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Mass graves: the forensic investigation of the deaths, destruction and deletion of communities and their heritage

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Abstract

Mass graves have for millennia been incorporated in the historic environment, often to conceal the dead. As a result of conflict, they form one part of the destruction of communities, and are intrinsically linked to wider destruction of historic and cultural heritage. They are symbolic of efforts to control the landscape by contesting groups. Repeated patterns in the properties of mass graves and related destruction can be identified. The investigation of crimes under international law have recognised these properties and the interlinked nature of destruction of communities. Archaeological methods provide an important resource for investigators to undertake a now established formal process of gathering criminal evidence and accounting for the missing.

Keywords

Mass grave; destruction; historic environment; atrocity crimes; genocide; missing persons; forensic archaeology

Introduction

In terms of ‘war and the historic environment’, mass graves are one consequence of conflict that unfortunately form an intrinsic part of many landscapes. The result of the mass burial of the dead, they have associations with a breakdown in undertaking, or deliberate avoidance of, normal burial practice. They can simply be defined as a ‘demonstrable place of deliberate disposal of multiple dead within the same grave structure’.¹ This paper outlines the phenomena of mass graves using examples of investigations from Eastern Europe and the Balkans, which may be of interest in providing both background and context to current events. Consideration is given on how these features in the archaeological landscape provide evidence of criminal events, what archaeology has contributed to investigation, where they are used to contest narratives and landscapes, together with discussion on their place in the historic environment.

Mass graves as phenomena have complex properties that are utilised for a broad range of political, social, cultural, legal and historical reasons. While there may be legitimate reasons for mass burial (war dead, results of epidemics), they usually relate to violent, traumatic and criminal activity. As such they are often contested in terms of the narratives describing the causes and histories of related events.

Mass graves form one part of the destruction within the historic landscape in conflict, often found in association with other elements of damage and devastation. Given the current events in Ukraine and elsewhere, it is hoped this discussion will prompt deliberations on how recent mass graves manifest in global affairs, provide awareness of the potential for, and results of, investigation and demonstrate how the benefits of forensic archaeology have been formerly established to assist national and international jurisdictions.

Properties of Mass Graves

A Long Legacy

Mass graves have a long history in human culture: buried archaeological features that often reach a stasis in a given environment, leading to long-term preservation and providing a volume of evidence that is definitive in demonstrating validity for specific interpretations.

For example, mass graves have been found from the Neolithic period that are the result of violence. Mass graves of the LBK culture (5500-4500 BC) in Talheim and Schöneck-Kilianstädten in Germany, and Asparn/Schletz in Austria are consistent with 'the concerted annihilation of entire social units... clearly evident from the analysis of human skeletal remains.'² These graves contain commingled bodies, buried without organisation or care. In contrast, bodies were collected together with great care by someone they knew in a Globular Amphora culture (3300-2700 BC) mass grave in Koszyce, Southern Poland. They belonged to a single extended family, however they were all killed by blows to the head.³ In times of conflict and stress, the normal rituals for the dead can be impossible to perform, or are denied, with the dead hastily buried in mass graves.

Tools of Eradication

A common property of both historic and more recent mass graves is to contain and conceal the victims of such deliberate massacres. Rapid mass burial underground disappears, nullifies and hides victims, removing them from the landscape, 'their resting places and bodies undifferentiated.'⁴ Such mass burial destroys the identities of individuals and communities potentially removing them from sight and memory. In this sense the mass grave can be a tool of eradication.

Preserved in the Landscape

Mass graves also have the property of preserving victims in the archaeological landscape, no doubt unwittingly in many cases. As an intrusion into the archaeological record, they have a stratigraphic permanence with potential for future investigations to gather evidence, countering the destruction of identity. Mass graves can also have a powerful symbolism, as evidence of violence and atrocity, but also in retaining community identity, preserved and protected in death and burial. As such they form an intrinsic part of the contested heritage and history that evolve in conflicted and post-conflict environments, as antagonists make claim and counter claim to the past and the land.

Territorial Markers

That permanence has also led to mass graves being utilised as memorials: territorial markers within landscapes and structures that come to form part of the historic environment. In the modern era, the politicisation of mass graves during the civil war in Russia (1918-1919) saw the Bolsheviks deliberately bury their fighters in overtly memorialised mass graves, publicly asserting their control of territory and as symbolic foundations of their authority. In the city of Yekaterinburg, dead from such a grave were removed and disposed of when the city fell to the White Army, but were then replaced in the grave by victims of Bolshevik terror: both sides replacing each other's dead in the same memorial within months as the city changed hands. Both sides searched for mass grave sites and undertook documented exhumations to demonstrate opposition atrocities, highlighting and displaying the sacrifice of the named dead. Later, from 1936-1939 in Stalin's Great Terror, the opposite occurred, with the organised and deliberate disappearance of victims into anonymous mass graves.⁵

Centralising Mass Murder

Similarly, in 1940, the Soviets ordered the systematic murder of some 22,000 Polish military officers and other prisoners from various prisons and camps. They were taken and centralised for execution and burial in large mass graves in Katyn forest, near Smolensk in Russia. At two related sites, executions took place at prisons with a subsequent movement of bodies by truck to mass graves. All three events were coordinated using extensive logistical planning and organisation. The graves were situated near secret police- the 'NKVD' - dachas (holiday homes), or had buildings put on or near them and as a consequence were watched⁶. The three locations had already been in use for clandestine burials during the Great Terror. Under the same order, over 7000 victims from prisons across Ukraine and Belarus were executed in the same way, clandestinely buried in mass graves across those countries⁷ including near Kharkov.⁸ Centralised burial, sequential use of sites and subsequent monitoring of graves by perpetrators are consistent properties of mass graves.

Political Propaganda

Some of the Katyn graves, pinpointed by witnesses and appearing on Luftwaffe aerial photography⁹, were exhumed and documented in a formal investigation by the Nazis in April 1943, in an effort to gain propaganda against the Soviets. The Nazis gathered a European Red Cross committee including forensic experts, who oversaw autopsies. Some 4143 bodies were examined, of whom 2185 (67.9%) were identified. Evidence of blindfolding and restraints were found and cause of death determined.¹⁰ Bodies were reinterred and a monument

set up. In September 1943, the Soviets took control of Katyn and undertook their own investigation that contradicted all German findings and concluded the Nazis had initiated the massacres. This stance was officially adhered to until 1990 and the break-up of the Soviet Union. Analysis of Luftwaffe aerial imagery from 1944 provided evidence the Soviets went to great lengths to destroy the 1943 graves and monuments and conceal their crimes.¹¹ Eastern European members of the Red Cross committee were forced to recant their evidence by the Soviets after the war. Nazi minister of propaganda Joseph Goebbels stated in his diary in September 1943:

"Unfortunately, we have had to give up Katyn. The Bolsheviks undoubtedly will soon 'find' that we shot 12,000 Polish officers. That episode is one that is going to cause us quite a little trouble in the future. The Soviets are undoubtedly going to make it their business to discover as many mass-graves as possible and then blame it on us".¹²

The Soviet authorities admitted NKVD responsibility for the Katyn massacre in 1990 amid calls for war crimes investigations.¹³ Graves were exhumed during 1990-1995, and while some Soviet investigation against those involved was made, there were no prosecutions. The Katyn war cemetery was opened in 2000, holding victims of the massacre and of the Great Terror. The Russian State Duma issued an official declaration that condemned Joseph Stalin for Katyn massacres in 2010.¹⁴ The Communist Party of the Russian Federation however, still insisted the Katyn massacre was perpetrated by the Nazis.¹⁵ In 2020 plaques in Tver commemorating the massacres were removed by local authorities, stating the inscriptions were "not based on documented facts"¹⁶ After the invasion of Ukraine in 2022, Russian authorities removed the Polish flag from the Katyn memorial, a result of rising political tensions.¹⁷

Pathology and Taphonomy of Mass Graves

The Nuremberg trials 1945-1946 provided the evidence of infamous Nazi mass graves and mass murder. The regime had taken their crimes to industrial level extremes of concentrated death, destruction and deletion. The Soviets exhumed a sample of holocaust mass graves to provide film footage to the court, revealing the extent and horror of atrocities¹⁸. While there was deliberate limited use of physical investigations for forensic purposes at the trials, the British pathologist Keith Mant did undertake specific forensic exhumations of graves containing murdered British servicemen during 1945-1948. He provided some of the first descriptions of the taphonomic properties of mass graves and accurately utilised evidence to judicial standards to match documented accounts of executions and the identities of listed missing combatants.¹⁹ !

