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Turf wars: Authority and responsibility for the investigation of mass graves

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Abstract

Mass graves are complex products of large-scale crimes. Such scenes pose four conceptual challenges to investigators and forensic experts: the individual victim, the crime, the setting, and the statistical. Exhumation and post-mortem examination of mortal remains with associated personal and forensic evidence require integrated management of core forensic personnel including investigators, archaeologists, anthropologists, odontologists and pathologists, among whom there is overlapping expertise. The key to avoiding competition and ill-will among experts is to recognize that all such experts should be enabled to make known how their expertise matches with the temporal and spatial boundaries of victim, crime and setting. In turn, they should be apprised of where they fit into the overall judicial process and their limits within the investigation. Consequently, each expert requires access to the factual background of the case, to the site and its contents throughout the investigation. Each forensic team member has a responsibility to influence the investigation – throughout its course when possible – to make findings within their areas of expertise, and to make these available to the rest of the team so as to contribute most meaningfully to the aims of the investigation, both forensic and humanitarian. The on-site crime scene manager has an overarching role to enable integrated access to the complete scene and its contents by each forensic expert team member. In other words, the forensic scientist is given access and the ability to influence the investigation while control of evidence from the site as to identity and criminal activity are maintained by the crime scene manager. This contribution is directed at both the crime scene manager and each forensic expert; it describes the essential spatial and temporal parameters of an expert's opinion so as to encourage cooperation, and discourage conflict, within the forensic team.

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1. Introduction

This contribution addresses the question of who should be 'in charge' of the exhumation of a mass grave with

collection and examination of all evidence of commission of a crime and identification of victims.¹ Historically, the

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¹ The ideas presented in this paper arose from personal experiences gained through participation in the exhumation of sites in Bosnia-Herzegovina, Afghanistan, East Timor, Iraq and Serbia on behalf of Physicians for Human Rights, United Nations High Commission for Human Rights, United Nations Mission in Sierra Leone (UNAMSIL), the International Commission on Missing Persons from the Former Yugoslavia and the Coalition Provisional Authority (CPA), none of which organizations should be construed as necessarily endorsing the views expressed here.

most active agencies for the investigation of mass graves have been: the Argentine Forensic Anthropology Team (EAAF) created in 1984 to investigate the fate of the 'desaparecidos' by the American Association for the Advance of Science (AAAS) – a team which has now participated in numerous countries under the aegis of the United Nations (www.eaaf.org.ar); several Guatemalan forensic anthropology teams commencing in 1991 working notably in Bosnia, Congo, Chile, Columbia, Haiti and Honduras – teams now (2003) united under the organizational umbrella of Latin American Forensic Anthropology Association (Asociación Latinoamericana de Antropología Forense (ALAF)) (Mercedes Dorreti, Pers. Comm.); the Australian led investigation, by the Special Investigation Unit, of WW II mass graves in the Ukraine in 1990; the United Nations International Criminal Tribunals for the former Yugoslavia (1993) (ICTY) and Rwanda (1994)(ICTR). These latter bodies fielded teams under the authority of the Chief Prosecutor. Exhumations were performed through liaison with EAAF, Physicians for Human Rights (PHR) and the International Commission for Missing Persons from the former Yugoslavia (ICMP) by mixed teams of pathologists, anthropologists, archaeologists and scene of crime officers. In addition, ICMP continues to provide expertise and personnel to local commissions for missing persons from Bosnia, Croatia and Yugoslavia (now Serbia and Montenegro) which function under the aegis of the local national courts. The ongoing examination of single and multiple graves of victims of the 1999 conflict in East Timor is being performed by the Serious Crimes Unit of the United Nations Mission in Support of East Timor (UNMISSET). The United Nations Mission in Kosovo (UNMIK) is currently conducting exhumations in Kosovo with assistance from ICMP. With the advent of independent forensic organizations such as the Institute for International Criminal Investigation (IICI), Inforce Foundation, British Association for Human Identification (BAHID) and Centre for International Forensic Assistance (CIFA), who are starting to become actively involved in mass grave exhumations (or providing a contact list of specialists, in the case of CIFA), one can only assume that the court appointed commissioning authority would be in ultimate charge.

2. Levels of authority and control

A pervasive problem in our experience is that local 'commissions for missing persons' derive their mandate from an uneasy mix of local historical precedent of authority structure (e.g. Kantonal court judge, chief prosecutor) more or less influenced by international agencies or courts with different organizational structures, forensic protocols and expertise; all leavened by ad hocery. This creates an unwieldy structure of interacting agencies in which all too often quite inexperienced or biased individuals, who become vested with considerable authority, can negatively

influence or even prevent the appropriate deployment of forensic experts and scheduling of their expertise. At this level, the potential for political manipulation of site investigation is considerable and worrisome. Some investigative agencies may not be able or particularly willing to implement a fair and competent system for investigating mass graves. Individual forensic experts are ill prepared to rectify such situations and may have to struggle in their day-to-day forensic tasks to perform to a professional standard within a flawed command structure. Sadly, their time is taken up not doing anthropology, archaeology or pathology but is spent simply trying to justify their contribution to uncomprehending or unwilling authority figures who themselves are under considerable political and budgetary pressures to speed up the process of tackling the enormous challenges of large numbers of mass graves.

Pragmatically, at the site itself all such agencies assign responsibility to the team of forensic experts who actually undertake site assessment, survey, excavation and, ultimately, post-mortem examination. It is this level of authority which often seems uncertain itself of who should be in charge that we wish to discuss. A team of forensic scientists should be able to work out among themselves a system of integrating their efforts to maximum effectiveness so as to present a unified voice to their own agency and other organizations such as local commissions.

