new archaeology' emerged in association with social sciences, and archaeology became a social science as well as a science, in a great explosion of new approaches (Hodder 2002). There was a small revolution, as sociological and political ideologies challenged the existing archaeological professionals – one 1968 publication by Clarke is still referred to as 'a bombshell' for the effect it had on British archaeological thinking (Champion 1991). Marxist archaeology shifted the emphasis from palaces and great cities and treasure, to the huts and potsherds of the common people. Feminist archaeology enabled half the world's population to emerge from the archaeological past, formerly apparently peopled almost entirely by males. The location of sites of archaeological interest expanded, from the previously narrow interest in Europe and the Ancient Near-East, to the Americas, to Africa, to Asia. A host of –isms came in, from diffusionism through cognitive-processualism to structuralism and post-structuralism among others (Hodder 2002). These –isms gave new ways to examine the past, either by means of new philosophical and theoretical methods of social interpretation, or from previously unconsidered perspectives such as those of the working-class populations, or from a female perspective (Fagan and Beck 1996, p.283).

There are now universities offering BA Archaeology and others offering BSc Archaeology. It is no longer an art or a science but can be either, depending on context. This appears linked to the position of Archaeology within each university – those with strong links between History and Archaeology departments tend to offer it as an Arts subject, whilst those with independent departments of Archaeology tend to offer it as a Science subject.

This is important, as it means that the term "an archaeologist" in Britain has no single meaning. Holding qualifications in archaeology does not ensure knowledge of the scientific aspects utilised in forensic archaeology. It is possible to gain a degree in Archaeology in some universities without carrying out any practical excavation. Forensic archaeology depends on a thorough grounding in archaeological sciences and particularly the principles of survey (non-invasive methods to assess what is below the unbroken ground surface), stratigraphical analysis (interpretation of the order and relative positioning of artefacts or soil changes below ground), recording and excavation. It can readily be understood that the qualification of a degree in Archaeology does not necessarily ensure competence to carry out a forensic excavation.

2.2.2 The Americas

In the United States, archaeology did not develop as a discipline in its own right. It developed generally as part of anthropology courses. Where Britain had combined departments of history and archaeology and later departments of Archaeology, the

USA had departments of anthropology which included archaeology. This dates back to Boas and the establishment of the School of Anthropology as four-fold, according to Douglas Ubelaker, the pioneering forensic anthropologist who is the curator and senior scientist at the Smithsonian Institute's National Museum of Natural History (pers. comm. Ubelaker 2010). Four-fold anthropology brings together cultural anthropology, linguistics, physical anthropology and field archaeology to form a single subject area of anthropology, whereas in the United Kingdom, anthropology has traditionally been cultural anthropology alone. This early American decision by Boas (discussed further below, in Section 2.3.2) to include field archaeology within his School of Anthropology appears to be one of the three reasons why the work of both forensic archaeology and forensic anthropology is centred in anthropology departments in the United States (Gaillard 2003, p.325).

In the 1970s, the first courses in forensic archaeology started at Florida State University, working in partnership with the local law enforcement agencies (Morse, Duncan et al. 1983). This innovation probably developed as a result of the early 1970s establishment of the Forensic Anthropology Section of the American Academy of Forensic Sciences, discussed below, which gave the discipline the status of a formally-accepted forensic science. By 1983 the first authoritative guide to using specifically-adapted archaeological methods in forensic contexts was published for an American law enforcement and archaeological market (Morse, Duncan et al. 1983). The Florida course and handbook both worked on the same principles – that the forensic archaeologist must work as part of a team with an awareness of the limits of their expertise; that methods must be modified, as there is a difference

between field archaeology and forensic archaeology; finally, that excavation in a forensic investigation should always be carried out by someone with training and experience (Morse, Duncan et al. 1983). Thus through the late 1970s and early 1980s, forensic investigation in the USA increasingly included either a trained experienced archaeologist in the team, or team members who were trained and experienced in forensic archaeological techniques (Haglund 2001). Often these practitioners of forensic archaeology were described as forensic anthropologists, because of the wider scope of American training which includes archaeology within anthropology.

The importance of this teamwork approach is highlighted in a discussion of the excavation of a mass grave in the former Yugoslavia (Connor and Scott 2001). The authors describe the American archaeologists as being unhappy without their traditional string-gridding and baselines, despite the fully adequate electronic mapping and back-up carried out by Connor and Scott – as the authors put it, archaeological techniques had transferred into the forensic world but they had transferred independently of the paradigms behind them. In other words, the archaeologists in the team were trying to run the forensic excavation as if it were an archaeological dig. This is a perennial problem, and has been reported anecdotally in Great Britain in recent years, with an individual not understanding the difference between archaeology and forensic archaeology[1]. This confusion amongst both law enforcement officers and forensic practitioners between archaeological methods and the specifically-adapted methods becoming known during this period as forensic

[1] A situation experienced and narrated by a police sergeant during interviews carried out by the current author (See Chapter Six)

archaeology suggest that the early Florida courses and the 1983 Handbook were not capturing all the possible intended audience (Morse, Duncan et al. 1983). Throughout the 1980s and 1990s, American forensic archaeologists started to become more active in promoting the concept of forensic archaeology, intent on communicating across this divide, to bring archaeology in its modified form more fully into the forensic world and to demonstrate to investigators how useful to their enquiries forensic archaeology could be.

One individual who worked both inside and outside the USA throughout this period was Dr Clyde Snow. A leading forensic anthropologist (with American four-fold anthropology training, including both physical anthropology and archaeology), he worked on a number of aircraft crashes in the United States, and in so doing became experienced at working with archaeological techniques modified for forensic settings. He had to become expert at excavating and recovering human remains himself because he had become so exasperated at the inexpert work done by well-meaning but untrained police officers. Haglund quotes Snow as saying that "having a policeman excavate a skeleton […] was a bit like having a chimpanzee perform a heart transplant" (Haglund 2001).

The following account is summarised from Joyce and Stover's detailed account of the founding of the Argentinian *Equipo* (Joyce and Stover 1991). In June 1984, Snow was invited to present a seminar in La Plata, Argentina, on the topic of forensic science and the investigation of human rights abuses. A third year medical student named Morris Tidball Binz attended out of curiosity. As the translator was

struggling, Tidball Binz volunteered his excellent English and knowledge of medical terms as a replacement translator. At Snow's suggestion, Tidball Binz rounded up a handful of anthropology and archaeology students from the University of Buenos Aires: anthropology students Douglas Cairns, Mercedes Doretti and Luis Fontebrider, with archaeology students Patricia Bernardi and Sergio Aleksandrovic, as well as Tidball Binz, who was halfway through his medical degree. Clyde Snow started to train these students as the first dedicated team of forensic archaeologists and forensic anthropologists anywhere in the world. Together they formed the *Equipo Argentino de Antropologia Forense*, translated as the Argentinian Team of Forensic Archaeology and Anthropology. Tidball Binz remained a core part of the *Equipo* for many years and now is based in the International Committee of the Red Cross (ICRC). With three colleagues from odontology, radiology and forensic pathology, the *Equipo*, along with more hand-picked medically-qualified personnel, anthropologists, scientists and the investigators of CONADEP, were trained more fully. Other countries in Latin America followed the idea and started to establish their own Equipos practising forensic archaeology and forensic anthropology.

2.2.3 Great Britain

It seems that the first use of archaeology by the police in Britain for forensic purposes was in 1988 in Yorkshire, in the Jennings case (Hunter 1994; Hunter, Roberts et al. 1996). Stephen Jennings was reported missing by his father in 1962 in the North of England. As the boy was only 3 years old an intensive search was made, in one of the worst winters known in the area. Suspicion was directed towards the boy's father, but no charges were made and no trace of his son was found. Twenty-

six years later, the remains of a child were discovered just a kilometre from his home by a man walking his dog; the remains were identified as those of Stephen Jennings. On examination, multiple rib fractures, of a kind typical of child abuse, were found on the rib cage.

The "grave" consisted of a very shallow, superficial burial next to a dry-stone wall which had subsequently collapsed over the grave. Hunter writes, "the archaeological interpretation was straightforward and provided little opportunity for interpretation. There had been no grave as such: the body had been laid on the ground surface, not dug into the ground; and the shallow, thick black layer that surrounded it was the result of decomposition products and naturally accumulated organic material. The stones which lay across the body were separate from, and prior to the collapse of, the wall and were seen as a deliberate attempt to cover the remains. This sequence implied that the body had been laid against the foot of the wall, covered with stones and abandoned; that later the wall had slumped over the remains providing a partial seal. Furthermore, the recovery of all but a small number of the bones suggested that the body might have been wrapped" (Hunter, Roberts et al. 1996). The father eventually admitted beating the boy and causing the boy's death – he had wrapped the body in a sack, carried it away from the house and covered it with stones against the foot of a field wall. This matches the archaeological interpretation. The boy's father was convicted of murder.

The importance of this case in British forensic archaeology and forensic anthropology is considerable. For the first time in a British criminal court, the jury

heard from a forensic archaeologist an interpretation of how the body had been positioned, what efforts had been made to conceal it, what had subsequently happened by chance to conceal it further and even what season the deposition had been in. The long timescale involved rendered more usual methods less useful in this case.

It is not clear why, after the clear usefulness of forensic archaeology in the Jennings case, the discipline did not gain specific recognition. In Great Britain, when the police are faced with skeletal remains which cannot be identified by the usual means, they may be more likely to think of requesting an archaeologist to help than an anthropologist because, in this country, anthropologists are not generally concerned with physical remains. On television, in magazines, novels and news media, it is archaeologists who are publicly credited with finding out about ancient human bones and so very often they are – wrongly – assumed to be competent to work in forensic settings.

Much of the impetus for forensic archaeology to be taken seriously and used across Great Britain has come from John Hunter, Professor of Ancient History and Archaeology at Birmingham University. In the 1980s and early 1990s he taught in the Department of Archaeological Sciences at Bradford University, along with Rob Janaway, one of the editors of the seminal *Death, Decay and Reconstruction: approaches to archaeology and forensic science* in 1987 (Boddington, Garland et al. 1987). Together they helped found the Forensic Science Advisory Group to advise police forces on, amongst other things, the appropriate use of archaeological method

in forensic contexts. Nearly a decade after Janaway's book, Hunter co-authored the first major text-book in Britain on forensic archaeology, with Charlotte Roberts (then also at Bradford) and Anthony Martin (Hunter, Roberts et al. 1996). Hunter has also given many presentations at conferences attended not by archaeologists but by forensic scientists and police officers, continuing to explain the benefits of utilising all resources in a forensic investigation including those to be found in forensic archaeology.

In 1995, all the British news media had reported in detail the unfolding horror as the victims of Fred and Rosemary West's murders tallied into double figures in western England (a critical discussion is below in Chapter Six). All of these victims were buried, and all were excavated by police. No use was made of specialist forensic archaeologists, but no comment was made on this lack by any news organisation. Forensic archaeology did exist at that time in Britain, but until the late 1990s almost nobody was aware of it, apart from the practitioners (a tiny handful) and the few police who had worked directly with them and benefited directly from their skill and experience.

The widespread adoption of forensic archaeology as a valid discipline in the UK only came when the British Forensic Team was sent in 1999 and 2000 to Kosovo to carry out forensic investigations of mass and multiple graves (for the present author's experiences as a member of the 1999 BFT, as well as her 1996 work in the former Yugoslavia, see Section 2.4). The UN investigation of mass graves in the former

Yugoslavia was probably the single biggest factor that changed police attitudes in Britain

In 1999, there was a second wave of killings connected to NATO involvement in Kosovo. Whereas the UN had authorised and instructed the investigation teams in the main part of the former Yugoslavia, the situation in Kosovo was different, as it involved NATO rather than the UN. As a result, teams were sent by several NATO countries and the British Forensic Team was created and deployed by the British Foreign & Commonwealth Office in the summers of 1999 and 2000. It was made up of British police officers and civilian police staff (photographers, crime scene investigators, etc., are civilians in British police forces). The UK team was of combined British and Dutch nationals, headed by Sue Black, now Professor of Anatomy and Forensic Anthropology at the University of Dundee.

Black was responsible for the enormous task of organising the logistics involved in two seasons' worth of overlapping 3-week rotas of 18-strong teams, all the paperwork and formal submission of the evidence to the Hague. She was subsequently awarded the OBE for her "services to forensic anthropology" but the services to forensic archaeology were equally valid, in gaining recognition of the discipline as an asset to a forensic investigation. The majority of police officers deployed in the British Forensic Team in 1999 came from the Metropolitan police; a small number came from other British police forces, but in 2000 many more police officers from outside London worked in Kosovo on the mass graves. Deployment was for a three week tour, with each team averaging around 17 or 18 individuals

making up a standard British-style investigation team but with the inclusion in every team of a forensic archaeologist, or of a forensic anthropologist with some level of archaeological experience.

In this way, several hundred serving police officers and crime scene investigators across Britain gained direct experience of working alongside an experienced forensic archaeologist (or a forensic anthropologist with archaeological skills). On the police's return to Britain, to their normal jobs, the memory stayed with them of the benefits and usefulness of having an experienced specialist on the team for locating, excavating and retrieving remains whilst maximizing the retrieval of evidence. Although there is no specific literature, this is clear from subsequent conversations the present author had with many of these officers over the next few years at conferences.

This involvement of British police in Kosovo could not have been predicted, and certainly could not have been deliberately engendered by the forensic archaeology community in the United Kingdom, but the benefits it brought were immense. British attitudes to forensic archaeology and to forensic archaeologists were permanently and widely changed for the better in British police forces as a result of the deployment to Kosovo of the British Forensic Team.

2.3. Anthropology to forensic anthropology

2.3.1 The emergence of anthropology

In North American universities, the discipline of "anthropology" has long included not only cultural or social anthropology as it does in Britain, but also linguistic anthropology, field archaeology and physical anthropology. These make up Boas's Four-Fold Anthropology, which is very different, in practical terms, from the (solely cultural or social) Anthropology discipline in the United Kingdom (pers. comm. Ubelaker 2010).

In the United Kingdom, in the far past, there have been sporadic cases of sudden or unexplained death or unidentified remains in which the bones were, in the phrase so beloved of dramatic writers, 'made to speak'. In the England of the 17th century, a man named Norton coveted his neighbours' land and, after members of the neighbouring Leeson family disappeared and bones were found, an inquest was held. The remains were identified by stature, sex, ante-mortem trauma and individual anomalies in a primitive version of modern forensic anthropological assessment (Weatherford 2001). However, interesting though it is, the identification of the murdered Leeson family is anomalous. The routine use of physical anthropology in forensic contexts would not happen in Britain for more than another three centuries.

Physical anthropology (the examination of skeletal remains to gain information about the individual or population, as differentiated from forensic anthropology which uses related and derived methods for forensic purposes) developed during the 19th century (Jurmain and Nelson 1994). Its origins lie largely in the same explosion of

intellectual questioning and scientific advance, as do the origins of archaeology discussed above. As the literal acceptance of the Biblical creation story was thrown into doubt by scientific theories on evolution and geology, and the age of the planet was extended beyond Archbishop Ussher's four millennia, so the origins of the human species began to be questioned. The biblical story of Adam and Eve being created in the Garden of Eden would not suffice for everyone. New concepts and ideas began to be explored around how humans had evolved, and where. These ideas are still provoking fierce academic debate even in modern times between those who hold differing views.

The physical anthropologists were, and continue to be, in the centre of these debates on hominid evolution, but are also involved in almost all areas relating to human remains from the far past. Indeed, even the more recent past has become the study of some physical anthropologists – for example, the large-scale examination of late 19th-century human remains of known identity from Spitalfields Church in London (Molleson and Cox 1993). Even closer to modern times, it is becoming more common in a number of countries in Europe for the battlefield dead of the 1914-1918 Great War to be examined by physical anthropologists in an attempt to identify the individual soldier – Glasgow University now offers a post-graduate course in 'Battlefield and Conflict Archaeology' (University of Glasgow 2010).

The examination of the skeletal remains of those who lived in pre-modern times provides detailed information on how our ancestors lived and died – what diseases were prevalent, what dietary differences they had, how their backs ached or how

their teeth hurt. This helps to keep the public interested in attending museums, and most large museums have human remains on display partly because it will attract visitors. Modern disease prevalence and spread can be further understood by assessing past prevalence and spread. Physical anthropological assessment of skeletons found during archaeological excavations also helps academic research and understanding move forward and may indicate new areas of research.

There are parts of 19th-century, and indeed 20th-century, physical anthropology which make uncomfortable reading in the 21st century. A large number of physical anthropologists seem obsessed by race above all other aspects of physical anthropology, and specifically race as an indicator of quality, intelligence, superiority or inferiority of a group of people. Even today, the standard forensic anthropology texts provide methods to determine whether an unidentified set of human remains come from an individual who is Caucasian, Negroid, or Mongoloid (Krogman and Iscan 1986; Bass 1987; Buikstra and Ubelaker 1994). These divisions are social constructs – in terms of the underlying bone structure, there is little difference between a white skinned Norwegian Caucasoid and a black skinned Ethiopian Negroid. In fact, in terms of the underlying bone structure, there is more difference between a typical Norwegian Caucasoid and a typical Sicilian Caucasoid, although both are classed as Caucasoid, at which point it becomes increasingly apparent that this term relates to the fact that they are basically white-skinned people. Similarly, there is more difference between a typical East African Negroid and a South African Negroid.

Within these main 'racial' groups, there is more variation than between the groups: the socially-constructed grouping relies on skin colour. In the 21st century, physical anthropologists are still applying 19th-century racial distinctions based on skin colour, and are trying to apply those skin colour distinctions to the underlying bone, regardless of the reality bred in the bone.

The modern physical anthropologist seems now to be moving actively away from the concept of differentiating 'races' and is examining human variation on a much wider scale. They study the mechanisms of genetic change in a population over time as well as physiological changes and adaptations to environment and lifestyle, such as altitude, cold or hot climates, agricultural communities or hunter-gatherer communities. These were included in physical anthropology in the past, but were not the main focus.

2.3.2 The Americas

This part of the discussion concentrates upon the United States because that is where forensic anthropology emerged first and most strongly. Its development in other countries in the New World can usually, if not always, be traced back to the influence of some American forensic anthropologist, such as Clyde Snow's involvement with the establishment of the Argentinian *Equipo*, explained above. This is not the case in Europe, as far as can be ascertained, and that, in turn, has influenced the development of forensic anthropology in the United Kingdom.

There are three reasons which explain the different situation and global dominance of American forensic anthropology: Boas's four-fold anthropology school bringing both disciplines (social and linguistic anthropology, alongside field archaeology and physical anthropology) into a unified whole; the state-funded identification centres acting to bring together forensic anthropologists into groups who practised, researched and published; and the early 1970s professionalisation of the discipline in the USA (Gaillard 2003).

Until the Second World War, the bulk of forensic anthropological consultation in the United States was divided between anatomy departments and physical anthropologists in universities and museums (Grisbaum and Ubelaker 2001). The first physical anthropology journal was established in 1918 by Hrdlicka (Ubelaker 1999) and is still a respected peer-review journal today – the American Journal of Physical Anthropology. In 1939 the first major publication came in the form of a guide in the FBI Law Enforcement Bulletin (Grisbaum and Ubelaker 2001).

Between the FBI guide in 1939 and the early 1970s came the period in which some American physical anthropologists became fully-fledged forensic anthropologists. Much of the basic methodology was first developed in this period. Interestingly, it is also this period in which the GI Bill of Rights brought "a large number of people into American universities who would not have been able to get in earlier" (Gaillard 2003, p.322). Although now overlaid by more modern or population-specific data, the original publications of the standard methods were during this period. Trotter and Gleser's stature calculations derived from a modern population of known individuals

were published in the American Journal of Physical Anthropology in the 1950s and 1970s (Trotter and Gleser 1958; Trotter and Gleser 1978; Bass 1987). McKern and Stewart published data on pubic symphysis changes in 1957 in a US Army report (Bass 1987). The Phenice method of sex estimation from the pelvic bones was published in 1969 (Phenice 1969). These methods are still taught, still known by their author's name the world over – the Trotter regression tables, the McKern and Stewart charts, the Phenice method. Their data and methods have been refined by others, but not rejected.

The first laboratory for forensic anthropology identification was established in 1947 in Hawaii, to become known as CILHI (Central Identification Laboratory, Hawaii). The Hawaii laboratory was established for the purpose of identifying the American war dead after the end of World War Two. The Korean conflict enabled forensic anthropology to prove its worth in assisting with identification in a number of US Army identification laboratories in the USA and overseas (Grisbaum and Ubelaker 2001). The American Armed Forces have generally had a tradition of "bringing the boys back home" when service personnel die overseas in conflict.

Groups of forensic anthropologists worked together, with a steady supply of casework, with funding, equipment and facilities made available to them. They were able to establish data from large numbers of known individuals – that is, as well as their names, their age, sex, stature and race were all known, as distinct from unidentified remains in museum collections.

After forensic anthropology in the USA had its initial phase of intermittent use when all other methods had been tried, and the second phase of research and identification of military dead, it entered the third phase, that of professionalisation, in 1972. During the late 1960s and early 1970s, Kerley and others campaigned for the American Academy of Forensic Sciences (AAFS) to set up a sub-section specifically for Physical Anthropology in forensic sciences. This it did in 1972, and by the late 1980s it had over ninety American members (Bass 1987). In 1977 the American Board of Forensic Anthropology (ABFA) was incorporated and developed the 'diplomate' system respected and known internationally as 'being Board Certified'. There have been 85 diplomates in all, of whom 63 are currently practising (American Board of Forensic Anthropology 2014). Until recently, this was available only to those resident in the USA or Canada, but that requirement has recently been dropped (Simmons and Randolph-Quinney 2010) .

By the 1960s it was relatively common for local investigators in the United States to take bones along to a nearby Anthropology Department or Museum and ask for the opinion or advice of one experienced in physical anthropology. The Smithsonian Institution has been advising police across the United States for over a century (pers. comm. Ubelaker 2006).

In 2001, Grisbaum and Uberlaker analysed the forensic anthropology casework of the Smithsonian from 1962 to 1994 (Grisbaum and Ubelaker 2001). These cases were submitted to the Smithsonian Institution by the Federal Bureau of Investigation. The period covered is of interest since, in 1962, forensic anthropology had not yet

organised itself into a formal community in the United States. During the period covered by Grisbaum and Ubelaker, the physical anthropology section of the AAFS was set up, the ABFA established, and its system of 'diplomates' instituted. An interesting finding is that the highest rate of referrals was during the late 1970s, despite increasing competition from other centres; by the early 1980s, cases were being sent to other forensic anthropology centres as well as to the Smithsonian. This reflects the growing professionalisation of the discipline in the USA during the period 1962-1994.

2.3.3 Great Britain

The confusion in nomenclature is an ongoing problem in Forensic Anthropology in Britain – the majority of people have no understanding of the gulf between British university Departments of Anthropology and the discipline of forensic anthropology. There can be difficulties when academic specialists interact with the more rigid codes of conduct required within a police investigation. In the UK, until relatively recently, the study of ancient human remains was mainly carried out by medical personnel with an interest in archaeology, almost as a hobby although some, such as Calvin Wells in Bradford, developed it to a high standard. Until very recently, when a forensic case involved questions about decomposed or partial human remains, the police turned as a matter of course to forensic medicine and anatomy, less often to archaeology – any 20th-century memoir by or about a forensic pathologist, as well as informal discussions with, and occasional conference addresses by, eminent forensic pathologists will bear this out (Browne and Tullett 1952; Smith 1959; Simpson 1978; Knight 2009). This is similar to the situation before 1939 in the United States. What

followed in the United States was a world war and then several major international conflicts involving US troops and large numbers of service dead, whose remains were transported back to the USA, in a time before DNA identification existed. The result was government-funded facilities with enough unidentified remains to employ dozens of forensic anthropologists.

This did not happen in the United Kingdom, for three main reasons – firstly, the British Armed Forces have, until the later 20th century, traditionally buried their war dead in official war cemeteries around the world as a matter of policy (pers. comm. Commonwealth War Graves Commission, Arras, France 1999). This is possibly the result of the British Empire enabling British cemeteries to be established with relative ease in British-controlled regions in most parts of the world, where the United States had fewer options of establishing its own war-graves outside the USA. Secondly, Britain had lower levels of involvement in post-war international conflicts during that second phase of American forensic anthropology development. There was minimal involvement of British troops in Korea and other post-war conflicts around the world. Thirdly, after the Second World War ended in 1945, Britain was heavily in debt with food rationing continuing for economic reasons until 1953. A great deal of re-building required what money was available, both literal re-building of bombed areas and metaphorical re-building of morale of a population who had been subjected to extraordinary levels of disruption of normal life, restrictions on everything from food and clothing to travel, and of course the bombing in many cities (Hennessy 1993; Addison 1995). The study of death was not a priority.

In the late 1980s and early 1990s, the group of forensic specialists started to develop around the Department of Archaeological Sciences in the University of Bradford – John Hunter starting to focus on methods of locating concealed human remains, Rob Janaway developing his interest in decomposition of human remains and associated textiles and ferrous materials, and Charlotte Roberts working on the forensic anthropology side. At the same time, Sue Black had continued her long-established working relationship with forensic pathologist Peter Vanezis, moving from London to Glasgow during this period and continuing to develop her interest from anatomy to forensic anthropology. Others worked on the subject area, mainly in anatomy, such as Louise Scheuer, but the impetus for development seems to have been centred around Bradford's archaeologists and Glasgow's forensic medicine unit at this time.

It is not clear what drew these early practitioners into the field of forensic work. They were the spearhead of what has developed into a "growth industry". Taught Master's degrees in forensic anthropology now exist in a number of universities. Black has described this period of early forensic anthropology in the United Kingdom: "For many years, 'forensic anthropology' in the UK ambled along comfortably, offering assistance in an ad hoc manner, but rarely ever taking centre stage" (Black 2003, p.188). She identifies the late 1990s and early 2000s as the time in which this situation changed and makes the point that the sudden expansion into taught Master's courses came mainly from archaeology and not from anatomy or from medical schools.

In the late 1990s the term ‘forensic anthropology’ entered into common usage (and university syllabuses) in the UK partly from news reporting of the excavation of mass graves in the former Yugoslavia, and partly from its presence in American fictional forensic dramas both written and televised. The most famous fictional forensic anthropologist is ‘Tempe Brennan’, the character created by crime-novelist Kathy Reichs. Whilst much crime fiction is packed with basic errors of method, Reichs’ books are dependably accurate in method. ‘Kathy Reichs’ the novelist is, in fact, ‘K.J.Reichs’, editor of the 2nd edition of *Forensic Osteology*, one of the standard texts of forensic anthropology (Reichs 1998). The character is now the lead female in a highly-successful television series called ‘Bones’ with high viewing figures on both sides of the Atlantic.

The result of the news coverage of former Yugoslavian mass graves investigations coupled with Kathy Reichs’ publishing success throughout the 1990s has resulted in the British public being firmly aware of the term “forensic anthropologist”. There is a clear benefit to forensic anthropology in this wider acknowledgement of the term, even if the specifics are poorly portrayed and consequently poorly understood.

During the last couple of years of this period, police understanding of the role of forensic anthropology was raised by police involvement in the British Forensic Teams in Kosovo in 1999 and 2000. As with forensic archaeology, it opened the way for police in the United Kingdom to suggest a forensic anthropologist be brought in on certain cases.

One frustrating aspect of the Kosovo deployment has been that it left many police with the firm conviction that forensic anthropologists are only for buried remains or for completely skeletonised remains, not realising that they can also be of help with dismembered fresh bodies, burnt bodies and fresh bodies with blunt force trauma or ballistic trauma, and so on. If one limits forensic anthropology involvement to buried or fully-skeletonised remains, one reduces the number of cases significantly in the United Kingdom. This is simply because the United Kingdom is so densely-populated that few bodies become skeletonised. In North America, it is possible for a body to lie undiscovered for months or years until it becomes a skeleton, requiring forensic anthropology input; in the United Kingdom, most bodies are found within hours or days and are identified by more usual means, such as fingerprints or visual identification by relatives. Forensic analysis of DNA is perhaps more widely-used in the United Kingdom than in any other country, and is often the first line of approach for identification, even before forensic odontology in some cases. This is despite the fact that other methods are faster, cheaper and easier. Forensic odontology and forensic anthropology can provide confirmation of a suspected identity, or draw up a 'biological profile' for a body with no suspected identity, within hours, compared to DNA analysis, which takes longer, costs more and is dependent on there being a 'match' available.

In the last decade, a number of postgraduate courses have arisen across the UK in Forensic Anthropology, offering training in the interpretation of skeletal human remains. Across the mainland of Europe, there are no training schemes but a large number of forensic pathologists have made the effort to acquire these skills and have

organised themselves into the Forensic Anthropology Society of Europe (FASE) which is a sub-section of the International Academy of Legal Medicine (IALM), in much the same way as the Forensic Anthropology Board is a sub-section of the American Academy of Forensic Sciences.

2.4 My own experiences and contributions to the development of forensic archaeology and forensic anthropology in the United Kingdom

The development of both forensic archaeology and forensic anthropology is of personal interest to me, because I was involved in the adoption of both disciplines in the United Kingdom.

2.4.1 The background to forensic work in former Yugoslavia

In Europe the impetus for greater recognition of forensic archaeology and forensic anthropology was provided in the early 1990s by the violent break-up of Yugoslavia. A country with much internecine strife over many centuries, the population had been artificially welded together for some decades during the middle of the 20th century by the dictator Tito (Stover and Claude 1996; Glenny 1999). When he died, it took less than a decade to fracture the apparent unity of 'Yugoslavia' in a bloody civil war which shocked and bewildered many of the watching Europeans in peaceful countries which suddenly felt far too near to the Balkan bloodbaths.

At the request of the United Nations, the American organisation Physicians for Human Rights (PHR) sent a small team to Yugoslavia during the conflict to carry out preliminary forensic work and to assess future forensic work possibilities. Eight

missions were carried out by PHR up to and including 1996 (Stover and Claude 1996). Subsequently a larger team carried out the most complex work yet attempted, from 1996 onwards, whilst other PHR teams performed similar work in Rwanda (Stover and Ryan 2001).

An active member of PHR involved in both sets of investigations was Bill Haglund. Stover and Claude's report for PHR and Haglund's own writings provide a major source for the work in Europe: "Excavations conducted in 1996 by PHR under the auspices of the International Tribunals for both Rwanda and the former Yugoslavia were unprecedented in terms of the size of the excavations and complexity of logistics. The nearly 1200 exhumations were conducted at multiple graves containing from 1 to over 450 individuals. Investigations were conducted on two continents and within four separate political entities" (Haglund 2001).

Haglund (ibid.) emphasises the role of archaeologists and physical anthropologists as members of the multi-disciplinary teams. More than a decade after the 1983 Florida handbook with its emphasis on the importance of archaeological approaches being adapted and modified specifically for forensic work (Morse, Duncan et al. 1983), Haglund does not use the terms 'forensic archaeology' or 'forensic anthropologist' in his writing. He designates pathologists and dentists as 'forensic', yet the archaeologists and physical anthropologists retain their non-forensic designations. One of the "three professional archaeologists" referred to by Haglund, below, was the present author (see Section 2.4.2): "Among the experts utilised were forensic pathologists, radiologists, forensic dentists, physical anthropologists, archaeologists,

logisticians, evidence technicians, photographers, and data entry and autopsy support staff. Three professional archaeologists were utilised and many of the physical anthropologists had varying archaeological skills" (Haglund, Connor et al. 2001).

The 1996 exhumations in the former Yugoslavia and Rwanda may have been carried out by one small organisation, PHR, but were radically different from each other. In the former Yugoslavia, the majority of graves contained dozens of people who had been killed as unarmed civilians by groups of heavily armed military or paramilitary individuals with government sanction (although of course, given the multiple sides in the civil war, the concept of government sanction is open to debate). In Rwanda, some graves contained a few but many contained hundreds of people who were killed as armed or unarmed civilians, sometimes by paramilitary groups but often by their civilian neighbours. In the former Yugoslavia nearly all the victims were male and over the age of 16 or so; nearly all the victims had gunshot wounds listed as the cause of death. In Rwanda, some of the victims were adult male but many of them were adult female and a large proportion were children, including infants; some of the victims were killed by gunshot wounds, but the majority were killed by sharp force trauma (machetes, bayonets and knives) or blunt force trauma (baseball bats, pieces of wood, anything which came to hand, or indeed the hand or foot itself in the form of beatings) (Haglund, Connor et al. 2001). To interpret all of the events leading up to death, at the time of death, at the time of deposition and subsequently, it can be seen, requires a great deal of skill, caution and experience. If the excavation is carried out badly, then evidence will almost certainly be lost.

The demands on the archaeologists working with PHR were enormous. No project on this scale had ever been attempted before 1996 and suddenly two projects of this magnitude were being attempted by the same organisation in one year. By 1997, the United Nations had organised itself to employ staff designated as full-time 'forensic archaeologists' and 'forensic anthropologists', as PHR simply could not spare the personnel to be involved in such an enormous long-term project.

2.4.2 My own involvement

I originally trained as a field archaeologist, a digger first and foremost, only later specialising in the assessment of human skeletal remains in archaeology. Coming from a family of social scientists, I had always felt that archaeology was enjoyable but of no great service to humanity. For this reason, when I heard one night on the BBC World Service radio that archaeologists were working in former Yugoslavia to locate and excavate mass graves from the recent civil conflict, I wanted to go and be of use. That was in December 1995, at a time when the terms 'forensic archaeologist' or 'forensic anthropologist' were unknown in Britain, apart from perhaps a tiny handful of practitioners such as Prof. Sue Black and Prof. Louise Scheuer.

In April 1996, I sent about ten letters enclosing a short note and my CV. In July 1996, I had a phone-call from Physicians for Human Rights, the Seattle-based organisation, asking if I would come and work with them in Bosnia. Within a week I flew out to Zagreb and joined the team, driving down through Croatia to the area around Tuzla in Bosnia. I spent two weeks working at the makeshift mortuary in Kaliseja, two weeks excavating mass graves at Lazete, and another two weeks back

at Kaliseja. I was the only European in the team and, so far as I can determine, I was the first British person to assist in the investigation of mass graves in a forensic context since Dr Keith Mant who, in the late 1940s, excavated the mass graves of the Nazi death-camps. His work was of great help to me, and I recognised many of the factors he wrote about which I had been told were incorrect – for example, that it is possible to have both mummification and adipocere formation in a single body.