Archaeological Excavation as a Litmus Test of Forensic Science

The first forensic excavations involving archaeologists of mass graves related to Nazi war crimes, did not take place until 1990-1991 at Serniki, Ustinovka and Gnivan in Ukraine. After the invasion of the Soviet Union in 1941, Serniki was under German control. Einsatzgruppen (mobile killing units) carried out mass executions of political targets and Jews, enlisting local Ukrainians to assist in rounding up victims and undertaking shootings. In September 1941 some 850 Jews from Serniki were executed by shots to the back of the head in a large mass grave in the nearby forest. The Australian government amended the War Crimes Act in 1989 to allow resident suspects to be prosecuted for Nazi war crimes. Investigations resulted in prosecutions of three men, linked to atrocities committed in Ukraine. One of the alleged perpetrators was identified as living in Adelaide and was charged in January 1990. A decision was made that forensic evidence would be required, with excavations of mass graves undertaken by a joint Soviet-Australian team.²⁰



Figure 1. The Serniki excavation. Looking along the length of the grave and the 553 bodies. (Source: Richard Wright).

In 1990 witnesses pinpointed the Serniki mass grave site. The archaeological properties of the grave were revealed by excavation, recording stratigraphy and phases. Samples were taken for specific dating analysis including carbon dating, dendrochronology and artefact assessment. Uncovering the grave revealed 553 bodies. Autopsies were undertaken at the grave and bodies were not removed. Ballistic evidence was recovered and cause and manner of death recorded. The evidence matched the eye witness statements and was consistent with the documented date of events. Forensic work at Ustinovka and Gnivan in 1991 provided similar results. Excavation tested the witness evidence 'confirmed it, and supplemented the initial inquiry with evidence of bodies that addressed further atrocity'.²¹ While the accused relating to Serniki events was found not guilty, due to a lack of evidence directly connecting them to the killings, the excavations proved important. The bodies confirmed holocaust eye-witness events. They established what archaeological evidence could be retrieved from mass graves and presented at trial. They demonstrated finding victims of atrocity is important for justice, historical accuracy and the countering of revisionist positions. The archaeologists, Richard and Sonia Wright, also provided insight into the difficulties in undertaking such forensic work for archaeologists²², something expanded upon in subsequent work in Bosnia-Herzegovina (BiH) and Croatia²³.

Legislating the Heritage of the Missing

Since the collapse of the Soviet Union and Yugoslavia, there have been an increasing number of investigations in Eastern Europe into the massive mass grave legacy resulting from the WWI to post WWII period. Some of the work has been formal and extensive. The Commission on Concealed Mass Graves in Slovenia has confirmed 720 mass graves,²⁴ the most notorious being Barbara Pit (Huda Jama) abandoned mine shafts where an estimated 3000 bodies were recovered. These related to the massacre of Slovenian and Croat soldiers, home guard and civilians brought by Yugoslav partisan forces from prisons and holding camps in May-June 1945. Many had been returned to captivity from Austria as part of the Bleiburg repatriations.²⁵ The victims were shot or bludgeoned and fell into the shafts, many still alive, followed by grenades. The mine was sealed and no records kept. The Yugoslav secret service worked to prevent facts or commemoration of massacres emerging.²⁶ The rest of the mine complex continued producing coal until 1992. The mine is now a monument, with a chapel built in 1997. The commission proceeds with its work under formal legislation, which defines mass graves as 'immovable cultural heritage'.²⁷ Similarly other countries are formerly investigating, for example the Commission on Concealed Mass Graves in Serbia²⁸ and investigations in Poland under the auspices of the Institute for National Remembrance.²⁹ Historical reviews of the numbers of war and post-war victims and war dead have begun to reveal vast numbers of missing.³⁰ Other legal investigations have been of a more *ad hoc* basis, often implemented due to political sensitivities or expediency, for example the excavation and examination of the Romanov royal family in Russia in 1991.³¹

Weight of Numbers

Volunteer groups have undertaken a great volume of work, often because of the lack of national funding and commitment. Some 15,000 war dead have been exhumed in Germany since 1993 by volunteers. They are supported and coordinated by Germany's *Volksbund* war graves commission and the German Red Cross, who assist with repatriation and burial in formal war cemeteries.³² Approximately 1.3 million German soldiers died in the last four months of the war alone, mostly in eastern Germany, where the post-war political situation prevented widespread recovery and repatriation.³³ Similarly groups in Austria undertake rescue excavations when remains are found or investigate information on suspected sites. Operating under federal and heritage laws, supported by the Austrian Black Cross and the Austrian war graves commission, WWI and WWII combatant remains are repatriated to war cemeteries. The archaeological investigation of the architecture of the Nazi holocaust sometimes reveals remains, exemplified by the Mauthausen concentration camp.³⁴ Mass graves and remains though to be of Jewish victims are normally left undisturbed in respect of Jewish custom, lying as memorials in themselves. There are exceptions, and there have been tensions between legal requirements under national criminal and heritage laws that require formal burials, political motivations to determine scale of holocaust deaths and the wishes of families and communities.³⁵

Investigations have also been encouraged since the report on totalitarian crimes by the Council of the European Union in 2008. The European Parliament passed a resolution in 2009 on European conscience and totalitarianism, calling for support for investigations into totalitarian crimes, recognition of past suffering and reconciliation through truth and remembrance.³⁶ The sheer number of graves that fall within actionable legal timescales, or are alive in the memory of family and community, makes scale a daunting property of mass graves, not just across Europe but across the globe.

Multiple Properties of a Grave

It is clear from these examples that mass graves and the dead within in them are utilised for political purposes, are manipulated to shape historic narratives, are frequently disturbed and altered, are memorialised and are places of commemoration. They are frequently used to centralise individuals and populations as part of efforts to make them disappear and stay hidden. In recent decades, the latter phenomenon has led to the pursuit of international justice and the legal rights of victims and families to be extended in scope and implementation with regard to mass grave investigations,³⁷ exemplified by forensic investigation in the Balkans.

Recent Mass Graves as Phenomena in the Destroyed Historic Environment

International Responses

The break-up of Yugoslavia saw internal conflict, ethnic cleansing and mass murder in the Balkans from 1991-2000. Investigations by the International Criminal Tribunal for the Former Yugoslavia (ICTY) led to mass grave excavations to gather criminal evidence, with many more exhumed by national missing persons entities and state prosecutors to collect evidence and identify the missing, supported by international organisations such as the International Commission on Missing Persons (ICMP), Physicians for Human Rights (PHR) and the International Commission of the Red Cross (ICRC). Data assessed from the Missing Persons Institute (MPI) in

BiH found that while two thirds of the graves of the missing contained only one or two persons (many within cemeteries), two thirds of the missing were found in mass graves.³⁸

Destruction of Cemetery Heritage

Cemeteries were regularly used to contain murder victims gathered for burial from singular episodes of ethnic cleaning and violence during the conflicts, but they were also used to hide the disappeared. In 1992, the Pasinac cemetery near Prijedor, North-West Bosnia, was utilised to hide multiple dead bodies within standard grave plots. The murdered victims came from the Keraterm camp³⁹ and a local hospital. They were only buried in the Bosnian Muslim section of the cemetery. The graves were monitored. When excavated in June 2000 by ICTY, the graves were found to lack markers, coffins or grave furniture. Most held between two and five bodies, and conformed to the standard grave rows and dimensions, the victims hidden in plain sight. As excavations were being undertaken, tensions were raised as a suspect was arrested in a raid on his home in Prijedor and removed to The Hague.⁴⁰

Other cemeteries in Eastern Bosnia were used to bury victims of 1992 fighting, detentions, executions and the ethnic cleansing of villages around the town of Zvornik. The bodies were collected from various locations and centralised, then trucked to burial sites in Muslim cemeteries, that had been scoped out for use. Bodies were placed in body bags, and burial was observed by the Red Cross. They were buried in rows in long trenches dug by bulldozers. Some of these graves were later disturbed by heavy machinery and robbed. The terms 'robbed' and 'robbing' in the context of these mass graves is used in the archaeological sense.⁴¹ The bodies and soil were moved by truck in 1995 and centralised in one large secondary grave at Crni Vrh.⁴² This grave was excavated in 2003 by MPI assisted by ICMP and was 35 metres (m) long, 6m wide and 4m deep. The remains of 629 victims were recovered from a sequence of 19 deposits of remains, some mixed with historic grave stones, grave markers and burial boards brought from primary cemetery burial sites.⁴³

