Preliminary Observations:

Prepared by Julie Roberts RGN.B.A.(Hons), MSc FSSoc
Forensic Anthropologist and Archeologist

1. The medical autopsy / specialist reports do not:
   - contain a comprehensive inventory of all skeletal elements present and absent.
   - provide a detailed description of the fractures observed in each fragment, or a comprehensive assessment of whether they were caused by ante-mortem or postmortem trauma, or thermal damage. It should be possible to distinguish this
   - Interpret any of the burning patterns with reference to body position on the fire.

2 The inadequacies of the specialist anthropology report may be due in part to the fact that they only had access to photos and not to the remains themselves (if my understanding is correct)

3 The CT scan report seems minimal

4 Some of the conclusions reached in the forensic medical expert report 08000-91/2009 bu, do appear to make sense, e.g. "in respect of question 7", and "in respect of question 8", but these would need to be reviewed thoroughly preferably together with the skull fragments. Certainly their conclusions relating to the fractures of the base of the cranium seem to make sense – see my comments –points 1 and 2, page 2 with reference to the photographs. The addendum (PI 377/2009 Ref 08000-91/2009 however suggests that these fractures could have been caused by pressure in the cranium because of the heat. This theory relating to skulls "exploding" in fires is generally no longer thought to be true (Pope and Smith, 2004).

5 In the suspects statement sent to me on the 26th April he says that the skull was covered in tar. This does not appear to be the case on the photographs

6 There appears to be no excavation report detailing the burial context from which the remains were recovered. A typical excavation report should contain information relating to the dimensions of the grave, soil type and stratigraphy, method of excavation and contents of the grave. All stages of the excavation, i.e. pre-excavation, the remains *in situ*, and the grave after removal of the remains, should have been photographed and drawn (scale drawings in plan and section). Environmental samples should have been taken from the grave to assist in determining time of burial and potentially movement of the corpse prior to burial.

7 There appears to be no satisfactory explanation for the absence of the torso *unless* it was taken by animals. See further information from fire scenes expert, page 4

8 There appears to have been no systematic search of the grounds for the missing remains

9 There is no statement relating to a forensic search of the house and / or the grounds

10 The bones of non-human origin are also of interest. Where had they come from? Could they have been included in the rubbish the suspect says he piled on the remains? Did they belong to the cats the suspect says were being burnt on the fire?

Observations from Photographs sent to me by Judith Majlath on 24th April 2010

1. The clarity of the photographs is poor, but the cranium appears to be largely unburnt. According to what Sophie told me, the suspect says that the skull and the torso were covered during burning. This would fit with the skull not being very burnt and also means that some of the fractures to the skull are unlikely to have been cause by heat (see also below)
2. If my interpretation of the images is correct, there appears to be a fracture of the base of the cranium. It is very rare for this to occur as a result of burning (Lewis and Rutty 2003, Edland 1980). The Hungarian experts initially seem to have concluded that these fractures were caused by trauma and not by heat, which made sense. The addendum (PI 377/2009 Ref 08000-91/2009 contradicts this in part. These are certainly key areas to re-examine.
3. There appears to be sufficient soil present on the remains to undertake analysis of soils and palynology (pollen analysis)
4. It is not possible to distinguish what might have caused the trauma to the left maxilla from the photograph alone

Based on the information provided to me by Ms Sophie Barta between the dates of 23rd April and 24th April 2010 I have made the preliminary observations below. These views are my initial thoughts based on the information available to me at this time and they do not constitute a full and proper review of the all the forensic evidence in this case. A review of this type can be undertaken by the Cold Case Review team at LGC Forensics if a formal request is made.