On my return to Britain, I completed my Master's degree in Osteology, Palaeopathology and Funerary Archaeology and in 1997 returned to my home city of Edinburgh. By chance I met a dental pathologist, with a forensic odontology background, and I became involved in a facial reconstruction project, on Robert the Bruce. Through this, unknown to me, my CV was passed to Dr Howard Moody, then and for many years, the forensic odontologist for the Edinburgh region. He wrote inviting me to speak to the MSc Forensic Medicine and Science course, which was then run as a two-yearly part-time course by the Forensic Medicine Unit of the University of Edinburgh. I took the opportunity to apply for a Small Projects Grant through the university at the end of 1997 and became loosely attached to the FMU. Between 1997 and 2009, I continued to be loosely and informally attached to the FMU through a series of small research grants, a little teaching and some casework. I believe I was, for most of that time, one of only three people working in either forensic archaeology or forensic anthropology to be based within a forensic medicine unit in Britain, the other two being Martin Evison in Sheffield and Sue Black in Glasgow.

In 1999, Sue Black contacted me, having met me at the inaugural Bahid meeting that year, and asked me to join the British Forensic Team in Kosovo – I spent three weeks there in August 1999, partly in the mortuary but mainly in the field. There was a little friction about this afterwards, as it was felt by the organisers that the role of forensic anthropologist was in the mortuary assisting with post-mortem work, whereas it was clear to me on the ground that I was more useful in the field assisting with excavation. I believe I may have been the only forensic anthropologist with extensive archaeological training and experience involved in the 1999 work. This may be why I felt I was far more useful assisting with excavation and retrieval, and leaving the mortuary work more to the (highly competent) forensic pathologist, who was more than capable of it. He and I discussed cases most evenings – he was able to do my forensic anthropology work, whereas the police were not able to do my forensic archaeology work. I am not sure all forensic anthropologists at the time understood the complexities (or value) of forensic archaeological skills and experience.

An example will show why I felt forensic archaeologists should be involved. At one site, the information was that 5 or 6 bodies had been buried at the edge of a village cemetery, disguised as legitimate burials. When we started to excavate, nothing was found. All previous burials had been less than one metre below the surface and so when we had dug down 1.5m, the site supervisor called a halt and said we would close down the site as the information must have been wrong. I asked for, and was granted, permission to double-check by a standard archaeological technique known

as “cleaning up the section”, i.e. using a hand trowel to make smooth the vertical wall of the trench in order to examine the structure of the buried ground. When I did this, I could see no stratification – the soil was the same from bottom to top, with no roughly-horizontal variation such as is usually seen in naturally-deposited soil. This suggested it had been disturbed at some point and replaced in a single mixed-up deposition. That could be explained by the site’s previous use as a cemetery, but in addition there were identifiable autumn leaves and parts of cardboard cigarette packets, indicating that this was a recent disturbance. Unwillingly, the supervisor gave further permission for me to continue digging while they cleared up ready to depart and so I continued excavating. At almost two metres I found signs of a burial and shortly afterwards uncovered a blanket-wrapped body in advanced adipocere preservation. The site was declared open still and over the next days we excavated and retrieved six bodies of adult males, two of whom were eventually identified by name. Those bodies would not have been discovered without the simple archaeological technique of cleaning up the section and the archaeological training and experience to understand what the section showed.

Also in 1999, I saw a news item about British soldiers from 1918 buried in the north of Russia. That site could not be excavated because of subsequent building work, but it gave me the idea to contact the British Army, specifically the Casualty and Compassionate Unit which deals with the retrieval and repatriation of dead service personnel from current and past conflicts. After initial telephone and postal discussions, I travelled to London to talk further – they had no idea that a skeleton could yield information such as age or height, let alone any of the other information.

As a result of these talks, they commissioned me in September 1999 to travel to the Somme region of France, where I examined 8 sets of remains. Five had suspected identifications (from records kept at the time of the battle in 1916-8, and from effects found with the remains such as remnants of uniform indicating rank). I was able to confirm four of these as probable and was able to rule out a fifth, thus preventing someone being buried under the wrong name. This fifth individual, along with the three unidentified, were buried as 'Unknown Soldier, Known Unto God' as is usual, but physical descriptions were placed on file for any future possible identification.

From 1999, one of the four forensic pathologists in Edinburgh started to take me out on casework, and gradually the police started to realise I could be of use and began calling me in on their own. At the same time, the other forensic pathologists also started to call me in if a post-mortem might be of interest to me, and gradually I was able to convince police, Fiscals and pathologists that my presence and input could be of use in investigations.

In 2000, my first involvement in a UK forensic investigation came with new information (subsequently shown to be false) on the whereabouts of long-term missing person Vicky Hamilton. Intelligence given to the police suggested an individual known to her had disposed of her remains in a deep narrow shaft dug somewhere near a particular small town in West Lothian. Visiting the probable location, combined with accessing the weather records for the period after her disappearance and consulting the works records of utilities companies, resulted in my being able to tell the police that my professional opinion was that this story was not

true. The weather had been abnormally cold, below freezing for a week before and after her disappearance. This made it very unlikely any individual could have hand-dug a shaft of the depth indicated, nor were there any open utilities trenches in the area at that time. Further, the ground in the area was very stony, making it unlikely that the deep shaft had ever been dug. Some years later, her remains were found many hundreds of miles away, and indeed the vertical shaft story had not been true.

In the same year, 2000, I was involved in the post-mortem of a murder victim, reconstructing the badly-fragmented cranium using acetone-reversible PVA adhesive over a period of several days. From my reconstruction, the forensic pathologist was able to ascertain not just the minimum number of blunt force trauma impacts but the probable order in which they occurred; also, of some relief to the family, he was able to conclude that, after the first blow from behind, the victim had not moved and that therefore it was probable he was unconscious from that first blow. In that case, I was precognosed and called, and eventually gave expert evidence to the trial. So far as could be ascertained, this was the first time a forensic anthropologist had given expert evidence in a criminal prosecution in Scots Law. The case ended in a conviction (*HMA v. Anderson 2000*).

In 2000, I designed and taught, with a colleague initially but later alone, a 10-session evening class for the university of Edinburgh's Open Studies department. This informal not-for-credit course is an Introduction To Forensic Medicine and Science and has consistently, for a decade, been amongst the most popular courses in Open Studies, with a high quality of feedback from students. The hope in setting up the

course was to try to bridge the gulf between the public and the idea of forensic practitioners as remote distant boffins. So far as I can ascertain, this course remains the sole example in Great Britain of a forensic practitioner doing 'outreach work' to the general public. I have also talked to schoolchildren in the Linnaean Schools programme, and to my own old state school's Modern Studies classes.

Between 2000 and 2010, I was involved in many cases – almost every forensic case around Edinburgh on which I might be useful, from searches and planning of searches, to non-suspicious deaths. An example was an elderly demented woman who had wandered away from home and whose remains were found on open ground some 8 months later with the classic half-undressed clothing signs indicative of hypothermia; there was extensive decomposition along with some adipocere formation. A more high-profile murder case was the second, Scottish, post-mortem of the dismembered remains of Vicky Hamilton when her body was finally found in Kent.

In 2006, I spent three months working in Montpellier in the Languedoc region of Southern France, in their Médecine Légale section. I assisted in many post-mortems, as well as submitting reports to the legal authorities in my own right on three cases involving badly-decomposed remains. I also assisted with training visiting forensic pathologists from several countries in basic forensic anthropology techniques for establishing the biological profile of unidentified remains (i.e. the age, sex, race and stature estimates), including one session in French for a French Canadian pathologist. This opportunity grew from my involvement in FASE (Forensic

Anthropology Society of Europe), at meetings and workshops of which I have generally found myself to be the only participant from the UK.

When I took part in the second post-mortem examination of Vicky Hamilton (the first having been carried out in England by a single forensic pathologist and so a second being required with corroboration under Scots Law), I had the great honour of being the corroboration[2] for the forensic odontological examination, Dr Moody being satisfied that my experience would stand up to examination in court if required, despite my lack of dental qualifications. He and I had worked together on many cases by that time. I also found it personally satisfying to be involved at the end of the long case, as this search had been, as mentioned above, my first British forensic work.

My last casework was observing at the post-mortem of a murder victim in October 2009. Following a review within the police and Crown Office department it was decided to place work with a nearby larger and consequently better resourced unit; this, combined with the change from a university-based forensic medicine unit to a unit entirely under NHS-contract, meant that a lone practitioner was no longer tenable in the Edinburgh region.

I made no further court appearances, although I was precognosed and called, on half-day stand-by for ten days, for the trial of Peter Tobin for the murder of Vicky Hamilton. Interestingly, the Tobin case is, so far as is known, the only time in Scots

[2] corroboration: in Scots Law, for much of the evidence in criminal trials a second expert or witness is required.

Law when a forensic anthropologist was retained by the defence, as well as one being employed by the Crown.

During my 13 years in practice, from 1996 to 2009, I was the first British person since the 1940s to undertake international forensic mass-graves work; the first forensic practitioner to examine the remains of service personnel from past conflicts for the MOD; the first forensic anthropologist to give expert evidence in Scots criminal proceedings; the only forensic anthropologist to be accepted as corroboration for a forensic odontological identification in a murder case. I have been the only regular attendee from the UK at FASE workshops as well as assisting in consultation for the proposed European guidelines. Finally, I am the only forensic practitioner in the UK actively communicating in person with the wider public community via public education.

2.5 Summary

Within the United Kingdom's domestic medico-legal structure, the last two decades have seen forensic archaeology and forensic anthropology becoming more and more widely accepted by the police, by forensic medicine and by the Courts. Forensic archaeology and forensic anthropology developed initially in the Americas, and especially in the United States – I wanted to know why the disciplines developed together in the Americas, but are so widely divergent in Great Britain.

There appears to be no published account for the dominance of the United States in forensic archaeology and forensic anthropology across the world throughout the

latter part of the 20th century. I suggest that this dominance is the result of three factors: the four-fold system of anthropology as taught in the USA, the establishment from the late 1940s of a number of government-funded laboratories enabling forensic anthropologists to work in groups to practise and research in forensic anthropology, and the early professionalisation of forensic anthropology in the early 1970s in the United States.

The American 'four-fold anthropology' established by Boas includes field archaeology and physical anthropology. Hence, both forensic archaeology and forensic anthropology are centred around one group of practitioners. This, coupled with US government investment in forensic anthropology for identification of war-dead in the mid-20th century, led to the professionalisation of forensic anthropology in the 1970s in the USA. In the 20th century in the United Kingdom, archaeology was more strongly linked to history, and developed into a discipline in its own right, without links to anthropology. In this country, forensic archaeology developed out of field archaeology, not from anthropology. Physical anthropology in the United Kingdom seems not to have existed at any meaningful level until quite late in the 20th century, and perhaps this is the reason why modern forensic anthropology practitioners in Britain come from so diverse a range of backgrounds from anatomy to archaeological osteology.

At present, forensic archaeology in Great Britain has an increasing presence in peer-review publication and appears to be increasingly utilised by police at crime scenes. The basic concept of the discipline appears to be well understood by the lay-person

(including police, coroners, fiscals, pathologists and so on) and this contributes to its wider use. The benefits of experienced excavation are known to a large number of police officers through the mass graves investigations in the former Yugoslavia a decade ago. However forensic anthropology in Great Britain has no strong links to any one subject; the practitioners are based, and post-graduate courses taught, in a variety of settings, including anatomy, archaeology and forensic sciences. This is because physical anthropology was not a major discipline in Britain prior to the emergence of forensic anthropology during the late 20th century.

These academic divisions of the 19th and 20th centuries have resulted in Great Britain having two disciplines of forensic archaeology and forensic anthropology, with varying links and overlaps between the two.

Chapter Three

Experts and Expertise

3.1 Introduction: why worry about experts?

This thesis examines the use and usefulness of forensic archaeologists and forensic anthropologists. When called in to work on an investigation, the outside specialist must be capable of two tasks: to carry out the required work, and to present the work, both to those commissioning the work and in court if necessary. This chapter looks at the reasons why police or legal authorities need to be assured of the specialist's competence in these two tasks, and examines the various means that have been, or are, in place to provide this assurance.

The forensic odontologist Gordon Macdonald, a man who appeared many times as an expert witness, disliked the term heartily. His definition of the word was that "*x* means an unknown quantity and a 'spurt' is a drip, under pressure" (Macdonald 1998).

It would appear that the more experienced a specialist is, the more likely they are to avoid using the word 'expert', preferring either a technical term such as odontologist, pathologist or neuropathologist; or a word such as specialist, which engenders fewer implications of omniscience. To be a specialist in a subject does not carry the connotation that one knows everything about it, whereas to be an expert in a subject has somehow acquired that meaning. Macdonald's joking definition is possibly closer to the truth than most self-described experts would like to think.

In the disciplines of forensic archaeology and forensic anthropology there are no nationally-recognised qualifications to designate the individual as being competent in their subject. Neither are there nationally-accepted methods for use in specific circumstances. Thus, both practitioner and practices are, to a certain extent, unknown quantities to those instructing their involvement in an investigation. With little or no training for court appearances, and few opportunities to build up experience in giving evidence, the practitioner may well find himself 'spurting forth under pressure'. More worryingly for the investigation, the practitioner may be incompetent, or unqualified, or fail to understand the requirements of expert witnesses to keep all notes and records for disclosure; they may even fail to understand the *sub judice* law and the need for them to not discuss the case. In some cases, they may become

traumatised by casework for which they are ill-prepared, and be unable to keep details to themselves. At worst, they can fail to understand the limitations of their role as expert witness and may give evidence leading to an initial conviction for murder which is subsequently quashed on the basis of that same expert (Appeal Court 2013).

3.2 Recent regulatory systems for forensic experts in the United Kingdom

In the past, an expert witness in a British criminal court could be pretty much anyone who was known in the field and carried the required reputation of authority, without any specific requirements to prove any of their expertise. In recent years, this situation has changed. In most fields, an expert must now meet certain specified criteria. The remaining unregulated experts' days are numbered, as all main forensic fields will be required to meet internationally-agreed standards over the coming few years (Office of the Forensic Science Regulator 2012).

In 1999, following a number of reviews (Hadley and Fereday 2007), the government established the Council for the Registration of Forensic Practitioners, more commonly known as CRFP, considering such a council necessary "to secure the confidence of the Courts and the public in the competence of forensic practitioners" (1.3, CRFP 2008). By the end of 2006, fifteen practitioners had become registered in the fields of forensic archaeology and forensic anthropology; by the end of 2008 the number on the register was down to fourteen – 5 in forensic archaeology and 9 in forensic anthropology[3].

[3] Numbers from author's own records, originally from CRFP website, now defunct

CRFP made a valiant claim to continue its role (CRFP 2008), but the lack of numbers of individuals accredited and a general perceived lack of success led to its official demise in March 2009. Despite widespread concerns that CRFP was closed down leaving no immediate successor, in fact the Forensic Science Regulator, Andrew Rennison had been appointed in February 2008 (Smith 2009).

Wide consultation amongst forensic practitioners of all kinds had shown that, although CRFP had established the principle of regulation in a hitherto-unregulated field, it was not fit for purpose. Concerns were raised about the newly-proposed Office of the Forensic Science Regulator's accreditation scheme with regard to individuals not employed full-time by a forensic provider (Office of the Forensic Science Regulator 2009). The initial regulation was of the most-frequently used forensic sciences, the laboratory-based work, and those employed full-time in forensic settings. The office of Forensic Science Regulator was established with the role of setting and maintaining standards in forensic science across England and Wales – but from the outset, the authorities in Scotland and Northern Ireland have been involved so, in effect, the Regulator has a remit covering the entire United Kingdom (Office of the Forensic Science Regulator 2009).

Over the last five years, the majority of forensic services and practitioners have been brought together under the Regulator's remit, and both forensic archaeology and forensic anthropology now have professional bodies. Forensic archaeology is now a specialism within the Institute for Archaeologists (IfA) and forensic anthropology

has a certification of competence scheme within the Royal Anthropological Institute (RAI).

Both the IfA and the RAI systems of regulation have been developed in consultation and agreement with the Office of the Forensic Science Regulator, although as yet there is no definition from the Regulator as to how verification of competency should work for individuals.

3.3 The current situation for forensic archaeology and forensic anthropology

3.3.1 Forensic archaeology and the IfA

The IfA has long been the professional body for archaeologists of all kinds in the United Kingdom, and it is logical to extend that to include the newly-emerged group of forensic archaeologists, many of whom would reasonably be expected to be members, at some level, of the IfA. Originally the Institute of Field Archaeologists, in recent years it has kept the initials and formal name, but become known as the Institute *for* Archaeologists, as its remit spread beyond solely field archaeologists. It will shortly change its structure to become the CIfA – Chartered Institute for Archaeologists – following the granting in February 2014 of a Royal Charter. General accreditation, at several levels, is through submission of two references and three pieces of casework; 50 hours of continuing professional development (CPD) is required for continued accreditation or upgrading from one level of accreditation to another. Joining fees are on a sliding scale, ranging from £228 for the highest level of 'Member' on a full salary, down to £20 for a 'Practitioner' on a reduced or nil income.

The ‘Standard and Guidance for forensic archaeologists’ (IfA 2013) makes it clear that there is no requirement to join the IfA – the Standard and Guidance document is specifically for forensic archaeologists, giving a national standard against which all practitioners of forensic archaeology can be compared, whether IfA members or not. It sets out, in clear detail and plain language, the behavior and competencies expected of anyone practicing forensic archaeology in the United Kingdom. First adopted by the IfA in 2011, it is not a static set of rules, having been updated as recently as November 2013. In addition, it is compliant with the requirements of a range of government bodies. Further, the Statement of Competence, which every applicant must submit, is based upon the National Occupational Standards (NOS) for archaeology, and upon the Competence Matrix specifically drawn up for forensic archaeology.

The decision to grant accreditation to an applicant is made by a Validation Committee of the IfA, who base their decision upon the references and casework submitted, and the Statement of Competence. This last is really a detailed requirement, as it is, in practical terms, a heavily annotated CV, listing every piece of work one has done, and what the skills were that one used or learnt, how each job related to previous ones; whether one was re-employed by an employer and how one has built upon previous work to progress in the discipline over the years, even decades.

Since the IfA is a membership organisation and not a statutory body, it is only able to

discipline those who are accredited by the organisation. A range of sanctions exist, from instructing an apology be made, to suspension from the IfA for 1-3 years, or expulsion altogether (IfA 2012).

Obviously, no repercussions exist for those who are not members. However the existence of the broadly-accepted Standard and Guidance, under the aegis of the professional body for archaeology as a whole, having been drawn up by widely-respected and highly experienced forensic archaeologists, means that there is something for professional conduct and skills to be held up against, compared to. In addition, accredited IfA members may apply to join the Forensic Archaeology Expert Panel, by meeting criteria laid out in the Competence Matrix; membership of the FAEP is recognised by the Office of the Forensic Science Regulator (IfA 2014).

The Standard and Guidance document is publicly available and assists in ensuring realistic expectations from employers, as well as making sure the employer demands the highest standards. The IfA Standard and Guidance have, in effect, created a system to set out very high standards, giving clarity to practitioners for what they should know, understand and be capable of performing; and giving clarity to employers as to what they should expect and demand from any forensic archaeologist they utilise. Membership of the IfA within the forensic archaeology specialism, if the individual chooses to join, is an indicator that the individual's work and career have been judged by their progress and career development over years as a reflection of their skills and abilities being above merely 'competent'.

3.3.2 Forensic anthropology and the RAI

The Royal Anthropological Institute of Great Britain and Ireland (RAI) has existed under that title for over a century, emerging from more than one older group. It covers all areas of anthropology, including biological anthropology, although until 2014 it had not been prominent in biological anthropology, and even less so in forensic anthropology. In April 2010, the establishment of a national association for forensic anthropologists was spearheaded by a group based in the University of Dundee. In 2014, this now exists as BAFA – the British Association for Forensic Anthropology – which, after much consultation, has set up the first competence certification in forensic anthropology in Britain, as part of the RAI.

The certification process has two aims: "a transparent, fit-for-purpose guide to end users on the required skill set of the forensic anthropologist and a career pathway for the forensic anthropology professionals of the future. The accreditation process and its development will be presented within the framework of appropriate scientific quality standards now being demanded by the Forensic Science Regulator and the criminal justice system in the United Kingdom" (Royal Anthropological Institute of Great Britain and Ireland 2014). At the time of writing, there are six accredited practitioners at the highest level, FAI: one from UCL Preston, one from a forensic provider in Preston, and four from the University of Dundee, with applications for the next round of examinations currently ongoing.

Membership of the RAI is a required criterion for application for the entry-level FAIII; fellowship is required for FAII and FAI. There are three levels, from the

highest FAI, to the entry-level FAIII. The examinations cost between £100 for FAIII and £500 for FAI. Those certified as competent at any of these three levels are required to undertake a certain level of CPD, which is of a varied and complex arrangement. CPD is divided into two groups of tasks, and the three levels must undertake certain amounts of each group over a 3-year period. There is a detailed Code of Practice, drawn up with full reference to the various government regulatory bodies; and a 'curriculum' for those studying to sit the written examination.

The RAI Certification of Competence has, in contrast to the IfA, set up a complex and hierarchical structure, with compulsory membership at considerable cost, and examination fees, which will clearly identify practitioners who meet the requirements devised by the Examination Board. Independent validation comes from one member of the Examination Board who is from the wider world of forensic science (i.e. outside forensic anthropology), acting in effect as an external examiner. This certification is truly peer-review: admittedly, it requires much documentation and provision of evidence and certificates of degrees and attendance, but for the intermediate and top levels, the certification is to confirm that the applicant both satisfies levels set by their colleagues, and is judged by their colleagues (plus one external person).

3.4 Discussion

3.4.1 The role of the expert witness

By definition, any forensic investigation may lead to a court case. 'Forensic' means involved with the legal system, involved with the courts. Not all situations which

may involve forensic archaeology or forensic anthropology will lead to the courts, but when a forensic investigation may lead to criminal prosecution, the investigating authorities rightly expect that any specialist involved will be competent to carry out the required work, competent to provide a written formal report and, if necessary, to give expert evidence in any subsequent criminal trial proceedings.

The definition of an expert is someone with expertise - yet that expertise can be defined by the action of experts, leading to circular definitions (OED 2009). Who is determining who is an expert and who has expertise – *quis custodiet ipsos custodies* – who is guarding the guards themselves? It may be asked why one should need to accredit expert witnesses. Surely these people, high in their professions, are expert by reason of their professional standing?

The tales of two individuals prosecuted in recent years in the United Kingdom make it plain that there is, and has been for a long time, good reason to check the expertise of an expert.

In early 2008, news emerged of the Crown Prosecution Service reviewing a very large number of criminal cases. An expert witness in the field of computer crime, who gave expert evidence in scores of cases over years, was charged with making a false written statement claiming he had a degree, and with perjury. He was sentenced on five convictions, four of making false written statements and one of perjury. The man had not only been on the police's own informal list of experts, but had lectured

at Bramshill, one of the national colleges for new police officers and for continuing professional development and training (BBC News 2008; Doward 2008).

In a 2007 case, an expert witness in the field of forensic science and psychology was given five years' imprisonment on twenty charges including perjury and perverting the course of justice; about 700 cases will now have to be re-assessed, going back 27 years (McVeigh 2007).Perhaps one reason why this man escaped suspicion for so long was that few people can have been aware that it was possible to buy a B.Sc. in Forensic Science, a Masters (with excellence) in Forensic Investigation and a Doctorate in Criminology by sending away for them by post. The 'expert', Gene Morrison, worked mainly in the area of forensic psychology. Writing in *The Guardian* newspaper (Wilson 2007), the (real) forensic psychologist David Wilson said that "my worry is that he'll be dismissed merely as an outrageous charlatan rather than someone who perfectly exemplifies a system that encourages personal opinion to masquerade as science and the "truth", with various hired guns prepared to be an expert on fingerprints, facial mapping, and imagery analysis one day, and dangerous driving, offender profiling - and dare I say it, child sexual abuse the next" (worryingly, "child sexual abuse" turned out to be highly relevant in this case, as in 2009 Morrison was detained indefinitely after convictions for sexual abuse and grooming of four children aged 8 to 14 years (BBC News 2009)).

It is clear, therefore, that it is possible for somebody with no qualifications or specific training at all to become widely known as an 'expert' on their own word. These individuals may be few and far between, but the judicial system has to find

ways to try to ensure the highest standards possible. As Wilson said, “At the end of the day it is not the experts who let our court system down, but the failure to subject what they are saying to the appropriate care and scrutiny” (*ibid.*). Mostly, the experts are honest and competent; but “mostly” is not good enough for a criminal court.

A government-issued directive on The Use of Experts (Legal Services Commission 2004) made it clear that accreditation of experts is an area of great importance, linking it directly to a number of miscarriage of justice cases “in which defective expert evidence was given”. This problem led to the establishment of the Council for the Registration of Forensic Practitioners (CRFP) discussed above in Section 3.32. The Use of Experts report clarifies on page 20 the role of the professional witness: “A professional witness gives evidence of fact (and not an expert opinion). Some professionals e.g. doctors are called upon to give evidence of fact in criminal proceedings because of the nature of their profession” (Legal Services Commission 2004).

The Crown Prosecution Service (CPS) defines the role of the expert witness thus: “36.3 The difference between an expert and other witnesses is that experts are the only witnesses allowed to give opinion evidence.” (CPS 2014).

Significantly this is the difference between professional witnesses and expert witnesses: that expert witnesses are the “only witnesses allowed to give opinion evidence”. All other witnesses must avoid giving opinions and submit evidence of fact: evidence only of what they witnessed or experienced directly (with certain

exceptions for admission of ‘hearsay evidence’ under tightly-controlled circumstances, for example where a person has died but gave a statement to a second party who then repeats it in court (Select Committee on Science and Technology 2005; Ministry of Justice 2010)).

In other words, by law every witness must give evidence only of what they *know* to be true, with the sole exception of the expert witness who may speak to what they *consider* to be true. This distinction clearly demonstrates the weight given in law to the status of the ‘expert’ – all other people, no matter how intelligent, well-educated, experienced or clever they may be, are permitted only to state facts or their own experiences. The expert, alone in this status, may give opinion, may extrapolate, may introduce evidence based on other casework, or on unpublished experimental work. As the CPS cautions, “For that reason, an expert witnesses' competence in their field of expertise may be in issue as well as their credibility. If an expert's credibility and/or competence is the subject of concern, that information should be considered for disclosure” (CPS 2014).

It is clear why it is so important that this solitary figure, this ‘incomparable witness’ as the forensic pathologist Spilsbury was described by the judge in the Crippen trial (Lee 2006), must be answerable in some way as to their competence. There is still a problem, a century after Crippen, with experts appearing to be ‘incomparable witnesses’. Black, in evidence to a House of Commons Select Committee, stated that there was “unquestionably a league table among expert witnesses” (Select Committee on Science and Technology 2005). The Association of Chief Police

Officers (ACPO) supported this statement, adding that "some experts are perceived to have more credibility and are more persuasive than others" (Select Committee on Science and Technology 2005).

It is recognised, in the Use of Experts report (Legal Services Commission 2004), that 'most experts' are not solely engaged in the provision of forensic services – their recognition and abilities and experience in their 'day job' may or may not be adequate for assessment of competence in forensic work. A Home Office registered forensic pathologist has a range of checks and balances to ensure competence but, as seen above, a computer expert may have none at all. He or she may (or may not) be a very good computer expert but that does not make them a competent forensic computer expert. If, for this reason, membership of a professional body is to serve as a guide to a practitioner's competence, that professional body must have standards and codes of practice which can be seen as ensuring a degree of competence in a way, and at a level, that can transfer to courtroom competence.

There are obvious reasons why expert witnesses should be expert in their field, whether called to court or giving written statements – specifically because they act as an extension of the judge's and jury's technical knowledge. A spokesman for the Expert Witness Society in 2005 described this as "an extension of the judge's know-how" (Heald 2005). Expert evidence therefore could mislead the judge into an incorrect direction to the jury, or mislead the jury into a verdict based on a misunderstanding of the expert evidence.

A further area of concern is the involvement of an expert witness who does not normally work on forensic material. This may include forensic archaeologists, who may work normally as field archaeologists, and forensic anthropologists, who may work normally as anatomists or as archaeological osteologists. Haglund recognises the need for mental preparations and the presence of a psychological burden in situations where one's prior experience with skeletons is replaced by remains with recognisable facial features and personal effects (Haglund 2001). There is no certainty that a forensic archaeologist or forensic anthropologist fully understands the requirements and responsibilities laid upon them by the laws of *sub judice* and the standards of confidentiality essential to an investigation. Information relating to the investigation and evidence must be contained within a tightly-controlled number of people, those directly involved in the investigation and gathering of evidence. After the crime scene or mortuary work is complete, the specialist may have no further contact with the investigation or with other forensic specialists, which can leave them feeling isolated and unsure how to process the experience. It is asking a great deal of anyone to spend hours working closely with the body of a murdered individual and then to go home and speak of it to nobody under any circumstances for perhaps months or years until the trial is over – and of course if nobody is charged, then that information must remain unspoken forever.

If the specialist is based within either a forensic unit or the police system, then they are far more familiar with all kinds of cases and the emotional drain or impact is therefore reduced. To become blunted and inured to murder is usually viewed as a negative effect, but in practice it is not so much that one becomes blunted and inured

as that the shock and horror value is lessened and the situation becomes normalised. Frankl was a psychologist who survived years in several Nazi concentration camps. His subsequent writings referred to an abnormal response to abnormal events being normal; it can be argued that working routinely within a field like the medico-legal system, at the locus or at the mortuary, can alter the abnormal to normal, thus reducing or removing the traumatic impact of an experience (Frankl 2004). There may still be cases which an individual will experience as traumatic, but with experience and with support in the working environment from colleagues and team-members, the acts involved in excavating and handling the dead body of a murder victim become routine and thereby less traumatic. Frankl's theory suggests that trauma no longer develops when the abnormal becomes normal – the 'normal response' to encountering a dead body becomes abnormal and, for forensic workers, the normal response will be to be undisturbed psychologically by encountering sudden or violent death, which is an 'abnormal response' for mainstream society.

This is important because it enables the specialist to stay silent on the topic until after the trial, if any, has passed. The specialist who spends the days and weeks after the forensic work becoming increasingly upset by the experience is a danger to the investigation as they are more likely to confide in a friend, colleague or relative who may in turn confide in another and, thus, sensitive information becomes known in the community. This may affect the investigation and potentially the court case. Because it is assumed by police that a specialist who has previously worked in forensic contexts will understand the need for total confidentiality about the case, it is less likely that they will specifically ask the specialist to remain silent about their

experiences. In fact, this author has never had this requirement asked of her, either by police or by other forensic specialists, despite having worked on dozens of forensic cases in Great Britain for a decade.

As well as maintaining the silence enjoined by the *sub judice* laws, there are other duties within the role of the expert witness (Ministry of Justice 2010; CPS 2014; CPS 2014). These duties are embodied in the *Guidance Booklet for Experts* produced by the Crown Prosecution Service (CPS 2014), applicable to England and Wales. It sets out the obligations of the expert very clearly, but applies only to the area of disclosure of evidence. It explains, in clear language, the importance of the expert's correct retention, recording and revealing of their work. Notes, sketches, jottings, all must be retained – "you should retain everything, including physical, written and electronically captured material until otherwise instructed". It does not mention what the situation is for experts working across jurisdictions, but in a 2007 case in which I was precognosed as an Expert Witness, involving both English and Scottish police force districts, no mention was made of this booklet. It appears that little or no guidance or preparation is given to expert witnesses who do not normally work within the forensic sphere, a point made by the Select Committee's report on forensic evidence (Select Committee on Science and Technology 2005). They recommended that the "training of expert witnesses in the general principles of presentation of evidence to courts and the legal process is essential. For independent forensic practitioners and those who would not otherwise receive such training, the Department for Constitutional Affairs should make funding available to ensure that they do have access to this training in advance of their appearance in court."

In 2002, Bromby described the role and responsibilities of the Expert Witness in the United Kingdom (Bromby 2002). He states that "the ability [in law] of an expert witness to express an opinion as well as to testify to facts distinguishes the expert from the ordinary witness". In 2000 the key points in the role of Expert Witnesses were revised by Judge Toulmin, and Bromby quotes point 2: that "the expert's opinion should normally be confined to technical matters on which the Court will be assisted by receiving an explanation, or to evidence of common professional practice" (*ibid.*). Chapter Four of this thesis suggests that "common professional practice" is, according to the only survey known to the author, non-existent in forensic anthropology (Martinson 2003). In forensic archaeology, even a basic survey, like Martinson's, appears not to be available. A survey of preferred methods and practice of all practising forensic archaeologists and forensic anthropologists in the United Kingdom would be of great benefit to both disciplines. This would be problematic to carry out, however, due to the difficulty in identifying the number and whereabouts of practitioners; that difficulty in itself is an indication of how haphazard the current situation is. In consultation for new Home Office regulation in 2009, the initial email sent out by one eminent forensic anthropologist had to include a request for it to be forwarded on to anyone practising in the UK who was not already included in the email addresses. The practitioners themselves do not know how many they are.

Not only is it not known how many practising forensic archaeologists and forensic anthropologists are prepared to give expert evidence, it is not even clear how many

have previously done so. Much of the evidence appears to be 'accepted statements', which are not questioned by either prosecution or defence and so the practitioner never goes to court and never gives their expert evidence in a courtroom. The admissibility of the evidence is never questioned when the evidence is accepted in this way.

In Great Britain's judicial systems, the responsibility for determining whether or not evidence is admissible in court lies with the judge (Ministry of Justice 2010). How that decision is made, and by what factors it is influenced, appears less certain.

3.4.2 Cross-examination and 'accepted' statements

Bromby asserts that an expert who fails to comply with his responsibilities will undoubtedly be uncovered during cross-examination and that effective cross-examination provides an effective check on accuracy and impartiality – this might be so, but it does depend on there being any cross-examination (Bromby 2002). As far as the current author has been able to ascertain, there have been very few cases in the British criminal courts in which either a forensic archaeologist or forensic anthropologist has appeared in court. Further, some of those appearances have involved no cross-examination whatsoever. A recent case (*HMA v Tobin*, 2008) is thought to be the first case in Scottish legal history in which the Defence retained a forensic anthropologist, and probably the first case in British legal history. Neither

Crown nor Defence expert was required to attend court and therefore neither underwent even examination in chief, let alone cross-examination[4].

Hunter and Cox make the point that archaeological evidence has been used in verdicts in several murder cases in this country and that this is "a fact which itself lays non-archaeological victim recovery open to more exacting cross-examination" (Hunter and Cox 2005, p.5). This is an area of the courts' use of experts which has not, to the author's knowledge, yet been exploited. When cross-examining Prosecution witnesses about the location, excavation and retrieval of concealed human remains in a case of murder, it is possible for the Defence to attack the means of excavation and retrieval. This arguably does need to happen, in order to bring into serious question any "amateur" excavations still undertaken by police. It is, of course, quite possible for a police force to excavate and retrieve concealed human remains competently, without bringing in a forensic archaeologist.