The inclusion of cemetery contents in the Crni Vrh grave is an example of deliberate destruction of specific historic and cultural heritage. The centuries old Muslim cemetery in Zvornik was also destroyed and bulldozed with the material and bodies removed to Zvornik's stone quarry,⁴⁴ creating a new mass grave. The cemetery of nearby Divič was similarly destroyed, 'the aim, clearly, was to eliminate both the [Muslim] community in Divič and its historical, cultural and religious identity and even the very memory of its existence'.⁴⁵

Mass Graves and Centralised Cultural Destruction

The centralisation of destruction at mass graves can also involve demolished cultural heritage. The excavation of a mass grave site in Brcko, Northern Bosnia by ICTY in 1997, found five graves containing 66 victims of fighting and those executed in 1992 in the Luka detention centre. The landscape of graves was covered with two metres depth of rubble and debris containing Muslim grave stones, shaped stones and ceramic tiles: building material consistent with that of a mosque⁴⁶. A further levelled layer of clay soil covered the whole site, giving it the appearance of a meadow. The debris material has been suggested to have come from the Brcko Sava ('old') mosque, of Ottoman date, constructed in 1739. This was completely destroyed and levelled in June 1992, along with several other mosques.⁴⁷ The Brcko mass graves were also found to have been robbed and were estimated to have originally contained 200 victims. A related secondary grave contained 114 complete bodies and 159 body parts was excavated by MPI supported by ICMP at Gorice, 10 kilometres (km) from Brcko in 2006.⁴⁸ The process of how the Brcko mass grave excavation evidence was incorporated into war crimes prosecutions has been described in detail in documents from the ICTY outreach program, which sought to explain the trials, evidence and judgements to communities in BiH.⁴⁹ The extent of the destruction of religious buildings in the war is both widespread and shocking,⁵⁰ with destruction of mosques, churches and monasteries noted in ICTY trials.⁵¹



Figure 2. The presence of shaped stone blocks found covering the Brcko mass graves during excavation. They were consistent with architectural elements of a minaret. (Source: Richard Wright).

Hiding the Dead Within Destruction

Conversely, mass graves have also been placed in landscapes of destruction. Whole village across BiH were destroyed through burning, artillery fire and demolition using mines and explosives during ethnic cleaning. Investigation by ICTY in 1999 uncovered a series of graves in the destroyed village of Kevljani, near Prijedor, North West Bosnia. They were placed along the perimeter of the old village cemetery, which was adjacent to the toppled minaret of the demolished mosque. There were 26 graves containing 72 bodies, cut by a long robbing trench. There were 26 body parts mixed in the robbing backfill, a common occurrence in disturbed graves⁵². Historic cemetery burials were cut by the clandestine graves, with bones and parts of a coffin and grave stones in mass grave fills.⁵³ In 2004 the Federal Missing Persons Commission supported by ICMP under took an excavation of a related secondary mass grave containing multiple deposits of remains including 200 bodies and 209 body parts at Stari Kevljani. DNA analysis demonstrated the remains represented a total of 456 bodies. Some of these related to the Kevljani primary graves. The two grave sites are only 500m apart.⁵⁴ Victims identified from both graves were last seen in the Omarska, Keraterm and Trnopolje camps,⁵⁵. Small stone memorials have been placed at both grave sites. There have been 11 convictions at the ICTY for crimes related to these events. Indictments continue to be issued nationally, for example concerning crimes against the villages of Zecovi and Carakovo, near Prijedor⁵⁶. Victims from these villages were found in numerous mass graves including those of Pasinac cemetery, Stari Kevljani, Tomasica (and its related secondary grave Jakarina Kosa) discussed in this paper. Some 57 mass graves have been found in the wider Prijedor and neighbouring area, where around 3200 people were killed, while around 650 remain missing. Families continue to search for their family members⁵⁷.

Deliberate Actions to Contextualise the Dead

As well as being hidden, there has been a common argument by defence teams in trials that the positioning of mass graves relates to events other than those included in indictments. Several mass graves resulting from executions during the Srebrenica massacres were placed where there was fighting between 1992 and 1995 including fields within the destroyed village of Glogova. Aerial imagery determined the time of initial ground disturbance at Glogova to be July 1995. Bodies were brought from a number of locations: an execution of captured men at agricultural warehouse at nearby Kravica; from fields along a road where men had surrendered and were summarily shot; from the town of Bratunac where captives held overnight and men who fled to Serbia were returned and executed at the site. The defence argued in the Karadzic trial that the graves included victims who had died years earlier,⁵⁸ or died and were buried as combatants from either contemporary related events or earlier events.⁵⁹

The Glogova graves were disturbed and robbed, with many bodies taken to a series of secondary graves located on confrontation lines, where there had been combat, and where villages had been destroyed. It was argued by defence that the secondary graves were created as part of battle field clear up or “asanacija” operations and therefore contained the dead of legitimate military action, not executions.⁶⁰ The forensic evidence however linked these graves to the primary graves at Glogova, with the graves robbed in October 1995.⁶¹ There was no evidence documented that combat casualties were placed in these graves. One secondary grave at Bljeceva contained seven deposits of bodies, two brought from Glogova mass graves but five containing bodies in or associated with black body bags. These were found to have come from a primary grave in Redjici, Bratunac related to 1992 killings. This secondary grave commingled and conflated victims from separate 1995 and 1992 events.⁶²

Desecration by Deposition

Mass graves are also frequently incorporated into existing landscape features. Use of rubbish dumps to hide graves is common. The primary mass at Kozluk relating to the Srebrenica massacres in July 1995 was a series of depressions caused by local gravel extraction, subsequently used as rubbish dumps. Over 800 men and boys were taken and shot in these pits. The graves were robbed in September 1995 and moved to secondary graves. The graves were first excavated in 1999 by ICTY, recovering several hundred bodies and body parts. One element of the rubbish dumps at the primary grave- green bottle glass from a nearby factory- was key evidence in connecting the primary and secondary sites, ubiquitous across these graves. From 1999 the primary grave site continued to be used as a rubbish dump for local town waste. When a second excavation at that location was undertaken in 2015, burning layers of waste, dumped building material and trenches of rubbish hampered investigation and made it a more complex operation. However, a further grave was found by revealing and exposing the buried 1995 land surface, after stratigraphic assessment. Remains from a further 65 individuals were recovered.⁶³

Weight of Concealment

Quarries were frequently used to hide graves. The Tomasica primary graves near Prijedor were dug into a plateau of iron ore mine waste in 1992. Up to 9m depth of clay and rock were bulldozed over the graves, leading to an anaerobic stasis in decomposition. Remarkable preservation of tissues recorded at excavation and examination in 2013 allowed determination that 97% of bodies died from gunshot wounds.⁶⁴ Described as the largest mass grave excavation since WWII, stratigraphic assessment revealed the graves were dug into the 1992 land surface, exposed by the removal of an estimated 40,000m³ of made ground. The graves had been robbed in 1993, with bodies taken to the related secondary grave at Jakarina Kosa, an open cast mine. Truckloads of bodies and clay were tipped down this quarry cliff, which was then brought down on top of the remains using explosives. In logistically complex excavations to recover remains, tens of thousands of metric tons of rock and soil were excavated in 2001 by a Bosniak Commission on Missing Persons supported by ICTY, and further excavated by MPI supported by ICMP in 2015. These postmortem events caused great fragmentation of remains but did not prevent assessment of the cause and manner of death.⁶⁵ The use of DNA to match body parts was extremely important in allowing reassociations to individuals, and provide evidence links between the two sites: The remains of 99 individuals found in both locations. By 2015, 604 victims from the two sites had been identified through DNA,⁶⁶ many last seen in villages during ethnic cleansing and at Omarska and other camps,⁶⁷. The argument that victims were combat casualties was again raised.⁶⁸

Watching the Dead

In 1999, in an effort to conceal victims and prevent investigation, quarries were used to conceal remains of Kosovars dug up from primary graves in Kosovo and then moved across a jurisdictional boundary into Serbia. Investigation was undertaken under the auspices of the Serbian war crimes department coordinating with the Serbian and Kosovo commissions on missing persons, and supported by forensic experts, ICMP, ICRC and the European Union Rule of Law Mission in Kosovo (EULEX). Mass graves were found at Rudnica Raska quarry in 2014⁶⁹ and the nearby Kizevak open-cast mine in 2020.⁷⁰ Aerial imagery was the key to pinpointing specific disturbance in the relevant time frame in what are entirely disturbed, dynamic and changing landscapes. Before imagery availability, searches at both sites had failed to pinpoint graves, that were hidden under hundreds of cubic metres of rock and clay. The Rudnica quarry is overlooked by a Serbian police compound. Further graves of Kosovars were found in in 2001 in mass graves in a police training centre in the Belgrade suburb of Batajnica,⁷¹ with more in mass graves at the Petrovo Selo training camp. The location of these graves is consistent with perpetrators not only moving and concealing victims, but also placing them where the graves are difficult to access and can be monitored. Some 950 victims from Kosovo have been recovered from the mass graves in Serbia, with DNA led identification work undertaken by ICMP. More suspected quarry sites are under investigation⁷².