Minimally, complete teams include core expertise from crime scene managers, archaeologists, anthropologists and pathologists. In addition, there is often a met, or felt, need for further expertise in the form of evidence officers, security personnel, logisticians, heavy equipment operators, photographers, surveyors, dentists, mortuary managers, etc. Each person in these various functions is 'in charge' of their duty and assistants, and has the authority to control the realization of their role within the nexus of functions being performed at the site. While lip service may be paid to 'team work' and 'cooperation', it is our observation that confusion, conflict and resentment occasionally occur among experts striving to perform their function. Simply throwing together a team of experts who meet in the field does not guarantee that each understands what the others can and should do. Particularly, experts from the humanities (biological anthropologists/archaeologists) and health sciences (pathologists, dentists) come from different academic cultures whose knowledge bases are not sufficiently shared nor understood. Because, in our experience, neither the crime scene manager nor the various types of forensic experts are adequately aware of each other's areas of competence, we provide a summary of the parameters of experience typically possessed by each expert.

It is undeniable there is overlap in training and experience among forensic experts such that each feels they know best how the job should be done. For example, it has been claimed 'the forensic archaeologist is effectively the person responsible for maximizing the forensic potential of the scene' [1, p. 21]. Crime scene managers may claim the site

and its contents as their own to oversee. They feel uncomfortable with simply handing over the roles of surveying, mapping, recovery and recording of evidence to the archaeologists. They also express misgivings about anthropologists who are unfamiliar with forensic evidence contained in the fill of mass graves and on bodies. Historically, mass graves have been dug by anthropologists with only slight knowledge of archaeological method and theory; their focus is on the body mass while the archaeologist's focus is on the archaeological feature and its contents. It has been said that the archaeologist should be in charge 'within the tapes' [2]. While in simple terms this can be defined as the area containing the bodies in a mass grave, it can be construed quite properly to include the entire forensic landscape that has become modified in the creation of a mass grave. Some archaeologists and anthropologists at mass graves have pursued lines of inquiry, which to the crime scene managers seem to be merely self-indulgent scientific research, rather than concentrating on what is necessary to serve the court process. It has also been said that only the skilled osteologist (read, anthropologist) has the necessary familiarity with the skeleton to excavate it properly. By contrast, some local pathologists insist on conducting excavations, to the common, but regrettable, extreme of getting into the pit and applying their autopsy skills to the soils. More reasonably, the pathologist may expect to attend the scene and to view ligatures and body position in the grave prior to a body being moved or lifted. Yet another pathologist, from Britain, has stated that American anthropologists have more expertise with gunshot damage to crania and long bones than do British pathologists. Pathologists often question the necessity for anthropologists to help identify bodies when classical indicators of personal identity, which pathologists customarily use, are at hand. Anthropologists seem to have a low opinion of most pathologists' knowledge of bones. One senior pathologist has averred categorically that any forensic pathologist who is part of his team is fully capable of recognizing and interpreting any osseous changes perceived by an anthropologist. Both anthropologists and pathologists appear to find dental charting to fall naturally within their purview. And it seems that everyone has a digital camera and wants to take pictures of the site, bodies and evidence; and do.

The entire team of inter-acting senior investigators, crime scene managers, forensic experts, their assistants, and support personnel at a mass grave may include dozens of individuals whose activities must be organized. It is not our intent to describe the management of all such roles and personnel. Rather, we wish to focus on those roles which may be termed senior management positions (e.g. the supervising pathologist [3]), their functions and command structure. Consequently we have identified the following key positions: on-site crime scene manager (CSM), archaeologist, anthropologist and pathologist. We will not address here the role of the judge, chief prosecutor, chief investigator, or commission team members as these do not form part of the

forensic expert team and are not consistently present at the site depending on local legal practices. Our review of the roles and responsibilities of a forensic team is directed towards investigators and, indeed, individual forensic specialists with insufficient familiarity with that of other forensic disciplines.

3. Acknowledged areas of competence

3.1. *The crime scene manager*

On-site crime scene managers are experienced in the management of investigation of serious crime and are familiar with current forensic scientific techniques. They are trained to consider virtually all aspects and objects at a site as potential forensic evidence that needs to be objectively assessed, not prejudged, as well as recorded and recovered. In addition, they are expected to brief and organize staff to assess and process such scenes. They should provide the forensic experts with factual background avoiding speculative scenarios which could bias the experts to try to prove the prosecutor's theory of a case. Forensic scientists should not labor under a burden of ignorance of what may be known about a case, imposed by a CSM; as scientists they are used to the concept of falsifying hypotheses or weighing competing hypotheses as evidence is gathered. While CSM's are not trained to work with archaeologists and anthropologists per se they do include civilian expertise (e.g. forensic engineers) at some sites. They are trained to sample evidence from complex crime scenes that may include numerous bodies in varying states of decomposition with associated forensic evidence and personal effects including paper documents. They have the equipment and knowledge to map sites and record objects, relationships and other evidence with various forms of imagery including digital and video-photography. They have knowledge of rules for continuity of evidence and chain of custody and have had their expertise tested in courts of various levels. Fundamentally, the investigator has an overview of an alleged crime and how a particular site relates to other sites and to 'joint criminal enterprises' that so often typify large-scale killings.

3.2. *The forensic archaeologist*

Forensic archaeology is the application of mapping and excavation skills of the archaeologist to recent death scenes or places where bodies have been disposed [4]. Archaeologists are trained to recognize and recover complex features from a wide variety of site types, many of which contain skeletal remains. Archaeologists are also familiar with fielding large teams over long periods of time. They are experts in the recognition of material culture and the preservation of artifacts including fragile items. Furthermore, they are used to assessing site formation including landscape surveying and mapping of physical features such as discrete

deposits within graves with their contained objects. Typically, in domestic situations, sites are fresh and have had little opportunity to change. Mass graves are usually months or years old before they are investigated. Also, the creation of such sites has had a large and disseminated impact on the scene and its environs. Sites change over time. Only archaeologists have an understanding of site transformation processes on this scale. Finally, given the public nature of many archaeological sites, they are used to dealing with public curiosity and the media.