Some forces have officers or other staff who are themselves trained, qualified and experienced field archaeologists, or who have undergone specialist training on a short intensive course. Other officers will have had direct experience and practical training in one of the several countries where police officers from the United Kingdom have been posted as part of the response to either mass graves or a mass disaster. In addition, some forensic pathologists have extensive experience as well. By contrast, it is unacceptable for a forensic excavation to be carried out by a team in

[4] this author's own casework included precognition for the Crown in *HMA v. Tobin* 2008, but after 10 days on standby, it was decided not to call the forensic anthropology evidence.

which nobody has training, skills and experience. If a police force has competence to conduct its own forensic excavations then it has no need to employ an outside specialist, but if it does not have this competence then it should consider carefully how its procedures may be criticised in court: “Case experience [by the police] has now developed a clear line of thinking that is slowly being adopted: namely, that successful conviction can depend on effective archaeological recovery, and that proper recovery in its turn can depend on prudent and considered searching.” (Hunter and Cox, 2005, p.5)

If the integrity, ability and competence of the expert is to be maintained and assured by the system of cross-examination, then where does that leave forensic archaeology and forensic anthropology? If the expert does not appear in court, but their report is simply accepted as valid evidence by both sides, then where is the assurance of competence?

There is no nationally-accepted qualification that can be relied upon to denote competence in the forensic archaeologist or forensic anthropologist; lawyers may or may not have attended lectures on forensic science but, given that any criminal lawyer must have left undergraduate days behind them more than ten years earlier, these classes are unlikely to have included forensic archaeology or forensic anthropology as they have only attained academic popularity in relatively recent times. It may then be difficult for a lawyer to assess the validity of a written report from a discipline of which they can surely know little in practice. The judges and lawyers are expected to educate themselves in forensic evidence. All members of the

Bar are required to undertake Continuing Professional Development, at a minimum of 12 hours a year (Select Committee on Science and Technology 2005).

Perhaps a lack of confidence in their understanding of forensic evidence of this nature explains why the legal profession rarely applies cross-examination, the 'fail-safe' of the British expert witness system, to expert evidence, or expert witnesses, in forensic archaeology or forensic anthropology. With regard to an expert witness being produced by only one party in court, Good makes the point that the obligation on experts to observe proper professional standards is greatest when no expert evidence is being introduced by the Prosecution – in his field of political asylum matters, this is generally the case (Good 2004). One may safely assume that this obligation in the case of one-sided 'solo' expert evidence is just as great when the 'solo' expert evidence is on the Prosecution side and none introduced by the Defence.

3.4.3 The Disparate Origins of Experts

Good also makes clear the fact, established by research, that different professions are trained in different styles of thinking. This particularly applies to lawyers and medical experts, as well as to his own profession of social science (Good 2004). This is perhaps worth considering because the specialists in forensic archaeology and forensic anthropology come from a range of backgrounds. There is no recognised path of training or qualification by which one becomes a forensic archaeologist or forensic anthropologist, as there is for other forensic specialists such as forensic pathologists.

In the United Kingdom, as discussed in Chapter Two, one may study archaeology at undergraduate level as a Bachelor of Arts or a Bachelor of Science, resulting in very different mind-sets. Regardless of designation, the result ought to be a good habit of questioning what is fact and what is interpretation, as this is part of the fundamental ethos of archaeology: one observes and then one interprets, never the two together. Obviously, this way of thinking is also the basis of good investigation in criminal cases: one develops the theory from the evidence. A good archaeologist has many of the required attributes of a good forensic practitioner. Another aspect of good archaeological training is the record-keeping – archaeological sites are often re-interpreted many years after the excavation, in the light of new knowledge, understanding or techniques, and so a good archaeologist records their excavation knowing that their notes may be needed decades hence. Again, this is good training for working in forensic archaeology.

Forensic anthropologists may come from a range of arts or science backgrounds. They may have either an arts or a science degree in undergraduate archaeology; or perhaps a Master's degree (commonly a Master of Science) in physical anthropology or in forensic anthropology – in which case they may have a thoroughly scientific mindset of Hypothesis leading to Experiment leading to Conclusion, or they may have an Arts mindset which may tend to see the wider picture with the clarity of an over-view. Some come from an anatomy background, trained specifically to notice and differentiate the normal and abnormal.

The ‘worst-case scenario’ is that an unaccredited specialist, with no specialised training and limited experience, may have a mindset that manages to miss all of the positive aspects suggested above – the result would be the bad medic’s tendency to stick to tradition regardless of quality, the bad arts scholar’s inability to see the wood for the trees, and the bad science scholar’s inflexibility in ignoring alternative explanations for the data.

It has proved impossible to uncover how many forensic archaeologists or forensic anthropologists are practising in this country at present. One way to achieve this might be to look at those teaching and being taught the subjects, but this is in itself lacks clarity. The Forensic Science Society, the professional body recently granted Chartered status, has an accreditation system for university courses, and it lists only one university’s MSc degree in forensic archaeology and forensic anthropology (Forensic Science Society 2014). The Prospects website (which describes itself as ‘the UK’s official graduate careers website’) lists a further two MSc courses in Forensic Archaeology and a total of seven MSc courses in Forensic Anthropology, across six universities. A seventh university is currently advertising for lecturers for a new MSc in Forensic Anthropology starting in autumn 2014. With the exception already noted, none of these courses is accredited by the Forensic Science Society. This means a number of individuals each year are graduating from these courses, some of which have run for a decade or more, although others are in their first few years. By now, hundreds of individuals will hold a Master’s degree in one of the two disciplines from a UK university. Many of these students may, of course, come from, and return to work, outside the United Kingdom.

It seems inescapable that there is a discrepancy between the numbers training and the numbers practising. Prof. Sue Black has summed up what the situation was until recently: "for many years, 'forensic anthropology' in the UK ambled along comfortably, offering assistance in an ad hoc manner, but rarely taking centre stage. The relatively low crime rate within the UK ensured that their services were required only on a sporadic basis and the demand for courses and teachers in this subject kept apace with this requirement and were restricted in number." (Black 2003). After explaining the burst of increased use and media attention from international forensic anthropological work in mass disasters and human rights work, she then goes on to summarise the resulting situation: "probably in an attempt to capitalise on this global exposure, many UK universities were quick to realise the potential attraction of this subject […] this drive for expansion did not come from the medical schools or the anatomy departments but principally from archaeology departments. These courses proved extremely popular and in a very short space of time a plethora of students were released onto the employment market looking to practise their newly-acquired knowledge and skills. […] A classic situation of inverse imbalance of supply and demand has arisen within the discipline […] it is potentially disastrous for the judicial system when those who are less reluctant to admit to lack of experience choose to offer their services when they are clearly ill-equipped to practise with credibility". (Black 2003)

John Hunter is Professor of Ancient History and Archaeology at the University of Birmingham and is generally regarded as the foremost forensic archaeologist in the

country. In recent years, he published *Forensic archaeology: advances in theory and practice* (Hunter and Cox 2005), co-edited with Margaret Cox, who held the Chair of Forensic Archaeology and Anthropology at Bournemouth University at the time, moved thence to a Chair at Cranfield, and has now retired from academia. This book has been desperately needed, as the last major publication on forensic archaeology in the United Kingdom was the 1996 *Studies in Crime: an introduction to Forensic Archaeology* (Hunter 1996) by Hunter, co-authored with Roberts and Martin. Roberts was the first forensic archaeologist to give evidence in a murder trial in this country (the Stephen Jennings case in the 1980s) but has long since left forensic work and is based in the University of Durham's (non-forensic) Anthropology department. Martin was a consulting archaeologist for a firm of engineers at the time of writing the book, but appears to have had no further public or publishing involvement in forensic archaeology since.

Hunter and Cox's book is not simply yet another "coffee-table" style guide, but an informative text of practical use. This is largely because it includes 29 case-studies, which is, to this author's knowledge, the first time such data has been gathered together and published for the United Kingdom. Of the 9 contributors to the book, 7 do not appear to work within the United Kingdom; only Hunter and Cox appear to be involved in the case-studies given. The police forces thanked for permission to use material are wide-ranging: Durham, Greater Manchester, Gwent, Hertfordshire, Leicestershire, the Metropolitan, Nottinghamshire, Northern Ireland, the Falkland Islands, West Mercia, West Midlands, West Yorkshire and Wiltshire. It is interesting that none of the Scottish police forces are listed despite, from word of mouth and

anecdote, having used forensic archaeology from more than one practitioner on many cases, including the current author.

Hunter and Cox are scathing in the Introduction about the media's and, by extension, the public's misunderstanding of the word 'forensic' as somehow glamorous, and the 'knock-on' effects of this into university courses, a problem acknowledged by the government's investigations into the current state of forensic science (Select Committee on Science and Technology 2005). Hunter and Cox list only 3 universities which include forensic archaeology in courses – not as a vocational post-graduate training MSc but as part of the undergraduate courses: "These are modules which provide awareness, intellectual breadth and technical understanding, as opposed to vocational opportunity. Such modules are popular, but students learn quickly the fictitious nature of TV drama and the artificiality of sedate village murders in the Home Counties. Instead, the reality is with social sub-cultures – prostitution, drugs dealing and paedophilia – contexts in which the value of human life has little meaning, where torture, abuse and corruption are standard, and where sexual depravity and perversion are high-profile." (Hunter and Cox, 2005, pp. 3-4)

Hunter and Cox make very clear that forensic archaeology is not 'just' the practice of classic field archaeology with a police officer standing beside the archaeologist, but a discipline in its own right with different requirements, often a different speed of work, and with different questions being asked. It is clear that police need some way of knowing which archaeologists are capable of this work. Accreditation of some kind is as important in forensic archaeology as it is in forensic anthropology.

With no nationally-accepted training in either discipline, there is no certainty that any individual forensic archaeologist or anthropologist will necessarily understand their responsibility with regard to expert evidence. Much of this responsibility, one would hope, is common sense to an intelligent and educated person, but the importance of confining opinions to specified areas may not be fully understood. Especially in the witness-box, lawyers may try to lead the Expert Witness outside their area of expertise to give opinions on other aspects of the case or the findings. In a situation which is one of duress (close questioning for an indefinite length of time, by one or more lawyers, under public scrutiny, in an unfamiliar and often intimidating setting), this may end in disaster for the practitioner and of course for the trial. It should be the responsibility of the judge and the lawyers for each side to ensure that expert witnesses are not led, but this does not always happen. Professor Sir Alec Jeffreys has stated that the flaws in the expert forensic pathology evidence implicated in two specific cases should have been identified at the time, and has described it as "a failure not only of the experts but also of the courts" (Select Committee on Science and Technology 2005). The forensic pathologist, Bernard Spilsbury, was so renowned that the public (and therefore juries) regarded him as not only an incomparable witness but an infallible witness (Browne and Tullett 1952). Black has identified this situation as continuing to happen today, where one expert is regarded as so eminent that undue trust is placed in everything that expert says, to the potential detriment of the trial's fairness (Select Committee on Science and Technology 2005).

In the 1990s, the practitioners of forensic anthropology in mainland Europe (mainly forensic pathologists who have taken the trouble to be trained in forensic anthropology) set up the first sub-section of the International Academy of Legal Medicine – FASE, the Forensic Anthropology Society of Europe. The author is seemingly the only practitioner from the UK to have attended the meetings in Europe. The current President of FASE, Prof. Cunha of Coimbra University in Portugal attended both Bahid and BABAO conferences in Britain in 2008 in order to encourage involvement, but to no avail. An improvement came in autumn 2008 when the annual meeting was held in the UK, with a strong presence, for part of one day only, from one of the leading centres of forensic anthropology, Dundee. No British-based practitioners attended from outside Scotland. It seems some communication happens at American conferences, as the FASE website refers to discussions at AAFS meetings with forensic anthropologists from Dundee.

In 2014, FASE announced the launch of their International Accreditation system for forensic anthropology (FASE 2014). This has taken many years to develop, because it is designed to be valid across the legal jurisdictions of all 27 member states of the European Union. This obviously includes the United Kingdom but the British forensic anthropology community has chosen to develop their own UK-specific system of certification. The FASE system is in full accord with the findings of the European Union's work on accreditation and the importance of Europe-wide standards (Council of the European Union 2011).

The FASE accreditation involves a range of assessment, from references to oral examination – but because it is Europe-wide, it brings in a wider range of approaches as the assessors are individuals with a fully-international background and experience. The obvious advantage of FASE's broad-based international approach with larger numbers of adjudication Committee members across many countries, is that there is perhaps less scope for what Black described to a government Select Committee as "a vested interest" in accepting candidates: "[Black] highlighted the limitations of the CRFP register for a small specialist community such as hers. She pointed out that the members of this community were all responsible for accrediting each other and that they had a vested interest in increasing the number of people in their field with CRFP registration since this would eventually bring more people into the discipline" (Select Committee on Science and Technology 2005).

3.5 Summary

In any forensic investigation, the specialists involved must be expert in their role. The decision to use, or not use, specialists from outside the traditional medico-legal system, such as forensic archaeologists or forensic anthropologists, is not straightforward.

The end-point of any forensic investigation is potentially the courtroom, and any expert must be prepared, and competent, to give expert evidence in court. The important point is that only expert witnesses may give evidence based on opinion and not solely on fact. Court appearances are rare for forensic archaeologists and forensic anthropologists, perhaps because lawyers are not fully aware of the variation

in background, training or experience that is found across these disciplines. Without a good understanding of how the disciplines work, the lawyers of both parties accept the written report of the specialist, or if the specialist is called to court as an expert witness, there may be no cross-examination. Without a good understanding of the legal requirements, the specialist may unknowingly infringe *sub judice* laws or may give evidence outside their field of expertise, or state as absolute fact something which is only opinion, thus misleading the judge and jury. Lack of awareness of the legally-specified duties of forensic experts may mean records are not correctly kept or stored.

The need for some level of registration of specialists is shown by the ongoing debate over admissibility of evidence in general from expert witnesses. It may reasonably be expected that both forensic archaeology and forensic anthropology expert evidence come into this debate over the next few years, especially as this expert evidence has featured in recent Appeal Court judgements (Appeal Court 2013).

There is considerable variation in the training and background of forensic archaeologists and forensic anthropologists across the United Kingdom. This is in part due to the ways in which the two disciplines have developed in the UK, as compared with the USA where all comes under Anthropology. Here we may have geographers, physicists or archaeologists working in forensic archaeology and anatomists, archaeologists or doctors working in forensic anthropology. It has not been possible even to identify the numbers of practitioners currently carrying out casework in this country, let alone the range of training or qualifications involved.

Large numbers of post-graduate training courses add to the numbers annually but with no standardisation of teaching content.

One way to have a degree of quality assurance is to develop professional bodies, with guidelines on behaviour, standards to be kept, a Code of Practice, and a means of sanction if these are not followed. Efforts have been made in the last decade to regulate the less common forensic specialisms, notably by means of the Council for Registration of Forensic Practitioners, but have not been a success. The new Office of the Forensic Regulator is developing guidelines and standards in a methodical and systematic way which, it is hoped, will reduce the likelihood of incompetent training or practice in those specialists utilised by the medico-legal system. An internationally-accepted system has been launched, designed to be legally accepted across all 27 EU member states, but it is not clear why this is not being used by forensic anthropologists in the UK.

These issues of training, qualification, accreditation and registration are directly relevant to those two tasks specified at the beginning of this chapter. The forensic archaeologist or forensic anthropologist must be a) competent to carry out the work and b) competent to report on the work. These two tasks embody the question of 'experts and expertise' in this chapter's title and must be addressed by the courts before they accept evidence from an 'expert' – and if the courts cannot address those two tasks, then cross-examination must be employed to examine the evidence in detail.

Chapter Four will consider to what extent the methods and techniques commonly used in forensic archaeology and forensic anthropology, and potentially forming expert evidence, may or may not be "part of a body of knowledge or experience which is sufficiently organised or recognised to be accepted as a reliable body of knowledge or experience" (The Law Commission 2009).

Chapter Four

Analysis of Methodologies

4.1 Introduction

In the previous chapter, the practitioners themselves were discussed: their competence and qualifications for being used as 'experts'. In this chapter the methods and techniques used by those practitioners will be examined, as well as examining to what extent these methods are reliable in all or any given circumstance and what factors might apply to the choice of one method over another. One specific area of each discipline is looked at in detail (geophysical survey in forensic archaeology; estimation of sex in forensic anthropology) and then the issues involved in selecting a method, assessing its accuracy and other complexities of choice are

considered. How does one choose a method? Is there a method that can be applied to all searches for all types of clandestine burials in all soil types and conditions all over the world, or to assess the sex of skeletal remains all over the world of all age groups and all racial backgrounds? To what extent are practitioners aware of the potential problems inherent in any method? Are there legal reasons for practitioners to be wary of choosing and using the wrong method?

Within the discipline of forensic archaeology, this section will focus on specific types of geophysical survey used to search for concealed human remains; in forensic anthropology, this section focuses on perhaps the most straightforward aspect of the 'biological profile', namely establishing the likely sex of the individual from disrupted remains.

These two aspects have been selected because they are typical of the questions asked of a forensic archaeologist or forensic anthropologist on being brought into a police enquiry, in this author's experience. Often, more standard investigative methods have not yielded useful results, and so the decision is made to bring in an outside specialist, often with police expectations raised by high-profile media coverage of certain cases such as the Cromwell Street searches (see Chapter Five) or by fictional forensic dramas. It is assumed that every forensic archaeologist has access to, and can operate, GPR equipment (ground penetrating radar), and that a GPR survey will locate a sought-for grave or other buried materials; similarly, it is assumed that a forensic anthropologist can identify the sex of human remains in any condition – burnt, dismembered, partial, gnawed, weathered. Both demands might be met by

forensic archaeology and forensic anthropology, and can add useful data to a medico-legal investigation of death – but only in certain circumstances, within certain constraints and given certain facilities. Some of these complex circumstances will be examined below.

4.2 Forensic archaeology: locating clandestine burials

The most obvious, and most common, use of forensic archaeology by police is to assist with the location of alleged clandestine burials. Information may be deduced by police from intelligence or other evidence to do with the disappearance of an individual and the whereabouts at that time of a main suspect, or an informant may provide an account which is firm enough for the police to consider it worth following up whilst not pin-pointing the location precisely. Thus there is usually an area to be searched, and forensic archaeology is employed in two ways: inclusion and exclusion. Ten or fifteen years ago, in this author's experience, police only occasionally involved a forensic archaeologist in planning the initial search, but in recent years this is increasingly likely.

Firstly, a forensic archaeologist may be able to identify the location of the concealed remains. To pinpoint the location of a clandestine grave precisely and quickly is unusual. A clandestine grave, by its nature, tends not to be obviously visible. After the passage of time and consequent growth of vegetation, settling of ground, perhaps even such things as the depositing of quantities of topsoil in landscaping, or the area being used to dump building materials or waste materials on, it may become very difficult indeed to survey a site in accurate detail and to say "the burial is here".

The second way in which forensic archaeology may be employed is more common – excluding an area or parts of an area from the search. This latter is obviously of benefit, as it saves time, effort and money. The exclusion of part, or all, of a search area must be reliable, however.

From the current author's experience, the most common suggestion from a search team is to use ground penetrating radar (GPR). This technique hit the British headlines in the mid-90s when it was used in Gloucester in the search for the murdered victims of Frederick and Rosemary West. Ever since then, it has been the most common search method that the police, and indeed the wider public, can name. It is odd, given our society's appetite for television programmes about archaeological exploration, that the resistivity meter and the magnetometer and the humble probe have not gained the same recognition. Perhaps it is because the term 'radar' is already known and understood and the prefix 'ground penetrating' requires little explanation, whereas neither 'resistivity' nor 'magnetometry' is readily explicable to the non-specialist. Perhaps the probe is just too obviously low-tech and simple, lacking the exciting glamour of the hi-tech equipment. Another explanation might be that non-archaeologists do not realise the extent to which an experienced archaeologist can 'feel' through a good hand-tool. In the same way as an experienced excavator can feel through the trowel that there is a change in the soil long before it is visually apparent, so the experienced probe-operator can feel through the probe that there are changes in the resistance or in the makeup of the sub-surface material. This means that it is rare indeed for an experienced operator to cause major damage to any buried remains or materials in the way that perhaps the police and public

assume would happen (Owsley 1995; Ruffell 2005). Police are forced to take into account public opinion because the media now follow forensic search and excavation in detail. The media and public criticism have to be considered in police planning and policy when excavating, or preparing to excavate, a suspected clandestine burial site (Bennett and Gardener 2005; Ruffell 2005).

This bias towards ground penetrating radar from the public and media is, however, not a major concern. It might be preferable if non-specialists understood more but this is not essential. A bigger concern is that the people carrying out the searches (typically the police) and the people commissioning outside contractors to assist in searches (again, typically the police) may not fully understand the range of methods available, nor indeed the variation within, and limitations of, those methods. By failing to understand this, they will fail to understand the need for the correct method to be utilised in the specific circumstances (Watters and Hunter 2004). It may jeopardise the full retrieval of all possible evidence if they do not have an awareness of the need to consult an experienced forensic archaeologist on the techniques and equipment that may yield the best results.

An example of this from the author's experience is a case in which an adult male had been missing for three years in the north of the United Kingdom, in an area of dense vegetation and scrubby woodland and old peat-digging. Peat-digging typically will result in squared-off holes, known in many places as 'peat hags', which fill up over time with viscous liquid from the peat. The initial proposal was to fly a thermal imaging helicopter over the large area to locate the body. Aerial thermal imaging

relies upon the differences between the temperature of the general ground surface and the raised temperature of an actively decomposing body. A short period of informed thought should bring up the problems with this – remains after three years give off no heat although their wrappings or clothing can show up as hot-spots on thermal imaging. Also tree cover means the thermal camera cannot 'see' all of the ground flown over, while the water in the peat hags will reflect the beams back up to confuse the issue. It is an inappropriate method costing many thousands of pounds over several days. As Blain recognised as far back as 1979, it is rare for police to search for a dead body, and "the cost in manpower of a widespread search can be enormous" (Blain 1979). In this case, the search eventually took the form of line-searching by officers, which is indeed expensive, but far less expensive than the tens of thousands of pounds which were nearly wasted on search methods that could not have located the remains.

4.2.1 Comparison of case studies

By comparing two published case studies, it becomes more clear how geophysical survey carried out by an experienced forensic archaeologist can assist police investigations. On opposite sides of the world, similar situations arose – requiring the search for a victim buried for more than a decade within an area which could not be simply dug up (due to complex tree-roots and size in the first case, and because of security concerns in the second).

When the correct method is applied, it can speed up an investigation and actively help the enquiry. This is well-illustrated by the search for "Yvonne" in New Zealand

(Nobes 2000). It is a classic case of the kind on which a forensic archaeologist might usefully be consulted with benefit to the search. A woman had disappeared some 12 years earlier in suspicious circumstances and although her partner was suspected, no evidence was found which could result in charges. For reasons unstated, the suspect finally directed police to the site where "Yvonne" had been buried more than a decade before. This was within an area of plantation forest not far from Auckland in New Zealand's North Island. Despite the suspect's co-operation with the police, a number of factors prevented easy location of the grave – twelve years are enough to blur even the most vivid memory and to muddle fine detail; the trees had grown considerably, being fast-growing commercial plants, with some being felled and others being planted and, possibly most confusing of all for the assailant's memory, the layout of the internal access roads within the plantation had changed. For these reasons geophysical surveys were utilised. Nobes describes how a T-junction of access roads had effectively been rotated during the 12 years – instead of the current main East-West road with a spur running North, it had previously been a main North-South road with a spur to the East.

To confuse matters further, the body had been moved, according to the suspect, from an initial shallow grave to a grave approximately 1.2m deep immediately adjacent to the first grave. This had the effect of giving a larger area of disturbed ground to locate than a single grave, but on the other hand it could mean that anomalies would be less obvious than from a single grave – as Nobes explains, "the cross-section of the body or bones may be enough to cause an anomalous radar response, by scattering the radar signal, but if a site is significantly disturbed, the target response

may be masked by the background site variations" (Nobes 2000). The soil was mainly a medium-grained sand but with pockets of clay, meaning the condition of the remains was unpredictable as the sand might encourage skeletonisation but clay might encourage adipocere formation – and the survey's signals would differ for each of these.

Nobes used two types of geophysical survey – ground penetrating radar and a soil conductivity meter. The GPR was used second, since the soil conductivity meter can give useful information on the site to enable the GPR's use to be fine-tuned for that specific site's conductivity.

Ideally, a survey should be made outside the search area to give information on the site's background readings, but time constraints made this impossible for Nobes, so the survey was instead extended a little beyond the search area as delineated by police on the intelligence they had. The body was found within this extended area, and it did indeed show up as anomalous on the soil conductivity survey; there was not time to cover that area with the GPR, and so in this case the location of the grave was identified by good survey technique (extending the survey beyond the search area to establish the background patterns) combined with the soil conductivity results. The police were excavating anomalies as fast as they showed up, rather than waiting until all was finished, and this was why the GPR survey was not completed. Nobes' conclusions were that the survey gave good results considering the complexity of the natural soils, the soil disturbance caused by forestry operations, the presence of numerous sub-surface stumps and large roots, and the pressure for a

rapid answer. He made the point that spending time on completing both surveys before excavating would have saved resources and money, as well as what were apparently frayed tempers as the police excavated numerous tree-roots in their urgency. Finally he comments that a combination of methods is important – the GPR alone might not have identified the anomaly that turned out to be the grave, whereas the soil conductivity survey did.

Five years later, Ruffell published his experiences on the other side of the world from Nobes, but in similar circumstances (Ruffell 2005). Following many years of paramilitary activity in Northern Ireland, a new spirit of peaceful co-operation finally emerged in the 1990s, leading to intelligence being provided to the authorities about the whereabouts of a number of "disappeared" from both sides of the conflict. In this case, police were given information that the remains of one of the "disappeared" were in a church graveyard on the edge of a large city. The peaceful co-operation did not extend to all residents and, since this graveyard was near a volatile area with marked antipathy to the authorities, speed was important. What was required was "rapid, non-invasive techniques [...] to establish ground conditions and to assess the likelihood of a burial or re-burial anytime from 1972 to the time of investigation [in 2003]" (Ruffell 2005, p. 1430). Due to the volatile community overlooking the area, the use of cadaver-dogs or any military technology was not possible; the probe was considered but eventually decided against for fear the local community might misunderstand its use. Conveniently, the GPR equipment had been used for non-forensic purposes a few weeks earlier by Ruffell, which meant the local people were familiar with seeing him operate it. All the same, the survey was carried out at

daybreak in winter to be on the safe side. These are issues that rarely arise during conventional archaeological survey, it must be said.

The site, when cleared of vegetation, contained three known legitimate burials, which comprised one from the 1870s and one from the 1970s (thus conveniently giving documented examples to build up a picture of how burials of these ages would respond to the survey) as well as one burial from the 1860s into which the clandestine burial was alleged to have been inserted since 1972. The GPR survey could be potentially adversely affected by standing structures, specifically iron railings set in concrete around the 1860s plot and a very large headstone. This had to be taken into account when setting up the equipment. The soil was mixed topsoil overlying a glacial till, and the area was generally wet, partly from water-table levels and partly from precipitation.

The area surveyed included the 'controls' of the documented legitimate burials of the 1970s and 1870s and the suspected plot, the 1860s grave with possible 1970s or 1980s intrusion and continued beyond the suspect plot into the relatively undisturbed ground where no documented burials had occurred in the last couple of centuries. The results showed no deep disturbance of the suspect grave, no parallel between the results of the known 1970s grave and the suspect grave and no import of new material (such as might happen when backfilling a grave) in the suspect grave; therefore the conclusion was that the suspect grave was not a grave – that ground had not been disturbed for the insertion of a clandestine burial in recent decades. Human

remains were subsequently discovered at another location (i.e. not in the graveyard) and identified as the victim alleged to have been buried in the graveyard.

Ruffell makes several interesting points, prime amongst which is that the signals from the known graves were markedly different from what was expected, from both simulated burials in experimental studies and from documented studies of forensic search and exhumation cases. The final conclusions after processing the data were the same as the preliminary conclusions in the field from looking at the raw data. Finally he raises the question of particular patterns resulting from the suspect grave. These patterns were of unknown cause but were supposed to be the undisturbed soil allowing a bounce-back of the signal from the railings. Ruffell's theory is that in the more disturbed soil around a burial, the signal may be absorbed more readily and bounce back less, hence the difference between the signal pattern adjacent to railings outside the suspect grave plot and the signal pattern adjacent to railings inside the suspect grave plot. If it were simply the railings causing this pattern, then the same pattern would be expected either side of the railings and not solely within the suspect grave plot.

4.2.2 Discussion of complexity of choice

It is useful to compare these two case studies. In both case studies, the investigation was applying time pressure on the surveyor and it is clear that the forensic archaeologist needed confidence in their abilities in order to work at the optimum pace. In Nobes' case the GPR survey was not completed because the grave was located, but he made the point that it would have saved time and effort if he had been

allowed to survey and then process the data and then direct the excavations to the most likely few sites, instead of every anomaly being dug as soon as it had been provisionally identified. Both Nobes and Ruffell refer to the emotional cost of forensic searches and excavations, in different contexts. Reading between the lines of Nobes' paper it seems clear that police tempers frayed as anomaly after anomaly was excavated with no result, and in Ruffell's case, it is clear that the cost could have been serious civil unrest in the area and further distrust of the authorities by the local community.

A geophysical survey does not say "here is a human body buried"; instead it indicates disturbed ground, from a clandestine burial, legitimate burial, burial of other materials such as bank-notes (Hunter 1996), tree roots or any one of a number of causes (Nobes 2000; Ruffell and McKinley 2005; Fiedler, Illich et al. 2009; Ruffell, McCabe et al. 2009). Much of the time, the true value of geophysical survey is to exclude areas from the search; to give a pattern that is interpreted by the specialist as "this ground has not been disturbed; you need not look further in this ground".

The underlying technology of Ground Penetrating Radar is explained clearly in Chapter 3 of Geoforensics (Ruffell and McKinley 2008) and in Chapter 4 of Forensic Recovery of Human Remains (Dupras 2006). It involves an array of two antennae: a transmitting antenna generating a pulse of radio waves, between 25 and 1000 MHz, which are detected by a receiving antenna at a set time interval. The receiving antenna is linked to a recorder that displays the data to a visual output, shown as

‘wavelets’. These wavelets stack up above each other as the array is moved and as more pulses are generated. This radargram reflects the profile of the signal.

The longer the time interval allowed in the setting between the two antennae, the further into the ground the radio waves will have the chance to go, and the deeper the survey. In certain conditions the signal may become attenuated, or too weak to interpret, or may be lost altogether – these are more likely where the medium through which the signal is sent is more conductive, such as seawater or clay soils. On the other hand, the signal works most strongly in ice, certain types of hard rocks and quartz sands. This is why GPR may give poor results when used in one location, despite good results in another location. The soil type must be considered when deciding upon the type of array to be used.

Low frequencies, 15 to 50 MHz, will travel further into the ground but will have lower resolution in the received signal; higher frequencies of 50 to 1000 MHz will produce a higher resolution but may travel only centimetres into the ground. As well as these factors, there may be physical constraints due to the location. The low-frequency array can be several metres long, and the high-frequency array only a few tens of centimetres. It would therefore be impossible to use a low-frequency array to penetrate to considerable depths if working in, for example, a small cellar.

An overview follows of the problems which forensic archaeologists may face when involved in locating clandestine burials. It is not possible to follow the procedure used later in this chapter, in the parallel discussion on sex estimation in forensic anthropology, of comparing published methods with subsequent published ‘test’ papers, as there are not sufficient papers of this type, as discussed below. Forensic

archaeology papers have only in recent years been published in the main forensic journals; prior to that, being found only infrequently in the 'hard science' journals. There is now an increasing body of literature. There does not seem to be a 'test' paper approach, possibly because many of the forensic archaeology papers are, like Nobes' and Ruffell's papers discussed above, case-studies. Those two contain few references to the mainstream forensic literature, with many of their references coming from the forensic geosciences literature. For example, all 14 of Nobes' references (Nobes 2000) are outwith the main forensic journals, although Ruffell (Ruffell 2005) does have 6 of his 17 from the Journal of Forensic Sciences, including Nobes. This may reflect the growing level of acceptance of forensic archaeology by the 'forensic mainstream' community between 2000 and 2005, although Ruffell refers to the "rush of papers in 2000" and attributes the cause to the development of smaller more rugged computers and data-loggers, enabling techniques to be used more easily and also more effectively.

In the same way that methods of assessing sex from certain skeletal elements could be initially assumed to apply to all humans but may turn out to apply only to those from one region, or age group, so forensic archaeological techniques may be thought to apply to all ground but turn out to be less or more applicable to different situations. Factors that affect results include (but are not limited to) ground type, time of year, climate, and even the searched-for individual's age and size, the depth of burial and the post-mortem interval. Although geophysical prospecting techniques have been used in archaeology in the United Kingdom for many years, and GPR was first suggested for forensic use in 1973 (Cheetham 2005), there seems to have been

relatively little discussion across both specialist literature and that for the general public.

This discussion of geophysical searching will not be able to match percentage accuracy rates (as is done in the related discussion below on sex estimation), since these cannot be provided for many published articles such as case-studies. If a case involves a survey which is successful in locating the sought-after remains, then it has a 100% success rate; if it does not locate the remains then without full excavation we cannot know if it was a 100% success rate because the remains were indeed not present or if it was a 100% fail rate because the remains were present but not identified by the survey. It is hoped that the following discussion will demonstrate the range of complex and complicating factors that may be involved in searching for a clandestine grave, and how important it is that these factors are known about, understood and taken into account during all stages of the search, from planning through execution to interpretation.

The papers discussed here are from recent years, partly because of difficulty in accessing journals outwith the normal range of university subscriptions, and partly because the technology of GPR has changed so dramatically that results from a decade and a half ago are difficult to relate to results using more modern technology, both in terms of software and hardware. A 400 MHz antenna still weighs around 5 kgs or 12 lbs, as it did when Miller wrote his seminal article in 1996 (Miller 1996), but it is now far smaller and easier to carry and use, expanding the ways in which GPR may be used.

A few months before the publication of Nobes' paper on the search for 'Yvonne' (Nobes 2000), Davis et al published the results of their search for known, recorded, legitimate burials (as opposed to clandestine burials) dating from 1918 in a region of permafrost, using ground penetrating radar (Davis, Heginbottom et al. 2000). The purpose was to take samples of the 1918 'Spanish Flu' virus which caused a significant number of deaths worldwide; it was hoped that studying the virus in an exceptionally well-preserved state might help identify why it had so high a death rate, especially amongst young adults who usually have better survival rates of influenza. Using GPR in permafrost is similar, in technical terms, to using it on dry sandy soil or gravels; thus this survey was different from that described by Ruffell on graveyard soil (Ruffell 2005). It also differed from Nobes' survey, despite Nobes describing the soil as well-drained sand, because the sand in Nobes' survey contained pockets of silt, pockets of clay, iron sands and a very great number of trees, tree stumps, tree-roots and so on (Nobes 2000).