Voids of Convenience

The utilisation of natural landscape features including sinkholes, ravines, caves as well as built features such as wells is a consistent feature of victim disposal. In Herzegovina (BiH) and coastal Croatia, the shallow soil overlying limestone bedrock make digging of large graves impractical in many places. The natural geology however, provides a large number of caves and sink holes. These were frequently utilised during the 1992-1995 conflict to dispose of victims. Excavations at a cave in Hrgar in 1997 recovered 70 individuals and at Laniste, 200 were exhumed in 1996⁷³. Deposits show serial use of caves, not only for victims but as rubbish dumps. In 1991, in the town of Gospic, Croatia, Serbian victims of ethnic cleansing were found in an unused rock cut cess pit of a partially built house. Deliberately hidden under building rubble, part of the neighbouring demolished building had been collapsed onto the grave. Ten bodies were recovered in an ICTY excavation in 2000, matching witness statements for specific missing persons. There were Croatian protests at the work,⁷⁴ and tensions associated with an ICTY team investigating the incumbent government and working with national judicial authorities.⁷⁵ Related prosecutions were undertaken in Croatian courts with successful convictions,⁷⁶ despite political pressures, also demonstrating successful support by an international court of a national jurisdiction through provision of evidence.⁷⁷

Excavation of such sites is very challenging in terms of logistics, time and expense. Many caves are deep and inaccessible. It is no surprise therefore that they are utilised by perpetrators across conflicts and time.⁷⁸

Numerous caves were also utilised for massacres during and after WWII. The notorious massacre of Golubinka pit near the village of Surmanci, Herzegovina in 1941 saw 650 Serbian villagers thrown into a deep karst cave by Croatian ustashe troops. The grave was sealed by Yugoslav authorities in the 1960s. After Tito's death, the cave was exhumed in 1990 by Serb Orthodox priests and experts from Belgrade, with victims buried in the crypt of a nearby church, just as ominous signs of new conflict started to spread.⁷⁹ In an act of cultural desecration the church and crypt were burnt in 1992 by Croatian Army troops. The effect of covering up of mass graves and events from previous conflicts 'was not to make people forget, as was the intention, but to leave the wounds unhealed'.⁸⁰

Accidental Damage, Incidental Evidence

In the belief that they may be the victims related to the 1990s conflict, many historic and prehistoric remains have been recovered from caves and other sites. This has significant impact on the archaeological record. With no hope of any DNA matching, remains have sat in mortuaries across BiH as open cases. A systematic re-assessment between 2013-2017 resolved the origin and historic nature of many cases.⁸¹ Further damage to the archaeological record has been noted as an effect of the digging of large mass graves. Bifacial stone tools were found at both the Lazete primary grave (one of the main Srebrenica massacre execution and burial sites) and the related Hodzici 03 road secondary grave. This indicated a palaeolithic archaeological horizon had been dug through during the construction of the primary grave, movement of artefacts to the secondary grave occurring during robbing. One consequence of recognizing such unique inclusions was to provide, along with other environmental evidence, strong comparative indications of the connection between primary and secondary mass graves,⁸² countering attempts to hide evidence and impede investigation.

Dominating the Dead

The construction of symbolic buildings near mass graves can form an intimidating change to the landscape. A Serb Orthodox church was built in 2013 some 30m from the secondary mass grave of Budak, a Srebrenica massacre related grave. The church also overlooks the Potocari memorial a few hundred metres below, where thousands of Muslim victims of the Srebrenica massacre are buried. While geo-spatial intelligence has ruled out the church being built on a grave (a concern of Srebrenica survivors), the construction has been described as a provocation by the international community.⁸³ It is not an isolated example. A church was constructed from 2011 some 200m from the primary mass grave at Branjevo Farm, one of the largest in BiH, and the largest mass grave and execution site related to the Srebrenica massacre.⁸⁴ The church is part of a new expanding housing estate. The re-excavation of the mass grave in 2013 by the BiH State Prosecutor saw crime technicians and ICMP staff locating and gathering shell casings and cranial fragments from the 1995 execution site through the gardens and gravel roads among the houses.⁸⁵ The destruction of the mosque and cemetery in Divič in 1992 saw a Serb Orthodox church built on the site. This has prevented reinstatement of the cemetery, confirming permanence to the physical destruction and providing a symbol of the success of violence on this landscape (see note 45). In the immediate aftermath of the war in 1996, another church was built at Konjevic Polje in a prominent position at a road junction, where many men fleeing Srebrenica surrendered and were held in July 1995, and near to where executions took place. The church was built on the land of a Bosniak woman, without consent. The church was the scene of repeated confrontations as Bosniak refugees returned after 2000,⁸⁶ but was demolished in 2021 after a twenty-year legal battle.⁸⁷

Separating the Dead

Such specific placement of construction results in part from motivations for highlighting and asserting dominance upon a disputed landscape. But there is also frequent segregation and concealment of mass graves within already ethnically cleansed villages, separating the dead from contested space. With reference to Srebrenica, this compartmentalisation by placing the Bosniak dead in abandoned Muslim villages and cemeteries restricted Muslim presence on landscape in both life and death. Such is the strength of this phenomena that MPI investigators discounted searching for missing Bosniaks in traditionally Serb villages, land or cemeteries. It was simply not considered as a possibility for mass graves of Muslims to be there. Such patterns of disposal do however provide a basis for targeting search strategies within specific parts of the landscape to locate mass graves.

Application of methods to excavating a myriad of mass graves has adapted and evolved to each context and provided detailed evidence that has been used in court. The motivations of perpetrators for undertaking disposal of victims and material are varied. However, their strategies, implemented to destroy and hide the dead and other evidence of crimes, do not seem to have been formulated with the expectation that geospatial intelligence, archaeological and forensic sciences would provide such capable responses.

Aerial Imagery: Crucial Evidence for Forensic Investigations

Unique Records Revealing Concealment

The use of aerial imagery-geospatial intelligence- has been crucial to investigations in the Balkans, pinpointing the exact location of suspected graves. The Srebrenica massacre utilised imagery to the greatest effect. The signatures of ground disturbance indicated by the light reflection of exposed soil allowed investigators to accurately pinpoint search areas, test trenching to locate graves on the ground. Around 80% of the missing from Srebrenica that have been recovered and identified were within graves for which there was imagery, much provided by U2 aircraft platforms.⁸⁸ The majority of secondary graves would not have been found without it, having been placed during a clandestine operation. Many of the graves were found only after assessment of stored images, when intelligence could provide specific geographical areas for analysts to review, concerning a specific time frame. For example, the trigger to assess available 1995 imagery of the Hodzici road area, West of Zvornik, was the accidental locating of a mass grave by US Army engineers repairing a road after a landslide in 1998. Subsequent imagery analysis detected anomalies along the road, later tested and revealed to be seven graves. ICTY excavation of three of the graves in 1998,⁸⁹ revealed they were ramped secondary graves, related to the Srebrenica massacre. The imagery showed they were backfilled by 2nd October 1995. Review of this imagery in 2015 revealed an eighth anomaly, that was not backfilled, consistent with an open, empty grave. Excavation in 2015 found this had been backfilled (sometime after 2nd October 1995), without human remains, interpreted as having been prepared but not used in 1995⁹⁰.

As well as pinpointing mass graves sites, the imagery provided other specific information and so were of great value to ICTY as trial evidence.⁹¹ An image from 17th July 1995 of Branjevo farm mass grave is labelled by analysts as depicting an open grave, heavy machinery and bodies lying on the ground, another on the 27th September 1995 shows the grave during robbing activity.