One purpose of death investigation is to understand circumstances surrounding death. Most of this evidence is found at the site, including evidence transformed by processes that archaeologists understand. Nevertheless, each site must be viewed and processed as a potential crime scene. Those who first confront a site and commence to expose the victims through careful excavation encounter evidence that is critically important to determining the mode of death; e.g. cartridge cases. The archaeologist exposes temporal and spatial relationships at the scene that help explain how the bodies came to be in the observed state; e.g. in the cavalier chucking of bodies into a hole; or, in the physical relationship between a gag and a mouth. The field worker who uncovers the remains is often in a far better position than the pathologist back in the morgue to determine circumstances surrounding a death. The archaeologist has to create good records (including photographs) in the field to provide to other experts including pathologists. A good forensic archaeologist (with knowledge of skeletal variability) can make essential contributions to crime scene investigation most especially in perceiving taphonomic phenomena, such as the clandestine removal of bodies [5] and their re-deposition in secondary graves, which often result in the scattering of dismembered bodies and body parts throughout a site. Careful excavation and mapping of isolated bones and body parts assists greatly with the later task of spatial re-association of body parts through Nearest Neighbour[©] analysis [6]. Historically, mass graves have been dug by anthropologists with a slight knowledge of archaeological method and theory. Their focus is on the body mass while the archaeologists' focus is on the archaeological feature (and its contents of course). As forensic archaeology emerges as a separate forensic science, which it most certainly is, there has been a discernible shift in the processing of mass graves from concentration on the bodies to include the grave itself [7]. The investigations of ICTY have shown that good archaeology can link sites by shared formation processes and, additionally, link execution sites with inhumation sites; and robbed primary graves with secondary graves.

3.3. *The forensic anthropologist*

Anthropologists, too, usually have some experience in the excavation and recovery of skeletal remains. In addition, anthropologists are trained to analyze skeletal and dental

tissues. The primary skill of the anthropologist is in recognizing and interpreting varying and altered states of bone. Such alteration is acquired at different times:

- during the individual's lifetime (e.g. innate traits of ancestry, sex and stature, as well as acquired features such as robusticity or healed fractures);
- around the time of death (e.g. gunshot wounds and cut marks);
- subsequently, due to various influences such as cremation, (re)burial, decomposition, scavenging and weathering.

Due to the survivability of teeth, anthropologists are usually very familiar with dental anatomy and variation particularly among populations with little or no intervention by dentists. Their training and experience prepare them particularly to reconstruct fragmented or disarticulated bones and bodies; a function that yields more complete, identifiable individuals and allows the calculation of the minimum number of individuals at a mass grave. The anthropological report contributes to the post-exhumation analysis of the criminal evidence as well as the process of identification; moreover it forms an accurate record that resists historical revisionism.

3.4. *The forensic dentist*

Dentists or, perhaps more appropriately termed, odontologists are experts in oral biology and dental work. Early on, in the history of forensic science, they established a vital role in the investigation of mass disasters involving the identification of fragmented bodies. Oddly, however, their involvement in the protracted examination of bodies from mass graves appears inconsistent. They are regularly employed by Latin American teams (Ute Hoffmeister, Pers. Comm.) and occasionally by ICTY; but have been notably absent from post-mortem examinations in East Timor and countries of the former Yugoslavia. While non-governmental organizations deploy anthropologists and archaeologists to mass graves, dentists seem often to be left out. Dental charting at mass graves has devolved to the anthropologists and/or pathologists; arguably quite inappropriately. The alleged lack of ante-mortem dental records in many parts of the world is the usual reason cited for not involving dentists in post-mortem examination of remains from mass graves. However, using this logic, the lack of ante-mortem medical or skeletal records would preclude these other professions as well. Physicians for Human Rights was able to obtain 600 dental charts from Srebrenica. This is 8% of those missing; not so small when one considers that only 40% of Americans are said to see a dentist [8]. Due to the primacy of the dentition in life, odontologists have an unparalleled familiarity with variation in the teeth, mouth and related structures. They should be consulted about the epidemiology of local oral health and dental treatments; and they should be present at autopsy.

3.5. The forensic pathologist

Pathologists perform a post-mortem examination of a body and related materials such as clothing and personal effects to determine identity and circumstances surrounding death. Typically they perform an autopsy, which involves a meticulous examination of the external and internal surfaces of mortal remains [9]. Their training includes knowledge of normal and abnormal anatomy of both the soft and hard tissues including the mouth. Forensic pathologists are able to interpret circumstances around death. Particularly, they are able to determine if there were pre-existing conditions (such as coronary disease), which may have contributed to death. They are experienced in criminal aspects of death that leave physical traces on the body; e.g. ballistics including entrance and exit wounds, cut marks, blunt trauma, asphyxiation, drowning, torture and so on. They have established procedures for investigating deaths in mass disasters (e.g. [3]). With that said, pathologists rarely possess expertise in bones comparable to that of a forensic anthropologist. Similarly, in the United Kingdom for example, no pathologist would think about getting into the pit to perform an autopsy and yet it seems that in other locales where mass graves occur the pathologist is all too often given the role of ‘senior’ forensic expert in charge of the exhumation and who then proceeds to recover the bodies. This is unacceptable.

It should be evident from the preceding description that there is considerable shared expertise and practice among CSM’s, archaeologists, anthropologists, odontologists and pathologists. The question becomes how best to deploy such expertise so as to ensure minimal duplication of effort and the best possible recovery of evidence without infringing unduly on the customary, perceived role of each expert. It must be acknowledged at the outset that rational allocation of duties may be viewed as unfair by some.