The chief interest, for the present discussion, in Davis's survey of the permafrost graveyard is that their results conflicted in one respect – depth of coffin burial – with their prior expectations; this resulted from the choice of a specific antenna. In other words, because the team's prior knowledge of the site led them to expect coffins to be buried at about 2 metres' depth, they used antenna settings which would give best readings for that depth. The GPR did locate the presence of the graves, and this was confirmed by subsequent excavation, but they were at around one metre in depth, not two. The GPR did not identify the coffins. Davis noted that the GPR could not

resolve [i.e. identify or pinpoint] the actual coffins because the antennae had been selected in order to penetrate to the expected depth of burial in Norwegian cemeteries, which was two metres. The team did carry out subsequent tests on part of the site using other antennae more appropriate to exploring a depth around 1m, and confirmed no signals below 1 metre. Retrospectively, after excavation, it is possible to locate the signal showing the one coffin remaining intact of the seven, although the six collapsed coffins are not identifiable even retrospectively.

Davis et al also made the point that GPR can detect the empty space, the void, within an intact coffin, but if the coffin has collapsed and this void has filled with soil, then the GPR they used can detect little contrast between soil-in-the-ground as it might be described, compared to soil-in-a-coffin. Both show up as "soil" and soil of the same type at that, since the soil-in-a-coffin is in fact the very same soil-in-the-ground simply dropped down from above the coffin. The possible tiny differences of signal between soil and collapsed coffin-fragments or even bone may well be "almost impossible to detect" in clay soils because the clay is a good conductor of electricity. Disturbed soil, even when not clay, also makes it more difficult to detect small differences. In Davis et al's survey, they found that the disturbed soil signal reached down as far as two metres, probably due to dynamite being used to break up the permafrost to enable graves to be dug.

This paper demonstrates the importance of being able to assess a site for its suitability for a specific technical setting, and in addition the need to be wary of prior information, or extrapolation from other sites, regarding probable depth of burials.

After using GPR on very different terrain, Buck published her field test results, working in collaboration with CILHI, the acronym for the US Army Central Identification Laboratory, Hawaii (Buck 2003).

Buck spent a year training and becoming familiar with the equipment and then carried out field tests of the GPR. Hunter (Hunter and Cox 2005) points out an inconsistency with Buck only using a 400 MHz antenna despite mentioning a 900 MHz one also being available. 400 MHz is the antenna used by both Nobes (Nobes 2000) and Ruffell (Ruffell 2005), although Hammon (Hammon, McMechan et al. 2000), as Hunter also points out, recommends using a 900 MHz one – in fact Hammon recommends 900 MHz or greater. Basically, the 400 MHz antenna is most likely to detect anomalous signals from a little deeper than would the 900 MHz antenna, according to Miller (Miller 1996), although when he was writing in 1996, it appears only three frequencies of antenna were used (300, 500 or 900). It seems possible that the reason Hammon (Hammon, McMechan et al. 2000) recommend a 900 MHz antenna may be related to their geological location, as the antenna is also influenced by what terrain it is used on. In Florida, good results have been obtained from both 500 MHz and 250 MHz antennae (Schultz and Martin 2011), and in Spain's mountains, searching for a body buried over a decade earlier along with a pick-axe, a 250 MHz antenna was found to combine a useful degree of detail with the ability to survey a very large area of sloping ground over 10 days (Novo, Lorenzo et al. 2011); Ruffell compared results from 200 MHz and 400 MHz antennae and a 'shielded' 225 MHz antenna in Northern Ireland (Ruffell, Donnelly et al. 2009),

while Pringle et al found a 900 MHz antenna gave good results in an English soil rich in industrial debris (Pringle, Jervis et al. 2008).

Buck carried out field tests of GPR for CILHI, involving two known cemetery locations and a then on-going police investigation into an alleged murder some years earlier but with no body found.

At the first location, Buck surveyed an area with hundreds of known graves, those of soldiers from the Korean War with burials being at a depth of two metres and in metal coffins in close rows. The area surveyed was of graves which were due for exhumation, so the survey results could be checked against excavation results. This is an ideal test situation, as it does not rely upon interpretation as to accuracy.
A caesium magnetometer was also used, which detects disturbances in the ground by different means from the GPR. No graves were detected, despite their presence. Buck suggests that the metal coffins were so closely spaced that the differences could not be distinguished. In addition to the metal coffins, there were metal flower-holders on each grave and a stone grave-marker. Given that archaeologists carrying out magnetometer surveys on ancient sites are forced to wear metal-less outfits (i.e. elastic-waisted sweatpants rather than jeans with a metal zip and pocket-rivets) and that the current author's own student days on survey demonstrated that both (very) extensive amalgam dental fillings and metal-framed spectacles worn by the operator appeared to 'throw' a magnetometry survey, the 'negative data' resulting from Buck's magnetometry come as no surprise. Magnetometry has its place in forensic geophysical searches but is, obviously, at its best when searching not for organic

human remains but for metallic items such as buried weapons (Fenning and Donnelly 2004; Holland and Connell 2009; Dionne, Schultz et al. 2011; Rezos, Schultz et al. 2011).

Buck surveyed a number of sites within the cemetery complex, with mixed results. In one area of unmarked burials, she did use both the 400 MHz and 900 MHz antennae and the conclusions were that no graves were present in the survey area. Subsequent excavation confirmed that this was correct. Another area containing three graves (subsequently excavated for confirmation) gave reasonable correlation between a resistivity survey and the three graves, but the GPR gave only one clear anomaly. Further to these test surveys in burial grounds, a backfilled trench (with no human remains) was surveyed, a few days after backfilling. The trench had been 1.5m wide and 2.5m deep. Both the magnetometer and the GPR failed to identify the trench, even after the data being further processed with specialist software. Buck herself admits surprise because "this [...] presented an ideal scenario from a pure testing standpoint in many ways: little or no interference, undisturbed sediments, and a clearly defined feature of known dimensions" – in other words, no metal coffins or flower-holders or stone grave-markers to provide confusion amongst the signal; the surrounding soil was undisturbed – there had simply been a trench dug in otherwise-undisturbed ground; finally, that the trench was big and simply shaped, not a small or complex object.

The field tests having given very mixed results, Buck was able to test the GPR further. Police received intelligence about an alleged murder victim said to have been

buried in a yard approximately 15 x 20 metres; the post-mortem interval was several years. Buck used the 400 MHz antenna on the GPR and also ran surveys using resistivity and magnetometry (despite metal waste in the yard and power lines overhead which could provide disruption and confusion of the data). The results were confirmed by small excavations of anomalous areas. The magnetometry readings, as was expected by Buck, were of no use due to interference to signals. Both the GPR and resistivity indicated a number of anomalous areas; on excavation these yielded two dog burials, a diaper and the house's buried cesspool. Both the GPR and the resistivity indicated areas that yielded no explanation of the anomalous signals. Eventually the whole search area was excavated to be certain of the absence of any murder victim.

As Buck says, the purpose of using expensive hi-tech geophysical surveys is to reduce time and costs, in place of excavating the whole search area. In this case, it increased both time and cost and eventually the search area had to be excavated in its entirety.

There is a prevailing idea that geophysical survey techniques can be used to exclude areas to narrow down the search area's size. Buck rejects this quite clearly, stating: "Given the right mix of conditions, geophysical techniques may be effective in pinpointing subsurface features such as burials; however they should not be used to exclude prospective areas of investigation. Ideally, they offer a tool to narrow down the most promising places to start searching for an unmarked grave using standard archaeological techniques." (Buck 2003)

In 2009, Fiedler et al conducted their own test of ground penetrating radar, using a modern cemetery in Germany (Fiedler, Illich et al. 2009). Their aim was "to investigate the probability of identifying graves after a resting time of 25 years and of detecting potential body remains using GPR". Their aim was to produce data on local soil conditions for the identification of burials, as they felt that existing information based on animal burial tests in other parts of the world was not of sufficient relevance to their region.

The cemetery in the Black Forest area of southwest Germany was surveyed using both ground penetrating radar and tachymetric surveys. The area investigated was approximately 15 x 26 m. This area contained 95 graves, in four rows, at a depth of between 150 and 160 cm, and the majority were buried between 1975 and 1977. They excavated one grave and a corresponding control site some 40 m north of the area – this provided information about the chemical and physical soil characteristics of the investigation area. The two excavated areas were so similar that an assumption could fairly be made that they were representative of the entire search area. In addition, the German team hoped that some level of adipocere would be present in the buried bodies, perhaps making the graves easier to identify.

The individual graves were surveyed using an electronic tachymeter – in other words, a very detailed plan was made of the whole grave area. After these measurements were taken, all gravestones, borders and kerbs, foundations and suchlike were removed; the area was flattened and sown with grass seed. Two and a half years after the grave demarcations were removed, the GPR survey was carried

out. Fiedler et al used a 400 MHz antenna, which has a maximum energy penetration depth of 2 m. Fiedler felt that this gave better penetration than 500 or 900 MHz antennae. In addition, the resolution was better than a 200 MHz antenna. The 400 MHz antenna was neither the best penetration (that would be the 200 MHz antenna) nor the best resolution (that would be the 900 MHz antenna), but it gave the best combination of penetration and resolution for the detection of a burial.

All but two of the 95 graves were found. The undisturbed soil of the walkways between the four rows of graves could be clearly distinguished from the disturbed soil. The disturbed soil did not present with the uniform signal: it was "a mix of naturally grown soil horizons, no bulk density and higher water saturation". They describe the higher water saturation as 'the bathtub effect', a phrase which produces a vivid mental image of how a grave-cut might have water seeping into it from surrounding soil, causing a damper, more saturated context.

Of the 95 graves known to be in the cemetery, the GPR, somewhat confusingly, revealed the position of 97 graves. Comparing the tachymetric and the GPR data, 63 graves were identified with a very high probability of accuracy, 17 other graves with a reliable level of accuracy and 10 other graves with " doubtful" accuracy – the location of seven graves was known at the time of the GPR survey. This makes the total of 97. The two "additional graves" were excavated and this excluded the possibility of there being previously-unknown graves. There was however more water in this area, and it is thought that water at a depth of 90 cm probably caused the readings to resemble graves. A third area was excavated as an anomaly, and

turned out to be a coffin buried at less than the mandatory depth (65 cm, rather than 90 cm) due to the presence of large blocks of stone in the soil in that area.

Interestingly, the cemetery was in quite poorly-drained clay and loam. Damp soil and clay soil (often, of course, the same soil) may provide problematic data in a GPR survey – it is partly the lack of damp soils in the hot dry sandy regions of Colorado, where a team from Colorado State University carried out some of the earliest published experimental GPR work (France, Griffin et al. 1992; D.L. France, T.J. Griffin et al. 1996), which has caused GPR to have such a reputation for infallibility. It is indeed very effective in Colorado deserts, but this does not extrapolate to chill soggy clay in Europe (Pringle, Jervis et al. 2008) or stony soil such as regions once under glaciers (Connor 2007), which of course includes large parts of Europe and much of Great Britain.

The Fiedler study overall, especially that third grave, shows that the above-ground grave demarcation does not always parallel the below-ground burials exactly. This study appears to have much greater levels of accuracy in using GPR to detect known graves than did Buck's study. A very strong possibility to explain the bulk of this difference would be the difference between bodies buried approximately 25 years ago and bodies buried approximately 50 years ago. When one adds into the equation the fact that the German cemetery had burial conditions likely to encourage the formation of adipocere, as compared to the American study with its sandy soil and warmer climate encouraging skeletonisation, the difference becomes even less surprising.

Ruffell (Ruffell, Donnelly et al. 2009) recently published a case study subtitled "a cautionary tale" recounting the forensic excavation of a suspected "subsiding grave" in Northern Ireland. Both ground penetrating radar and victim recovery dogs gave a positive evaluation to the suspected grave-site. Twenty-four hours of excavation by forensic archaeologists showed a vertical-sided excavation, which was 'stepped', i.e. with the base on different levels. Puzzlingly, no human remains or trace of human remains were found – the fill was described as uniformly sterile with no evidence suggesting a body had once been present but was removed before Ruffell's excavation (such as insect larvae or pupae, or body fluids or decomposition products in the soil) (Ruffell, Donnelly et al. 2009). The conclusion was that it was a type of 'test-pit', probably excavated by a mechanical excavator to ascertain the level of the water table before a new civil engineering development.

Ruffell (Ruffell, McCabe et al. 2009) summarises the problems of ground penetrating radar as exemplifying the problems that all operators of geophysical survey equipment must deal with – controlled experiments, 'ground-truthing' and data.

Ruffell attempted to add a useful controlled experiment to the information available on the location of mass graves by ground penetrating radar. A mass grave obviously may give a different signal by GPR from that given by a legal burial in a graveyard. A mass grave is considerably bigger than the usual grave-plot, and is usually lacking in coffins and may be less deep than legitimate burials. The survey was carried out

using three antennae of 100 MHz, 200 MHz and 400 MHz. The 100 and 200 MHz antennae simply were not feasible until recent years, although it is worth noting that, as far back as 1992, one of the earliest experimental studies for forensic geophysical investigation purposes used three different antennae – 900 MHz, 300 MHz, and a remarkably low (for the time) frequency of 80 MHz – to survey areas where pig carcasses had been buried (France, Griffin et al. 1992). Low frequency antennae (which have better penetration but lower resolution of the signal) are now available at even lower frequencies, 50 MHz or even 15 MHz.

The overall findings from Ruffell and his team's survey of the site were inconclusive. There were notable discrepancies between what was visible on the surface in terms of ground collapse and general topography, standard metal detector indications, and the two different frequencies of ground penetrating radar survey (Ruffell, McCabe et al. 2009). The burial period of over one and a half centuries in this experiment would presumably yield different results from the German modern cemetery with its 25-year span (Fiedler, Illich et al. 2009), but the crucial point is that two different frequencies of GPR, a metal detector survey and ground survey all came up with different conclusions in terms of indicating where the burials were and how many of them there were. No single method could be regarded as "failsafe". Their study is still useful, as they constructed it within a scenario comparable to the search for non-recent mass graves in countries such as Colombia where the recovery of dead from the 20th century is of increasing importance as these countries move towards peace and reconciliation between factions (Ruffell, McCabe et al. 2009). Ruffell and his team were able to put together an approach based on sketchy historic

information and use aerial photography to locate likely sites; a combined interpretation of surface features such as collapses or breaks of slope; metal detector indications (also evaluated for use in the United Kingdom by the Police Scientific Development Branch (Willot 2004)), and GPR data provided indications of where burials in large numbers might be found on excavation. The problem is not with obtaining data to indicate anomalies – the problem is with interpreting the data, and this is where the trained, experienced operator is essential in order to aid the investigation (Cheetham 2005; Holland and Connell 2009).

The "rush of papers" after 2000 described by Ruffell (Ruffell, McCabe et al. 2009) are indeed numerous – case studies from Nobes' search for "Yvonne" in New Zealand in 2000 (Nobes 2000) through Ruffell's search for the IRA "Disappeared" in Northern Ireland in 2005 (Ruffell 2005), and a great many experimental surveys and case studies from the countries and years in between. The flow has hardly lessened, as equipment becomes easier to use – smaller, lighter, faster and cheaper.
In the United States, Schultz buried small and large pig carcasses in Florida and used GPR to monitor the sub-surface changes (Schultz 2006; Schultz 2008). He deliberately explored the differing signal responses known to occur in soil which is sandy and dry compared to soil which is clay and damp. Six of the large pigs were buried at 50-60 cm in depth in sand and the other six were buried at 100-110 cm in depth in contact with an underlying clay horizon. There were also control excavations constructed as 'blank graves'. The burials were excavated after 12 months or 21 months and the decomposition compared to the results given by the GPR monitoring. His findings confirmed that, even when completely skeletonised

after 21 months, the pigs buried in sand were easily detected by GPR; those buried in clay were initially detectable but during the course of one year they became more difficult to observe, even when they retained soft tissue. He then buried 12 small pigs, all in sand – six at a depth of 50-60 cm and six at a depth of 100-110 cm along with four 'blank graves'. After 12 or 21 months these were excavated and his findings were that small cadavers, even when buried in sand, become difficult to recognise using GPR once skeletonised. He suggests that the surrounding soil may not have a strong enough contrasting signal to distinguish between the disturbed soil, the undisturbed soil and the skeletonised remains. The pigs buried deeper, again in sand, were easier to detect, probably because the deeper burial depth slowed down decomposition, meaning the remaining soft tissue helped to provide a distinctive GPR signal.

In the United Kingdom, the straightforward approach of Schultz burying a pig in the experimental graves was replaced by a rather complicated mixture of elements to represent a body – a plastic resin skeleton with 'animal products' and physiological saline was clothed, placed in approximately anatomical position and buried (Pringle, Jervis et al. 2008). Surveys were carried out prior to burial (as a control), and after one month and three months of burial. They employed a range of different geophysical techniques – bulk ground resistivity, conductivity, fluxgate gradiometry (a type of magnetometry) and ground penetrating radar using high-frequency antennae (900 MHz) as well as soil magnetic susceptibility, electrical resistivity tomography and self potential. They found that, although other methods were better for initial grave location, GPR (when using horizontal time-slices) was one of the

best methods for spatial resolution. Two of this team subsequently explored resistivity survey as a means of locating clandestine graves, using three 'graves' containing respectively no pig, a pig, and a pig wrapped in tarpaulin; the resistivity meter was unable to detect the disturbed ground with no burial, but did identify anomalies for both the buried pig and the buried wrapped pig (Jervis, Pringle et al. 2009).

The Australians have been systematically developing their own local data for forensic archaeology – unsurprisingly, given the unique environment of Australia and especially its outback, they have found that data from other parts of the world does not give the best results. Powell (Powell 2004) buried pigs, like Schultz in Florida, but she also surveyed buried kangaroos at sites in South Australia. At the time of the GPR survey, the pig graves were eight months old and the kangaroo graves were four years old. Powell used some of the lowest frequency antennae, just 200 MHz, and although she expected a penetration of approximately 4 m she found that the signal seemed to be almost completely attenuated below just 1 m. In an echo of Schultz's findings, the older (and presumably more skeletonised) kangaroo graves were less easy to identify than the pig graves which were only eight months old. In fact, although the pig graves were readily identifiable, Powell comments that had she not known that the kangaroo graves were present, the GPR survey results probably wouldn't have merited further examination in a real-life search for buried remains. The kangaroo graves were not only older than the pig graves but were also approximately half a metre deep. Given the attenuation problems below one metre

with the low-frequency antenna, the age of the graves may not be the only factor at work.

These studies all emphasise the differing results obtained by differing technical set-ups. If one changes the antenna frequency then one changes the results. What is crucial in the use of GPR as a means of identifying sub-surface features such as clandestine graves is the understanding of the technology and its subtle variations, and the ability to interpret the data produced by a GPR survey.

The importance of the interpretation of data is clearly brought out by Heron (Heron 2007) in his review of Forensic Geoscience: Principles, Techniques and Applications (Pye and Croft 2004). Heron groups 27 chapters into rough categories which show the emphasis of the book – there are three chapters on geophysics, one chapter on stratigraphy, three chapters on case summaries, one chapter on teaching forensic geoscience but there are 19 chapters on the topics of instrumental analysis and data handling. Heron's opinion of the book is given somewhat guardedly, as seen in his comments in the opening paragraph. With reference to an older piece of writing on archaeological practice: "Clarke saw the challenge of archaeology as a discipline with the 'theory and practice for the recovery of unobservable hominid behaviour patterns from indirect traces in bad samples'. Indirect traces in bad samples characterises the nature of much of the forensic evidence presented here" (Heron 2007). He hastens to add that it is not the practitioner but the practice – "a feature of recovering fragmentary evidence from events past".

The majority of recent papers in the forensic peer-reviewed literature are focused on success in locating the sought burial. There seems less consideration of the potential to use ground penetrating radar in order to exclude parts of a larger search area. Morgan and Bull (Morgan and Bull 2007) analyse expert evidence submitted by the defence to the jury in recent murder cases in the United Kingdom which 'grades' the prosecution evidence on a scale of 0-10 (classing the evidence as "no scientific evidence" for zero through to "extremely strong" for 10). All the evidence involved comes under the heading of forensic geoscience, although ground penetrating radar is not one of them – this particular case is more to do with identifying a soil sample. They are scathing about the emphasis by the expert witness on the importance of "match" and the way in which "the concept of excluding a sample rather than matching a sample was completely ignored". This criticism arises several times in their paper, and with great emphasis they quote a 1974 paper by Kirk which evokes a central tenet for forensic geoscience – that physical evidence and its analysis cannot be wrong, it is only the interpretation that can introduce error.

Morgan and Bull's analysis of the present state of forensic geoscience in general in 2007 is a good summary of the problems and dilemmas faced when considering the use of GPR in a criminal investigation. It can be of great use, giving good reliable results and locating burials with ease – for example, a reasonably fresh cadaver in sandy soil (Powell 2004; Schultz 2006; Schultz 2008). However they stress it must be used by trained and experienced operators who are well aware of the importance and range of differential interpretation of results – the increased difficulty in identifying the difference between undisturbed and disturbed soil when remains are

skeletonised and the soil is clay (Schultz 2006; Schultz 2008; Fiedler, Illich et al. 2009), or the potential for confusing signals due to nearby above-ground objects (Buck 2003; Ruffell 2005; Ruffell, McCabe et al. 2009).

Furthermore, the forensic archaeologist may have to deal with possible pressure from non-geophysicists to use the GPR with which they are familiar from television dramas and news reports; there may well be another survey technique which is more appropriate to the specific task (Fenning and Donnelly 2004; Ruffell and McKinley 2005), and of course each of those other survey techniques will have requirements for experienced understanding in terms of their limitations and best applications (Scott and Hunter 2004).

The range of methods available to the forensic archaeologist for investigating what lies beneath the surface of the soil without excavation is wide. Because GPR is seen as a 'magic bullet' by non-geophysicists, it is sometimes difficult to resist pressure. Even practising archaeologists may be swayed by the glamour of GPR into using it for all sub-surface survey, regardless of the soil type, the type of terrain, even regardless of the nature of the object being sought.

4.3 Forensic anthropology: estimation of sex

Having discussed one aspect of forensic archaeological practice and the complexities of choice involved, we will now consider one aspect of forensic anthropology and the factors relevant in choosing the optimum method to use.

In this section, the problems faced by forensic anthropologists in assessing the sex of an unidentified adult skeleton are examined and discussed. Identifying the probable sex of unidentified human remains is a rapid way to move an investigation forward, as it can eliminate all the 'possible identities' of the opposite sex. At the same time, getting it wrong can, of course, set back the investigation by sending it along the wrong path of inquiry. There are well over five hundred different articles published on methods of sexing and barely a bone in the body that has not been looked at for sexing purposes. A competent forensic pathologist will be quite able to assess sex from relatively complete remains, but in cases of badly damaged, altered or incomplete remains, a forensic anthropologist may be able to help; another solution may be for the forensic pathologist to take Continuing Professional Development workshops and training days which would give them the skills to assess disrupted remains for sex estimation.

Two published articles and their subsequent published responses are compared. One article describes a method of assessing the sex from the shape of a specific part of the lower jawbone, and one from the measurement of a specific area of the hip-joint. The published responses to each are in the form of a systematic 'test' of the method on different populations. These two papers and the published responses show the questions and difficulties involved in selecting the optimum method to apply to estimate the sex of skeletal remains in different circumstances.

Estimating the probable sex of adult human remains in life is probably the least complicated aspect of the 'Biological Profile' assessment (the other estimates being

age group, stature and population group). The obvious differences are that men are generally bigger and more strongly-built than women, and that women can carry a foetus for 9 months and give birth. It is, of course, not that simple: in fact the sex of a skeleton is now recognised as a continuous range. At one end of the range is the Definitely Male category and at the other is the Definitely Female. Moving inwards from these, towards the middle, are the Probably Male and Probably Female categories – these are the categories into which the majority of skeletons are placed. Finally a tiny section in the centre of the range is Unascertainable Sex. This could be for various reasons: a very incomplete skeleton, a juvenile skeleton, or a skeleton with a mixture of typically-female traits and typically-male traits, for example.

The differences typical of male and female sex in the skeleton are called sexual dimorphism. There are many sexually dimorphic elements in the skeleton, with some being more reliable indicators than others of the person's biological sex. In the cranium alone, there are nearly twenty elements demonstrated to be more useful or less useful for estimation of sex (Walrath, Turner et al. 2004; Rogers 2005; Braz 2009). The sexually dimorphic elements can be divided into two types – form and function. In other words, some are caused by males generally being bigger than females (the form) and some are caused by females carrying and delivering babies (the function). In the skeleton of those who have not reached puberty, it is difficult to distinguish between male and female individuals. Identifying the sex of a complete, well-preserved adult skeleton is a fairly straightforward task in the majority of cases. Some skeletons fall into the 'unascertainable' category because they have such a mix of male-type and female-type elements that it is simply not clear where on the

spectrum they should be placed and so they fall into the middle category, but these are less usual.

Below are discussed two cases in which the identification of sex was achieved correctly, but only after initial wrong identifications of sex were made. The cases are discussed and compared here to illustrate that estimation of sex is not always carried out successfully and that an inaccurate estimation of sex is costly in terms of the time, effort and direction of the forensic investigation.

4.3.1 Comparison of Case Studies

One case study here is a British case from the author's own case-notes and is unpublished; the other is from Portugal (Cunha, Pinheiro et al. 2007).

In Great Britain, it is not uncommon for human bones to be retrieved from the sea. Britain has an extensive coastline and bones may be washed up or retrieved by fishing boats in their nets. Ancient burial grounds on the mainland may be eroded, releasing their bony contents to the coastal waters; innumerable people have been lost at sea in the last century alone, whether accidentally, deliberately or as a result of the two world wars of the twentieth century.

When a fishing boat's nets brought up a partial cranium a few years ago, approximately 100 miles offshore in the North Sea, they simply popped it into several plastic bags and stored it in the ship's deep-freeze until their return to port when it was handed over to the police. A forensic pathologist gave it a brief look

while it was still frozen and determined the sex to be female, the age to be around 30 years and the post-mortem interval to be about a fortnight (although skeletonised, there was also still recognisable brain tissue visible inside the cranium). After a partial DNA trace determined the sex to be male, the author was asked to re-examine the partial cranium. This resulted in a biological profile of male, middle-aged and towards the older end of middle-age; the post-mortem interval was given with caveats as probably 1-15 years and most likely at the more recent end of that time. Eventually a full DNA profile was obtained and the individual was positively identified as a male aged 61 who had drowned himself deliberately some two years earlier. During the brief period when the remains were thought to be just weeks old and of a younger female, the investigating police force sent out a request to all forces for any case in which a young woman was missing with no head found or no body at all found; they were startled to have over fifty responses from around the country. It would seem there are a lot of body parts 'missing', yet to be found, from cases in which only partial remains have been found.

In the Portuguese case study (Cunha, Pinheiro et al. 2007), a mass killing took place in Angola, and the remains of four of the six known to have been killed were found and identified whilst still fresh; these four were identified, forensic post-mortem examinations carried out and three sent to Portugal for burial and the fourth buried locally. Despite extensive searches at the time, it took a year before the remaining two bodies were found, only 500 metres from the site of the first four bodies. Some bones of the 'new' bodies were sent to Portugal for examination. At this point it was realised that one of the two 'new' bodies was female, the other being a very young

child. This caused concern because the six people who had been killed were an older male, two males over 30, one female aged around 30, and two juveniles, both male, one 14 and one 3 years of age. The bodies identified and buried were supposed to be the three adult men and the adult woman, with the missing two being the two juvenile males. Since one of the two 'new' bodies was the adult female, who had been buried as the adult female? Exhumations were ordered and the Portuguese team, including a forensic anthropologist as well as forensic pathologists with training specifically in forensic anthropology, re-examined all six sets of remains.

The 'new' body identified by the Portuguese as the young child was the young child; the 'new' body identified by the Portuguese as the adult woman was the adult woman. Of the four previously identified as the adult woman and three adult men, the 'woman' turned out to be the 14 year old male; the two adult males in their 30s had each been identified as the other; the only one correctly identified was the 59 year old male.

The UK case is understandable – a partial cranium is not much to work with, although the sexually dimorphic areas were well-marked. The Portuguese-Angolan case is far from understandable. Even if the sexually dimorphic regions were not well-marked, the age indicators ought to have flagged up that the remains were a teenager and not a 29 year old. It is incredible that anyone with full medical qualifications, even with minimal forensic awareness, could make this type of error. In fact, it turned out to be not credible – it was found on exhuming the bodies that no autopsy had taken place, despite the authorities of the region insisting it had been.

The bodies were simply packed into coffins without examination and presumably the visual identification was so hasty that the gracile nature of a teenage male body was mistaken for the gracile nature of a female body.

In each case, the remains were supposedly examined by a person with full medical training in the knowledge that these were remains which were the subject of a police enquiry and yet, in each case, the sex was wrongly assigned. In the Portuguese-Angolan case, no examination took place, and in the UK case, it appears to have been only a brief visual examination without handling the remains.

The importance of estimating the sex correctly is shown by the results of misidentifying the sex – a police force starting a long complex task of exclusion with more than fifty possible identities for the partial cranium in one case, with all its attendant expense (financial, temporal and emotional) and contacting of anxious relatives. In the other case, the wrong identification of sex resulted in not only the emotional distress caused to relatives in two countries who had buried the wrong person, but the expense involved in remains having to be exhumed and further still the damage done to public confidence in the judicial system of the country. Yet, as seen above, sex ought to be one of the most straightforward attributes to assign correctly assuming several elements of the sexually-dimorphic bony elements are present, as was the situation in both these case studies.

4.3.2 Discussion of complexity of choice

In 2002, an undergraduate student contacted the author as part of a survey of practising forensic anthropologists in the United Kingdom. Her dissertation study involved surveying forensic anthropologists known to have practised within the United Kingdom, on a variety of topics relating to their casework (Martinson 2003). The survey was sent in a rather ad hoc manner, with practitioners passing it on amongst themselves and suggesting other possible practitioners for Martinson to contact; eleven practitioners responded. This author requested a full copy of the dissertation and was granted permission to use it in this thesis.

When practitioners were asked for comments on characteristics that were found to be consistently inaccurately-assessed, the majority of comments were about age estimation, and none was made about sexing estimation – however 57% of the cases reported by practitioners involved remains described as "complete" or "partially complete", rather than "cremated", "fragments" or individual bones. This suggests that practitioners may have had more than one area of the skeleton available for sex assessment, thus increasing the likely accuracy of the sex estimation, as explained above.

Eleven practitioners gave a total of nine sexing methods between them, as well as a tenth category of "Not stated". The list of methods included DNA, which is not usually classed as a forensic anthropological technique. This leaves eight methods between nine practitioners, individualised by alphabetical means (Table 4.1). The first three rows refer to standard works, compiling extant methods (Krogman and

Iscan 1986; Bass 1987; Buikstra and Ubelaker 1994). The next four rows refer to general morphological aspects, rather than specific methods attributed to specific authors; the section classed as “Metrics” could cover any one of over a hundred methods using almost any bone of the skeleton, or could refer to using many more than one Metrical method.

The eleven practitioners who responded used between one and five methods; as the survey asked for methods used on specific cases, this may not be representative of the number of methods available to each practitioner. No single method was used by more than five practitioners; this emphasised the disparate nature of forensic anthropology’s methods. Only four of the eleven respondents used “new techniques”, specified in Martinson’s text as being isotope analysis (another technique not usually included in forensic anthropology), computerised-assessment (developed on American populations) and changes in reported ages for development of bone. Obviously, the survey had only eleven respondents (out of the 23 identified by Martinson to have been practising within the United Kingdom in 2003) and the questions are general, rather than specific. It would be valuable for this survey to be repeated, in more detail, in order to establish all methods for sexing in use in the United Kingdom at the current time. It would also be useful to know the methods used for other aspects of the biological profile, i.e. age, race, stature.

Practitioner	A	B	C	D	E	F	G	H	I	J	K	Number of practitioners using this method
Bass	X				X							2
Ubelaker & Buikstra					X			X	X		X	4
Krogman & Iscan									X			1
Cranial morphology, inc mandible			X	X			X	X		X		5
Pelvic Morphology			X	X			X	X		X		5
Long bones and femoral/ humeral heads			X	X						X	X	4
Vertebral column				X								1
DNA								X				1
Metrics			X				X	X				3
Not Stated		X				X						2
No. of methods used by each practitioner	1	-	4	4	2	-	3	5	2	3	2	

Table 4.1 Methods used for sex estimation by nine forensic anthropologists practising in the UK in 2002. (Adapted from (Martinson 2003))

Martinson's study showed that a range of methods were used in the United Kingdom at the time of her survey. As some of the categories (Buikstra and Ubelaker for example) contain a range of methods within one book, it widens the field further. What is interesting is that no single method listed is employed by all the practitioners, which may reflect the different backgrounds of forensic anthropologists in the United Kingdom.

To illustrate why it matters whether one method of sexing is chosen over another, two methods will now be reviewed, along with subsequent papers relating to each method. Neither method discussed below is specified in Martinson's table above, the first being generically classed as a morphological method and the second as a metrical method.

The first is a method of sexing by visually assessing the shape of part of the mandible (Loth and Henneberg 1996), along with four papers which tested the method with considerable variation in results (Donnelly, Hens et al. 1998; Haun 2000; Hill 2000; Kemkes-Grottenthaler, Löbig et al. 2002). The second method involves a metrical assessment of the neck of the femur (Seidemann, Stojanowski et al. 1998), along with three papers which tested the method, again with considerable variation (Stojanowski and Seidemann 1999; Alunni-Perret, Staccini et al. 2003; Frutos 2003), and a brief discussion of factors which were not taken into account by the original authors.

4.3.2.1 Mandibular ramus flexure

In 1996, Loth and Henneberg (Loth and Henneberg 1996) published a new method of establishing the sex of a skeleton from a single element of the mandible. In the following four years, three other papers (Donnelly, Hens et al. 1998; Haun 2000; Hill 2000) tested the method and found not only lower rates of accuracy but a clear intra-observer error; that is, that the rate of accuracy varied when the same material was examined on two occasions by the same observer using the method.

The original paper (Loth and Henneberg 1996) claims accuracy in sexing of 99% from a single morphological element, namely the curvature, or flexure, present where the jawbone becomes more vertical at the back of the jaw. The method requires the assignment of a numerical 'score' to the degree of flexure of the ramus at the level of the occlusal surface of the lower molars in adult males, but near the neck of the condyle in females.