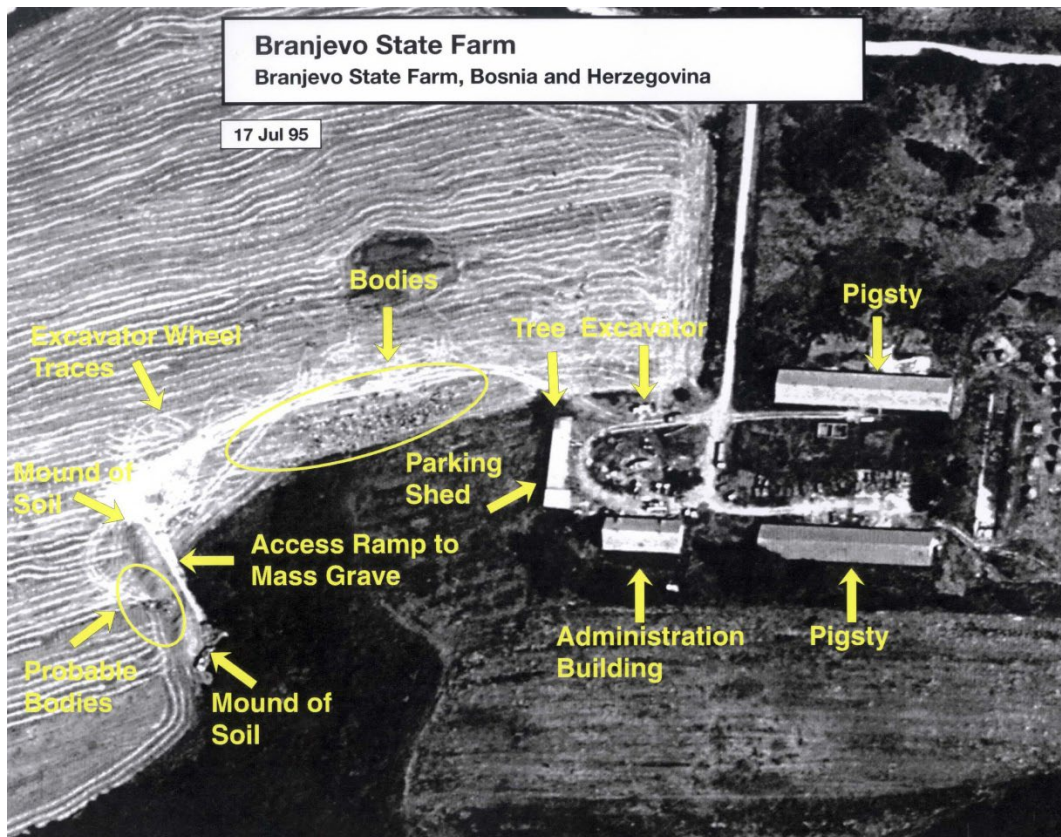


Figure 3: Imagery showing the open Branjevo Farm mass grave (Source: ICTY).⁹²

Evidential Signatures

Related secondary graves on the Cancari road are shown in imagery as open and empty on the 27th September 1995 and backfilled by the 2nd October, placed between destroyed buildings. Vehicle tracks and ramps provide evidence for the type of vehicles involved. Robbing activity indicates likelihood of truncated bodies and dispersed body parts. The primary grave field at Glogova saw sequential digging of graves from different events captured by imagery. All of these signatures provide evidence and alert investigators to what may be encountered at excavation. The clarity of images impacted the ability to interpret and assess elements that might affect archaeological decision-making during excavation. The quality of images provided to ICTY seems to have been reduced, presumably to protect asset capabilities.⁹³

Timelines of Destruction

Evidence of multiple events over time can be captured in one image. Imagery of Kaldrmice, near Cerska showed both the aftermath of the demolition of the village buildings during ethnic cleansing in 1993 and the subsequent placing of a mass grave between those ruins in July/August 1995. The Kaldrmice 05 grave was excavated in 2010 and 20 bodies recovered.⁹⁴

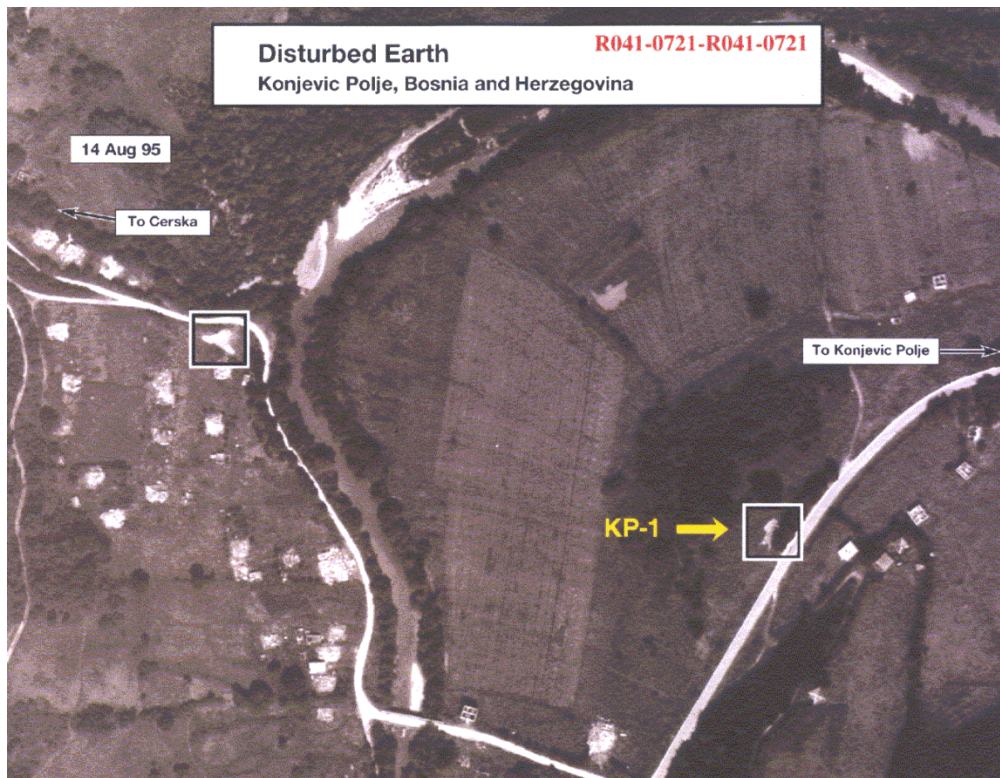


Figure 4. Imagery showing ground disturbance in August 1995 (within the squares). Kaldrmice 05 mass grave was found within the left-hand square. (Source: ICTY).⁹⁵

Sequences of images for the same location provides dating evidence. Observed disturbance at grave sites within limited time windows, augmented by physical evidence, narrows the date of the placing of victims. For example, Srebrenica execution sites and primary mass graves were dated to July 1995 by evidence including the fact victims were witnessed alive on the 11th July 1995 and were then recovered and identified from mass graves created and backfilled by 17th July 1995, the combination of physical evidence including the victims themselves and aerial imagery providing a *terminus post quem* and a *terminus ante quem* for the creation of the grave.

The Limbo of Archives

Availability of archived imagery is extremely important in investigation. In the past there has often been limited scope or coordination to take imagery for the specific purpose of detecting mass graves or evidence of crimes under international law. The reaction to the fall of Srebrenica is an exception. The current mass availability of commercial imagery has made it a far easier task to capture events in recent conflicts such as Syria and Ukraine. But the re-assessment of stored imagery going back decades -much of it in classified archives- which may have captured mass grave locations and the destruction of cultural heritage as a by-product, has great potential for resolving the fate of the missing as well as gathering evidence from past conflicts.