Possible Further Examinations

Test	Rationale
Archaeological search of premises	To locate missing body parts and fragments in particular the torso. This could assist in determining cause and manner of death. Grid search and other archaeological methods could be employed. A full strategy can be produced on request
Examination of alleged grave site If it can be located	Examine for bone fragments or body parts left behind. Examine for signs of animal activity. Look at depth, dimensions and construction of grave to see if this agrees with the suspect's account of events
Anthropological Examination	Comprehensive examination would enable a record of fragments present and absent to be made, assessment of fracture patterns would assist in distinguishing between traumatic injury and thermal damage, assessment of the location of the fractures would assist in interpreting relative positions of victim and offender, assessment of colour might assist in interpreting circumstances surrounding burning of remains. Examination would also identify any signs of animal scavenging which could be relevant to absence of torso.
Pollen analysis of soil in nasal passages	Could assist in determining location where death occurred (suitable control samples would need to be taken from suspect locations)
Examination of axe handle found in house for presence of blood	If positive it may be possible to do DNA analysis. This could potentially confirm its use as a weapon but provide evidence the suspect didn't throw it on the fire
Analysis of soil from remains	Soil from remains could be matched against controls from alleged burial site. Signature of soil in which they were buried could be obtained. This might assist in determining whether the alleged burial site was the only / primary burial location
Analysis of fire debris for accelerants	For evidence of "gas oil" or bitumen. Presence of this could confirm the suspect version of events but wouldn't necessarily refute it if traces weren't found (they could have been burnt away)

Analysis of wrappings from body for Accelerants	As above

Additional Information from Senior Specialists

Fire Scenes Examiner: Roberts Lewis

On 26th April I provided Mr Lewis with details of the case as I understand them and asked him for his opinion on how the remains might have burnt, with particular reference to the absent torso.

Mr Lewis said that the bitumen and blankets combined around the torso could have acted as a wick (the wick effect is referred to in one of the expert statements, but not with specific reference to the absent torso). This could mean that whilst the suspect may have thought that the remains were no longer burning, they could in fact have been slowly combusting. If the remains had been left on the fire, i.e. with a continued oxygen supply, complete combustion could have taken place within 10 to 12 hours. However, Mr Lewis said that the "wick effect" (and therefore combustion of the remains) would have ceased if the torso had been buried as the suspect described, because they would have been deprived of an oxygen supply.

As the suspect has stated that he removed the body part from the bonfire and buried it, then this would have stopped the wick effect and one would have expected the torso to still be present within the grave had it remained undisturbed.

Senior Toxicologist, Pauline Lax

On 26th April I asked Ms Lax if it was possible to determine whether or not somebody had been alive on the fire at the time of death and if so, what tissue would be required to confirm this. She said that this could be measured by carboxyhaemoglobin levels. In order to do this she said that some haemoglobin would have to have survived, i.e. they would need some pink muscle tissue and preferably blood. Burnt soft tissue has not yielded any results in the past and it would not be possible to test levels of carboxyhaemoglobin in decomposed brain matter or bone

Senior Examiner in Biology, Adam McConochie

On 26th April I provided Mr McConochie with details of the case as I understand them and asked him for his opinion on what tests could be done relating to biological trace evidence. He listed the following (some with caveats):

1. Examination of the axe handle for traces of blood and DNA

2. Forensic search of the house for traces of blood and subsequent blood pattern analysis (BPA)

3. Forensic search of the areas outside where the murder may have taken place, with the caveat that it is likely most biological trace evidence will have been washed away since the time of the murder. It may still be possible however to find fragments of bone, or other items linked to the incident (e.g. if other weapons were used.

Roles of Different Specialists

- Archaeologist: skilled in search and excavation of remains. Able to interpret sequence of events surrounding burial and assist in formulating and directing search strategy

- Fire Scenes Investigator: Would be called to investigate the cause of a fire, including looking at use of accelerants. They can provide expert opinion on fire temperature and duration, and the spread of a fire.