The mandibles of a total of 200 skeletons (116 males and 84 females) from historical collections in South Africa, of known sex[5], were 'scored' by one of the authors, between +1 and –1. This 'score' was based on how much 'flexure' was observed in the judgement of the observer. The addition of left and right scores then yielded a total score between +2 and –2, which was compared with the documented known sex, and prediction accuracies calculated. The numbers are not measures but simply the observer's decision on the presence or absence of a visible bend in the bone. The results for this "normative sample" indicated that this flexure was diagnostic in 99.1% of males and 98.8% of females for overall prediction accuracy of 99.0%. In other words, the authors claimed that their method could determine the sex of an individual in about 99% of all cases simply by judging, by eye, the shape of the jawbone. Subsequently the method was blind-tested on 247 more skeletons from historical collections in the USA and the results included in Loth and Henneberg's original paper (Loth and Henneberg 1996). 191 of these had accompanying

[5] Skeletal collections are either of "known sex" (the sex of the individual in life is known; this and other details of the specific individual are curated with the skeleton) or of "unknown sex" (the sex of the individual has been assessed post-mortem by examining the entire available skeleton and producing a biological profile based on the skeleton)

documentation which gave the sex of the individual, but 66 of them did not have this information and so the sex of these 66 was determined by "other methods" – presumably by using the existing accepted methods already in use in forensic anthropology. Some of this blind-testing population of 200 had pathological conditions, including one each diagnosed with Paget's disease and acromegaly, and unspecified numbers with leprosy, syphilis and healed trauma. The results for these ranged from 90.6% and 92.4% accuracy.

The overall accuracy for all mandibles ('normative' and 'test' populations together) is given as 94.2% - which is not the same as the 99% accuracy mentioned twice in the abstract, and claiming to be comparable to the accuracy from assessing a complete pelvis. The pelvis is traditionally regarded as the best area of the skeleton for assessing sex. The authors do caution against using mandibles with certain teeth missing, potential problems with individuals aged below their early 20s, and they admit that there may be problems with the accuracy of sexing of the skeletons of unknown sex used in the test sample. However, it is clear that they recommend the method as having a sex-prediction accuracy of "at least 91%" (Loth and Henneberg 1998).

Subsequent tests have not found the same levels of accuracy. Donnelly et al (Donnelly, Hens et al. 1998) found only 62.5% accuracy, and 67.7% by a second observer, using a sample made up of 16 known-sex individuals and 80 of unknown-sex, sexed by pelvic morphology. The origin and date of the 80 is not given, save that they are Native Americans, a group not included in the original Loth and

Henneberg study, which used mainly African and American Blacks and Caucasians. Thus, there is uncertainty over the test sample's relationship to the original sample, as well as the possibility that the unknown-sex sample may not have been correctly sexed by non-mandibular methods in every skeleton. However, Loth and Henneberg's original paper does not include any caveat saying that the method should only be applied to the population group they studied – in fact, there does not seem to be a widely-recognised idea of sexing elements differing in different populations. Stature equations are known to be different for different ethnic groups (Ozaslan, Iscan et al. 2003; Celbis and Agritmis 2006; Ryan and Bidmos 2007; Bidmos 2008; Krishan 2008; Hasegawa, Uenishi et al. 2009); some age estimation methods differ for different ethnic groups as well as for each sex (Krogman and Iscan 1986; Bass 1987; Reichs 1998). Sexing, however, appears to be generally regarded in forensic anthropology as applicable to all populations worldwide.

Hill (Hill 2000) tested Loth and Henneberg's 1996 method and found 79.1% of predictions of sex were accurate for one observer and 64.7% of predictions for a second observer, testing on a sample of 158 adult mandibles from a recent-historical (born before 1900) known-sex collection in the USA, including some which are pathologically-affected. It may seem obvious that any skeleton with systemic pathological condition should be excluded from the study, because the shape of relevant bones may be altered by the disease process, but apparently this is not routinely done.

Hill wanted to see if her judgement was consistent and so another 17 mandibles, not used in the test, were assessed six months apart. Of these 17, only 11 were given the same score in each examination and 6 had a score in the second examination which was not the same as the score in the first examination. This suggests that the method is not as simple and reliable as its original authors claimed, and is liable to intra-observer error. This is a situation in which the same bone is examined on two occasions by the same observer with differing results.

Further, Hill tackled the question of including pathological specimens: removing the pathological specimens didn't change the overall accuracy of the method – in fact, when Hill tested the method on a sample in which all the mandibles had marked pathology, the method correctly sexed all of them. This is particularly odd, since if the teeth are absent, then the "occlusal level" (i.e. the place on the bone which is level with the chewing surface of the back tooth) can only be guessed at, which rather contrasts with the detailed instructions given by Loth and Henneberg (Loth and Henneberg 1996) for locating this precise spot.

This is only the start of Hill's reservations about the method, as she also found that mandibles could score differently for the left and for the right (for example, left scoring -1 and right scoring +1). She makes the point that these ought not to be classed as 'male' with their score of 0 (i.e. +1 -1), but should be excluded as "unable to sex" because they give conflicting results on the two halves of the mandible. However, she found that if she removed these ambiguous mandibles, the accuracy level fell to 67.7%, which makes little sense, assuming the method to be reliable.

Summing up Hill's work, she found that the method gave good results when 'guesstimating' the location of measurements due to pathological absence of teeth; that the method became less reliable if mandibles with conflicting scores of "female and male" were removed from the sample; that one person looking at 17 mandibles six months apart can score a third of them differently.

Haun (Haun 2000) found 78.2% accuracy for one observer and 67.2% for a second, using 150 unknown-sex individuals from an archaeological site in Iran, dated to between approximately 800AD and 4000BC. The sample used only adult mandibles, but did include some pathologically-affected specimens. It also included individuals from approximately age 16, which may not be old enough to have fully adult mandibles, given that the roots of the second molar are only just finishing formation at age 15, and the third molar (the most variable in eruption age) is typically still forming inside the posterior area of the horizontal ramus of the jawbone at age 16 onwards. There are obvious potential problems with testing a method developed on recent-historical (i.e.19-20th centuries) material from Africa and the United States on a sample of such archaeological age, of a racial group from an area of the world not included in the original sample. However, the specific aim of Haun's study was to try to replicate specific situations by deliberately using unknown skeletons (Haun 2000, p.430):

"The purpose of this study is to test the predictive accuracy of [the method] on a population that lacks an historic documentation of sex and age, a situation that will duplicate (at best) the conditions under which future assessment of archeological, fossil hominid and forensic specimens will be conducted."

It seems illogical to test a method by using bones from individuals whose biological profile is not ‘known’ (in the sense of ‘known-sex’ collections). It would be better reasoning to test the method on known specimens so that the test-results can be checked for accuracy.

There is also an assumption in that quoted reasoning from Haun that one bone element will not have changed in any way between fossil hominids and modern human populations. Lavelle studied 210 mandibles to compare Romano-British (roughly the first four centuries AD) and Anglo-Saxon (prior to the 1066AD Norman Conquest) with 19th-century British individuals (Lavelle 1972). He found that changes had occurred at a statistically significant level – between the Romano-British period and the 19th century, the jaw became significantly smaller. The mean measurement for the length of the ramus changed from 65.1 mm to 60.5 mm; the width of the ramus reduced from 34.2 mm to 31.9 mm. The angle at which the two rami meet increased from a mean of 123.6° to a mean of 125.6° – admittedly only 2° difference, but all ten of the measurements taken for Lavelle’s study reduced by several millimetres over the centuries. As Britain was, and is, an island of mixed racial types, the physical typologies involved may well have changed through two thousand years, which could affect the measurements. Diet has certainly changed a lot, which could also affect muscle attachment areas of the mandible. It is not clear just how many factors could be involved, or not involved, in trying to match a subtle shape-change in modern human jaws to the same bony area in archaeological

humans from another part of the world. It could be dozens of factors, each of which could affect this element's flexure.

Schmittbuhl et al in 2007 used elliptical Fourier analysis to assess variation in mandibular shape in a range of hominids (Schmittbuhl, Rieger et al. 2007). They found that there was less sexual dimorphism in humans than in some other hominids, but make the point that this can be exhibited to different degrees and that research is needed across the world in different populations. An example of the complicated relationship between different aspects of the biological profile (age, sex, race, stature) is in a paper from Indonesia (Indrayana, Glinka et al. 1998) which concluded that the method as published by Loth and Henneberg (Loth and Henneberg 1996) was a reliable indicator of sex – results were above 90% accuracy – but that they found that diet made a difference in the shape of the ramus. In one region, people in the same population had varied ramus shape depending on whether they ate soft or hard food; this in turn was determined culturally by gender, with women tending to eat softer foods which could affect the results.

Kemkes-Grottenthaler investigated the reliability of mandibular ramus flexure, along with gonial eversion or the degree to which the angle of the jaw flares outwards in a lateral direction, in 2002 (Kemkes-Grottenthaler, Löbig et al. 2002). The accuracy got worse, and it became apparent that the original method devised by Loth and Henneberg had a tendency to assign some female skeletons to the category of 'male'. The results for two samples, made up of a forensic population of individuals of known sex (153 individuals) and of archaeological remains in which the individuals

were sexed by other means (80 individuals), were 66% accuracy for male correct identification, but only 32% accuracy for female correct identification.

A Turkish team (Balci, Yavuz et al. 2005) noted that a number of tests had resulted in accuracy levels considerably below the 90% plus claimed in the original paper, and set out to conduct a blind test on a Turkish population, using 120 mandibles from forensic cases, i.e. individuals of known sex. They discovered that the method may be usable, but by no means on all individuals. It is necessary to remove from a study all mandibles with more than two molars missing, and all mandibles which do not have both sides available for observation, as well as all mandibles which do not produce the same 'score' on both left and right sides; finally, all mandibles which produce a 'score' of zero, which is the category for which sex cannot be determined, must be removed. So if one uses the method on a complete mandible with one or no molars missing, which is absolutely symmetrical, and which definitely does or definitely does not have flexure of the mandibular ramus at the occlusal level – then it is a reliable method. A different South African study in 2006 on 28 males and 43 females found that there was not enough difference to correctly identify any individual specimen as being from a specific sex (Oettle, Pretorius et al. 2006).

These main cautionary aspects about the use of mandibular ramus flexure as an indicator of sex are contained in a short note published in the same journal, American Journal of Physical Anthropology, in the same year, 1996, as the original paper. Koski wrote in detail of the potential failure of the method in sexing an

individual, both in terms of the differences between populations and the differences of what he describes as the very complex functional aspects involved (Koski 1996).

It took two years for Loth and Henneberg's response to be published (Loth and Henneberg 1998). In this response, they dismiss Koski's concerns. Rather than address Koski's general concerns, they focus on differences between their work and his observations based on experience with clinical radiographs. Where Koski reports concerns based on a Finnish population through his work in the Institute of Dentistry at Turku (Koski 1996), Millicent Henneberg dismisses his being unable to see the relevant dimorphism in dozens of female mandibles. Koski writes that he cannot observe any consistent lack of flexure in females – Loth and Henneberg respond that he isn't looking at both males and females, and seem dismissive of the suggestion that a Finnish population may have differences. After stating that they had addressed population differences in their original paper, and found that they "do not affect the overall accuracy of sexing which ranged from 91% to 99% and averaged 94.2%", they go on to say:

"Koski asks for independent confirmation. Obviously this must come from other authors. In the meantime, however, numerous colleagues from around the world have informed us that they are using [this] method and find it very helpful and easy to apply. We look forward to publication of the results" (Loth and Henneberg 1998).

Possibly they would not have looked forward to publication of results from other authors had they known how badly wrong they were on the question of population differences.

	Accuracy %	Difference from Original	Inter-observer difference
Original Loth & Henneberg	99	-	-
Test 1 Donnelly et al	62.5 to 67.7	-36.5 to -31.3	5.2
Test 2 Hill	64.7 to 79.1	-34.3 to -19.9	16.6
Test 3 Haun	67.2 to 78.2	-31.8 to -20.8	11
Test 4 Kemkes-Grottenthaler	32 to 66	-67 to -33	-

Table 4.2 Difference in accuracy rate (%) between original paper and the main test papers (Loth and Henneberg 1996; Donnelly, Hens et al. 1998; Haun 2000; Hill 2000; Kemkes-Grottenthaler, Löbig et al. 2002)

These 'test' publications subsequent to Loth and Henneberg's paper make it clear that this method is not a reliable global indicator of sex, for a wide range of reasons.

4.3.2.2 Supero-inferior neck of femur

Seidemann et al's 1998 paper described a method of estimating the sex of a skeleton from a single measurement of the neck of the femur (Seidemann, Stojanowski et al. 1998). The femora used in the study came from the Hamann-Todd skeletal collection (curated at the Cleveland Museum of Natural History) and from five archaeological assemblages (from a number of American institutions). The Hamann-Todd collection consists of known-sex individuals, most born between 1825 and 1910, dying between 1910 and 1940; the individuals are "primarily of low socioeconomic status and were inhabitants of an early 20th-century urban industrial community". Both African-Americans and Caucasian populations are represented. The archaeological

specimens are, obviously, of unknown-sex and these samples were not used to assess the accuracy of this method. The Hamann-Todd specimens were all adult with no major pathology apparent; each group of male, female, African-American and Caucasian contained 50 or more individuals. After analysis of all samples, the authors concluded that the predictive accuracy is about 90%.

The archaeological samples were then used to determine how well the femoral neck survives for measurement. 424 femora were examined; whilst only 48.6% had enough of the femoral head present for measurement (a more usual method of sex estimation), over 85% had the femoral neck present for measuring. This showed that the method, if reliable, would be of use in fragmented remains.

In the summary and conclusions, Seidemann et al do make it clear that for samples to produce accuracies of 96% to 100% is "unrealistically high" and that true error rates are "likely much higher". The abstract states that, despite one or two minor differences, "it is more likely that the true accuracy […] approximates 90%". Three papers (Stojanowski and Seidemann 1999; Alunni-Perret, Staccini et al. 2003; Frutos 2003) published over the following 5 years found that the true error rates were indeed "likely much higher".

This original study used a sample from a historical (born 1825-1910) known-sex collection; the first "test" paper was by two of the original authors, Stojanowski and Seidemann (Stojanowski and Seidemann 1999), in 1999, using a population from a modern known-sex collection (born after 1900). The authors specifically set out to

test the method on a modern population of known age, sex and biological affinity. They were aware that using individuals born before the turn of the 20th century as the sample may not correlate with using the method on a modern forensic sample. They used 143 individuals, all adult and with no obvious pathology, including male and female, African-American and Caucasian. They found that the modern sample of Caucasian males showed no real differences in the size of the femoral neck compared to the pre-1900 individuals measured in the original study. However African-American males, and both African-American and Caucasian females all showed statistically significant differences. The modern sample showed an increase in the mean neck of femur diameter. As Stojanowski and Seidemann describe this, they also comment that this means their previously published method may not be appropriate for use on modern individuals. The accuracy drops in all groups to 82-84%. They attribute this to an increase in female femoral neck measurements effectively decreasing the gap between the male distribution and female distribution.

The second test paper (Frutos 2003) sets out with two aims: to test the original (recent historical, North American) discriminant functions on a modern Guatemalan population, and to calculate new discriminant functions from data collected from this modern rural Guatemalan population.

As can be seen below in Table 4.3, the results demonstrate the importance of population-specific data: using North American data on a different population gives only 36% accuracy in sexing from this measurement, compared to 89.5 using population-specific data for the discriminant functions.

The third test paper (Alunni-Perret, Staccini et al. 2003) specifically examines the differences in accuracy when the original discriminant functions are applied to a Caucasian French sample born after 1910. The original paper (Seidemann, Stojanowski et al. 1998) and the first test paper (Stojanowski and Seidemann 1999) concluded that in males born before 1900 and males born after 1900 there was no significant difference, but that in females born before or after 1900 there was. Alunni-Perret et al tested the method on a sample of 35 pairs of adult femora from males and 35 pairs of adult femora from females, all taken from individuals born after 1910, who died between 1998 and 2000 and of known sex. Their results show the importance of not applying historical data to modern problems: 71.4% accuracy rises to 90.1% accuracy when using discriminant functions calculated for a modern French population.

	Original data	Adapted Data
Original – Seidemann et al	90	-
Test 1 – Stojanowski and Seidemann	85	85
Test 2 – Frutos	36	89.5
Test 3 – Alunni-Perret et al	71.4	90.1

Table 4.3 Accuracy rates (%) using Original data (historical USA) and adapted data (Seidemann, Stojanowski et al. 1998; Stojanowski and Seidemann 1999; Alunni-Perret, Staccini et al. 2003; Frutos 2003)

The potential for making mistakes due to changes between the population from which the method was derived and a modern population under study is serious. Duthie et al's study shows that the femoral neck measurements have changed by up to 10% during the 20th century (Duthie, Bruce et al. 1998).

For sexing American Whites, the femoral head diameter is often used (Bass 1987). The general principle is that less than 42.5mm strongly indicates Female, 42.5-43.5 suggests Female, whilst above 47.5mm strongly indicates Male and 46.5-47.5mm suggests Male. The area between, 43.5mm to 46.5mm is Indeterminate.

Looking at the data for the head of the femur in the Duthie study, the femora of those dying between 1900 and 1920 have a mean head diameter of 48.5mm for men, and 43.7mm for females (Duthie, Bruce et al. 1998). This mean is larger than the American White data given in Bass – but the mean measurements for those dying in the 1980s is even worse – 50.2mm for men, but 45.2mm for females. The table below shows how the Duthie data, plus or minus one Standard Error, fits into the accepted sexing measurements. Other studies are included to show how data varies from country to country.

	?Female or Female	?Male or Male
Bass (Bass 1987) 'American White'	43	47
Purkait (Purkait 2003) Indian *	38.19	44.11
Asala (Asala 2001) South African Whites*	42.32	48.44
Asala (Asala 2001) South African Blacks*	39.8	44.47
Steyn & Iscan (Steyn and Iscan 1997) South African Whites	43.02	48.46
Mall et al. (Mall, Graw et al. 2000) German*	44	49
Aberdeen (Duthie, Bruce et al. 1998) 1900-1920	43.7	48.5
Aberdeen (Duthie, Bruce et al. 1998) 1980s	45.2	50.2

Table 4.4 showing the range of femoral head measurements (mm) given by authors

[* Vertical measurement, not necessarily the same as maximum measurement]

In both samples, the bulk of males would be correctly classified as Male, as the mean is over 47.5mm, and even including one SE the range does not extend down to 47.5mm.

For females in the early 20th century, the lowest end of the range created by adding or subtracting one SE is within the Probably Female category. The mean and most of the range sit within the 'Indeterminate' category – for the later 20th century, the lowest end of the range is well within Indeterminate. This method, widely accepted in human osteology, cannot be used on north-eastern Scottish females at all. It will simply categorise the majority of them as unsexable. Given that these changes

occurred during the twentieth century, it is possible that there are further changes since the 1980s. Thirty years on, perhaps the differences are greater, or perhaps lesser. We just don't know.

4.4 Summary

Following Chapter Three's evaluation of the practitioners themselves, this chapter sought to evaluate the methods used in forensic archaeology and forensic anthropology. It has examined a specific topic in each of the two disciplines of forensic archaeology and forensic anthropology, a topic chosen in each case because of the fundamental role it plays in the discipline. To examine an aspect rarely employed would achieve little. The specific topics chosen were based upon a question frequently asked in forensic archaeology ("where is the burial?") and a question similarly frequently asked in forensic anthropology ("what sex was this individual?"). The reason for evaluating the methods is to illustrate some of the circumstances where the traditional methods of death investigation in Britain may not produce results, but where the involvement of specialist practitioners may result in locating the concealed human remains or may correctly assess the sex of unidentified human remains. This critical examination shows that there are benefits in utilising the services of a practitioner who has extensive experience as well as training.

There are disadvantages to a forensic investigation in assuming that a non-specialist may perform a specialist role. Evidence may be missed or misinterpreted if the work is carried out by an individual without the fullest understanding of how the methods'

results may alter through time and across regions, and the deeper comprehension of the factors involved in selecting the correct method for each case, on a case-by-case basis. Access to all the relevant journals may affect this comprehension, especially as data is published in journals which may be either forensic or non-forensic.

Those instructing the use of a specialist may make assumptions – such as that anyone with access to the industrial-survey equipment can use it for forensic search purposes, or that anyone with an archaeology degree will understand the complexities of a forensic search, or that anyone with medical training can fully grasp the sometimes-conflicting range of published, peer-reviewed opinions and recommendations involved in assessing the biological profile of an individual from the bones. More realistically, it is essential that the survey is carried out by someone both skilled and experienced in the specific application of these techniques to forensic searches in differing terrains; and that the assessment of skeletal remains is carried out by someone familiar with the relevant data and techniques most suited to each specific case.

This chapter has also shown that inaccurate results can misdirect an investigation, and that this can cost time, effort and money – none of which the police have in enough abundance to waste. By utilising the appropriate person with the appropriate equipment or methods, the result is a higher quality and sometimes a higher quantity of evidence.

Chapter Five

The Scope for Use of Forensic Archaeology and Forensic Anthropology

5.1 Introduction

This chapter explores the potential for using forensic archaeology and forensic anthropology within the United Kingdom. If there are never cases that could benefit from the involvement of the two disciplines, then there is little point proposing their use. In Great Britain, the current situation is that the involvement of a forensic archaeologist or forensic anthropologist in a case is most likely to be driven by either police or a forensic pathologist, and to involve bringing in a specialist who would not otherwise be present. The suggestion may be authorised by a legal official, such as a Coroner or Procurator Fiscal, but they are less likely to instigate it.

One of the issues involved in regulating the use of forensic archaeology and forensic anthropology in Great Britain is whether there are enough cases to justify the time and effort involved in a formal recognition of the two disciplines, or if so few cases occur that it is not necessary to train and retain anyone specialising in the location, excavation, retrieval and identification of concealed human remains – is it *useful* to have forensic archaeologists and forensic anthropologists available to an investigation? This chapter will address that question.

Sources of data are explored and the limitations on using the media as a data source are discussed. Through the Media Derived Case List (MDCL), some evidence is produced of whether such cases occur in Great Britain with any real frequency. Conclusions are drawn regarding the realistic potential for the deployment of forensic archaeologists and forensic anthropologists across the country.

5.2 Death investigation and the role of forensic archaeology and forensic anthropology

The majority of deaths in Great Britain require no forensic investigation. For example, an elderly person has been seen regularly by their own General Practitioner for a terminal condition: that person dies at home, the GP attends and the death is certified as natural and non-suspicious by the GP with no involvement of the Coroners' or Procurators' Fiscal inquiry systems. There are no questions over locating or identifying the body, nor over the cause or manner of death.

Forensic archaeology or forensic anthropology may be usefully involved, where those questions *do* exist. There may be strong suspicion of death in a Missing

Persons enquiry. There may questions of identification, or the circumstances around death and clandestine disposal of the body. Commonly, the remains are decomposing, partial or preserved by adipocere formation or mummification. Less commonly, the remains are fully skeletonised.

There are many kinds of case in which forensic archaeologists or forensic anthropology could be of benefit to the investigation. An example of this is a 'cold case' which involved 15 years of a Missing Person enquiry in one police force area and 14 years of an unidentified body enquiry in another police force area, hundreds of miles away (Missing Persons Bureau 2009). A body was found in Cumbria in 1995, and remained unidentified after fourteen years. In 2009, Devon and Cornwall Police brought up for review a 'cold case' from 1994 of a man who had disappeared after setting off to hitch-hike from Torquay to Glasgow. The officer conducting the review of the 1994 disappearance worked with the Missing Persons Bureau and several unidentified bodies across the country were classed as possible matches. Factors such as the dates concerned, the height of the unidentified man's remains and the clothing found with the remains were used to identify the Cumbrian body as the most likely match for the Missing Person. Information from the manufacturer of the shorts found on the body helped to narrow the field of possibilities further, and finally familial DNA and clothing identification were considered to confirm identification of the unidentified body found in Cumbria as that of the missing man from Torquay. In 'cold case' reviews such as this, the remains are often re-examined by pathologists and at this early stage a forensic anthropologist could be of use.

Another example is of the kind of case in which the body is found, by chance or by organised search, and is identified, yet the cause and manner of death may not be established to the level required by legal protocols. Much use has been made of forensic anthropology for this purpose in mass grave situations, but within Great Britain there seems much less involvement of forensic anthropology in helping to establish the manner of death. The recognition and interpretation of bony trauma is one area in which a good forensic pathologist should be competent, hence there may be no requirement for forensic anthropology involvement. Forensic pathologists may not always be skilled in interpretation of some of the aspects of forensic anthropology, but they are frequently required to identify and understand bony trauma in bodies with or without decomposition.

In some circumstances, however, it is not the forensic anthropologist but the forensic archaeologist who can help with ascertaining the manner of death, as in a case-study given by Hunter (Hunter and Cox 2005). Hunter's 'Case 25' involved human remains found by chance partway down an embankment in a derelict area. The body was partly covered by soil and partly exposed. The remains were not sufficiently well-preserved to allow a clear cause, or manner, of death to be established by the pathologist; fortunately the Senior Investigating Officer had requested a forensic archaeologist to attend the scene before any further disturbance was made, on initial discovery of the remains. The question was whether the individual had been buried in a shallow grave, or had become buried by natural processes.

If the remains had been buried in a shallow grave whose overburden of soil had subsequently been disturbed by animals or eroded by rain and wind, then the investigation would become a suspicious death enquiry – since bodies cannot bury themselves, then at the very least it would involve failure to report a death, concealment of a body or a similar criminal charge; at most it would be a murder case. If, however, the body had become partially covered by soil by natural 'site formation processes' well known and understood by forensic archaeologists, then the enquiry may conclude that death was accidental or natural. In Hunter's 'Case 25', the experienced forensic archaeologist was able to establish that there was no grave-cut, and that the soil partially covering the body had been carried down from further up the slope by natural processes, namely the combination of weather and gravity. When the body was identified, by DNA, as a patient from a nearby hospital, with a history of wandering away in a state of mental disorientation, the case was closed.

Forensic archaeology could also be of benefit to enquiries in which a public or legal statement has been made to the effect that a missing person is now officially considered dead. These are sometimes known as 'No Body Murders' and a database of these is held by the National Policing Improvement Agency[6]. Unfortunately, despite ready co-operation with the author on her visit to NPIA in 2005, no data was forthcoming despite repeated requests.

An example of a 'No Body' murder enquiry from my own casework involved a 15-year-old girl, who was reported missing in February 1991 and whose remains were

[6] The NPIA was closed in late 2013, and its functions absorbed into a number of other national policing structures.

found buried in a garden hundreds of miles away in 2006. Scottish police were seeking the 15-year-old girl's remains, in one murder enquiry; her remains were excavated by forensic archaeologists during a search by a different police force in England on a different murder enquiry seeking the remains of a different girl aged 19, who also disappeared in 1991 and whose remains were in fact found in the same garden. Prior to the discovery of the 15-year-old's remains, the Scottish police had publicly announced that they would, henceforth be conducting the search as a murder enquiry, despite its then status as a 'No Body' enquiry.

'No Body' murder enquiries can and do go to court, and to conviction, without a body. The uncle of 15-year-old Danielle Jones was convicted in 2002 (BBC News 2002) after she disappeared in 2001, despite no body being found. The step-father of 15-year-old Jenna Baldwin was convicted of her murder in 2003 (BBC News 2003) – her body was found by the time of trial, but Baldwin was charged with her murder at a time when her body had not been found. Obviously, it benefits the successful prosecution of a case if the evidence is more complete, and for this reason, a 'No Body' enquiry could benefit from involving forensic archaeology in locating a body or forensic anthropology in correctly identifying a body.

These cases are but a few examples of the various types of investigations in which a forensic archaeologist could be used to benefit the search and recovery process, and to interpret evidence of events surrounding the deposition of the remains; or a forensic anthropologist to benefit the assessment of disrupted human remains for

purposes of identification of the individual and to establish events surrounding the death.

5.3 Missing Persons, unidentified bodies and unexplained deaths in the UK

There are relatively large numbers of missing persons reported each year in the UK, but many return home or are found alive (Tarling and Burrows 2004). What concerns forensic archaeologists are the searches for the category of missing persons generally labeled somewhat vaguely as 'at risk', a term with no single meaning across different government agencies (Kemshall 2002). This obviously includes children but, for example, research suggests that female adults, as well as female children, face a higher risk of being homicide victims if they are 'missing' (Newiss 2004).

Under the new Code of Practice for the Collection of Data on Missing Persons (National Policing Improvement Agency 2010), Missing Persons are categorised as 'low risk', 'medium risk' or 'high risk'. The NPIA report is derived from the official manuals produced by NPIA's predecessor (CENTREX) in 2005 and 2006 – efforts were made to obtain a range of official manuals, but on telephoning the library at Bramshill in 2006, it was made clear that these are not available outwith the police. All police forces adopted the NPIA's Code of Practice for data collection by April 2010 (Missing Persons Bureau 2009).

This categorisation of risk directly affects how a search is carried out by police, or indeed whether a search is carried out (Malloch and Burgess 2011). The fact that the effort has been made to develop such a Code of Practice indicates that the search for a 'high risk' missing person is not a rare occurrence. There is no single source of

information on the numbers of such searches annually, nor on their outcomes. There are some sources of information on searches, but it is very difficult to locate all the information and impossible without further detail to eliminate duplicates. A case may be reported in more than one summarising report, and there is no way of telling, from numerical totals, how often this is the case. Some of these reports are from government, and some from volunteer organisations.

The annual reports from the Ministry of Defence for 2008 include the category 'Search – Recovery' which is defined as '"Search for craft, person(s), etc., resulting in the recovery of person(s) apparently dead" and the category 'Recovery' which is defined as "the recovery of person(s) apparently dead" (Ministry of Defence 2009). In 2008, 27 incidents were recorded under 'Search – Recovery' and a further 8 under 'Recovery', making a total of 35 cases involving retrieval of dead persons by British military personnel in the UK.

In 2006, the charity Mountain Rescue (England and Wales) was involved in 32 'mountain fatality' cases in England and Wales, and 36 'non-mountain fatality' cases in which a dead body was retrieved after a search for a missing person (Mountain Rescue (England & Wales) 2006).

The Centre for Search Research is a registered charity established in 1997 to carry out research and training in areas relating to searching for lost and missing persons. According to the annual reports on their website, the work is carried out by David Perkins and Peter Roberts, members of the Northumberland National Park Search

and Rescue Team (Perkins, Roberts et al. 2005). They have analysed the 'Missing Persons Behaviour Data' database set up to collect records of searches for missing persons attended by Mountain Rescue Teams throughout the United Kingdom and Eire. By 2008, this had reached over a thousand records but this is only a fraction of the total search operations. It is estimated that in 2008 there were 220,000 missing person reports filed (Dean 2009).

Perkins et al found that, during 2004, out of 554 searches in their study, 125 persons were recovered as 'fatalities' and 32 listed as 'no trace'. In 2005, out of 708 searches, 66 persons were recovered as 'fatalities' and 37 were listed as 'no trace'. In other words, some sixty-nine people had not been found, alive or dead, from the 2004-5 period, in the regions included under England and Wales (Perkins, Roberts et al. 2005).

There are clearly a number of cases each year in which individuals go missing in circumstances likely to result in their death (such as becoming lost in harsh terrain or weather) and in which no body is found by the end of that year. When remains are found, they are less likely to be intact and in good condition. Police budgets rarely stretch to multiple DNA analyses of disrupted human remains in non-suspicious death cases. Forensic anthropology can assist with identification in these cases. Black (pers. comm. Black 2000) tells of a case in which remains were found in a state of advanced decomposition and two possible identifications were suggested, one of a very muscular active male and one of a sedentary slightly-built male. She was able to assess the muscle attachment areas of the remains and indicate to police

that the remains were those of the very active male who had represented his university in rowing and whose arm-bones showed the signs of strong muscular development (pers. comm. Black 2000). It should be said that this distinction could have been drawn by the forensic pathologist, but apparently wasn't.

The reason for the publication of any search report may affect the data included. Search and rescue organisations publish these figures simply to report the number of occasions on which the search and rescue team was called out. They are indications only, reflecting the situation in which a search for the living becomes a search for the dead after a certain interval. The longer that interval between "last seen alive" and "found dead", the less likely it is that the person disappeared accidentally or by their own volition, although an exception might be suicidal people who sometimes hide themselves away in dense undergrowth to prevent their being found 'too soon', i.e. before they have succeeded in dying.

This 'liminal' group – not found dead, yet not thought to be alive – is one of the situations relevant to this chapter, along with situations in which a body has been found but major questions remain unanswered, such as identity or cause and manner of death.

Initial searches, whether by police or the armed forces or the volunteer charities, are carried out with the hope of finding a live person, well or injured. After that phase of search stops, then the investigation becomes a search for a corpse. In the case of vulnerable missing persons, the person may have become a missing person

accidentally, intentionally, or against their will. These possibilities influence how the police search will continue.

The search for Vicky Hamilton is a good example of one in which some evidence suggested that she had simply run away of her own volition, but police kept the case open as a general Missing Person case, including active enquiries, interviews and searches throughout 16 years for any potential clandestine grave. They eventually determined it to be a Murder Enquiry, concluding finally in the recovery of her body, some 500 miles from where she vanished and sixteen years later, and the conviction of her murderer (from the present author's own case-notes, 2000-2008).

The police do not make available to the public data on the number of searches they carry out, nor on whom they consult or involve when planning a search, nor on what proportion of searches are carried out with a reasonable expectation that the person is dead and the body concealed clandestinely. In fact, it is only now that the Missing Persons Bureau, newly set up within the NPIA, is involved in a long-term review of unidentified bodies which have been found across the United Kingdom, as well as collating all available data on missing persons (Missing Persons Bureau 2008). The Review of Unidentified Bodies is currently in progress but is taking a number of years and as yet no data is available on any aspect of it (pers. comm. Rouse 2010). When it is completed, it will be available only to serving police officers for operational purposes.

Until the Review of Unidentified Bodies is complete, there is no official estimate

available of how many unidentified bodies there are in the United Kingdom. Nor is there any official estimate available on how many missing people are thought to be dead, whose bodies are 'Not Found', suspicious or otherwise.

5.4 Cases in Great Britain: the search for data sources

An attempt was made in the early stages of this study to establish how many cases across Great Britain did or might involve either forensic archaeology or forensic anthropology. As discussed below, the various methods tried did not give useful results. This is a recognised problem in other areas of criminological research, causing criminologists to engage in "alternative and competing strategies of collecting data about crime, such as the utilization of data other than that from the police" (Davies, Francis et al. 2007, 10). As a result, since the official information sources simply do not record the information required, unofficial information sources were examined. From this grew the Media Derived Case List (MDCL).

The Media Derived Case List (discussed in more detail below) is admittedly limited, but it does at least give information on the minimum number of cases in which forensic archaeology and forensic anthropology could be used. It is not, nor has it ever been intended to be, exhaustive or complete. Because the information came mainly (but not exclusively) from media databases and media online archives, it was necessary to look at those cases which the media *chose* to report – obviously, this inevitably puts the focus on to the more sensational, unusual and abnormal cases. The present author has worked on a number of cases that were never reported by the media. A typical example was the finding of the remains of an elderly woman who

had suffered from Alzheimer's disease and had a history of wandering off; eight months later, largely skeletonised remains were found. Identification was straightforward, by means of personal effects, clothing, location of remains, and these were corroborated by the forensic anthropological findings of her age group, stature estimation, sex estimation and racial group estimation. These types of cases may involve forensic anthropology but rarely attract the attention of the media.