The Potential of a Century of Aerial Imagery

As well as the example of Katyn, further examples demonstrate the potential of 100 years of imagery archives. The mass graves of missing WWI servicemen who died in the Battle of Fromelles were pinpointed through initial painstaking analysis by an amateur historian. Archived aerial images taken 1916 to 1918 provided exact locations and evidence of ground disturbance. The graves were excavated in 2009, leading to the recovery of 250 Australian and British soldiers, with 177 currently having been identified through DNA, anthropological analysis and assessment of historical records. A new cemetery and memorial were dedicated and opened for them in 2010.⁹⁶

Similarly, research assessed the potential for remote sensing analysis of the WWII Jasenovac concentration camp, where the Croat ustashe regime murdered some 100,000 mainly Serb, Roma and Jewish victims during 1941-1945. The victims were documented to have been buried in numerous mass graves, some of which were dug up and bodies burnt in 1945 to hide evidence of crimes. The site straddles the Sava River on the Croatian-BiH border and was assessed through analysis of multiple imagery archives. Aerial images from 1946, 1961, 1975, 1977 and 1983 were reviewed providing details of landscape change over time. Negatives were digitised to make the archive resilient. A procedure was described for processing available geospatial data including

contour modelling to provide ‘high-quality data for discovering mass graves’, that could then be tested physically through excavation. The assessment of the 1946 aerial image revealed a large number of potential mass graves. Six locations with signatures of disturbed earth on the 1946 image had been previously tested in 1984, the presence of numerous human bones and personal artefacts confirmed they were mass graves.⁹⁷ While there is a memorial to the victims, there has never been a formal excavation to identify or repatriate the dead, mainly because of political tensions. One of the camp commanders was extradited from Argentina and tried in a Croatian court in 1998, the only successful trial in post-communist Eastern Europe of a Nazi collaborator.⁹⁸ Jasenovac is a salutary reminder of how barbarism can prevail, how normal people can be induced to do horror.⁹⁹ Nevertheless, it is also a prime example of how mass graves can be politicised and problematic, dynamically used to maintain competing narratives of the past, that unsettle the present. Mass graves can remain livid scars on the historic landscape and on the memory.¹⁰⁰

Coordinating Support

The potential from assessing archived aerial imagery is clear. Many archives may be the only source of evidence to pinpoint grave locations effectively enough for them to be located. As well as developments in the international courts in using such imagery for investigations, recent legislation has developed capacity to support recognition and identification of atrocities. The USA Elie Wiesel Genocide and Atrocities Prevention Act of 2018, provides formal support to investigating and preventing atrocities, to ‘ensure resources are made available for the policies, programs, and tools related to atrocity prevention and response’ which includes assessment of ongoing atrocities and effectiveness of responses, as well as strengthening the role of international organizations in conflict prevention, mitigation, and response.¹⁰¹ The potential scope of this formal organisation and supply of evidence gathering has been extended -with specific reference to geo-spatial intelligence- in the introduction of Acts before the US Congress in 2022 to ensure intelligence and financial support to the investigation and prevention of atrocities and their manifestation in atrocity crimes scenes including mass graves.¹⁰² This legislation is designed to directly support the use of geospatial intelligence and satellite imagery for genocide prevention including to locate and identify the missing, provide evidence for war crimes, and bring transnational justice for perpetrators under international crimes.¹⁰³

The coordination of evidence gathering and responses is currently gaining momentum¹⁰⁴. Lessons learnt from the recent conflicts in BiH and the wider Balkans have been assessed, with the great resources put into investigation of the Srebrenica massacre over 30 years making it the best case study (probably anywhere globally) for review. The successful results of these investigations demonstrate ‘adequate resources are needed to undermine narrative foundations that justify atrocities, division and ethnic conflict. Access to, and coordination of, geospatial imagery assets is perhaps the most impactful way to expand resources.’¹⁰⁵ A mechanism for archaeologists to receive and feedback on aerial imagery intelligence before, during and after mass grave excavation is an intrinsic requirement of such resource provision.

Archaeological investigation: Physical Contributions to Evidence

Application of archaeological approaches to assessment, search and excavation of the landscape have now been widely implemented to compliment intelligence, forensic and criminal analysis processes during mass grave investigations.

The Chance to Test Interpretation

Excavation of mass graves by archaeologists has demonstrated the accuracy of aerial imagery interpretations by analysts. Re-excavation at Branjevo Farm in 2013 found a 41m long grave, with an access ramp at one end, wheel ruts leading to the grave. A distribution of shell cases and cranial fragments matched were found near the grave¹⁰⁶. These archaeological findings matched the analyst descriptions in the annotated aerial image (see figure 3). Conversely archaeological interpretation was ‘blind-tested’ by subsequent review and comparison of corresponding mass grass imagery. At the Glogova 1 mass grave, the excavation of wheel tracks and ruts, graves and heavy machinery bucket impressions were reported upon. They corresponded to details observed in aerial images that were not seen and were not available to the archaeologists during fieldwork¹⁰⁷. This confirmation of interpretation provided confidence not only in the veracity of excavation methods employed, but also for the archaeologist when presenting expert opinion as testimony in court. Together with witness descriptions of graves and events, this gives something quite unprecedented for the archaeologist who normally deals with the physical record of distant events with no records or witnesses: contemporary verification of the accuracy of their excavation and interpretations.

Principles and Laws

The detailed interpretations and accuracy of excavation are made possible through the application of the Principles of Stratigraphy.¹⁰⁸ These provide the basis for scientific justification of interpretation, 'as the same laws apply to every site as the principles of stratification are universal'.¹⁰⁹ Courts increasingly wish to know the scientific foundation of interpretation and expert opinion. These requirements are being described for forensic science disciplines in recommendations, code of practice and legal decisions.¹¹⁰ Stratigraphic excavation and the analysis and description of strata, in formal recording systems¹¹¹ are well suited to defining and describing phases of activity relevant to investigations within more extended site histories. The physical record of interest may have been formed and represent mere hours or days of activity, within a stratigraphy that may span millennia. Systems also provide quality control through cross referencing of documentation, that can be demonstrated in reporting. For example, the report for the Tomasica mass grave, BiH, provided a summary of the archaeological procedures and the best practice basis for the methods used, a description of the excavation method, tables and descriptions of the archaeological contexts, a Harris matrix depicting the contexts chronologically in phases, as well as glossaries of archaeological terminology and planning conventions. Section drawings and plans depicted the stratigraphy.¹¹²

Presenting the stratigraphic evidence as the basis for interpretation is important given contentions, for example over the robbing of graves. The physical evidence of robbing – alterations and truncations to pre-existing archaeological deposits, cuts and surfaces (and including remains) – causes discernible, recordable and permanent change in the stratigraphic record. This proves deliberate post-burial alteration, in a way that cannot be demonstrated in other contexts such as surface or aquatic depositions, because the archaeological record is by its nature subterranean, protected, tangible and retentive. Concerning Tomasica, both judges during testimony and the defence in cross examination queried how the deliberate removal of bodies was determined archaeologically, and why the interpretation of robbing was justified over other explanations.¹¹³

Archaeology the Repeatable Experiment

Indeed, some reports were unable to conclude whether robbing had taken place, with the excavation in 1996 of the Srebrenica related Lazete 2 (Orahovac) primary grave being an example. It was re-excavated in 2000 to answer investigative questions not previously resolved, by undertaking additional assessment and stratigraphic analysis. This provided evidence that the grave was 37m in length, 4m wide and 1.55 in depth, and had been extensively robbed. Re-excavation also recovered an additional 42 cases of human remains and extensive evidence of the execution site including 671 shell casings and 46 bullets.¹¹⁴ By 2012, a total of 830 victims had been recovered from graves related to the Lazete primary graves.¹¹⁵

Variation in excavation methods does produce variation in results. This has been determined experimentally, during formal comparison of method consistency. While testing is a requirement for forensic applications of archaeological methods, the experimental results also have implications for all archaeologists and excavations. They providing insight into potential evidence loss and non-recognition of strata depending how methods are applied.¹¹⁶ Methods must maximise the opportunity for recognising the evidence. A lack of involvement by archaeologists or a lack of formal excavation method can lose evidence. For example, at Oplenac, Serbia, a WWII mass grave was exhumed by an amateur group without waiting for the planned supervision of forensic experts, resulting in the loss of evidence including site formation processes and stratigraphy.¹¹⁷ This issue is a concern given the number of mass graves excavated *in extremis* by families and communities looking for their missing, and volunteers trying to address overwhelming human rights crises,

Re-excavation of mass graves is an important of investigation. Assessment of excavations reviews whether the there are gaps in the evidence from an event and whether all of the associated missing are accounted for. This may be due, for example, to graves or parts of graves being missed during excavation. The importance of review was demonstrated by the re-excavation of several mass graves in BiH 2000-2017.¹¹⁸ Hundreds of additional cases of remains were recovered, new criminal evidence gathered and evidence of robbing determined. For example, the results from the 2013 Tomasica excavation (first excavated in 2004 and 2006) led to the re-opening of the Prosecutors case against Mladic. The prosecution contended the additional evidence was directly relevant to charges in the indictment, with the number of bodies and scale of the mass grave indicative of planned, systematic killings.¹¹⁹ The related secondary grave of Jakarina Kosa was also re-excavated in 2015, with the assessment and removal of 12,000m³ of rock and debris. Remains representing over 600 further disarticulated and scattered cases were recovered.¹²⁰

Both re-excavations demonstrate the necessity of scrutinising methods as part of an investigation review process, despite obvious concerns about the integrity of original findings. Such review will always be required in a judicial setting if a threshold of evidence is to be reached to satisfy a court that an order for re-excavation is justified. The overriding principle is to gather evidence and find the missing. Excavation is then in certain

circumstances, a repeatable experiment.¹²¹ All archaeologists undertaking forensic excavation, including mass grave investigation, should work under the presumption that their work will inevitably be scrutinised and re-assessed.