4. The essence of the managerial problem

We recognize four fundamental conceptual entities in a mass grave: the individual victim, the criminal (forensic) event, the setting and the statistical. While inter-related, each of these has spatial and temporal boundaries that are germane to providing a complete and accurate picture (Table 1). Given the uniqueness of each site, we cannot be dogmatic or categorical about defining boundaries; nevertheless, we think it is possible to envisage general principles that will help us make our boundaries appropriate. Understanding these boundaries enables each expert to stake out their claim of investigative control and influence. Each of these entities will be discussed.

Table 1

Temporal and spatial boundaries of expert witness evidence relating to the challenges of victim identification, criminal act, site and setting, and statistical description

The challenge	Boundary	
	Temporal	Spatial
Victim ID	Conception to death	The body (plus scattered parts) Associated objects
The crime	Ante-mortem (e.g. repeated abuse)	Multiple, related scenes/deposits Criminal behaviors (e.g. dismemberment, taking/adding evidence) Scene transformation (e.g. burning the body) Evidence scatter
	Peri-mortem	
	Post-mortem	
	Detection of additional crimes Documentation of event times Documentation of durations	
Site/setting	Undisturbed landform Criminal disturbance Post-criminal disturbance (e.g. sequenced scavenging, discovery)	Spatial limits (e.g. search, excavation) Overall landform or structure Site access Relation of remains to site Relation of forensic material to site Vertical and horizontal measures Movement/transformations (e.g. compaction) Site processing (e.g. excavation, backfill)
	Statistical	Discretionary sampling of temporal and spatial subsets of data depending on mandate, logistical constraints, and relative strengths of evidence. Thus, for each category (victim, crime, setting) investigator and forensic expert can select the amount, scale and level of analysis.

No expert should be excluded from contributing to the resolution of any of these challenges (see text for further details).

4.1. *The individual victim*

It is necessary to identify individuals. This may be done for the limited purpose of strengthening a prosecution case as was witnessed, for example, in the ICTY 'Krstic Trial' or the additional goal of returning remains to families as has been undertaken by the various commissions of missing persons in the former Yugoslavia. The spatial boundaries of the identification problem are, straightforwardly, the physical body, possibly scattered throughout a site or even in different sites (as was demonstrated for some Srebrenica victims disposed in several related secondary mass graves created at the same time along Cancari Road in eastern Bosnia), plus any associated clothing, personal effects and documents. The temporal boundaries commence with the conception of the individual and end with death. Preserved within the tissues of the individual is a record of innate characters such as ancestral genotype including parentage, ridged skin, sex, and phenotypic attributes like facial features. In addition, the physical attributes have a developmental history of the ontogenetic interaction between genotype and the environment. For example, attained stature and build are complex products of both variables. At death we possess both a chronological and physiological age (hopefully, in terms of the identification problem, fairly coincident). Similarly, each of us bears a physical record in our hard and soft tissues of impacting variables like the birth process, pregnancy, disease, trauma and medical/stomatological intervention; all of which may assist identification. To take one simple example, hair often sloughs from a scalp during decomposition. Careful excavation can relate strands of hair trapped in sediment back to a skull; hair which has personal characteristics of color (sometimes dyed), texture and length. Locked within the hard tissues are biochemical markers such as stable isotopes and trace elements which reflect the local air quality, water sources, surrounding geology and occupational history in which the individual formed tissues from the water and food ingested [10]. Successful identification depends upon locating a record of as much biological, historical and medical information as can be found. Thus, investigators will seek DNA from the victim and relatives, photographs preferably showing teeth, fingerprint files, medical records (especially of surgery, treated fractures, scars and tattoos), dental records, health records, graduation photos, family memories, and so on.

4.1.1. *An ethical boundary: tissue disruption and sampling*

It is appropriate here to dilate upon ethical boundaries for examination of the remains for purposes of identification. Forensic scientists routinely take tissue samples and perform destructive processes such as removal of the calva to examine the brain and adjacent tissues. In an international context some ethnicities may regard such procedures as abhorrent mutilation and quite unacceptable. While forensic scientists have the responsibility to identify remains, the source of

their legal authority to perform certain historically accepted procedures may not be explicit. It must be remembered that the individuals being examined may well be murder victims and certainly did not give informed consent for (a) destructive procedures to be performed and (b) the taking of samples for research purposes. While the laudable end of identifying remains might be enhanced by the means of sawing out ribs, clavicles and pubic symphyses from individuals of, ultimately, known age for the purposes of building up locally specific standards for osteological age changes, it is arguably a transgression of the bounds of the anthropologist's authority to do so on such remains. The legal authority to conduct such research, in the face of ethical concerns, must be codified and procedures put in place to ensure the return of the correct bone samples to the body prior to return of the remains to the family.

4.1.2. *Specialist roles*

It is undeniable that the role of forensic anthropologists, pathologists and dentists in positive identification is diminishing somewhat while, at the same time, being enormously augmented by molecular biologists with expertise in DNA typing. Only recently and even to a certain extent still, the anthropologists' main endeavor was to determine basic biological characteristics of age at death, sex, ancestry and stature as well as hard tissue markers of individuality. Consequently, basic osteology is a cheap, quite reliable, sorting mechanism to provide a biological profile or window to help screen out potential DNA matches. This particular function of forensic anthropologists will continue as a useful, support role for identification. However, precision and accuracy of osteological methods are acknowledged to be only moderate [11] and have been little subject to verification in terms of identifications from mass graves (but see Komar [12]). Using traditional methods of forensic identification (documents, dental appearance, anatomical features, clothing) of more than 4000 recovered bodies from Srebrenica, only 73 positive identifications were achieved between 1997 and 2002 (ICMP web page (29 January 2003), www.icmp.org). This role is becoming obviated with an ability to ignore such variables and obtain a DNA match between a victim and a family member(s).