One original objective of this thesis was to obtain precise information on the numbers of police cases in Great Britain of a type that might involve a forensic archaeologist or forensic anthropologist; on the proportion of those cases which did, in practice, involve practical work or advice from a forensic archaeologist or forensic anthropologist; and the extent to which this input helped the police investigation.

Letters from the Regius Professor of Forensic Medicine in the University of Edinburgh were sent in 2002, to each of the eight police forces then in Scotland, asking for information on all cases they had which had involved a forensic archaeologist or forensic anthropologist. Written replies were received from 7 of the 8 forces. The eighth declined, by telephone, to be involved. None of the seven co-operating police forces kept records of a type that would be of use. This was either because they only kept recent records, or because the data retrieval was not possible with the desired parameters (i.e. how many cases had they of buried remains, partial remains, etc.).

Incidentally, it should be added that I was surprised to be informed that one police force responded that it had never employed a forensic archaeologist or forensic anthropologist. This was a force for whom I had worked a number of times on forensic excavations, post-mortem work and even giving expert evidence in a murder trial. Clearly this information was not recorded, or was not recorded in a way that was retrievable.

Approaches were then made to the National Injuries Database (NID), held at the NPIA, a comprehensive database of murder cases back to the 1960s where data was available to be included. No replies came to the initial letter and subsequent letters were sent. Eventually a personal approach was made at a conference in 2004 to a member of staff, and a subsequent visit made in person to the NID to go through the 24-page form to request data. A year later, in early 2006, the results were finally obtained: the police forces of the United Kingdom had never used a forensic archaeologist nor a forensic anthropologist in any murder case in the previous four decades.

This was clearly not correct, since a number of practitioners known to the present author, as well as the present author, had worked for police forces on a number of murder cases. The conclusion drawn was that, as with police forces' records, this information was simply not recorded in a form which could be retrieved by the NID search, or else was not recorded in the database at all. Therefore the primary source of official data on murder enquiries in the United Kingdom was of no use to this study.

The Home Office Homicide Index was not used for this study because it would have swamped the study with enormous numbers of homicide cases – some 2,685 homicides for 1993-96 according to Peelo et al (Peelo, Francis et al. 2004). This large number of cases does not include certain information which this study requires, such as where the body was found, the post-mortem interval or the relevant details which indicate whether the case might benefit from involvement of forensic archaeology or forensic anthropology. The Homicide Index "covers key elements of each homicide offence: date; in which police force it occurred; circumstance; method of killing (e.g., stabbing, shooting); some details of the victims (e.g., name, age, sex, ethnic group, country of birth and occupation); some details of the suspect(s) (similar to those for victims); and what court disposal was given, if any" – but not the location of the body when found (ONS 2003). Others researching in related areas of questioning have also found that the data on missing persons and homicides was not available, or not sufficient (Newiss 2004).

Finally, emails were sent in 2013 to seven forensic providers, and to the newly-established professional bodies for practitioners of forensic archaeology and forensic anthropology, with four simple questions asking about the number of forensic cases in the last five years, in each of the location categories (those used in the MDCL, i.e. *Buried*, *Surface*, *Other, Not Found,* etc.). Only three replies were received: one referring the questions to another source who did not respond; one from a professional body confirming the questions would be circulated to members; the third being the only practitioner who answered the questions – an archaeological

osteologist who simply confirmed that she had dealt with a number of skeletal elements during that period, of which all had been archaeological.

5.5 Cases in the UK: the Media Derived Case List

Unofficial sources became the last resort, but were plentiful. Sources varied from reputable online news archives such as the BBC News and *The Guardian*, to individual police force websites, and various websites set up by either individuals (the family and friends of missing persons) or organisations (such as the now-defunct National Missing Persons Helpline website). Search engines included Google and those within various archived websites.

These sources, along with some popular 'true-crime' books, had to be viewed throughout with a certain level of mistrust. It emerged rapidly that websites 'lift' from each other, so a paragraph of information about a missing person may appear on three different websites, but may also contain the same unusual typing error or peculiar grammatical error, effectively making it a single source. Where possible, information was only used if it clearly came from more than one source. The same approach was taken with books on 'famous cases'. Some are written with reputable sources, such as a senior police officer who was involved in the case, or had access to the taped recordings of all interviews with the suspect prior to trial plus the author having attended the trial. Others seem to have very little factual basis for some claims, and even less understanding of such issues as the normal processes of, for example, decomposition. Therefore, data from books was treated with the same caution as that from unofficial websites.

The search terms in Google and news archives initially were simple, such as police grave body but it became apparent that this was too wide. Irrelevant results from a search on these three words include articles on the politics of policing (police) and serious (grave) concerns expressed by a public organisation (body). When using the search term shallow grave for example, references to a film of the same name dominated. The use of double quotation marks around more than one word improved results, as did the use of a minus-sign before words to exclude certain results. For example, excluding the film's leading actor's surname considerably reduced the number of movie-related results: "shallow grave" –macgregor.

The biggest improvement in news archive searches came when 'journalese' was recognised and exploited. Reports have a tendency to use certain stock phrases. Good results were obtained using some of these word combinations in double quotation marks such as "seen since", "last seen", "not been seen". These phrases searched out articles about missing persons, cold case reviews and appeals for information, as well as reports of trials and convictions in 'No Body Murder' cases and those in which a considerable time elapsed between the disappearance of a person and discovery of the individual's body. Cases in which the body was found very quickly were excluded, so a minimum period of three days between the dates of 'last seen alive' and 'body found' was adopted.

The searches were carried out initially between autumn 2002 and December 31st 2006. All cases were updated in early 2010, but no new cases were added; the Media

Derived Case List reflects those cases which had been reported in the online media between autumn 2002 and December 31st 2006.

Finally, all cases which did not have sufficient information were excluded. The required fields included the name, age and sex of the individual; the date the person were last seen alive; finally, if remains were found, the date of finding. A post-mortem interval was calculated to reflect the difference between these two dates for cases with a body found; where no body had yet been found, the PMI reflects the interval from when they were last seen alive to January 2010. Where a case was reported with only the month and year of "last seen alive", the date was entered as '00', thus '00.03.1983' for "during the month of March 1983". Obviously this might affect shorter post-mortem interval calculations but the cases in which this detail was lacking were all on the longer timescale in which a variation of up to one month made little difference. A note was made of which police force was involved. Where possible, any mention of the use of forensic archaeology or forensic anthropology was noted, although this was rare. Any charges or convictions were recorded. Finally, the location of the remains, if found, was listed.

5.5.1 Limitations of the Media Derived Case List

There are different ways in which information on a range of cases is presented in the public domain. The 125 cases in the Media Derived Case List include cases of murder, suicide, accidental death, natural death, people who go missing voluntarily and people who go missing involuntarily. Some of those categories spark great interest in the public domain, whilst others remain almost unheard-of. Many

potentially-relevant cases do not appear in the MDCL because they have faded from public gaze or because they are not of sufficient interest to those who decide what makes the news.

Two newspaper articles illustrate this variation in reporting. In 2002, an article in *The Observer* newspaper explored the point that there are gradations of public, and especially news-media, interest in missing persons: "There are certain rules in the missing persons game. Don't be a boy, don't be working class, don't be black. As for persistent runaways, children in care or teenagers with drugs problems, forget it..." (Bright 2002)

An article in *The Guardian* newspaper (Prasad 2002) drew the comparison between the disappearance of Amanda 'Milly' Dowler, and the disappearance of Hannah Williams. 'Milly' was a bright, pretty, blonde, white teenager from an articulate affluent middle-class family living in a suburban part of England; Hannah was a cheeky, 'streetwise', pierced-nosed, blonde, white teenager from a single-parent working-class family living in Deptford, London. 'Milly' became known by her family pet-name across the country in just a day or two, her disappearance was featured on the BBC television programme 'Crimewatch', and hundreds of members of the public turned out to search for her; internet searches on "Hannah Williams" in 2006 yielded only the two articles quoted above (Bright 2002; Prasad 2002), which are not news articles but commentary pieces. Her disappearance had no national media coverage: her body was only identified when her mother saw pictures of clothes from a then-unidentified body on television news reports. Even the police

involved in investigating her disappearance seemed not to know her body had been found – as though so many murdered children turn up each day in shallow graves that it was impossible to suppose the body could be identified without public television appeals. The media treat even similar cases very differently, as discussed below.

Academic studies have been developing these ideas of selective reporting by the media since long before the disappearance of these two girls. This is an area which has been more widely researched in the United States of America, but less so in the UK. Soothill cites Orwell's essay on the fascination that certain types of murder hold for the British newspaper-reading population (Soothill, Peelo et al. 2002). Orwell described these as "the murders whose story is known in its general outline to almost everyone and which have been made into novels and re-hashed over and over again by the Sunday papers" (Orwell 1965). It seems that where a person is missing, presumed murdered, the news-reading public prefer a victim they could identify with, and the murderer to be labelled as inhuman, a monster, evil. As a society, we prefer our social narratives to be familiar: the innocent is lured by the evil villain. We, the consumers of news reporting, are not comfortable with surprises in our social narratives, and this is reflected in the news coverage, which reinforces the cycle because the news coverage must appeal to the largest possible number of paying readers.

In April 1983, the actual crimes recorded in Scotland during the previous month were analysed (Ditton and Duffy 1983). This data was compared with the amount of

coverage in six major newspapers widely-read at the time in Scotland. In 1983 the printed newspaper was still the main source of news information for the majority of people.

If all crime was reported equally, then the amount of coverage for a category of crime should relate directly to the number of cases for that category of crime. The coverage was analysed numerically (i.e.. the number of cases) and by area (i.e. the number of square millimeters of report).

They found that some categories of crime were under-reported, and some were over-reported, i.e. the amount of reporting was disproportionate to the frequency of occurrence. The category covering malicious and reckless conduct, vandalism, fire-raising and similar offences was the only category in which the cases were reported with a frequency matching their incidence. In Ditton and Duffy's categories covering dishonesty, theft, petty offences (such as breach of the peace or drunkenness) and motor vehicle offences, the coverage was less than would correlate to the number of offences. Of greatest interest with regard to this chapter is the considerable over-reporting of certain categories. Public order and drugs offences were over-reported; crimes involving sex were over-reported; crimes of violence, including murder, were over-reported. For example, crimes of violence (Category I) made up just 1.7% of all the crimes in the study, yet accounted for 44% of all the news coverage on crime. Conversely, motoring offences (Category VII) accounted for 30.6% of all crimes in the study period, yet were found in only 4.8% of the news coverage of crime.

What Ditton and Duffy showed was that the press did not present the known facts, but rather chose to over-emphasise some facts and under-emphasise others. This is now accepted 'common knowledge', but their Scottish newspaper study was the first time in the UK that the extent of over- and under-reporting of different types of crime was quantified.

Soothill (Soothill, Peelo et al. 2002) examined *The Times* newspaper's crime reports for the 22 years between 1977 and 1999 and identified a hierarchy within the scale of reporting of homicide cases which they distinguished in terms of 'mega-cases', 'mezzo-cases' and 'routine cases', ranging from high, through medium, to lower amounts of coverage. Two examples illustrate this approach. Firstly, they identified the 'top ten' cases, (by amount of coverage during 1999,) of murders in that year, 1999. Secondly, they identified the 'top ten' cases (by amount of coverage during 1999) regardless of the year in which the crime happened. In the first list, there is an obvious bias towards murders which happen earlier in the year - a murder committed in mid-December would have little time to travel up the 'chart' for that year; for this reason, cases were followed for 364 days after their initial reporting. In the second list, new publicity might be generated (by a trial, or by an appeal against conviction, for example) for a murder occurring earlier than 1999.

The majority of coverage in any given year is of cases which originated in a previous year – for example the Moors Murders of the early 1960s were still the second most-covered case in 1996. Of the top 71 cases in one particular year, only 24 originated in that year. This is clearly useful in the present study, as the Media Derived Case List

is built partly from coverage of cases which occurred before material was routinely published on the internet, although some news archives now include material back to the 1990 or earlier (*The Guardian* and BBC sites in particular included older material during the data collation period of 2002-2006). This older material was useful where a current news report during data collation in 2002-2006 gave some information but not, for example, dates of disappearance or discovery; it was necessary to view original reports, sometimes from many years earlier, in order to complete the information required. In 1997, Soothill and Grover (Soothill and Grover 1997) concluded that computer searches of newspaper archives were limited in usefulness by the then-available technology, but that this could reasonably be expected to improve as the technology develops. The change in the quantity of information between 2002 when the Media Derived Case List for this study started and 2010 when it was updated bears out their conclusions.

Soothill et al (Soothill, Peelo et al. 2002) conclude that all their mega-cases involve "either stranger homicides or work-related homicides", but that the remaining mezzo-cases and routine-cases have little to distinguish them – in fact almost all routine-cases are mezzo-cases in their year of origin, fading to become routine-cases over time. It is established that the element of 'unusualness' is a crucial factor in deciding the newsworthiness of a case (Gekoski, Gray et al. 2012). The grainy CCTV footage of the toddler Jamie Bulger being led by the hand to his murder by two ten-year-old children (Sereny 1995); the socio-political implications of the murder of Stephen Lawrence (Cottle 2005); the unique shock of the Dunblane Primary School shootings (North 2000); all have been identified as contributing to

the media's extensive coverage. However, it is noted that Stephen Lawrence's murder only garnered large amounts of coverage when the extent of police mismanagement in his case and the associated implications of institutionalised racism became apparent (Neal 2003; Cottle 2005; Greer 2007; Gekoski, Gray et al. 2012). The fame and public familiarity of television presenter Jill Dando, and the attractiveness of both Dando and model Rachel Nickell, along with the latter's toddler son witnessing his mother's murder, should have made both stories newsworthy. However, in Soothill's study Dando's murder is classed as a mega-case whilst Nickell's murder, possibly because of the lack of any real leads at the time, is classed only as a mezzo-case (Soothill, Peelo et al. 2002).

Only 13 cases out of over four thousand murders during Soothill's 22-year study period were classed as mega-cases, and all had elements that made them unusual, and/or had elements which struck a chord with particular social or political issues of concern to the British public at the time (Soothill, Peelo et al. 2002). These 13 cases accounted for nearly three thousand stories out of the total fifteen thousand stories, and this is reflected in the coverage available on the internet.

Two decades after Ditton and Duffy's newspaper analysis (Ditton and Duffy 1983), a related study was carried out on the reporting of homicides (not all crime) in England and Wales and the extent of coverage in three national newspapers (Peelo, Francis et al. 2004). The newspapers were one broadsheet, *The Times*, and two papers which occupy a peculiar position in terms of British newspaper clichés – the *Mirror* and the *Mail*, each of which has a reputation for a certain sensationalism, but positioned in

different places on the socio-political range, with the *Mail* traditionally being further to the right, in political terms, and the *Mirror* to the left. The period examined was 1993-97. It is perhaps even more relevant to the Media Derived Case List in this chapter than the earlier and more numerical analysis (Ditton and Duffy 1983) .

The Peelo study (Peelo, Francis et al. 2004) demonstrates just how much the Media Derived Case List is a 'tip of the iceberg' including only the minimum of relevant cases. Peelo accessed the Home Office Homicide Index as a starting point, although that covered only England and Wales, and the coding system is one scheme up to 1994 and a revised scheme from 1995.

Over 4 years, only 14% of all murders were reported in all three newspapers. Of all murders, 60.3% were not reported in any of the three newspapers. Each of the three newspapers reported between 20 and 30% of all murders – *The Times* reported the highest proportion, at 28.2%. The *Mail* reported 24% and the *Mirror* reported 24.5%. Ditton and Duffy established that the media reports murders more than it reports other manners of death (Ditton and Duffy 1983), and Soothill and Peelo show that within the category of 'murder', there is bias towards certain types of murder (Soothill, Peelo et al. 2002; Peelo, Francis et al. 2004).

Given that murder is a dramatic manner of death, one could reasonably expect that it might be more likely to be reported than other deaths. Ditton and Duffy found that 1980s reporting in Scottish newspapers over-represented the category of 'violent crime' by a factor of 22 (Ditton and Duffy 1983). It seems reasonable to put these

analyses of newspaper coverage together and conclude that the cases included in my MDCL, whether murder or not, represent only some of the possible total – and that they represent the more dramatic cases which follow certain narratives which the British media perpetuate to keep up reader numbers.

Looking in detail at just one factor in Peelo's study – the age of the youngest victim in an incident, or of the victim in a single-victim homicide (96% of the cases were single-victim) (Peelo, Francis et al. 2004) – yields interesting results. The Homicide Index showed that the most common age of youngest victim was under one year old, with 118 infants killed in the period. The number of victims then decreases until around age 10, which has the smallest number of victims, and then increases to age 22which has the next-highest number of homicides after infancy. The three newspapers all report the inverse of this homicide-rate. *The Times* reports only one in four of the infant homicides, but around 70% of all 10-year-olds who are killed, and dropping again to around 20% of all 22-year-olds killed. The larger groups are reported less, and the smaller groups are reported more. Again, as with Ditton and Duffy's earlier study (Ditton and Duffy 1983), there are other factors at work in the decision-making of which cases are reported most.

All three newspapers reported around one-third of all homicides with a female victim, but only 18-23% of all homicides with a male victim. The murders that these three newspapers were most likely to report were those featuring a victim who was female and aged 13-16 (Peelo, Francis et al. 2004).

The conclusions drawn are that the reporting or lack of reporting of any homicide in these three newspapers during the study period was affected by between nine and twelve variables, at a statistically significant level. These variables, in decreasing order of significance, are the circumstances of the murder, the number of victims, the relationship between victim and suspect, the age of the youngest victim, whether a victim was female, whether the homicide was initially classified as a homicide, the occupation of the victim, whether any suspect was female, the police region the death took place in, the age of any youngest suspect, the method of killing and the country of birth of the victim (Peelo, Francis et al. 2004).

It can be seen how an understanding of media bias in reporting is important if one seeks to make use of media archives for any estimate of "how many cases are there in which either forensic archaeology or forensic anthropology could be useful?" Without acknowledging the extent and type of bias, it is impossible to make correct use of the media archives.

5.5.2 Analysis of the Media Derived Case List

The Media Derived Case List (MDCL) is solely an attempt to *indicate* an admittedly incomplete listing of cases with some relevance to forensic archaeology and forensic anthropology. It would not be prudent to attempt any major analysis of the numbers, since the total cannot be determined. Acknowledging the media bias discussed above, it is possible to examine the MDCL and treat it as a 'test pit'.

A ‘test pit’ is used on an archaeological excavation when the general area of a site is known, but not the complexities of what lies below ground, nor exactly where is best to start excavating, as well as in situations where there will not be time to excavate the whole area. The test pits are typically small, sometimes one metre square and are excavated quickly. Their drawbacks are obvious: one sees only a fraction of what is present. Barker describes the process thus:

> “Imagine a room, the floor of which is covered to some depth by an assortment of carpets, rugs, blankets, newspapers, magazines and sheets of cardboard, the whole covered with a wall-to-wall carpet. A person wishing to understand fully the layers covering the floor will naturally begin by rolling back the uppermost carpet and then recording the surface revealed beneath. They will then remove one by one each overlying rug, newspaper or blanket, recording its removal and the layers revealed beneath, until they reached the floor.
> Surely no one faced with this problem would take a knife and cut a rectangular hole in the carpet and then continue this hole downwards to the floor removing the partial layers of paper and cloth as they went. How could they in this way know that, though they have recovered a portion of yesterday’s Times, a whole Persian rug may lie a little to their right?” (Barker 1993)

As it is not possible in the MDCL to remove a whole carpet, to follow Barker’s analogy, the next best option is to use partial sampling to assess what, or indeed whether anything, lies beneath the surface. Test pit sampling has been assessed statistically to give reliable indications of the whole in archaeological situations, although this reliability decreases in relation to the variability of the material (Nance and Ball 1986). As the homicide rate in the United Kingdom has not changed abruptly through the last century (Hicks and Allen 1999), it is hoped that the ‘test pit sampling’ approach to the data may be considered to give useful indications in this

forensic data excavation, although one with caveats about its media derived data, as discussed.

The Media Derived Case List resulted in 125 cases. In all, over two thousand possible cases were looked at between late 2002 and late 2006 (the MDCL was updated, but not increased, in 2010). Only in 125 cases was all the required information reported. The cases are, by definition, those which had, for any reason, an online media report between the end of 2002 and the end of 2006, of a kind which was included in the search results described above.

Looking at the 125 cases as a kind of 'test pit', what can be established? Most importantly, that 'this kind of cases' exist. Despite the United Kingdom's comparatively low rate of homicides, there is a steady number of cases in which either the body requires locating and retrieving from concealment such as (but not limited to) a clandestine burial, as well as questions requiring answers on what occurred at or around the time of deposition or concealment. There is also a steady number of cases in which the body may not be a 'fresh intact body' and so forensic anthropology may be of use in establishing both identification and events around the time of death.

The 125 cases are a reflection of their media derivation. The findings agree with the studies discussed above with regard to reporting of age groups and sex (Soothill, Peelo et al. 2002; Peelo, Francis et al. 2004). More females than males are reported, 87 to 38. There are 17 males under 16 years of age, and 29 females under 16, as

shown in Table 5.1. This is consistent with the findings that deaths of females are comparatively over-reported in the media and that deaths of younger individuals are most likely to be reported (Peelo, Francis et al. 2004). Accordingly, no conclusions can be drawn in this study about the age or sex of victims in the cases in the Media Derived Case List.

	Under-16	17+ years	Total	Age range
Male	17	21	38	7 – 81
Female	29	58	87	3 – 54
TOTAL	46	79	125	3 – 81

Table 5.1 The age and sex of victims in the Media Derived Case List

The existence of the cases is the important point. The areas of most interest are the locations and the timescales.

Locations

The location categories are varied; some have very few cases – for example, only two cases involved the body being found in a vehicle. Other categories had more cases and became sub-categorised. An example of this is the location-category *Buried* which numbered 34 cases out of 125 (27% of all cases). This was sub-divided whilst other categories remained as a single group. The overall categories are shown in Table 5.2.

Location	Number of cases	% of total
Not Found	38	30.4
Buried	34	27.2
Surface	20	16
Water	15	12
Complex	11	8.8
Packed	3	2.4
Car	2	1.6
Underground tunnel	2	1.6
Total	125	100

Table 5.2 The range of locations where bodies were found in cases in the Media Derived Case List

Given the discussion in Chapter Three above on the rarity of court appearances by either forensic archaeologists or forensic anthropologists, it is worth noting that the Media Derived Case List includes all three first-known occasions on which expert evidence was given in murder trials in Wales (BBC News 2003), in England (BBC News 2001) and in Scotland (the present author's own case-notes, 2002) by practitioners of forensic archaeology or forensic anthropology.

Not Found (38 cases)

The largest category was *Not Found*, the 38 cases in which the person remains a missing person despite searches, and in 6 of these despite a murder conviction having been reached in court. A further 2 cases have manslaughter convictions reached in court. Of the remaining 30, all were publicly declared either 'suspicious' by police in appeals for information, or else have been formally determined to be murder investigations. One case was retained on the Media Derived Case List through a series of changes. In late 2002, a murder enquiry was launched after an adult male went missing; after several years, the police announced that, despite no body being found, they would no longer be treating it as a murder enquiry and that the conclusion was that the man had fallen, accidentally, into a large fast-flowing river near where he was last seen.

The reason that the *Not Found* cases all have suspicious circumstances is because this increases the chances that a body is somewhere to be found, and decreases the chances that there is no body because the missing person is alive and living voluntarily under an assumed name. The aim here is to try to identify cases where a body could reasonably be searched for.

An example of a *Not Found* case is that of Sarah Benford who disappeared from local authority care, in April 2000, aged 14. At the same time as television publicity in June 2003, Northamptonshire Police carried out an excavation of a garden in her home town of Kettering, but found nothing. In July 2003, the police search moved to South Wales, but again no remains were found. In September 2003, the police

announced that they were considering her disappearance as a murder enquiry. In December 2003, police searched another area of Northamptonshire, and utilised all available assistance. Specialist search dogs were brought in from police in Strathclyde and Manchester, a forensic archaeologist was involved and a police helicopter assisted with imaging. In July 2009, responding to a Freedom of Information request, Northamptonshire Police stated that no charges have been brought and no body has been found (Northamptonshire Police 2009).

Two older, linked cases illustrate how increasing police awareness combined with a long-term enquiry resulted in the use of forensic archaeology. On Boxing Day, 1996, two boys disappeared from near their homes in the West Midlands. David Spencer was 13 and Patrick Warren was 11 years of age. The usual searches were made by police but neither boy has since been found. In 2003, police brought in a forensic archaeologist for a re-assessment of an area already searched by police in connection with anonymous letters; this area was not subsequently excavated. In 2006, the case was formally re-opened, and in 2007 an area of waste-ground associated with a convicted child-killer was excavated in an organised manner (BBC News 2006).

In the Benford enquiry, police used forensic archaeology to advise and assist in excavation. The two excavations may not have resulted in remains being found, but they are still of use in eliminating an area from the enquiry. Similarly, in the Spencer/Warren enquiry, the involvement of forensic archaeology was able to exclude the area indicated by the anonymous letters, and excavation was carried out to exclude the area known to have been frequented by a main suspect.

'No Body' murder trials are rare, but they do occur. There are obvious advantages to having found the remains before a murder trial. There is the possibility of forensic evidence linking the suspect to the burial location or to the victim's remains. One *Not Found* case in the MDCL was a 'No Body' Murder at the time charges were brought but the body was found by the time the case came to court. Jenna Baldwin was 15 when she disappeared in September 2002; her step-father was charged with her murder. Subsequently in November 2002 he led police to where he had buried the girl; he was convicted of her murder. As far as is known this was the first time a forensic archaeologist gave evidence in a Welsh murder trial (BBC News 2003). Barrie Simpson of the University of Birmingham gave expert evidence based on his experienced professional opinion on the grave he excavated for police. He also explained how the accused man had indicated both the grave and an area he had previously started to excavate a few metres away (Hunter and Cox 2005).

Buried (34 cases)

The next-largest category was that of *Buried*, of which there were 34 cases sub-divided into various burial-site groupings. Those within what might be termed a domestic setting were relatively common – as well as one case of burial in a coal-cellar, there were six cases of burials in gardens, and five cases which involved burial in a shed in a garden. These five burials were in fact one single case in which a man murdered his wife and four of her children over the course of approximately 24 hours, with subsequent exhumation and re-burial by the killer of two of those five bodies.

Apart from dwellings and their gardens, three cases involved burial in public urban areas – in a grassy area, in a cemetery, and in what was at the time a building-site. The first two were, as might be expected, noticed quickly and investigated within 3 weeks and one week; the latter was a successful hiding-place for the body for some 18 years until demolition work began.

One of the urban burials was that of Angela Pearce, aged 18. In 1998, she became friendly with a group of young people who subsequently held her captive for several days, inflicting a wide range of non-fatal injuries before killing her and burying her body in a shallow grave in a disused cemetery in Leeds. Passing comments by one of the accused led to a taxi-driver informing police, who then investigated the cemetery. The body was excavated 19 days after she was last seen alive (other than by her killers) and it is, therefore, probable that the burial period was around 15 or 16 days. Five people, men and women aged between 16 and 21, were convicted of murder in 1999 (Her Majesty's Courts Service 2002; Her Majesty's Courts Service 2002). When more than one person is charged with a single murder, it increases the importance of any evidence to back up statements given by witnesses or the accused. The obvious defence is to throw the guilt onto another, and it can appear impossible to work out what the jury is to believe. In this case, two males dug the grave and three females watched this, so five statements could involve considerable contradictions.

In 2001, a man digging the garden of his new home found a skull. Grampian Police were called and a crime scene specialist who had been on a short course in forensic archaeology methods in the United States gave his opinion that someone with more archaeological skill should be brought in. The police force contacted the local council's archaeology department, and a field archaeologist attended the scene. This is an interesting case because the practitioner was not a forensic archaeologist, and yet because she was exceptionally able to work within the team setting, her collaboration with the crime scene specialist enabled all possible information to be retrieved. Photographs of the excavation show that although the natural fibres of the dead man's jeans had decomposed, the synthetic thread of the seam-stitching was visible lying in two long interlinked lines alongside the bones of the legs. To excavate stitching demonstrates the quality achievable by combining the skills of the forensic investigator with the field archaeologist. Neither took precedence, but both worked together, to ensure the highest possible levels of quality and quantity of evidence. There was a question in the trial of the possibility of sexual assault of or by the victim, and so the evidence that he was fully clothed at the time of burial was of relevance (pers. comm. Grampian Police personnel 2003).

In the Pearce case, the use of forensic archaeology in excavating the shallow grave could have helped interpret the events surrounding the burial. Any evidence about how the grave was dug by the perpetrators, what implements were used, and so on, could have helped to confirm (or otherwise) the varying stories given by co-accused or any witnesses. In the Grampian case, events surrounding the death were clarified by the evidence of clothing from the excavation's involvement of forensic

archaeology in the combined work of a forensic practitioner and an archaeological practitioner.

Surface (20 cases)

A dead body left lying on the ground surface in a city is usually found very quickly and so is unlikely to be included in the Media Derived Case List. A single case in the 20 *Surface* cases was in an urban setting, a 9-year-old boy whose body lay for five days in a little-frequented lane in a city. The other 19 *Surface* cases are all non-urban. They range from woodland and undergrowth to moorland, fields and allotments; even the Royal Horticultural Society's gardens at Wisley.

In 2002 in southern Scotland, some parents, tidying litter from the planned route of a children's Treasure Hunt, began to cut up a dumped old rolled-up carpet. Police were called when a body was found inside. I was involved at the suggestion of the forensic pathologist, in the capacity of forensic anthropologist. The cranium was badly-fragmented but the wrappings of the body had retained nearly all the fragments. The forensic anthropologist reconstructed the shattered cranium, which in turn enabled the forensic pathologist to reconstruct the order and number of blunt force trauma impacts to the cranium. This was of relevance during the trial when the defence suggested that the death had been accidental, the accused was guilty of no more than disposing of the body in panic, and that the body's disposal from a high bridge had caused the damage. The reconstructed cranium showed a number of impacts from an implement with a flat round surface such as a hammer.

The forensic anthropologist gave expert evidence to confirm for the jury that the pattern of fractures could not have been created by the reconstruction of the skull, because the cranium differs across its surface. I believe that this is the first time a forensic anthropologist has given expert evidence in a Scottish criminal trial (the author's own case-notes)

In 2003 in southern Scotland, decomposed human remains were found in a lay-by. Eleven months later, police contacted a forensic anthropologist to ask for an opinion on a fragment of bone found during sieving of the leaf-litter taken as samples during the retrieval of the remains. No forensic archaeologist or forensic anthropologist was involved at the time of the original find. The fragment was only a few centimeters in diameter, but the forensic anthropologist was able to identify it as human, adult, either from a male or from a female whose mid-face region was noticeably strongly-built, and further give her opinion that there had been blunt force trauma at or around the time of death. The fragment was from the area between and above the eyes, and possibly contained more information than most other square inches of bone could (the author's own case-notes).

In the first case, the involvement of forensic anthropology directly assisted the forensic pathologist in establishing the cause and manner of death, and assisted police with interpretation of the events surrounded death. In the lay-by case, the involvement of forensic anthropology was able to suggest a possible cause and manner of death.

Water (15 cases)

The category of *Water* includes four cases in which human remains were found in canals, two cases washed-up on coastlines, one in a lake, five in rivers or streams (i.e. flowing freshwater) and three cases in water-filled ditches. Because moving water is able to transport a body as well as actively assisting in rapid disarticulation and dispersal of the remains (Haglund 1993), this category in particular illustrates why the Media Derived Case List holds only the minimum of the total cases of relevance.

Human remains found in water are often fragmented, sometimes only a single bone being found. The forensic analysis of DNA can be adversely affected by immersion in water (pers. comm. Shirley Marshall 2004). When human remains are found after immersion in water and cannot be identified by the usual processes, these are cases where a wide-ranging familiarity with the anatomy of hard tissues may indicate information which could lead to identification, either by means of supplying a partial Biological Profile, or by means of identifying some uncommon identifier. A forensic pathologist or anatomist traditionally carried out this work, but in recent years it has become viewed as the work of a forensic anthropologist.

Complex (11 cases)

This category has the deliberately-wide title of *Complex*. Eleven cases are categorised as complex, because it was not possible to categorise them into one of the other simple categories. Examples include those in which the body was found in a number of different locations over a period of time – an elderly man whose body

was dismembered, some parts being *Buried*, others *Packed* and others *Surface*. In another case, a man's body was found all in the same location but it had been stored under a bed for some days, burnt and then dumped in a ditch, thus coming under both *Burnt* and *Water*. Hence these cases are categorised as *Complex*.

Establishing an estimate of the post-mortem interval when the environment has changed considerably, or remains have been in separate environments, can be difficult, and both the forensic archaeologist and forensic anthropologist have skills that could be of benefit to the investigation. Decomposition represents the short-term end of the natural and cultural site formation processes known to archaeologists as N-transforms and C-transforms (Renfrew and Bahn 1991). Identical materials in non-identical environments, whether due to natural conditions or to human actions, will behave differently. For example, imagine a case involving a body cut into two, with one half dumped under bushes in woodland and the other half stored in a domestic freezer. It is easy to understand that the body-part in the woodland will undergo different 'transforms' (insect activity, natural decomposition from the putrefaction processes inside the body after death, gnawing by scavengers, etc.) compared with the body-part in the freezer (suspension of putrefaction, possibly some dehydration if frozen for a long period, some damage to cell-walls if thawed, etc.).

Familiarity with a wide range of 'disrupted' bodies in differing environments and a deep understanding of how bodies behave in different kinds of environments, known as forensic taphonomy, may enable the experienced forensic archaeologist and

forensic anthropologist, ideally working together and with the crime scene investigators and forensic pathologist, to produce suggestions based on indications from the remains.

A forensic archaeologist should have a more extensive knowledge and understanding of forensic taphonomy than a forensic pathologist whose work rarely includes such cases. Where remains may have been buried and then submersed in water, or stored within a dwelling and then dumped on the ground surface, a forensic archaeologist may be able to interpret the ways in which the decay or preservation of the body reflect the differing environments.

In dismemberment cases, a forensic anthropologist may be able to advise on the implements used for dismemberment. In addition, where identification of scattered dismembered body parts is not possible by means of DNA analysis because of burning or the body parts having been submersed in water, the forensic anthropologist may be able to assist with matching parts, both from physical fit, and from a thorough familiarity with the 'range of normal' in skeletal anatomy. Obviously an anatomist would also be of assistance here, but not all anatomists are happy to work with decomposing remains.

Other (7 cases)

Packed: 3 cases involved a body being *Packed* – one in a suitcase, one in a sportsbag, and one in a bin bag involving only partial remains.