- Pathologist: Responsible for determining cause and manner of death

- Toxicologist: Responsible for identifying any toxins in remains, usually from blood, soft tissue or urine. Toxins could include drugs or alcohol, or such things as carbon monoxide

- Anthropologist – Can assist in the following:

    - Determining species (animal or human)

    - Determining ID from examination of remains, e.g. age at death, sex, stature, race, and identification of unique physical characteristics

    - Interpretation of fracture patterns (although only it is the pathologist who has ultimate responsibility for stating cause of death)

    - Interpretation of patterns of burning

    - Physical reconstruction of remains to assess defects and injuries

- Biologist – can assist in collecting and interpreting all types of trace evidence including:

    - Fibres, DNA and body fluids – blood, semen, saliva etc.

    - Blood pattern analysis to assist in determining how a person was injured or killed

The Biologist would normally be one of the most important people at a crime scene and would have a big say from the outset in determining forensic strategy, i.e. what methods should be used to examine the scene of the crime (e.g. is it relevant to use luminol, which causes traces of blood to fluoresce). They would also decide which items were important at a scene, which should be sampled and or / examined and which tests should be undertaken

All of the above disciplines should work closely together from the beginning of a case

General Information on Burnt Remains

(Roberts 2010)

(NOT FOR DUPLICATION WITHOUT PERMISSION OF AUTHOR. FULL BIBLIOGRAPHY CAN BE PROVIDED IF REVIEW IS UNDERTAKEN)

A body may be burned as a direct consequence of the event which caused death, for example an explosion, or it may represent a deliberate attempt by the perpetrator to conceal evidence of ante-mortem trauma (Knight, 1997).

When the body is subjected to extreme heat it will undergo a number of predictable changes:

- The skin will harden and split, the subcutaneous fat and muscle will burn, there will be dehydration and oxidation of the organic component of the body and eventually, at very high temperatures, there will be re-crystallisation of the mineral component of the bone (Mayes, 1998; DeHaan and Nurbakhsh, 2001; McKinley, 1994; Shipman *et al*, 1984).

- As the body burns, it will adopt what is known as the pugilistic pose which is caused by contraction and shrinkage of the muscles in response to the heat. The orientation of skeletal elements may become rotated, flexed and repositioned, which in turn can cause actual fracturing and warping of bone (Symes *et al*, 1999; Smith *et al*, 2001). Smith *et al* state that the pugilistic pose "can be expected to occur regardless of body position" (2001:214) and advocate caution if it is not present. Symes *et al* also claim that absence may reflect conditions where the body has been restrained (1999). Whilst this is true, there may be other factors to consider: in the first instance, the body has to be fleshed and reasonably fresh in order for the muscle contractures to be strong enough to modify the skeleton. An absence or only slight adoption of the pugilistic pose could also be an indication that the heat was not very intense or that it did not last for long, as in a flash fire (Redsicker and O'Connor, 1997). It might also be absent or reduced if full *rigor mortis* was present at time of burning (ibid) although this opinion is the subject of some debate (Shepherd *pers comm*.)

- Burning fleshed bone typically produces characteristic curved, transverse, thumbnail, and step fractures (Ubelaker, 1989) which are very different in appearance to the fractures caused by ante-mortem trauma. Rockhold divides heat induced modifications into seven categories: longitudinal fractures, step fractures, transverse fractures, patina, splintering and de-lamination, curved transverse fractures, and burn line fractures, all of which have unique identifying features (Rockhold, 1996 in Symes *et al* 2001). Familiarity with the appearance of these fractures is the key to being able to differentiate between post-mortem modification caused by burning and ante-mortem trauma, particularly the radiating fractures caused by blunt force trauma. Attention should be paid to any fractures which do not fit the descriptions of those above, particularly if they are seen to extend into un-burnt bone.

- The skull will behave in a specific way when subjected to heat. It may display some of the characteristics described above and in addition, the *tabula externa* (outer layer) will often split away from the *tabula interna* (inner layer) to expose the *diploe* between. As with the other bones in the body, the skull can become warped as a result of extreme heat. The affected fragments will tend to warp outwards and the associated fractures will often follow the line of the sutures, particularly in younger individuals. If the fragments around a fracture site are seen to be depressed inwards, then this may be evidence of blunt force trauma, or perhaps post-mortem damage.