Biomolecular techniques provide an unequivocal diagnosis of sex and a high probability of identification. It is good forensic practice to re-examine those remains in which the DNA 'match' yielded a high likelihood of identification in a so-called 'post-DNA analysis'. This analysis is conducted by anthropologists and/or pathologists to ensure that all markers of individuality (including personal effects and classical biological markers) are consistent. Often such remains have been somewhat disarticulated and body parts re-associated in the field or by careful archaeological mapping of remains and body parts within discrete deposits followed by Nearest Neighbours[©] analysis [6], or later by anthropologists skilled in anatomical re-association of bones. However, it must be remembered that the DNA from the victim's remains come

usually from just a few skeletal or dental elements (e.g. one tooth or one femoral cross-section). Re-examination of the remains in a post-DNA analysis will permit the examiner to spot problems such as a skull not belonging with the post-cranial skeleton and other extraneous skeletal elements that were mistakenly included with the remains. This procedure ensures that remains returned to families are indeed from their loved one and only from that person.

Turning to what may collectively be called extra-corporeal markers of identity, the clothing worn at death by an individual may be quite individualizing in terms of gender, brand, size and repairs; or may not. Similarly, documents usually provide a presumptive identification but on occasion are misleading. The hundreds of Bosniaks fleeing the UN 'safe zone' at Srebrenica in July, 1995 rescued personal possessions from downed comrades for preservation; and took and wore extra clothes despite the heat so as to ensure they had clothing for the winter – effectively they had little else but the clothes on their backs for the future. A further consideration is the handling of delicate structures such as photographic emulsion, cloth fibers and corroding metallic objects. Archaeologists are often particularly equipped by training and experience in the curation of disintegrating objects—a task they can perform in tandem with CSM's.

Clothing is usually processed, preserved and described by the forensic pathologist. Documents come in a variety of forms and so are usually handed off to CSM's/document examiners for evaluation. In a mass grave situation, where clothing and documents are often deranged and displaced, it devolves upon the archaeologist to locate and map the physical proximity of objects to bodies. Yanking a leg may leave a sock with contained papers, typically money, behind in the soil. Archaeologists are the experts in the knotty problem of 'association'; indeed it is their primary task to determine such relationships within the site matrix [13]. Clearly, archaeologists and pathologists must have adequate access to the clothing and documents as the site is processed.

In that clothing and documents are culture specific, local knowledge is required. Locating ante-mortem records of document registration, their meaning and variability as well as of clothing styles and so on, is a large challenge best met by skilled investigators working closely in this case with both forensic advisors and local persons. It can be seen that archaeologists, anthropologists, dentists and pathologists have a role in recognizing and examining biological and non-corporeal markers of identity.

4.2. *The crime*

Determining the spatial and temporal boundaries of a criminal act is an interesting challenge. A scene transforms as the crime occurs; consequently, a crime scene can only be understood as part of its context. We believe that a scene does not have natural boundaries but that these are arbitrary and defined by the investigator. Also, the boundaries of the

site, in space and time, as conceived at the time of investigation will not be the same boundaries that existed in the past. One is looking for influences that are not immediately apparent or that at the time of the investigation are not even present. For example, the time of day and visibility when a crime was committed was probably different from that of an investigation; the temperature, weather, season, wind and so on may all have been quite different. What was the scene like at that time? Was it so quiet the sound of a scream could carry across a lake (in which case the spatial boundaries of the crime scene are very large)? Was there transport of the victim alive and dead? Was the crime conducted in several locations, as in repeated abuse of a victim? and so on.

We wish to draw a clear distinction between the death site and the crime. While the site where a crime is committed and a body lies may be the same, they need not be; and typically, in mass grave situations are not (although quite arguably the secretion of bodies in a remote location to hide evidence is a serious, prosecutable crime in itself). A crime may commence with capture; proceed through incarceration, abuse, transport, execution, burial, exhumation and re-burial. Effectively defining the spatial and temporal boundaries of such behaviors for the purposes of investigation and prosecution is formidable—sometimes so as to be avoided (as in East Timor where prosecution by the United Nations of crimes does not countenance acts prior to 1999 nor include perpetrators living in West Timor). Another example is afforded by the Foca KP Dam site where Bosnian Muslim individuals were said to have been physically abused, including beatings and torture, for a month prior to execution [14]. While these may be considered several crimes, to the anthropologist and pathologist the challenge becomes to anticipate and discover evidence of mild healing from such abuse that occurred prior to death [15] as well as outright torture which can affect both hard and soft tissues [16,17]. Indeed, one pathologist has recommended that forensic pathologists undertake examination not only of the dead, but also of the survivors of the crime for elucidation of the effects discernible on the bodies (Guy Ruttly, Pers. Comm.). To provide a third example, at several sites in Serbia the transport of bodies in large trucks to secluded, wooded hiding spots broke many branches along the way as did the buckets of the earthmoving machines used to dig the graves, providing clear evidence of the year and season when these criminal acts occurred. Seasonally and locally specific vegetation, from the kill site and/or the deposition site, may become incorporated into the grave fill. These are good examples of situations in which the temporal and spatial boundaries of a crime scene need to be pointed out by the investigators to the archaeologists and pathologists so as to alert them to potential evidence.

The crime scene manager will be aware of information gathered by investigators and document analysts that will allow them to tell the forensic scientists about possible evidence. Archaeologists study patterns of sites on a landscape and as such can have a decisive impact on an investigation; as with the discovery of unsuspected sites or with

the archaeologically demonstrated linkage of sites, e.g. along Cancari Road among themselves and with primary graves of Srebrenica victims elsewhere [18]. Sites may be known to be linked by the investigator or linkable by the observant archaeologist. For example, at Kozluk in Bosnia, individuals killed and dumped on a waste heap of bottling glass (the primary sites of Kozluk 2 and 3) were buried in several secondary graves along Cancari Road (CR 03, 07 and 11) that contained glass originating from the primary site. In this instance, the killing site (where the glass originated) was sought out on the advice of the senior archaeologist substantiating a confidential informant's account to the investigator. Similarly, the Dam site near Petkovci yielded unweathered blocks of limestone and occasional lumps of greenish clay in a primary grave, which were consistent with similar material found at the secondary site of Liplje 02 and not apparently native to that area [18,19].