The Complexity of the Dead

Mass graves by their nature contain multiple dead. They are often commingled and in a skeletonised form when excavated, and many mass graves are disturbed and robbed post-deposition. These properties result in complex osteological issues, encountered at excavation, where the objective is to remove discrete cases of remains, focusing upon intact recovery of the individual if possible.

Determining the anatomical distinction of each case requires specific osteologist training, skills and experience, in coordination with excavation of soil deposits using archaeological procedures that expose remains within a stratigraphic sequence. The multi-disciplinary nature of this work has been developed into dedicated procedures for mass graves.¹²² Proforma recording combined with photography and digital survey of anatomical landmarks, provide detailed positional data for each case. This allows the three-dimensional reconstruction of body positions within graves using software developed in 1997 at the Brcko mass grave excavation.¹²³ This provided a perspective that could not be produced with photography or written records alone, and proved very helpful for aiding interpretation. For example, the software demonstrated remains in secondary graves were spatially grouped, consistent with sequential dumping of bodies from trucks. Such visualisation is also helpful for courts to understand the properties of graves and arrangement of victims.¹²⁴ The software and applications have developed over time, for example during the Fromelles and Tomasicca excavations.

The field records are also important for those undertaking examinations, as an aid to understanding the context of remains they assess. With commingling exacerbated in robbed primary graves and mixed secondary graves, remains of individuals become intimately entangled. Careful procedures of autopsy, osteological analysis and DNA testing that separate body parts and re-associate individuals have been developed, including the review of cases previously examined before the application of DNA matching technology.¹²⁵ The processes have improved over time, for example determining which skeletal elements provide most consistent results in terms of successful DNA extraction through assessment of thousands of DNA sample results.¹²⁶ In many cases, remains are skeletonised. Pathologists and anthropologists work together to determine a biological profile, assessing sex, age, stature, pathology and trauma to provide evidence of cause and manner of death as well as information that can contribute to identification.

Repeatability of standard procedures is important given the scale of excavations and examinations. There are 17,000 sets of remains examined related to the Srebrenica massacre, representing perhaps 7100-7200 individuals, with 7017 formerly identified. A total of 6981 have been identified by DNA matching, a remarkable achievement.¹²⁷ The formal examination, re-examination and database recording provide evidence documentation, contribute to formal identification and act as quality controls.

Feeding Back to Investigation

The same field recording process applies to other evidence, be it grave structures, environmental samples or buildings material. Building debris and car parts found during excavation were consistent with having come from the Srebrenica-related Kravica warehouse execution site to the Glogova 1 primary graves. An entrance to the warehouse was partly demolished in July 1995 to access bodies when they were moved. When the graves were excavated in 2000, building material recovered among the bodies were surveyed and plotted. This provided distribution maps showing consistent presence of dozens of such artefacts throughout the mass graves. Comparison by an experienced scene of crime officer matched them to the warehouse, providing an example of determining the origin of demolished building material found in mass graves.¹²⁸

The Srebrenica execution sites were found to contain thousands of shell casings, bullets and cranial fragments, which were located through use of metal detectors and hand digging, individually recorded and surveyed. These produced distribution maps as evidence of execution and victim location, allowing witness statements to be corroborated, and investigators to determine directions of fire and type of weapons used.¹²⁹

Digital surveying also enabled contour maps to be produced, which visualised features such as ramps in graves, and evidence of heavy machinery operation. A review to find more graves used the survey data to calculate estimates of the volume of material robbed from primary graves measured against the volume that could be accounted for in secondary graves. Determination of significant deficits might be an indicator of missing graves. This form of analysis (together with others) suggested there may be a missing primary grave at Kozluk, which was then located and excavated in 2015.¹³⁰

The removal of deposits of bodies within mass graves, reveals the grave floor and walls as surfaces. These stratigraphic interfaces, representing a cut made at the moment of the creation of the grave, were sealed by the filling deposits. Stratigraphic excavation allows such surfaces to be carefully revealed. Any evidence left or impressed on the interface can be recognised and recorded. For example, the tooth marks and wheel tracks of heavy machinery used to create the graves are found with careful excavation, preserved under bodies. Measurement and assessment of these provides details of the machine type used by perpetrators. The ramped Srebrenica secondary graves at Hodzici retained teeth marks and wheel tracks of a front loader excavator bucket impressed in the clay. The specific patterns were consistent with one machine creating multiple graves. This intelligence then allowed investigators to track down the origin and location of the front loader.¹³¹ Similarly, truck wheel impressions revealed at Glogova 1 primary grave as well as secondary graves provided evidence of how bodies were transported between graves. As well as assisting investigators with evidence for the logistics of the mass murders, it provided evidence of the organised scale of the clandestine operation to move bodies. This was part of 'a concerted campaign' undertaken after the primary mass graves had been revealed by the international community through aerial images.¹³²

The physical evidence recovered from graves was crucial in connecting crime scenes related to the Srebrenica massacre. Shell cases fired from the same weapon were found at primary and secondary graves, and matching blindfold material connected graves in the same way. Environmental samples linked grave locations through transfer of soils. The initial use of DNA to identify the missing were soon found to provide an additional benefit: body parts from the same individual found in different graves soon started to make dozens of links between crime scenes, as parts of individuals were reunited. Some individuals were found across four different mass graves.¹³³

To determine where further graves may be found, new methods of analysis have been developed. Review in 2014 of the combined archaeological data of surveyed body positions, inventory of remains at examination and DNA sampling provided evidence of the positions of identified bodies and body part in the graves. This is important for three reasons. It demonstrates that body parts from individuals were separated and dropped in backfill of the same grave as part of robbing events.¹³⁴ It demonstrates physical connections not just between primary and secondary graves but also within and between all truck dumps of deposits within and between secondary graves. Together with stratigraphic assessment, these analyses help disprove arguments that bodies were placed into primary graves already fragmented, or bodies came to secondary graves from somewhere other than primary graves. This combination of known distribution of identified remains and their place in stratigraphic deposits also provides detailed evidence of the fate of each individual identified.

Review of this combined archaeological, anthropological and DNA evidence also allows a tallying of remains of individuals, of assemblages and of event-related graves. Review in 2014 assessed the minimum number of individuals (MNI) of an assemblage through collation of database records. This provided a table listing the MNI by major skeletal elements (such as a left femur or cranium). This was compared to the total of unique DNA profiles for the assemblage. All things being equal, the average MNI totals by element should be consistent, and should match the total DNA profiles if all the major body parts of the missing are accounted for. Any significant mismatch across MNI totals and between MNI and total DNA profiles may be indicative that part of the assemblage is still missing. Undertaken for the Kozluk assemblage (being the known primary and related secondary graves combined) it indicated a deficit of body parts. This was another of the assessments used to determine a potential missing grave at Kozluk. The 2015 excavation recovered an additional 55 cases, representing 65 individuals, reducing the deficit. These kinds of comparative analyses can in theory be used to assess what is missing from any assemblage of evidence if there is comprehensive recovery and documentation.

Communicating Excavation

In national jurisdictions, there are now very detailed guidelines, including specifically for archaeologists, for what is expected of an expert witness, their work and their reporting.¹³⁵ They provide standards that for archaeologists to meet when undertaking wider investigations. The requirements and practice under ICTY rules have been widely discussed.¹³⁶

Recent guidance also provide standards for reports, with recommendations to base reporting on formal use of archaeological proformas at a scene,¹³⁷ developed over time from on best practice.¹³⁸ Such forms are essential to provide the evidence of archaeological contexts, stratigraphy and position of human remains, as they are deconstructed or removed by the excavation process. For example, provision of a body form describing the location, attitudes and properties of each case of remains in the field as a record for reporting, quality control and to inform subsequent examinations developed during ICTY excavations.¹³⁹ They have evolved over time to

include stratigraphic, survey and nearest neighbour case data, and include body part, infant, juvenile and adult versions. They are used by ICMP and other organisations.