Car: two cases involved the body being found in a car. In one case the body was concealed in the boot; in the second case, the body was in the car, and both body and car were burnt.

Underground tunnel: Two cases involved bodies found in underground tunnels of differing kinds. These have been classed together because although the bodies were underground in each case, they were not surrounded by any densely-packed material serving as a burial matrix such as soil, vegetation, dead leaves or conifer needles.

These kinds of cases are unusual, and could benefit from the involvement of forensic archaeology or forensic anthropology for the same reasons given above for the *Complex* range of cases.

Timescale and Location

The range and spread of locations becomes more interesting when one looks at the timescales involved. The longer the interval between disappearance and the body being found, the more difficult the case becomes. Questions over identification, establishing the cause and manner of death and interpreting the events surrounding death and deposition all become progressively more difficult with increasing timescales. This is because witnesses' memories may fade or become confused, as well as because the physical evidence in the fresh intact body decays. Skeletons generally hold less information than does a fresh intact body. The longer the timescale, the more likely it is that a case may benefit from the involvement of forensic archaeology or forensic anthropology.

The longest-running police investigation in the Media Derived Case List was an excavation of a garden in 2001 following intelligence regarding the disappearance of a 6-year-old girl in 1944 (BBC News 2004). Nothing was found – a 'null excavation' – and the case remains open. The most recently-active case included was one that changed during the final updating of the Media Derived Case List in 2010. A 13-year search for a missing adult female, categorised by police as a murder enquiry developed in October 2009 when her remains were found and identified in dense undergrowth at the side of a motorway slip road (BBC News 2009). A case may be on a long timescale but still develop, change and alter, according to new evidence or information.

For this part of the discussion, the *Not Found* cases have been excluded, as they obviously lacked any 'Location' data. The Media Derived Case List contains 88 cases in which the body was found either in circumstances which might benefit from forensic archaeology involvement or in a condition in which a post-mortem examination might gain from forensic anthropology involvement. These are detailed in Table 5.3.

Location	<1 month	1-6 months	7-12 months	1-5 years	6-10 years	11-20 years	20+ years	Total
Buried	4	15	2	5	3	3	2	34
Surface	9	6	3	-	1	1	-	20
Water	6	7	-	1	-	1	-	14
Complex	7	4	-	-	-	-	-	11
Packed	1	2	-	-	-	-	-	3
Other	2	3	-	-	-	-	-	5
Total	29	37	5	6	4	4	3	88

Table 5.3 The timescale between the "last seen alive" date and the date when the remains were found, and the locations involved in the cases of the Media Derived Case List

The majority of location-categories involve a timescale of less than 6 months between the person being last seen alive and the remains being found.

The two main areas of interest for forensic archaeology and forensic anthropology are the *Buried* and *Surface* categories. One might reason that burial is an effective way to prevent, or at least delay, discovery of a body, but it appears that even a body left on the surface, with or without vegetation hiding it or pulled across, is quite able to remain undiscovered for a considerable period of time. However, the longest periods during which bodies may lie undiscovered is when buried. In the longest time-period cases, more than five years, 8 of the 11 cases involved buried remains. This must, of course, be viewed with an awareness of the media bias towards unusual circumstances making a case more newsworthy, as discussed above.

The burials in the Media Derived Case List which remained undetected for long periods were those in locations without little public traffic. Rural locations away from habitation and the gardens or cellars of dwelling-houses where access can be controlled by the householder are ‘good’ places to bury a body in the long-term to avoid its being discovered. A building site, especially in the foundations of a building, is a ‘good’ place if the body can be inserted in such a way that building work continues the next day without discovery – either the body will be found immediately or not until demolition of the building.

With regard to those found in water, it is relevant to note that many bodies which are in water for more than a few months will start to become disarticulated and dispersed. This is the case across the world and in both saltwater and freshwater(Haglund 1993) (Parker, Ruffell et al. ; Nawrocki, Pless et al. 1997; O'Brien 1997; Sorg, Dearborn et al. 1997; Anderson and Hobischak 2004). This makes it more likely that bodies in water will be found as partial remains, unless wrappings of some kind can hold the remains together. The cases here involving water as a location plus a timescale of more than six months are a lone foot inside a shoe and sock washed up on a coast after nearly two and a half years, and a body found at the bottom of the deepest lake in England after more than twenty years. Both involved external wrappings which kept the remains together. In the former case, determined to be an accidental death, the shoe and sock maintained the anatomical relationship between the foot-bones. In the latter case, a murder, the body

was wrapped and weighted and this had combined with exceptionally cold anaerobic conditions to preserve the body in remarkable condition.

The cases in the Media Derived Case List in the categories of *Complex* and *Other* all involved a timescale of a year or less. With dismemberment cases, this may be the result of having more locations involved. Once one body-part is found, investigators will actively search for the rest, making retrieval more likely.

5.6 Summary

Extensive searches for reliable and comprehensive sources containing data of cases involving either forensic archaeology or forensic anthropology at a national or local level unsuccessful. This information simply has not been hitherto recorded in any retrievable format. The Media Derived Case List is an attempt solely to indicate minimum numbers of these relevant types of cases.

The Media Derived Case List was developed to answer the question of whether any cases existed in the UK which could benefit from the involvement of forensic archaeology or forensic anthropology. It has its limitations and is not a complete or exhaustive Case List, but even so it demonstrates that there are a number of cases of relevant types every year which are active police investigations.

It is accepted that the derivation of this data from media sources is unsatisfactory and incomplete but I believe it is better than the current lack of anything other than anecdotal information. In addition, using media archives as a source of data carries

problems due to the bias in reporting, as ascertained by a number of academic studies of the ways in which news media in the United Kingdom publish preferentially according to the type of case and the individual characteristics of those involved, both dead and alive.

The concept of the 'test pit' is an established archaeological method used when complete investigation is not possible. It has been used here in an unusual application, which gives only a partial picture – but a partial picture is an improvement on having no picture. Standing looking at a proposed archaeological site, we can know nothing about whether or not the surmise is correct, whether or not there is anything of archaeological interest below. Excavating a test pit enables us to observe at least one small portion of the site and, provided something of interest is found, to say that there is material beneath of archaeological interest. It will still not be known how much, or what the full range is, but we at least know that *something* is below the surface and that it is relevant to our work.

What can be taken from the Media Derived Case List, therefore, is not the demographics of victims, but the existence of these cases. Bearing in mind the media bias, it is apparent that there are likely to be a significant number of cases in Great Britain in which forensic archaeology and forensic anthropology can be of use. It is reasonable to conclude that the longer the timescale involved, the more likely it is that a standard post-mortem could be usefully supplemented by a forensic anthropological assessment of the remains. The cases involving the longer timescales are, by their nature, likely to involve burial, as this seems to be a successful (from the

murderer's point of view) method of concealing human remains for a considerable length of time. In cases involving burial, partial burial, concealment by vegetation or debris pulled over the body and similar situations, it is reasonable to conclude that a forensic archaeological approach to excavation and retrieval is likely to be of benefit to the investigation.

It seems that it is not possible at present to assess the number of cases that could involve forensic archaeology or forensic anthropology, but by exploration of unofficial media sources, it has been possible to establish that cases do exist.

Expense to the police force, time in the investigation and distress to the families of the missing could all be reduced by the inclusion of forensic archaeology and forensic anthropology in such cases. Utilisation of the appropriate forensic specialism can lead to greater effectiveness in investigations, and may improve both the quality and quantity of evidence.

Chapter Six

The Usefulness of Forensic Archaeology in Two Police Force Areas

6.1 Introduction

This chapter presents two illustrations of the potential contribution that forensic archaeology and forensic anthropology might make. Two very different situations are contrasted. The first section discusses a major case where it appears that the police force and prosecution made no use of either discipline. As will become evident, this has left important questions unresolved that might have been more successfully tackled with forensic archaeology advice, in particular. The second section discusses the work of one police force which has, over the last decade, begun to make considerable use of forensic archaeology by building on the skills of its own staff.

6.2 Gloucester Constabulary and the West murders

6.2.1 Case discussion: the murders by Frederick and Rosemary West

As an example of the potential for forensic archaeology and forensic anthropology to assist an investigation, a discussion follows of one of the most high-profile cases in recent times, extensively published. First, there is the Gloucestershire Constabulary publication detailing many aspects of the excavation and enquiry (Gloucestershire Constabulary 2004). In addition, there is the published account of the Senior Investigating Officer, John Bennett (Bennett and Gardener 2005), references in authoritative texts (Hunter and Cox 2005), peer-review journal articles (Cox and Bell 1999), and several books written from various angles (Sounes 1995; Wansell 1996; Masters 1997; Burn 1998).

Considerable efforts were made to gain access to a transcript of the trial evidence, but this proved impossible. The cost of transcribing the court record was deemed too costly for the House of Lords library (Lord Braine of Wheatley 1998). Winchester Crown Court, when contacted by telephone in February 2013, was unable to provide a transcript, and in fact confirmed that the proceedings had never been transcribed; that the technology used to make the court records can no longer be accessed, and that the transcribers who could use that 1990s technology are no longer employed. It is appreciated that for proper analysis it would be best to use the evidence as given in court, but this has proved impossible in this case and the analysis has thus necessarily relied on available secondary material.

Frederick West died in prison before trial, and so only Rosemary was tried. She was convicted of ten murders carried out during her marriage to Frederick, but not of two murders attributed to Frederick prior to his meeting her. Those deaths took place over more than twenty years, between the late 1960s and 1987.

In the mid-1990s, the decision was taken to excavate the back garden of the family home at 25 Cromwell Street, to locate the Wests' missing daughter Heather. The findings at that address led to searches at the couple's previous home, 25 Midland Road, Gloucester, and at Fingerpost Field and Letterbox Field, outside Gloucester, where Frederick West had once lived in a caravan. A brief description of the facts of the four excavations is given here and then discussed, based mainly on the Gloucestershire Constabulary information (Gloucestershire Constabulary 2004) and the published account of the Senior Investigating Officer, John Bennett (Bennett and Gardener 2005).

The excavations

25 Cromwell Street, Gloucester

The search started on 24th February 1994. Originally a relatively straightforward search of a garden for the remains of one teenage girl, it rapidly became more complex on 26th February when the attending forensic pathologist, Professor Bernard Knight, identified more than one person's remains as being present. Part of the police interview of Frederick West by DC Hazel Savage has become widely-quoted. When West insisted only one body, Heather, was buried in the garden, DC Savage

responded that Heather didn't have three legs (Wansell 1996; Burn 1998; Bennett and Gardener 2005).

On February 28th, the third set of remains was found by "a support group officer digging in the garden" (Gloucestershire Constabulary 2004). On March 4th 1994, "specialist ground scanning equipment, which indicates any disturbance behind solid matter" was used at 25 Cromwell Street (Gloucestershire Constabulary 2004). On the same date, Fred West was taken to the house and indicated areas where the police should dig. It is not clear what role the 'scanning equipment' played in locating the remains, or if it was West's indications which were of more help.

On 5th March, two sets of human remains were found buried in the cellar; one later removed "from concrete in front of the false fireplace" (Gloucestershire Constabulary 2004). On the 6th, a further two sets of remains were found buried in the cellar, one under a staircase. On the 7th, a further set of remains was found in the house; a ninth set of remains was found on 8th March. On the 9th March, "ground scanning equipment", supplied and operated by ERA Technology Ltd., was used on waste ground behind the house. The equipment they used was "developed originally for use in detecting buried plastic mines" (Gloucestershire Constabulary 2004). Digging and searching continued nearly every day between February 26th and April 28th, although no further remains were discovered after 8th March. Safety had been ensured by infilling the excavated holes with concrete in order to maintain the structural integrity of the house; some 72.2 cubic metres in 14 deliveries. A surveyor and civil engineers from the Council were consulted throughout the period.

The entire ground-floor and garden were excavated down to the undisturbed hard Severn clay, the 'natural', which was around 6 to 8 feet below ground level (Gloucestershire Constabulary 2004).

Letterbox Field, 'Kempley A'

Excavations at a field at Kempley started on 29th March. On 6th April, West was taken to the field and indicated the probable burial site. On 10th April, human remains were found; Professor Knight excavated and removed the remains on 11th April (Gloucestershire Constabulary 2004).

Fingerpost Field, 'Kempley B'

On 9th March 1994, ground penetrating radar was used on "an open field site at Kempley", after West had been taken to the site and indicated a probable burial site (Gloucestershire Constabulary 2004). Excavation commenced on 13th April complicated by the fact that, since the disappearance of the missing woman, two fields had been amalgamated into one and the land levelled, partly by dumping quantities of topsoil on the surface, thus changing the landscape considerably. As the excavations were deeper than 1.25m, they required trenches to be shored up under Health and Safety Legislation – the old Construction Working Places Regulations with this 1.25m stipulation were still in force in 1994, now replaced by the Construction (Design and Management) Regulations 2007 (Health and Safety Executive 2007). Therefore, an engineering plan was drawn up with advice from the local Council (Gloucestershire Constabulary 2004). Topsoil was mechanically dug and removed; subsequent excavation was done by hand.

Remains subsequently identified as those of Ann McFall were found in the evening of June 7th. These were removed by Professor Knight between the 7th and 9th June (Gloucestershire Constabulary 2004).

25 Midland Road, Gloucester

Searching at the house where the Wests lived previously started on 26th April, 1994. Council engineers were involved, as access to the previous coal cellar involved removal of a concrete floor in the kitchen area, under which was metal sheet reinforcing and five feet of "impacted rubble" (Gloucestershire Constabulary 2004). On 4th May, "an officer excavating below the kitchen" found human remains. These were excavated on 5th May by Professor Knight. The search was concluded on 27th May. The Ground Penetrating Radar used at Midland Road was supplied and operated by EMRAD Ltd; their equipment was originally "developed to detect pipes down to 18mm in diameter at depths ranging from 5 cms to 3 metres" (Gloucestershire Constabulary 2004).

In addition to these four sites, two other small excavations were carried out in the Kempley area at sites indicated by members of the public, at which nothing was found.

According to Gloucestershire Constabulary between 26th February 1994 and 16th October 1995 the total cost to Force over budget, i.e. beyond normal expenditure in that period, was £772,604. The total cost, including normal salaries of officers involved was £1,726, 922 (Gloucestershire Constabulary 2004).

6.2.2 Location, excavation and retrieval

The procedure for excavating was the same at all sites (Gloucestershire Constabulary 2004). The main work was carried out by police officers, mainly trained search teams, but at times including individuals trained in underwater searches. As soon as any item resembling bone, or which they "considered could be relevant to the investigation" was found, the search was stopped. A Scene of Crime Officer then conducted an "initial cursory examination" and the pathologist, Professor Knight, was informed. The item was then "excavated by hand by Professor Knight […] After [he] completed his work at the scene the immediate area was enlarged and the spoil washed and sieved to ensure that nothing was missed" (Gloucestershire Constabulary 2004).

Plans of the excavated houses, gardens and fields and the locations of finds were recorded by a trained Accident Investigation Officer, using original plans of the buildings and electronic distance measuring (EDM) equipment, in conjunction with McCarthy Taylor Systems Ltd. These records are admirable in their thoroughness and clarity (Gloucestershire Constabulary 2004).

The excavation at Cromwell Street involved "a small excavator with caterpillar wheels and mechanical mini-digger with a hydraulically-operated scoop" to assist with removal of concrete and slabs covering the patio area of the garden. This was operated by a police constable "who said he had used one before" (Bennett and Gardener 2005). Conditions were difficult for excavating, as the soil was clay and had a high water-table; in fact at one stage a well was found. On the other hand,

these are good conditions for preservation of bone over the time-period concerned. Adipocere was present in the form of "traces of a soapy off-white liquid" (Bennett and Gardener 2005).

Of the Kempley excavations, the SIO Superintendent John Bennett writes that "an improvement in the weather brought with it an archaeologist to help them identify the precise parameters of the cow pond and any potential grave sites. She advised that the best way to uncover areas that had been disturbed in the past was to scrape the surface with trowels, gradually removing the firm soil on the top to reveal what was underneath. Laboriously slow, it was nevertheless such an effective technique that those who used it said it would show them where fence posts and stakes had been and would certainly identify the site of a grave" (Bennett and Gardener 2005).

Bennett's book goes on to detail how he, as the Senior Investigating Officer, vetoed the advised hand-trowelling as too slow and a waste of resources unless they 'uncovered something of significance'. It does appear that the method was used at Kempley 'B', the largest excavation site, in an effort to discover the line of a fence and pond which no longer existed. The police report states that the topsoil was "removed mechanically" and that subsequent excavation was carried out manually. From the descriptions given in both the police report and the book by Bennett, it is clear that 'topsoil' refers only to the surface of the ground, the grass and its roots, and not to the topsoil proper, that dumped mass of imported topsoil discussed below. There is no suggestion that it was carried out with any awareness of forensic archaeological principles. Even though it appears that the archaeologist was not a

forensic archaeologist, had they retained her services she could have assisted by identifying stratigraphic changes. The underlying principle beneath all archaeological excavation methods is that of stratigraphy. The ground is not one homogenous mass. It is made up of many layers, lenses and deposits, some of which are in the alignment and relationship in which they were laid down by geo-morphological processes when that land was formed, and others of which reflect subsequent changes to the land. What is important to note is that these interventions, whether by human or natural activity, will leave changes in the ground which can be recognised by an experienced archaeologist.

In this case, two fields had been made into one, at a time well after the suspected clandestine burial, and a lot of topsoil was dumped on top to level it. The dumped topsoil would be recognisable as such by an archaeologist, because of its homogeneity. The farmer had "drastically altered the lie of the land, laying down drainage pipes, infilling with all sorts of farm material and covering the area with soil" (Bennett and Gardener 2005). This activity should be recognisable and distinguishable to the trained archaeologist. There is a difference between laying a pipe and covering it, and digging down into settled ground and inserting a pipe and back-filling with the material dug out initially.

One simple method to discover the extent of the topsoil would have been to use the mechanical digger to put in trenches across the area, perhaps at 5-10 metre intervals. By examining the vertical sides of the trench, one would be able to ascertain whether the material was still the mass of topsoil or was changing to the pre-existing field

surface. This would result in the removal of the mass of dumped topsoil quickly and reliably. After that stage, the investigation could proceed using the contours and markers that were present at the time. West was taken to the field on March 7th 1994 and had told police where he thought the remains were buried. When he had indicated burial-sites at Cromwell Street and at Kempley 'A', the remains found were approximately where West had indicated (Bennett and Gardener 2005), and so although his stories were many, varied and unreliable on the whole, it would be reasonable to use his indications of burial sites as an initial guide.

He related the Kempley 'B' burial to a cow pond and a boundary. When the remains were found, after two months of digging and nearly half a million tons of soil having been removed, they were in accordance with the description he gave. A decision was taken early on to leave undisturbed an area near a hedge with trees, in order to avoid damaging roots. Given West's information and description of the burial-site, it would seem sensible to have hand-dug a test-pit in this area which would cause minimal damage to roots. The remains were found less than two metres from the tree-line and in the last corner of the large excavated area.

By the middle of May 1994 over 400 tons of soil had been moved at Kempley, about half the eventual quantity. The clay soil was waterlogged due to the weather and the trenches had to be pumped out often. Ann McFall's body was not found until the evening of 7th June; work there had begun on 13 April (Gloucestershire Constabulary 2004).

It is interesting to note that proper procedures were followed with regards to shoring-up of holes deeper than 1.25 metres in accordance with the Health & Safety regulations in force at the time and that the excavations "were based on an engineering plan" which was drawn up with the help of the local District Council.

Clearly, the police search teams and the SIO were aware that it is good to consult those with more experience when carrying out hole-digging – yet no mention is made in any of the four excavation records in the Gloucestershire Police information of any archaeological involvement, whether field archaeologist or forensic archaeologist (the non-forensic archaeologist is mentioned only in Bennett's book, and seems only to have been consulted initially and the advice rejected). The police in this case were clearly happy to work with specialists from a wide range of backgrounds, but they appear not to have included forensic archaeology. Every type of formal assistance and advice is listed, from surveyors to concrete delivery companies, but there is no mention of any involvement on-site of any individual who had experience, training or qualifications in the digging of holes *to locate and retrieve modern human remains*. This is crucial because the description given by Bennett of the bones suggests "secondary deposition" which is discussed below.

The involvement of a (specifically forensic) archaeologist, experienced and trained in locating non-archaeological burials, could have shortened the two-month excavation and reduced the large costs involved in this investigation.

6.2.3 Secondary deposition

From the first days, it was recognised that most of the remains had been dismembered to a certain extent. Bennett describes the first two sets of remains thus: "While the leg bones they had recovered were in some semblance of anatomical order, they appeared to have been separated from the torso and placed on it. Further down in the ground a black polythene bin liner was found partially underneath the torso. Close by were two lengths of cord. The head also seemed to have been separated and was found with its hair still in place, though by now heavily matted with mud […] Professor Knight leaned forward and pulled out another bone. It was part of a left thighbone – another femur. He could tell it was broken, though how he couldn't readily tell because of all the dirt that covered it. Then he pulled out another, longer portion that had a number of cuts near to where it had been broken. Moments later, another bone, this time a complete right femur." (Bennett and Gardner, 2005, pp.6-7)

This description strongly suggests Secondary Deposition: human remains which are initially buried as a body in one location, but then dug up and re-buried at another location after decomposition has started. In addition, many skeletons were missing small, irregular bones. The thorough sieving of everything in the cellar supports this theory of Secondary Deposition: the bones were not missed by inexperienced or incompetent police excavating teams. The fact that, of the second set of remains found in the Cromwell Street garden on 26th February 1994, one femur was broken also supports this theory.

The missing bones have spawned a number of theories – stemming from a forensic psychologist's suggestion that the bones were deliberately chosen and removed by the Wests as trophies. He gives an alternative suggestion that the missing bones and the scrape-marks on the long bones are an indication that the Wests were cannibals and that they ate parts of their victims (Britton 1997). The Gloucestershire Constabulary document appears to follow Britton's idea in its "Frequently Asked Questions" section where a question on the "missing kneecaps and fingers" is answered by a reference to "advice from Paul Britton" that it "was possible that they could have been retained and taken elsewhere" (Gloucestershire Constabulary 2004). The account given by Britton (Britton 1997) of a phonecall on March 7th 1994 gives Detective Superintendent Bennett the quoted sentence "Mainly kneecaps and neck bones, but also a shoulder-blade and parts of the sternum". This description tallies with various sections of Bennett's book (Bennett and Gardener 2005). Britton replies to this by suggesting the bones "could have been taken as trophies, or removed during the process of constraint and torture", before recounting, two pages later, a face-to-face conversation between the two men on March 9th, in which he adds the suggestion of cannibalism. First they discuss some "marks" on the larger bones which the pathologist says "don't make sense in terms of dismembering the bodies". Then Britton proffers the suggestion that "cannibalism might be part of the ritual. It would explain the missing bones" as well. After a lengthy discussion of the case, Britton concludes "of course I can't be absolutely certain that cannibalism took place, but the unusual scraping marks on the long leg bones make it a very strong probability" (Britton, 1997, pp.469-70).

This is a statement that could well be considered outside the remit of forensic psychology.

Bennett writes that the one juvenile victim, 8-year-old Charmaine, found underneath the kitchen at Midland Road and the only body found in that location, had not been dismembered like the other bodies but that both her kneecaps were missing. Professor Knight confirmed that the sieving was such that they could not have been missed by the recovery team, nor could they have decomposed (Bennett and Gardener 2005). If, however, the body had been initially buried somewhere else, then these irregularly-shaped small bones could easily have been missed in a hasty excavation by West before re-burial at Midland Road.

It must be borne in mind that the present author was not involved in this case and has not examined the bones in question. The information available from published sources involved in the investigation strongly suggests that there is one logical solution for the missing bones and the "marks" on the leg bones, which is far simpler than cannibalism or trophy-taking, yet opens up a far wider field of enquiry at the same time.

The placing of a body in a grave, clandestine or official, is termed in archaeology Primary Deposition. Sometimes for whatever reason, somebody (who may or may not be the original body-burier) digs up the body and buries it in a second location. This may be to hide it more securely if it is thought that the first burial site may be

noticed, or it may be for reasons private to the killer. The forensic archaeologist may well be able to identify that a burial is a secondary deposition.

The bones of the human skeleton most commonly missed and left behind by unskilled exhumers, from this author's experience, are the finger and toe bones (probably because they are so tiny), the scapula (because it is so thin, it is often the first bone to start to break up during burial and the pieces may not be recognised as human bone by an unskilled, albeit maybe experienced, exhumer, perhaps working quickly under pressure and maybe in poor light) and the patellae (because when covered with soil or mud, there is nothing the human kneecap resembles more than an irregularly-shaped smooth pebble). The other bones, the neck bones and sternum (mentioned by Britton (Britton 1997) but not by Gloucestershire Constabulary (Gloucestershire Constabulary 2004)) are also irregularly-shaped and easy to miss when covered in mud.

It is possible that West removed these bones for purposes of trophy-keeping or even cannibalism, yet they are, on the whole, difficult and awkward to remove from a fresh body, with the exception of fingers and toes. To excise a knee-cap would take considerable time and effort. However, these are the very bones which are most commonly 'missing' from skeletons excavated by what might be termed 'amateur' diggers. It is clear that the police recovered every bone and every bone fragment that was present. If the bodies were initially buried elsewhere, and were dug up and moved by West to the locations from which the police excavated them, then the missing bones being these specific bones makes sound sense.

These ‘unusual scraping marks’ on the long bones may be explained in another way. When bones are dug up inexpertly, especially when a spade is used (for example, when workmen find archaeological bones), then long shallow scraping marks are often found on the long bones, where the metal blade of the spade, shovel, pick-axe or even trowel has made contact with bone. People seem to have, in this author’s experience, a near-universal tendency to remove the clinging earth, from the long bones in particular, by scraping it away, unless trained not to do this. Bones are damaged during inexpert or hurried excavation often enough for there to be a recognised phrase in archaeology to describe it – “post-ex damage” or post-excavation damage. Bones become more easily breakable after a post-mortem interval dependent on circumstances but generally of a few months at least. It would be interesting to know how and where and in what way the broken femur of the second set of remains found in Cromwell Street garden was broken into two pieces. ‘Dry’ bone breaks more easily and often in slightly different ways from ‘fresh’ bone. Hurried excavation by one not specifically trained in excavation of bones, perhaps in the dark, could result in a femur breaking into two pieces, but it is less likely to occur as a result of peri-mortem trauma, at or around the time of death. Post-excavation damage is usually identifiable by an archaeologist, but may not be recognised by a forensic pathologist, even one so competent as Professor Knight.

In 1999, Cox and Bell analysed the recovery of bones from a recent murder case, clearly the West case (Cox and Bell 1999). They make the point that even foetal bones and fingernails were retrieved, indicating that missing bones are not missing

due to failure by police to retrieve them at the scene; whatever was present was retrieved, therefore these bones were not present in the burials. Further, they comment that only one bone was partially present; all other bones in all burials were intact, thus ruling out the kind of bone decomposition found in some archaeological sites. From their personal communication with the forensic pathologist, it is clear that no cut-marks indicating dismemberment were found contiguous to the missing bones in any set of remains. I find the paper inconclusive on the whole – the authors clearly state that dismemberment is the most likely reason for the missing bones, yet there are no cut-marks on adjacent bones to the missing ones. They then compare the pattern of missing bones to archaeological sites, looking at overall assemblages. My own experience is that it is more useful to assess missing bones from archaeological sites in the context of the condition of surviving bone. As an archaeological osteologist, I informally assessed quality of excavation by calculating the number of patellae per skeleton across an assemblage – if a skeleton is well-preserved, with bone in good condition, but has only one knee-cap then the most likely explanation is not some bizarre differential decomposition limited to a single knee-cap but not affecting adjacent joint surfaces, but that the excavator missed a mud-covered pebble-like bone.

Cox and Bell do not seem to consider Secondary Deposition as an explanation, although they do mention in passing, in a list of unexplored alternative explanations, that the element may never have entered the archaeological record.

The theory that these are Secondary Deposition burials explains the 'marks' on the long bones, and explains the missing bones, and even accounts for the bones being those specific bones. Professor Knight is, without question, one of the finest forensic pathologists, but he is not an experienced archaeologist or forensic archaeologist. Nor is Paul Britton, who produced the cannibalism hypothesis.

Many questions remain about other missing persons who may or may not have been victims, and there is the possibility that there are further bodies to be found, based on an interpretation of the known facts using the perspective of forensic archaeology. In addition, a widely-reported interpretation of certain aspects of the skeletal remains is challenged by an interpretation based on the experienced perspective of both forensic and field archaeology.

6.3 An example of good practice: one police force's experiences with forensic archaeology

In the course of the research for Chapter Five, it was noticed that one police force in particular appeared to have an unusually successful track record in searching for missing bodies, for establishing both identification and manner of death in cases with a long post-mortem interval, for identifying a suspect or suspects, and for prosecuting where there was a case to answer. It was unclear from the media reports why this force had so noticeable a rate of successful 'clear-up' since these cases are often very difficult to investigate successfully.

In November 2006, permission was granted to carry out interviews with eight members of staff working in the medico-legal investigation of sudden or suspicious deaths in this police force area. The cooperation given was extensive. The interviews lasted for between half an hour and two hours, and took the form of informal, unstructured talks. The aim was to explore to what extent this police force used forensic archaeology and whether it was useful when they did. The decision to interview in this way was taken because a structured, or even a semi-structured, questionnaire would have been very difficult to design in such a way as to apply to all the individuals interviewed. The advantage of the informality was that it enabled the individual being interviewed to set out their own experience, give their opinions on this and provide examples which seemed to them to be relevant and so on. There was very little in the way of questioning – on one occasion the entire discussion resulted from a simple, "What are your views on the use of forensic archaeologists by police?"; other questions were responses to what the subject had said, such as, "Did you find your background a help in cases like that one?" or "can you outline how you would go about that?".

Detailed handwritten notes were taken throughout the interviews: these notes are the source for the following discussion.

The individuals interviewed who gave generously of their time covered the whole range of those involved in the investigation of these kinds of cases. The most senior police officer interviewed was the Head of Major Crime for that police force, who was also at that time Acting Head of CID. His assistant was also interviewed, a

Detective Sergeant in CID with, unusually, specialist training in forensic archaeology. Also interviewed were a Senior Investigating Officer (SIO) in CID, a Detective Sergeant with the role of Crime Scene Manager (CSM) for both Volume Crime and Major Crime, the police force's Police Search Adviser (PolSA), and a Sergeant outwith CID with extensive archaeological experience, training and qualifications. In addition, a senior Crime Scene Investigator and the main forensic pathologist for the police force area also contributed to the discussions.

One finding emerged clearly throughout all the interviews and discussions with members of the force. All eight of the individuals interviewed were strongly of the opinion that both the quantity and quality of evidence retrieved can be improved by the use of an individual experienced in the location, excavation and retrieval of disrupted human remains.

It must be borne in mind that even senior professionals may have the all-too-human tendency to 'want to please'. Therefore, when being interviewed by a forensic archaeologist, they may have been likely to express opinions that were a little more positive towards the discipline than would otherwise have been the case. However, the respondents clearly felt able to be open and critical of certain aspects relating to the discipline, as becomes evident below.

It should be noted that the discussion focuses entirely on forensic archaeology. This is because it became apparent that this discipline was widely used and well respected within this police force, whereas forensic anthropology appeared to be unrecognised

as a distinct discipline. The forensic pathologist had more experience than most in disrupted human remains, and his approach more closely resembled the forensic pathologists in mainland Europe. His training in forensic medicine, coupled with his specific extensive experience, meant that it was rare for him to encounter human remains that required an outside expert. In the one case he mentioned in which an outside expert did assist with the human remains, this was not a forensic anthropologist, but a senior member of staff in an academic hospital's Anatomy Department.

The police force shall remain unidentified, as stipulated by them in arranging the interviews, save to make clear that the area it covers is of a type which can be found in many police force areas across the United Kingdom: a large area of remote rural land, with a range of villages and towns across it as well as city districts. In addition to the local population, the force area includes a number of tertiary education establishments with students from all over the UK and from outside it; both cities and countryside attract tourists and holidaymakers in large numbers. There are, as everywhere, districts both rural and urban with problems of illegal drugs and prostitution, and the organised crime that goes with them; residents of the region range from famous and wealthy to the deprived and socially-excluded.

6.3.1 The development of the force's use of forensic archaeology

No individual was quite clear at what stage the force had first started to use forensic archaeological experience, although it appears to have been in the late 1990s. About this time, the Detective Sergeant attended a two-year postgraduate course in Forensic

Archaeology at a major university. About the same time, an archaeology graduate from a highly-regarded department decided to return to his native part of the country after several years of working full-time in archaeological excavations and surveys for a well-established archaeological unit in London. He gave up archaeology and joined the police as a sergeant outwith the CID. This police force has an 'intranet' which includes a system of codes enabling officers to search the entire police force personnel to look for specialist skills, often from an officer's pre-police career or training. The Sergeant listed himself under the code "Archaeological Evidence" and gradually the Sergeant and the Detective Sergeant became aware of each other's backgrounds and skills and started to work together.

The Sergeant and the Detective Sergeant were able to produce a combination of archaeological excavation experience, forensic archaeology theory, and police training and experience. They were able to put their combined skills into practice because the senior officers in CID were interested in using any training and skills which would increase the quality and quantity of evidence.

There was apparently no written policy within the force on the use of forensic archaeology: instead the decision is made by the individual Senior Investigating Officer. He himself put it in these terms: "The SIO surrounds himself with specialists and listens".

He illustrated the way in which he took advantage of the Detective Sergeant's skills by asking him to give an opinion on the known intelligence on a missing person.

From his training the Detective Sergeant was able to narrow the search areas considerably, suggesting a city garden. The Senior Investigating Officer managed to find a way to bring the Sergeant in to examine the garden and used his findings, coupled with his pre-police career, to "lever headquarters into permitting the dig". Before that the Senior Investigating Officer had not worked with the Sergeant, but knew of his background through word-of-mouth from other officers in the force. The dismembered body was recovered fully. The importance of recovering all the remains (in this case, some eight bags of body parts) can be appreciated because in this back-garden case there were no reference samples for DNA to identify the remains. In fact, a tissue sample was eventually located, stored in a hospital hundreds of miles away, but at the time of excavation and initial investigation this was not known, and therefore retrieval of all the remains was crucial.

Another case referred to in detail by both the Head of CID and by the Sergeant involved a 'visiting' force approaching the 'home' force to investigate a particular site in their area. This highlighted the problems involved when two police forces have to work together on a case. Five individuals were missing in suspicious circumstances and a specific location had been identified as a suspected burial site. The 'visiting' force pushed hard in discussions for a mechanical digger to be used to excavate an entire field rapidly. The 'home' police force (the one under discussion in this section) believed, from their previous experiences, that the investigation would be best served by a planned, structured excavation by hand carried out by experienced excavators.