Anthropologists are experts in the recognition and understanding of altered states of bone, particularly in bones that are disarticulated and fragmented. At some remove from one well site in Afghanistan, the anthropologist recognized a small piece of cranial vault that had to be human (given its thickness and curvature) but which still bore dried periosteum; an observation that supported the alleged perpetrator's account to the investigators that some individuals had been shot in the head above ground if they refused to jump into the well [20]. Similar evidence was observed at the Dam Site in Bosnia where more than 400 skull fragments were recovered and plotted on the surface prior to excavation. The mapped distribution showed an area, adjacent to the grave, devoid of skull fragments and cartridge cases. It was inferred that the grave had been dug previously, creating a spoil pile where skull fragments from individuals being executed by machine gun fire were prevented from being deposited on the original ground surface. Similarly, the act of grave robbing often leaves bone fragments above ground that only an anthropologist would be able to recognize as such, while the overburden of turf is being removed by investigators to get at the robbed grave itself.

The floor of a grave, with a surface characteristically compacted by the mechanical excavator, is not necessarily the spatial limit of a site. Some individuals may have been executed while lying in a prepared grave, in which case bullets penetrate even deeper. Grave robbers, in their zeal, may scoop up pollen and mineral grains from the floor soil, which is then transported to another grave where it becomes incorporated into the secondary grave's fill [18].

Bullets and bullet tracks are important forensic evidence. Their recognition and correct interpretation are paramount. However, it is insufficient to wait until autopsy to search for such evidence. Bullets may have been fired into and through clothed bodies already lying in a grave to enter another body or the grave floor, as in some Guatemalan sites (Claudia Rivera, Pers. Comm.) and at the Kozluk 02 site. The pathologist will be enabled in their task of tracking a bullet's path through a body by viewing the remains before lifting

since body and limb orientation in a jumbled mass of bodies will be atypical of those in life. Bullets may migrate downwards as bodies decay and possibly due to maggot mass activity. Careless excavation can add holes to clothing. Clearly the role of the archaeologist, not only in careful excavation but also in precise mapping of bullet location and body orientation, is very important to correct forensic interpretation.

The anthropologist, with expertise in the reconstruction of shattered crania and bones, is vital to the pathologist who needs to determine the number of bullet holes, their direction and trajectory. Too often anthropologists are ascribed a secondary and passive role in which they await the pathologists' donation of select skeletal elements for age and sex diagnosis. Anthropologists are experts in the entire skeleton and its variation. Their expertise goes beyond the determination of markers of biological identity to include questions of elapsed time and cause of death. We see no reason why anthropologists should not be a participant in the autopsy from start to finish.

In summary, we have tried to exemplify that the spatial and temporal boundaries of a crime scene are not readily apparent especially to those forensic scientists whose universe of study may be intellectually blinkered by their training or inexperience to what is only a subset of the wider context of behaviors and influences that create a crime scene. Given this perspective, it is inappropriate for the archaeologist to think only about the grave feature, for the anthropologist to think only about the skeleton in the grave; or the pathologist to think only about the body in its state at the morgue. Forensic specialists will benefit from the over-arching guidance and perspective of the CSM at the scene and at autopsy.

4.3. The setting

Here we turn away from the strictly forensic landscape to that other, and most important, scene – the area for archaeological processing. There are many such scene types: for example, execution site, decomposition site, primary burial site, robbed site, secondary site, and cremation site. Obviously they are not mutually exclusive. We need to think about the site and its contents.

The essential understanding of mass killings and graves is that such sites usually have a comparatively enormous time depth and uncertain spatial boundaries. Each day that passes from a site's abandonment by a perpetrator is an opportunity for the site to change. These changes result in the transformation of the appearance of a site and in the degradation of its contents; that is, there is opportunity for forces to remove, destroy or add extraneous evidence. Two primary difficulties ensue: the site begins to disappear as it becomes part of the natural landscape; and secondly, tissues continue to disrupt and objects to decay in ways that are not evidence of the crime but which may be construed as such. Each of these will be discussed in turn.

Dumping of a large number of bodies, followed often by mass burial, affects the natural landscape. Finding sites is the forte of the archaeologist. Their expertise in landform analysis and remote sensing techniques are essential. Determining the spatial and temporal boundaries of the setting where this event occurred is also the job of the archaeologist. Finding a site, using for example, fluxgate gradiometry followed by non-invasive sensing of site dimensions and locations of body mass concentration(s) within the site using resistivity or Ground Probe Radar (GPR), will expedite the logistics of exhumation through informed allocation of personnel and equipment. Their ability is to interpret landforms within the non-forensic environment. This training can be applied to a forensic landscape. For example, vegetation may die back beneath bodies lying on the surface, animals may scatter remains over large distances, grave fill may compact over time, soils will change color as bodies decay, bioturbation can mix objects within the fill, weed species may colonize disturbed earth both beside and within the grave area, and so on.

Mass graves on the landscape require mapping. While investigators and CSM's are trained in basic survey and mapping techniques, the archaeologist is far more used to large sites which contain masses of objects and a complex history of site formation and stratigraphy. Given their involvement in mass grave exhumations, it makes sense for archaeologists to be charged with responsibility for all mapping so as to collect information as to the landform, contained features, the grave and its contents in a consistent manner. Furthermore, they have the hardware, software and imaging capabilities in hand to perform this work.