- Lewis and Rutty observe that in burnt remains "the pattern of cracking related to the fire commonly resembles a spider's web and affects the side of the skull often bilaterally" (2003: 206). They also note that fractures to the base of the skull caused by heat are "virtually unheard of" (*ibid*), an opinion supported by Edland (1980). If depressed fractures and fractures to the base of the skull are apparent then, depending on the characteristics of the defect, ante-mortem injury should be considered.

- Evidence of ante-mortem trauma and other pathological conditions will quite often survive the process of burning, although in cases of extreme fragmentation and incomplete recovery of burnt remains, the pieces of bone containing the defect may be lost (Reinhardt and Fink; 1994). Pope and Smith conducted a comprehensive study on the identification of blunt and sharp force trauma and gunshot injury in burnt cranial bone (Pope and Smith 2004). They used cadaver heads and burned them in a number of different environments which simulated forensic fires. They found that all trauma types survived the heat and retained their diagnostic features, although the edges of linear fractures became "bevelled, ragged, blunted, deformed or otherwise altered" (*ibid*, 2004: 436) at high temperatures when the bone became calcined. De Gruchy and Rogers carried out a preliminary study in which they made chop marks on fresh, fleshed animal bones, using a knife and a cleaver. They found that in the majority of cases the chop marks were largely unaffected by burning, with the noticeable exception that the size of the roughened point of exit increased in response to the heat. The chop marks became no longer visible in only the rib bones, because they were almost completely destroyed in the fire (De Gruchy and Rogers 2002).

- In laboratory conditions it has been proven that the colour of bone changes progressively and predictably according to the temperature of the heat source, ranging from white, yellow, through to red /brown, black, grey and finally, when all the organic matter has combusted and the bone is calcined, white (Shipman et al, 1984; Holden et al, 1995; Mays, 1999). There are, however, other factors which need to be taken into account when interpreting the colour of bone which has been subjected to heat, such as tissue thickness, relative distance to the source of the heat, and the duration of burning. A range of different colours may be present in a single individual or indeed in an individual bone, and this differential combustion might reflect a number of things including the position of the body in the fire, the amount of body fat or muscle tissue present on different body parts, and any wrappings or coverings on the body (Holck, 1986). Abnormal colour patterns may signify the presence of pre-existing trauma, or trauma which has occurred

whilst the body has been burning, for example, the collapse of building structures, or deliberate "stoking" of a fire and movement of the body within it to speed up combustion. Uneven or abrupt changes in colour on reconstructed fragments may be indicative of such things and can therefore provide useful information regarding both ante-mortem and post-mortem traumatic events (Pope et al 2004).

Observations Based on my Own Experience in 12 years as a Forensic Anthropologist

- It takes a considerable amount of effort to burn a human body. Efficient and total cremation of the body is difficult to achieve as it is dependent on an adequate and sustained oxygen supply and fuel source.

- Often what happens is that the limbs and the outer surface of the body will burn more easily and completely that the torso. The limbs and cranium will fragment due to the heat, and the suspect will be left with a large body part – the torso – which it is difficult to dispose of. I have encountered a number of incidents where this has been the case, and the torso has subsequently been buried or deposited in water in order to try and hide it.

- Remains will not just disappear. Even if all the organic matter is combusted you will be left with a mineral "shell". Subsequent fragmentation or powdering occurs as a result of post cremation mechanical damage – for example in a cremulator at a formal cremation, or as a result of incidental or deliberate crushing of the mineralized bones which are more fragile than unburnt bones (McKinley, 1994). The possible exception to this is when the "wick effect" occurs – see page 4 comments by fire scenes expert. In this case the remains could be reduced to powder

- The biological profile of the individual will affect how easily they burn, e.g. a person with a higher proportion of body fat will burn more easily and quickly as body fat can provide the fuel for combustion.