Mechanical diggers can be used in forensic excavation with great success – for example, in removing the overburden of soil from an identified mass grave site in former Yugoslavia. Within the United Kingdom, a forensic investigation (in which this author took part) involved the use of a mechanical digger - because the intelligence about the alleged burial was regarded as not overly reliable, with a post-mortem interval of some 30 years as well as difficult geology, the mechanical digger was appropriate for that case.

In the case discussed here, the 'home' force argued that the use of a mechanical digger could only be justified if the requirement for rapid discovery was greater than the requirement for the retrieval of all possible evidence in the best possible state. Despite the 'visiting' police force arguing for the use of a mechanical digger even at the level of senior officers and scientific support staff, the decision was taken at pre-excavation discussions to use the Sergeant's skills to excavate the most likely area of the field by hand. This strategy was successful as not only were all five bodies retrieved with no damage caused by excavation, but the retrieval was so complete as to include individual eyelashes which had become detached through the processes of decomposition. It is unlikely these would have been retrieved had a mechanical digger being used. The police could be certain that if some body part, or other expected evidence, were not present this could only be because it had not been buried at that location, rather than because it had been missed.

This shows the value of experience when it comes to excavating human remains in a forensic context, and underlines the importance of careful and planned excavation to

ensure that everything present is observed, documented, recognised, and understood. As an additional benefit in this case, because soil samples were taken from immediately around the bodies to use for possible DNA analysis for identification purposes if required, it was possible to link this via a forensic geologist's expertise to a vehicle examination. All of the possible evidence, with an unbroken chain of evidence, and the integrity intact were considerable benefits for the police.

6.3.2 The recognition of training

It was clear that all eight interviewees at all levels were conscious of the importance of training for police, and other medico-legal, personnel specifically to ensure an awareness of which specialisms are available to assist with investigations.

The Crime Scene Manager had attended a five day university course which involved two days in the classroom covering the basics of forensic archaeology and forensic anthropology followed by three days of practical excavation training. He said that his crime scene work drew directly on this course, complemented by the experience and training of the Forensic Pathologist and the Sergeant. Furthermore at least one other crime scene manager in the force attended a course on human body identification.

The Crime Scene Manager believed that there was scope for a Continuing Professional Development course for police in forensic archaeology and forensic anthropology. He stressed that one of the roles of the crime scene manager is to ensure the integrity of evidence, and for physical evidence to be recorded, recovered and packaged in a structured manner. The Crime Scene Investigator agreed that it

was essential to keep the training of crime scene managers up to a high standard because they are "catalysts" for the procedures employed at a crime scene, but he was conscious that in practice some courses have a three-year waiting list.

The Police Search Adviser agreed that more awareness of the range of forensic archaeology options available to help police search teams would be useful. There are training courses and talks available to the Police Search Adviser through the Police National Search Centre in Kent. He highlighted a major problem in his experience being that, although he (as an official Police Search Adviser) was more fully trained, the serving officers who made up a large search team covering a big area were less well-trained. He said "search teams need training to look for anomalies, not just 'for a body'" – he recognised that this is a skill that forensic archaeologists are practiced in.

6.3.3 The attitudes to bringing in specialists

There was a mixed attitude among the interviewees to bringing in specialists from outside the police. In this particular force, there happened to be two individuals with the right background and training to be used for forensic archaeological work, but these were serving police officers. As these interviews took place in 2006, the National Forensic Framework Agreement of 2008 was not then relevant, although nowadays police forces in England may be tied into a contract with a specified supplier across a region (NPIA 2008).

While there was general recognition of the value of forensic archaeology input, there was much less enthusiasm for bringing in outside specialists. The Crime Scene Manager, for example, argued that the skills already existing within this particular police force, and not just the Detective Sergeant and the Sergeant but the whole crime scene processing team, meant that there was little or no need to employ outside specialists for the purposes of forensic archaeology. The Crime Scene Manager stressed that in some cases he felt there had been no requirement for forensic archaeology to be employed, and contrasted this with other cases in which he felt that forensic archaeological methods had been of great benefit, but that still greater involvement of the Detective Sergeant and the Sergeant might have led to still greater benefit.

The raising of the issue of using other outside specialists, brought in as and when needed, with whom staff had not previously worked brought generally negative responses. Some interviewees stressed the importance of working with known people, the use of 'asking around' colleagues for a word-of-mouth reference and the advantages of keeping the forensic archaeology in-house. Many had clearly been marked by their past experience with one particular outsider because they all referred to a specific case in which an outside specialist (not in forensic archaeology or forensic anthropology) had become so opinionated and overbearing that one crucial member of the investigation team refused to work with the outside specialist, and in fact this team-member simply walked off the site in the end. The crime scene examination had to be held up for some hours while a replacement for the vital team member was found and brought in.

The Head of CID, the Detective Sergeant and the Forensic Pathologist all expressed very strong feelings on this incident, and the name of the outside individual was sent to Centrex (subsequently the NPIA) with a request that they be barred from future police work across the UK[7]. The NPIA maintained a list of "experts". A Senior Investigating Officer could phone and ask for contact details of a specialist. There was no 'vetting' of the names on the list – it was simply the result of a police officer being pleased with the work done and passing on the name of the specialist.

A major objection to bringing in outside forensic specialists, made by almost all of those interviewed, was that such specialists do not have enough awareness of police procedures and the vital need to follow certain police procedures to ensure the integrity of evidence. The Detective Sergeant said that archaeologists are 'fine with digging but not with paper'. The Senior Investigating Officer described a lack of understanding of their role by an outside forensic specialist. Similarly, the Head of CID said that he thought it would help if forensic archaeologists and forensic anthropologists had more awareness of police procedure, and a clear understanding of what police are asking. The Sergeant made it clear that outside forensic specialists are usually unaware of how the police need to work to maintain the integrity of evidence. The Crime Scene Investigator referred to outside forensic specialists having problems keeping adequate notes, not understanding the *sub judice* laws and

[7] Centrex was the Central Police Training and Development Authority. Its precise name changes from time to time and in fact at the time of the interviews in late 2006 it was formally known as the National Crime Faculty but was universally referred to in the interviews by both police and non-police as Centrex. It subsequently became the NPIA – National Policing Improvement Agency, which closed in October 2013 with its functions transferred to several other agencies.

how the discipline fits into the judicial system; he stated firmly that an awareness of police procedures is essential. The forensic pathologist was concerned that outside specialists lacked an understanding of the criminal burden of proof, the concept of "reasonable doubt" and the role of negative findings. He also believed that in the same way that medico-legal personnel needed a fuller awareness of the possibilities of forensic archaeology, so forensic archaeologists needed a fuller awareness of the medico-legal requirements.

The Senior Investigating Officer, however, raised a different point. While he was happy to use the Sergeant for forensic excavations, he would prefer to employ a professional forensic archaeologist for court purposes. Since he believed that the excavation was not usually relevant once the case reached court, this was likely to be entirely hypothetical. He stated that he felt a police officer, even with an archaeological background or having attended a course in forensic archaeology, would be "simply not good enough in terms of depth and breadth of experience" if it came to giving expert evidence in court. He felt that registration was important to demonstrate this depth and breadth of ability and competence in a profession, but that it was only necessary for court, not for practical purposes. He also suggested that in his opinion barristers were more likely to 'go for' (i.e. attack the evidence given by) forensic archaeologists or forensic anthropologists partly because police are no longer what could be termed 'easy targets' now that interviews are videoed. In the past, he felt, barristers could undermine the case by attacking police procedure and alleged shortcuts or contraventions of the standard police protocols. Now that this is very difficult for a lawyer to do in court, because of the electronic surveillance of so

much police work both in and out of a police station these days, the Senior Investigating Officer felt that lawyers were looking for other weak spots in a criminal case. A badly qualified, unqualified, or uncertainly qualified, forensic specialist called in from outside, especially one not used to giving evidence, could potentially bring down a case.

All of the individuals interviewed made it quite clear that experience counted for more than a certificate of qualification or having one's name on any central list of experts. However, all who were involved in decision-making in the progress of an investigation made the point that some kind of accreditation or registration would be useful. At the time of interviewing, in late 2006, the Council for the Registration of Forensic Practitioners (discussed in detail in Chapter 3) was at its height, but very little confidence was expressed in its work. In March 2009 CRFP was legally wound up and no longer exists: it certainly did not have the support of those interviewed in this force. It was described as not really relevant, of no use, or as of no relevance in the real world. The only positive comments came from the forensic pathologist who said that regulation is essential and that CRFP was "not a bad idea".

6.4 Summary

With regard to the West case, two suggestions emerge. Firstly, that the time and expense might have been considerably reduced, especially at the open-field sites, by the addition of a specialised forensic archaeologist to the team. Secondly, that there is a simple explanation, that of Secondary Deposition, which accounts for the 'marks' on the bones and the missing bones, and even explains why it is those

specific bones which are missing. This suggestion complements publicly-stated police theories that the Wests had at least one more undiscovered burial-site, and could help link future discoveries to the Wests, if the missing bones are found buried with more bodies.

Whilst forensic archaeology methods and experience would have been of use, no obvious area is identified in which forensic anthropology would have provided any information which was not provided by the forensic pathologist and forensic odontologist involved.

Expense to the police force, time in the investigation and distress to the families of the missing could all have been reduced by the inclusion of an experienced forensic archaeologist in this case.

As for the police force in the second part of this chapter, the main conclusion from the interviews is that all of the eight individuals were firmly convinced that forensic archaeology could be of benefit to a police investigation. Unusually, this police force used forensic archaeology whenever they could increase the quality and quantity of evidence retrieved. Part of the reason for this was that the police force had two individuals who were not just well known and trusted but were also serving police officers within the force. Obviously, this had implications for reducing the budget of investigations, but it appeared from the interviews that a much larger factor was that it was believed that these individuals could be trusted to understand the importance of *sub judice* laws. Because they were serving police officers, they understood fully

how a police investigation worked. Emerging from the interviews was a strong sense that this police force, as a whole, operates with an open mind.

What is important is that – wherever the expertise comes from – this police force is employing individuals who are bringing to an investigation the skills and experience necessary to maximise the quality and quantity of evidence. The job title is less important than the capability and ability of the individual.

Whether utilised as methods within a police force, or as practitioners brought in from outside for a case, it seems clear that forensic archaeology and forensic anthropology can be of help to police.

Chapter Seven

Conclusions and Recommendations

7.1 Introduction

Nobody sets out to spend twelve years writing a thesis on the 'current' situation of two professional disciplines; but that is the unintentionally-long time over which this thesis has been researched, written and revised. During this period, the roles and perception of both forensic archaeology and forensic anthropology within Great Britain changed significantly. Each has now reached the stage of professionalisation, with the expected levels of competence clearly and publicly outlined, as well as various levels of accreditation or certification.

7.2 Conclusions

Chapter Two, with its search for an explanation as to why American and British forensic archaeology and forensic anthropology had such differences, resulted in exploration of the past of each discipline. Once tracked back to a common origin in the 19th century antiquarian 'treasure-hunting' type of excavation, the diverging paths could be followed forwards. In the United States, Boas founded his 'four-fold'

American School of Anthropology, including field archaeology within the subject area of anthropology – thus, field archaeology was a part of anthropology from the early twentieth century. By the 1990s, some people were starting to really specialise in forensic archaeology, but many of them were anthropologists. In Great Britain, this blending of the two disciplines did not happen. Here, anthropology developed largely as a theoretical academic discipline examining cultural and social topics, whilst practical archaeology developed somewhere between other university subject areas. Sitting between history, geography and the sciences, the discipline of archaeology emerged as a world-renowned subject in British universities, as a science or arts subject, and with no formal link to anthropology.

In the 1990s, when American teams came to Europe to excavate and assess the mass graves of the former Yugoslavia, they brought with them, via the British news media, the *concept* of "a forensic archaeologist" – prior to this, the work of forensic archaeology was either carried out by forensic pathologists and anatomists, or was not carried out at all. In the years following the mid-1990s, forensic anthropology became overly popular as an idea in British culture, helped by popular television and film dramas. As a result of the initial news interviews from the former Yugoslavia being with American specialists, and the fictional dramas being mostly from the United States, there is still much confusion in Britain around the role and function of "a forensic archaeologist" or "a forensic anthropologist" – confusion amongst the public but also, in my experience, confusion amongst those organising crime investigation. I believe this is largely a result of the American role being 'imported' into this country, without its broad base of both field archaeology and physical

anthropology. I also believe the concept has been imported into this country without a real assessment of the need, or – significantly – the lack of any need, for it in British forensic work. If it hadn't been for the International Criminal Tribunal for former Yugoslavia and the TV drama 'Bones', would we have heard of the term "forensic anthropologist"?

In Chapter Three, it seems that there has previously been no real requirement for any expert witness in the British criminal courts to prove their expertise in order to give expert evidence. A range of new measures across the European Union are now bringing thorough standards and accreditation to laboratories, to equipment and to laboratory methods. The problem faced by both forensic archaeology and forensic anthropology in this development is the lack of any standard qualification or training. For a forensic pathologist to be considered competent to practice in the United Kingdom, there are standard requirements – they must be qualified and registered to practice medicine in this country, for a start. Lacking any such nationally-accepted requirements, both forensic archaeology and forensic anthropology must rely on assessment of an applicant's past casework by their peers. Continuing Professional Development courses should be introduced for the legal profession as well, so that they learn the questions to ask, of both the experts and their expertise, in the courtroom, to allow cross-examination to help assure the quality of forensic archaeology and forensic anthropology evidence.

Chapter Four started as a critical appraisal of the fluctuating reliability of some methods used in the two disciplines, but it rapidly became clear that many of the

practices *are* reliable, *so long as* the practitioner understands the full range of variation possible within a method, and the importance of local data. I believe there must be much more research in this country, focusing on local data, for both forensic archaeology and forensic anthropology. There is some work being done in forensic archaeology in the United Kingdom, especially on geophysical survey data, but there is little evidence of any real advance in forensic anthropology data.

Chapter Five was intended to be the mainstay of the thesis, examining the cases in which forensic archaeology and forensic anthropology have been used across the country. However, considerable efforts in searching over several years yielded only an unexpected and frustrating lack of officially-recorded data. I used news media archives, staying wary of bias, to construct a caselist which provided the bare minimum of cases across several decades in Great Britain which could have utilised either forensic archaeology or forensic anthropology. This Media Derived Case List did indeed demonstrate that the two disciplines could be used, but the true scope of the use of either remains elusive.

If nothing else, this illustrates the dearth of records available to professionals for analysis. This is almost tragic in its consequences as it generates very little opportunity for retrospective sharing of experience and best practice in order to develop improved methodologies in a broader UK forensic context. Whilst keeping information and expertise within a closed circle may have some short-term advantages, in the long term it more likely leads to “empire-building” and

development of "expert" points of view that may lack acknowledgement of (and indeed knowledge of) alternative interpretations of data.

In Chapter Six, I identified areas in a complex multiple-burial murder case which could have been significantly improved by the use of forensic archaeology – indeed, the police force I interviewed deliberately utilised several serving officers with a background, experience or training in archaeological methods to avoid loss of evidence in this way. However, I did not identify any areas which would have been altered significantly by a forensic anthropologist's involvement.

It seems more important that the methods are used, rather than that they are used by someone who specialises only in that area. A police officer with archaeological training and experience, who works to keep himself aware of developments in forensic archaeology, and who is often deployed by his force on forensic excavations thus increasing his experience, will be as valuable an asset to an investigation as any specialist forensic archaeology team brought in from outside. A forensic pathologist with a really thorough grasp of skeletal anatomy, who has perhaps attended workshops at conferences and spent time discussing related types of cases with colleagues, can carry out assessment of disrupted human remains as capably as any specialist forensic anthropology team brought in from outside. Note that, in both cases, I have referred to a 'team' being brought in; anecdotally, it seems less common now for individuals to work alone, instead operating as part of a team of two or more practitioners. Whether singular or plural, it does seem that it is possible

to nurture these skills and practices in-house, within the police, the crime scene personnel, or the forensic pathologist.

To my astonishment, it became apparent early in my research that forensic anthropology is simply not distinct enough to justify it as a separate profession in Great Britain. Gradually, but inexorably, it became obvious that forensic anthropology is, in reality, a small part of forensic pathology. Perhaps my involvement with FASE helped me to realise this, as the forensic anthropology work across mainland Europe is almost always carried out by forensic pathologists who have undertaken a little CPD training, such as the three-day workshops run by FASE at major legal medicine conferences. They are baffled as to why British universities offer so many postgraduate degree courses in forensic anthropology, training so many every year when there are basically no jobs (except in teaching more students) and when there are people already working in any investigation who have 95% of the skills and knowledge needed to apply forensic anthropological methods: the forensic pathologists. Why pay for someone else to come in and carry out this one small activity, when the forensic pathologist has almost all the knowledge already and can learn the specialised methods in a few days? I have been asked this by my colleagues at FASE, and I have no answer for them.

Despite all the various research, casework and forensic-related teaching I have done in the last couple of decades, immersing myself effectively in murder investigations, past and present, it has been unexpectedly difficult to identify any major case in Great Britain which would not have been solved equally well without forensic

anthropology. Some high-profile cases, such as dismemberment cases, have been resolved and have used forensic anthropologists to help identify the remains – but plenty of such cases were also resolved, and the bodies identified, by a good forensic pathologist, prior to the recent trend for using forensic anthropologists. In fact, the Wests cases are an excellent example – a large number of unidentified, mutilated, dismembered, skeletonised remains, with only a few names from a highly unreliable perpetrator to help with identification. Yet all were identified formally at inquests within nine months, without forensic anthropology being involved. Additionally, forensic archaeology was not involved in the Wests cases but I have shown in Chapter Six that the investigation could have been improved by its use.

After almost two decades working in two disciplines, I did not expect to research myself out of a job, so to speak, but I can only conclude that, of the two disciplines, only forensic archaeology can be considered a discipline in its own right, distinct from archaeology and not easily or effectively carried out by other personnel already involved in forensic investigations.

7.3 Recommendations

I believe that forensic archaeology, derived from field archaeology with specialised adaptation of accepted practical methods, has real benefit for forensic investigation in Great Britain. It can demonstrably speed up the timescale of searches for concealed human remains or other items of forensic interest, and might increase the retrieval and interpretation of evidence.

I would recommend that central government funding, either directly or through the police, be made available for a small number of forensic archaeology groups to carry out research nationally to build up data for the ground-types in Great Britain for which we do not yet have reliable information. For example, monitoring and analysis of a series of test burials, even if only of pigs, across the country could be of great use in only a year or two, and plenty of restricted-access land is owned by the government on which these burials could be monitored.

However, whilst finding that forensic archaeology has real benefit for investigations, I cannot conclude the same for forensic anthropology.

My second recommendation is that the most sensible use of resources would be for the forensic pathology community in Great Britain to reclaim this one small area of their work, and organise Continuing Professional Development sessions on common forensic anthropology methods. Forensic pathologists are the appropriate people to assess all forensically-important human remains, in whatever condition they may be, skeletal or otherwise.

7.4 Final Conclusion

The title of this thesis is *The Use and Usefulness of Forensic Archaeology and Forensic Anthropology in Great Britain*.

I conclude that the methods of forensic archaeology *are* used, widely and routinely, across the country, and that the use of specialist forensic archaeologists *is* useful – arguably reducing the length of searches and maximising the quantity and quality of evidence retrieved, in ways that cannot be carried out by other investigators already involved. I also conclude that the methods of forensic anthropology *are* used, widely and routinely, across the country, but that there seems *no* conclusive evidence that the use of specialist forensic anthropologists adds anything to the investigation which could not be brought to it by the forensic pathologist already involved.

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1	2	3	4	5	6	7	8	9
Carver, Kirsty	F	22	05.03.1998	08.04.1998	M 01, W 01		Murder	Buried coastal
Evans, Zoe	F	9	11.01.1997	00.02.1997	M 01, W 03		Murder	Buried in badger-sett
Collins, Karen	F	39	19.07.2000	23.07.2000	D 04		Murder	Buried in cemetery (!)
Folan, Michelle	F	24	16.10.1981	00.06.1999	Y 18		Murder	Buried in concrete - building site
Payne, Sarah	F	8	01.07.2000	17.07.2000	D 16	LS	Murder	Buried in field
Sands, Daniel	M	41	00.10.1980	15.03.1982	M 18		Murder	Buried in field
Taylor, Ian	M	28	22.11.1996	08.11.2001	Y 05		Murder	Buried in field
Hampson, Claire	F	42	25.09.1996	00.12.1998	Y 02		Manslaughter	Buried in garden
Munro, Michael	M	39	00.07.1998	04.05.2001	Y 03	AC	Murder	Buried in garden
Price, Karen	F	15	1981-1982	07.12.1989	Y 07		Murder	Buried in garden
Hamilton, Vicky	F	15	10.02.1991	12.11.2007	Y 16	LNS	Murder	Buried in garden
Green, Mark	M	30	17.01.2002	07.06.2002	M 04, D 21	JH	Murder	Buried in garden, dismembered
Crowie, Jean	F	40	24.06.1978	00.08.1994	Y 16	JH	Murder	Buried in garden, under concrete
McHugh, Bridget	F	29	01.01.1961	27.02.2002	Y 40+	SB	Perv.C.ofJust	Buried in house cellar
Healey, Sinead	F	26	18.10.2000	22.03.2001	M 05		Murder	Buried in lay-by
Ford, Lesley	F	36	30.08.2000	04.10.2000	M 01, D 05	MB	Murder	Buried in shed, lime
Tranter, Craig	M	13	30.08.2000	05.10.2000	M 01, D 05	MB	Murder	Buried in shed, lime
Tranter, Steven	M	14	30.08.2000	05.10.2000	M 01, D 05	MB	Murder	Buried in shed, lime
Tranter, Sarah Jane	F	17	30.08.2000	06.10.2000	M 01, D 06	MB	Murder	Buried in shed/ 2ary- field
Tranter, Anne Marie	F	16	30.08.2000	06.10.2000	M 01, D 06	MB	Murder	Buried in shed/ secondary- field
Frame, Margaret	F	34	12.10.1978	22.10.1978	D 12		Murder	Buried in woodland
McKendrick, Thomas	M	21	11.12.2002	18.01.2003	M 01, W 01	LNS	Murder	Buried in woodland
Handley, Daniel	M	9	02.10.1994	00.03.1995	M 06		Murder	Buried in woodland
Blatchford, Susan	F	11	31.03.1970	??.06.1970	M 02, W 3		Murder	Buried in woodland, vegetation overburden
Hanlon, Gary	M	12	31.03.1970	??.06.1970	M 02, W 3		Murder	Buried in woodland, vegetation overburden
Downey, Lesley-Ann	F	10	26.12.1964	10.10.1965	M 09, W 02		Murder	Buried moorland
Kilbride, John	M	12	11.11.1963	21.10.1965	Y 02		Murder	Buried moorland
Reade, Pauline	F	16	12.07.1963	01.07.1987	Y 20+		Murder	Buried moorland
Kenny, Anna	F	20	05.08.1977	23.04.1979	Y 01, M 088, D 18		Murder	Buried rural

1	2	3	4	5	6	7	8	9
Newall, Elizabeth	F	46	10.10.1987	00.11.1993	Y 06	JH	Murder	Buried rural
Newall, Nicholas	M	56	10.10.1987	00.11.1993	Y 06	JH	Murder	Buried rural
Baldwin, Jenna	F	15	10.09.2002	18.11.2002	M 02, D 10	BS	Murder	Buried rural - initial charge NB - conviction
Pearce, Angela	F	18	09.04.1998	28.04.1998	D 19		Murder	Buried urban grass
Tiernan, Leanne	F	16	26.11.2000	20.08.2001	M 09		Murder	Buried woodland, previously frozen?
Chandler, Karen	F	40	22.06.2000	25.06.2000	D 03		Murder	Burnt in car
Moore, Patrick	M	31	16.10.2001	27.12.2001	M 02, D 11		Murder	car boot
Collier, Shane	M	21	08.10.2001	17.03.2002	M 05, D 09		Murder	Complex - Buried moorland; dismembered, 2 shallow graves
Crookes, Russell	M	17	13.05.1998	26.05.1998	D 13		Murder	Complex - burnt, dismembered, buried
Fields, Paula	F	31	13.12.2000	19.02.2001	M 02, D 6		Murder	Complex - dismembered, 6 bags in canal
Hinz, Andreas	M	37	02.07.2002	11.07.2002	D 09		Murder	Complex - dismembered, binbags, pavement
Frisby, June	F	36	04.01.1999	00.04.2000	M 15		Murder	Complex - dismembered, buried
Glazebrook, Ronald	M	81	29.04.2001	17.05.2001	D 18		Murder	Complex - dismembered, in bag, buried, in bin
Wallace, Barry	M	18	05.12.1999	00.12.1999	D 14		Murder	Complex - dismembered, loch, coastal
Chapman, Jessica	F	10	04.08.2002	17.08.2002	D 13	CD	Murder	Complex - ditch, partial burning, submersed/dry
Wells, Holly	F	10	04.08.2002	17.08.2002	D 13	CD	Murder	Complex - ditch, partial burning, submersed/dry
Dyer, Ivor	M	65	12.06.2001	18.06.2001	D 06		Murder	Complex - indoor 4d, dismembered/ burnt, then ditch
Quy, Lindsay	F	21	16.12.1998	09.06.2000	M 18		Murder	Complex – dismembered, surface
Benford, Sarah	F	14	06.04.2000	NF	NF 05-10y	JH	Murder enq	NF
Chau, Elizabeth	F	19	16.04.1999	NF	NF 05-10y		Suspicious	NF
Kaminska, Iwona	F	20	13.07.2000	NF	NF 05-10y		Suspicious	NF
Shenkoya, Lola	F	27	03.01.2000	NF	NF 05-10y		Suspicious	NF
Pratt, Kellie	F	28	11.06.2000	NF	NF 05-10y		Suspicious	NF
Ray, Nicola	F	29	02.05.2000	NF	NF 05-10y		Murder enq	NF
Griggs, Debbie	F	34	05.05.1999	NF	NF 05-10y		Suspicious	NF
Law, Colin	M	18	16.05.1999	NF	NF 05-10y	LNS	Suspicious	NF
Duncan, Mandy	F	26	02.07.1993	NF	NF 11-19y		Suspicious.	NF

1	2	3	4	5	6	7	8	9
Fraser, Arlene	F	33	28.04.1998	NF	NF 11-19y		Murder	NF
Morton, Gracia	F	42	12.11.1997	NF	NF 11-19y		Murder	NF
Bowen, Sandie	F	54	06.08.1997	NF	NF 11-19y		Murder	NF
Warre, Patrick	M	11	26.12.1996	NF	NF 11-19y	JH	Suspicious	NF
Spencer, David	M	13	26.12.1996	NF	NF 11-19y	JH	Suspicious	NF
Palmer, Kevin	M	37	12.03.1999	NF	NF 11-19y		Murder	NF
Bennett, Keith	M	12	16.06.1964	NF	NF 20+y		Murder	NF
Tiffney, Louise	F	43	27.05.2002	NF	NF 05-10y		NB Murder	NF - 'Not Proven' verdict
Tildesley, Mark	M	7	31.05.1984	NF	NF 20+y		Manslaughter	NF - conviction Manslaughter
Fox, Sheila	F	6	18.08.1944	NF	Y 40+		Suspicious	NF - garden excavated 2001
Appelquist, Sybil	F	41	00.07.2002	NF	NF 05-10y		NB murder enq	NF - murder trial stopped by judge
Wilson, Rachel	F	19	30.05.2002	NF	NF 05-10y		NB murder enq	NF - no charges
Markham, Christine	F	9	21.05.1973	NF	NF 20+y		Murder	NF - no charges
Fabb, April	F	13	08.04.1969	NF	NF 20+y		Suspicious	NF - no charges
Tate, Genette	F	13	19.08.1978	NF	NF 20+y		Suspicious	NF - no charges
Bastholm, Mary	F	15	05.01.1968	NF	NF 20+y		Suspicious	NF - no charges
Exall, Pamela	F	21	30.08.1974	NF	NF 20+y		Not known	NF - no charges
Lamplugh, Suzy	F	25	28.07.1986	NF	NF 20+y		Suspicious	NF - no charges
Newing, Steven	M	10	02.09.1969	NF	NF 20+y		Suspicious.	NF - no charges
Gibson, Belinda	F	33	16.02.2002	NF	NF 05-10y		NB Murder	NF - River - post-conviction confession
Clive, Robert Scott	M	30	10.10.2002	NF	NF 05-10y	LNS	Non-Suspicious	NF - was Murder enq, now non-Suspicious; fell into Tyne
Williams, Jason	M	31	00.04.2001	NF	NF 05-10y		Murder	NF – surface, then removed; secondary depositionn NF
Jones, Danielle	F	15	18.06.2001	NF	NF 05-10y		NB Murder	NF (conviction)
Razzell, Linda	F	41	19.03.2002	NF	NF 05-10y		NB Murder	NF (conviction)
Allen, Victoria	F	5	01.05.1975	NF	NF 20+y		Murder	NF (conviction)
Carr, Gillian	F	8	00.02.1975	NF	NF 20+y		Manslaughter	NF (conviction)
McCourt, Helen	F	22	09.02.1988	NF	NF 20+y		Murder	NF (conviction)
Allen, Patricia	F	41	01.05.1975	NF	NF 20+y		Murder	NF (conviction)
Allen, Jonathan	M	7	01.05.1975	NF	NF 20+y		Murder	NF (conviction)

1	2	3	4	5	6	7	8	9
Paterson, Julie	F	32	00.04.1998	00.05.1998	M 01		Murder	Packed - binbag in hedge - partial
McCann, Rosie	F	5	13.01.1996	04.03.1996	M 01, W 03		Murder	Packed - sportsbag, urban alley
Jin, Hyo Jung	F	21	25.10.2001	18.11.2001	D 24		Murder	Packed - suitcase
Jordan. Jean	F	20	01.10.1977	10.10.1977	D 10		Murder	Surface - allotments
Wright, Nicholas	M	18	12.12.1997	15.12.1997	D 03		Murder	Surface - field
Swift, Jason	M	14	00.11.1985	30.11.1985	M 01		Murder	Surface - field
Figard, Celine	F	19	19.12.1995	29.12.1995	D 10		Murder	Surface - layby
Hogg, Caroline	F	5	08.07.1983	20.07.1983	D 12		Murder	Surface - layby
Maxwell, Susan	F	11	31.07.1982	12.08.1982	D 13		Murder	Surface - layby
Sibbald, William	M	48	08.10.2002	10.01.2003	M 03	LNS	Murder enq	Surface - layby
Molseed, Lesley	F	11	05.10.1975	09.10.1975	D 04		Murder	Surface - moorland
Trower, Michael	M	14	00.00.1966	21.01.1967	M 06		Murder	Surface - rural
Mehrotra, Vishal	M	8	29.07.1981	00.03.1982	M 07		Murder	Surface - rural
Earl, Jessie	F	22	15.05.1980	00.04.1989	Y 09		Murder	Surface - rural
Lavis, Jamie	M	8	05.05.1997	23.10.1997	M 10		Murder	Surface - rural - partial
Jenkins, Sion	M	20	00.11.1999	18.12.1999	M 01		Murder	Surface - undergrowth
Upton, Wendy	F	40	07.10.1998	22.07.1999	M 09, W 02		Murder	Surface - undergrowth
Hall, Melanie	F	25	09.06.1996	05.10.2009	Y 13		Murder	Surface - undergrowth
Walker, Amanda	F	21	24.04.1999	02.06.1999	M 01, W 01		Murder	Surface - undergrowth - Wisley
Simpson, Scott	M	9	17.07.1997	22.07.1997	D 05		Murder	Surface - urban
Mayo, Barbara	F	24	12.10.1970	18.10.1970	D 10		Murder	Surface - woodland
Dowler, Amanda	F	13	21.03.2002	18.09.2002	M 06		Murder	Surface - woodland
Linn, Gary	M	38	31.08.2001	17.05.2002	M 08, W 02	LNS	Murder	Surface - woodland
Whittle, Lesley	F	17	14.01.1975	07.03.1975	M 01, W 03		Murder	Underground - in tunnels
Williams, Hannah	F	14	21.04.2001	15.03.2002	M 10		Murder	Underground - in tunnels
Reid, Danielle	F	5	31.12.2002	07.01.2003	D 07		Murder	Water - canal
Ballantine, Eliz. Ann	F	20	23.11.1986	21.01.1987	M 02, W 1		Murder	Water - canal
Rimer, Lindsay Jo	F	13	07.11.1994	12.04.1995	M 05		Murder	Water - canal
Parker, Zoe	F	24	00.12.2000	17.12.2000	D 17		Murder	Water - canal - partial
Day, Ann	F	47	14.04.1999	07.07.1999	M 03		Manslaughter	Water - coastal, washed-up

1	2	3	4	5	6	7	8	9
Nolan, Daniel	M	14	01.01.2002	00.05.2003	Y 02,4m		Non-Suspicious	Water - coastal, washed-up
Park, Carol	F	30	17.07.1976	13.08.1997	Y 20+		Murder	Water - lake
Humphries, Anna	F	15	18.11.1988	28.11.1988	D 10		Murder	Water - river
Harper, Susan	F	10	26.03.1986	19.04.1986	D 24		Murder	Water - river
Ward, Kayleigh	F	9	19.12.1996	25.02.1997	M 02, W 1		Murder	Water - river
Anderson, Amy	F	19	06.05.2002	11.05.2002	D 05		Murder	Water - river - partial
Glass, Vicky	F	21	24.09.2000	03.11.2000	M 01, W 02		Murder	Water - stream, moorland
Hall, Vicky	F	17	19.09.1999	24.09.1999	D 05		Suspicious	Water-filled ditch
Curtis, Hayley	F	23	16.10.2001	04.01.2002	M 02, D 19		Murder	Water-filled ditch
Bettles, Michelle	F	22	28.11.2002	31.03.2003	M 04, D 02		Murder enq	Water-filled ditch

Notes:

Column 1: Name of deceased or missing person

Column 2: Sex of deceased or missing person

Column 3: Age of deceased or missing person when last seen alive

Column 4: Date when deceased or missing person last seen alive

Column 5: Date when body found. 'NF' indicates that body is Not Found

Column 6: Timescale between Columns 4 & 5, or Column 4 and time of writing – Y/years, W/weeks, D/days

Column 7: Any known involvement of forensic archaeology or forensic anthropology*

Column 8: Any charges brought or official designation of the enquiry as to expected charges

Column 9: Known locations of body or body-parts

* forensic archaeologists or forensic anthropologists known to have worked on cases, and their approximate region

MB – Martin Benetto, working in Devon and Cornwall area

SB – Sue Black, University of Dundee

AC – Alison Cunningham, Aberdeen Council archaeology unit

CD – Corinne Duhig, working in East Anglia area

JH – John Hunter, University of Birmingham

LS – Lucy Sibun, working in SE/ London area

BS – Barrie Simpson, working with John Hunter at Birmingham

LNS – Laura Sinfield, University of Edinburgh