Fundamentally, unlawful death disrupts human tissues and associated objects. The naïve investigator may be tempted to over-diagnose the evidence. It is the forensic expert's job to prevent this. The most obvious example is bone scavenging by animals – a natural process with which archaeologists and anthropologists are very familiar. Scattering of body parts by scavengers is often so enthusiastic that it is difficult to convince scene searchers to look far enough afield. The acts of scooping up half decomposed bodies with earthmoving equipment, transporting them over rough roads, dumping them in prepared graves and compacting the earth over the remains, tears clothing, dismembers bodies and breaks bones. Such damage is incidental to the major crime and must be distinguished by forensic specialists; especially archaeologists and osteologists. Identification of such evidence may favor an individual accused of killing someone. Again, we must avoid over-diagnosing the meaning of disrupted tissues.

In summary, if we can return to considering a site from a temporal and spatial perspective that spans both its criminal and non-forensic aspects, site formation is not sufficiently countenanced by death investigators and legal experts. The courts need guidance provided by the forensic archaeologist as to how the site was prepared, or not, to receive the remains; the impact of this act on the landscape and vegetation; the process of depositing the remains at the site; the

process of hiding the site and its contents; subsequent deliberate modifications to the site and its contents such as 'robbing', as well as natural transformation of the site; and, finally, how the acts of discovery and recovery of the evidence all combine to add, transform and destroy forensically relevant evidence. This is complex stuff. The archaeologist gives the investigator an understanding of a site that transcends that area just within the tapes.

4.4. *Statistical aspects – big picture considerations*

Statistics deals with large numbers of objects. It seeks to find patterns, to compare differences in size or numbers between groups, and to highlight the rare against the common. The forensic evidence of executions and burials of Muslims from Srebrenica, accepted by the ICTY Trial Chamber, was largely statistical in nature: numbers of bodies, demographic profile, numbers of primary and secondary sites, numbers of ligatures and blindfolds, proportion with gunshot wounds [18]. It is the nature of mass killings and burials to create numerous bodies and objects. Indeed the sorts of crimes prosecuted by international criminal tribunals are those directed at groups (e.g. genocide) or which contravene society's or humanity's perception of rightful behavior (crimes against humanity, violations of the laws or customs of war).

Eliciting patterns from populations of bodies and forensic evidence assists the investigator. This endeavor requires that an information technologist (IT person) be part of the investigative team. The temporal and spatial boundaries are entirely at the discretion of the statistical analyst. The outer limits are set by the investigations but the statistician (or forensic expert employing statistical methods) can select a spatially and temporally limited subset of data that is deemed representative and avoids weak data.

Archaeologists, anthropologists and pathologists tend to focus upon individual bodies or sites. In the world of mass graves, the investigator has a different mandate. Perspectives on the appropriate scale of analysis may differ, if not indeed clash. The anthropologist is trained to identify every bone. It can be perceived as time wasting by the pathologist or investigator for the anthropologist to empty each sock and laboriously identify all 26 bones. And yet, the anthropologist is trying to determine the minimum number of individuals (MNI) at a site and it is essential therefore to determine that single skeletal element, from within the whole skeleton, which occurs most commonly in a whole array of bodies and body parts. Why is this done? It is a humanitarian goal to DNA type those most common individual elements so as to be able to tell a family that a loved one is accounted for. Moreover, the goal of determining the relative proportion of 'found remains' versus 'persons missing' from an act of collective homicide is expedited by determining MNI – thus this procedure has forensic relevance as well.

Any invasive exercise to find bodies can have a detrimental effect on later geophysical prospection. Consequently,

any physical probes and trenches have to be accurately plotted and recorded. Nevertheless, there are situations (e.g. initial site evaluation) where it is appropriate to dig only a measured percentage of a site to predict the probable total content of a site [20]. This allows the investigator to prepare a sound budget for future exhumations.

Regrettably, the scale and complexity of killings in the former Yugoslavia are such that not all remains will be found and not all perpetrators will be convicted. Pragmatically, the international criminal tribunal has elected to prosecute 'controlling minds' – those who conceived and orchestrated these large crimes. Moreover, their mandate has not required that all remains, found and processed, be identified. Their goal is to show that many deaths have occurred; that these were unlawful in international criminal law, and to show linkage of the undeniable fact of sites containing bodies to individuals who shared in the joint criminal enterprise that created the sites. This goal can be attained without identifying each individual and without prosecuting all those involved. It is enough for them to show in a statistical sense that thousands died unnaturally, that their ethnicity is consistently demonstrable from a sample of remains, and that their deaths and disposal flowed from wilful choices made by powerful individuals.

Such a position has arisen out of the need to streamline the court process to make it workable. The sheer size, complexity, time and cost of mounting prosecutions by such bodies as the ICTY mean that newer, more flexible, models must be devised – models capable of encompassing the enormity of the crimes without becoming bogged down in the detail. This position is even more true when the stated policy of pursuing the 'big fish' of the ICTY is acknowledged. If normal domestic investigative procedures (including the meticulous examination of graves and deaths) were applied to the large volume of victims, the entire process would inevitably stall or worse not be completed in any reasonable time to be of assistance in trial – thus denying many of the victims a voice in proceedings. The major need for reform in the way evidence is presented before such bodies as the ICTY is the need to ensure a quicker trial process – both for the victims and of course for the accused who are normally incarcerated awaiting trial.

However care should be taken in applying this streamlined method too far as it is envisaged that properly constituted and demonstrably unbiased local court systems will try some lower level individuals based on evidence collected by such bodies as the ICTY. Also, in the rush to punish at least someone for crimes of great enormity, a statistical approach that samples a large body of data may carry great forensic weight and yet fail to include exculpatory evidence. For example, probabilistic sampling of a site said to contain only civilians (one sort of crime) or, alternatively, a site said to contain only executed prisoners from one side in a conflict (another sort of crime), might fail to detect, in the first site, military clothing; or, at the second site, soldiers from the other side of the conflict.

Thus, fault can be found in the application of a probabilistic, numerical approach to the presentation of evidence in court. A skeleton with gunshot wounds may have died from some other cause; the absence of soft tissue precludes a definitive opinion from the forensic pathologist [18]. Indeed their reports on individual cases may be consciously agnostic as to cause (and hence manner) of death; whereas the prosecutor argues that the statistical commonality of gunshot wounds, in the context of additional evidence, is sufficient to find the deaths unlawful.

Identification of individuals can be questioned especially if they were based on presumptive markers of identity like documents and medical findings. To argue that a healed fracture from a skeleton is good proof of identity, just because it occurs in association with a document from an individual who had just such a fracture (according to medical records or a family's memory, for example) is not proof positive. However, the prosecution's position in the Krstic trial seems to be that, while the occasional identification may be in error, the majority are probably correct. Moreover, if all documents at a site or within one deposit from a multi-component site come from a particular village, the prosecution can argue that the ethnicity and origin of the victims are sufficiently known to be accepted by the courts even if individual identifications may occasionally be questionable.

It should be evident that the prosecution accepts the legal validity of statistical probability. This perspective is probably congenial to most scientifically trained forensic specialists. Indeed archaeologists, anthropologists and pathologists contribute materially to this analytical approach. They provide body counts (or at least MNI); they describe patterns of disposal; they summarize wounding patterns, and so on. They paint a big, if admittedly blurred, picture of the overall criminal behaviors.

In order to deal with the large amount of statistical data generated from exhumation of mass graves, guidelines for data management and responsible officers are required. Is the purpose of the investigation to collect forensic evidence for the purposes of prosecution and/or is it to identify victims for humanitarian reasons? The answer to this question determines the scale of the problem. Nevertheless, the amount of evidence encountered, whether forensic or personal, is several magnitudes larger than in most domestic situations. It can be matched however by plane crash sites and major explosions as occurred in Bali, Oklahoma City and the World Trade Centre in New York. Experience with such sites indicates that databases emanating from the site and from the morgue should be integrated and sophisticated enough to allow statistical comparisons and analysis (e.g. Disaster Victim Identification – Interpol. www.interpol.int).

The principle of continuity of evidence requires that data logging be consistent throughout the process. Consequently, a single numbering system should be implemented which can be used in the grave to catalogue bodies, artifacts and carried over to the post-mortem examination where further items will be encountered. Growing out of the experience

gained by ICTY investigators, some local commissions of missing persons in the former Yugoslavia have adopted the practice of assigning a single sequential series of assigned numbers, modified with prefixes of B (for reasonably whole bodies), BP (for body parts) or A (for artifacts, including personal documents and artifacts) that works well; abbreviations from local language may be more useful. This system is frustrating to pathologists who like to have a current tally of actual bodies recovered; but the alternative of separate number lists for bodies versus objects results in a proliferation of duplicated numbers, which is very confusing to all, especially in court.

Given the last two considerations, we think it best to have a single evidence officer (CSM) available to assign an evidence number to the archaeologists, anthropologists, and (if autopsies are being performed concurrent with excavation) to the pathologists as needed. The on-site crime scene manager has a greater appreciation for the need to have data recorded in a way that will be understood and accessible by other experts and agencies down the investigative line, including the courts.

5. Conclusion

Multiple related mass graves are complex products of large-scale crimes. We have argued that such scenes should be viewed as posing four conceptual entities which have to be understood: the individual victim, the crime, the setting, and the statistical. Proper criminal investigation requires the coordinated input of many forensic experts who provide scientific response to the challenges noted above. The key to avoiding competition and ill-will among experts is to recognize that all such experts should be enabled to make known the temporal and spatial boundaries relating to their areas of expertise. Each expert requires access to the background of the case, to the site and its contents throughout the investigation. Sequential compartmentalization of their activities (e.g. the archaeologist to just the grave, the anthropologist just to the skeleton and the pathologist to only cause of death) limits the contributions they can make in their own areas and to the investigation as a whole. We wish to be explicit here. We do not recognize a hierarchy of authority or expertise among the pathologists, anthropologists, archaeologists and odontologists. Historical precedent, arising from simple, domestic death scenes has resulted in the impression that pathologists are the ‘senior’ profession. Mass graves require the involvement of other forensic experts such as archaeologists and anthropologists whose expertise should be recognized both within the team and by the court as essential and expected. Particularly, forensic archaeologists must shed the mantle of subordinate assistant and assume the role of forensic expert with the attendant authority and responsibility. Each forensic team member has a responsibility to make findings within their areas of expertise and to make these available to the rest of the team

so as to contribute most meaningfully to the aims of the investigation both forensic and humanitarian. It is the role of the on-site crime scene manager to enable integrated access to the complete scene and its contents by each forensic expert team member. In other words, the forensic scientist is given information, access and influence while control is maintained by the crime scene manager. In essence, a mass grave is a ‘crime scene’ which should remain under the control and administration of an individual trained in the preservation and forensic reporting of crime scenes; someone who is intimately familiar with the court process and who is able to retain in strong focus the ultimate goal of the investigation – the presentation of reliable and acceptable evidence before a court system. By virtue of training and experience the most suited individual to fulfill this role is the CSM.

Above this level, control should rest with a senior investigator able to co-ordinate the activities and output of multiple teams and incorporate their findings into the overall investigative and prosecutorial theory. The examination of mass graves should not be seen in isolation from the rest of the investigation and will of course be driven by information obtained from other parts of the investigations – such as witness/suspect interviews, intelligence or other broader information sources. The need for investigators to be very aware of the capabilities and limitations of the forensic sciences, such as archaeology, anthropology and pathology and how to integrate them in complex scenes, requires a depth and breadth of training among crime scene investigators that poses a challenge for the future.

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