Documentation and reports should include content that describe the history of the case; justify actions, decisions and method taken at the scene; excavation strategy and methods; results of the excavation; justifications for interpretations and conclusions as well as relevant references that demonstrate best practice. All records and samples should refer to crime scene reference numbers issued and conform to requirements of the criminal procedures of the relevant jurisdiction, or if not defined, to default best practice guidance. Reports must be detailed enough to meet guidance thresholds, allow re-assessment, take into account all relevant issues, be fair and unbiased and provide explanation for specific archaeological terms, descriptions and symbols. Archives of all documentation should be maintained.¹⁴⁰

In courts, a lack of method description, justification for approaches or details of the scientific criteria will likely be challenged, as will the competence to give expert opinion within or without areas of expertise. For example, defense counsel queried the archaeologist's expertise at the Brcko mass grave excavation in reporting blocks of stone as comparable to those from minarets.¹⁴¹ Concerning the Tomasica mass grave, the judge noted the difference between observations in the grave and expert opinion in relation to entomological evidence.¹⁴² Control of evidence and chain of custody at the site and during analysis, as well as who has access to the site may be queried. Questions concerning objectivity and impartiality may be raised. The basis of demonstrating deliberate and controlled excavation, integrity of crime scenes and evidence that provide confidence in results and interpretations start with employing best practice methods on the mass grave.¹⁴³

The results of mass grave excavation move over time into legal and historical archives, where they will be available for assessment. For example, the International Residual Mechanism for Criminal Tribunals maintains the legacies of the ICTY and ICTR including access to records.¹⁴⁴

The Principle of Re-interpretation

That the archived documentation of excavation should be available for re-interpretation is a founding principle of archaeology, a 'resource that enables not only the reinterpretation of original findings but also provides the raw material for further research.'¹⁴⁵ Considerations for this as a goal when starting investigation should be upmost in the archaeologist's mind. An archive should 'reflect the reality of evidence uncovered during fieldwork processes or even the fieldwork processes themselves' as fully as possible, to allow accurate review and re-construction.¹⁴⁶ Undertaken as a matter of routine, many archaeologists give little thought to whether such review of their archived work will occur.

Re-interpretation is the routine when archaeological reports of mass grave excavation contribute to evidence in court and where opposing arguments may be presented. The reports then contribute to verdicts and summaries in the public domain where competing narratives are contested. With such potential *gravitas*, it beholds the archaeologist to constantly consider the limits of interpretation, based solely on what can be demonstrated from documented evidence.¹⁴⁷ Standards and results of excavation should be expected to be scrutinised and it beholds archaeologists to undertake work that meets and exceeds the thresholds of evidential, discipline and judicial requirements for forensic science.

Many archaeologists are inured to contributing to the archaeological and historical record, including dealing with the politicising of interpretations. With mass grave excavation, results may be claimed to support narratives of truth, justice, memorialisation, reconciliation, revisionism and denial, as well as supporting claims to rights of victims, inheritance, heritage, ownership and the landscape itself.

Forensic Investigation of Mass Graves Within the Historic Environment: Conclusions

Evidential Value of Archaeology

It is clear that archaeological investigation of mass graves has contributed to criminal evidence, the identification of the missing and as intelligence to reveal further graves and evidence. Investigations demonstrate what can be achieved in relation to requirements of courts and the families of the missing. For example, the aim of undertaking the excavations related to the Srebrenica was to provide evidence related to indictments before ICTY. The required objectives corroborated victim and witness accounts of the massacres, provided an accurate count of victims, determined causes and manner of death, determined the sex and identity of victims and identified links to perpetrators.¹⁴⁸

Investigators did not initially appreciate the physical evidence for links between sites, and the detail that it could reveal. Video was taken during excavation at the Srebrenica related Cancari road 12 secondary grave to demonstrate how archaeologists peeled away a layer of clay to reveal perfect vehicle tracks. One of several similar layers, it demonstrated vehicles drove in and out of the grave multiple times to deposit truck dumps of bodies and soil. In ICTY trials, the connection of the excavation evidence to actions of perpetrators was found to provide clear indications of conspiracy to hide victims and disturb graves. This was something considered at length in judgements, with Krstic having been a specific charge in his indictment.¹⁴⁹

Connecting Crimes and Patterns of Destruction

Mass graves are deliberately placed, often in patterns. Finding one mass grave often leads to more as patterns are discerned. They form one of the physical manifestations of an accumulated destruction of cultural property and the victims themselves, that leaves traces across the forensic landscape.¹⁵⁰ The examples in this paper have provided clear evidence of the conflation of physical destruction of cultural heritage and destruction of the people, with the horror of homogenising demolition and mass graves together, confined in levelled, hidden and dominated landscapes. The examples also demonstrate pattern are not unique, but widespread and consistent over space and time. Although the first conviction by the International Criminal Court (ICC) for the war crime of 'destruction of historical and religious monuments' was only secured in 2015,¹⁵¹ examples show a clear tendency for destruction linking events such as murder and destruction of religious buildings together. For example, the mosques in Srebrenica were destroyed after 14th July 1995,¹⁵² in the same time period as the massacres, burials, re-burials and the hunt for survivors were being undertaken. The Mladic judgement noted in detail the destruction of mosques and churches as large scale, and that these incidents constituted 'destruction as an underlying act of persecution' as they 'were carried out in conjunction with a series of acts comprising murder and deportation.'¹⁵³ As such were found to be a crime against humanity, but not acts of genocide in their own right.

As Powderly notes 'while international criminal law does not expressly contemplate accountability for cultural genocide, evidence of heritage destruction was used to great effect by the ICTY as a means of establishing the specific intent required of the crime of genocide'.¹⁵⁴ However it has been argued 'consistent patterns of cultural destruction are...evidence of a desire to annihilate a people'.¹⁵⁵ Certainly, it seems hard to tease apart and separate the patterns of coordinated, concerted and 'commingled' destruction of the historic environment, cultural heritage and the population, at least when excavating the physical manifestations of these events. Evidence clearly shows these patterns are consistent across conflicts and countries.

Initial destruction is often followed up by patterns created by the organised removal and hiding of evidence. Whether the destruction of mosques in Brcko or robbing of mass graves, such disturbance and robbing are endemic. There seem to be few investigations around the world that are not complicated by such actions. While the robbing of graves related to the Srebrenica massacre are particularly notorious, it is a global phenomenon. However, there is a pattern within this pattern: perpetrators rarely succeed in removing all bodies. In relation to the Tomasic mass grave, and in answer to the question from the prosecutor as to whether it is common to find mass graves partially robbed, the author noted 'it is very common to find this. And in fact, in all the years of my work, I have never encountered a mass grave where all remains have been removed'.¹⁵⁶

Part of the hiding of grave sites is that they are often monitored by perpetrators, as exemplified by mass graves of Kosovars placed in or near police camps in Serbia. Again, discerning these patterns may lead to the location of more graves, but also provides evidence of an on-going conspiracy to conceal. Such strategies hinder the gathering of evidence and finding victims. There is great difficulty finding all of the missing, with the most successful investigation -Srebrenica- still looking for the last c.10% of victims. The pattern of centralisation of destruction then dispersal, does however increase the number of crime scenes to find. The ICTY trials have shown that evidence from a sample is enough for successful convictions (for example of Krstic in 2000 for genocide and other crimes). ICTY excavated seven secondary mass graves in 1998, but confirmed the presence of 21 further graves, which took until 2010 to excavate by BiH authorities. This left families waiting and slowly added further evidence to on-going trials.¹⁵⁷ As Fournet notes 'Specific and precise forensic identification of victims is thus not necessary for trials to occur and for individuals to be convicted; an admittedly reasonable position which allows for trials to take place in a context where victims may have been disappeared and their corpses concealed, mutilated or destroyed'.¹⁵⁸ Forensic and archaeological science can however now provide evidence for individual circumstances of death, with adequate resources, and if required by courts or families.

Mass graves hide evidence but also mark the landscape, detected through remote sensing and physical assessment. Once located, the deliberate destruction and confusion found within sequentially used, robbed and levelled mass grave sites requires the formal, deliberate process of stratigraphic excavation to both make sense

of the chaos and provides a system of evidence recording that meets forensic requirements. Archaeologists have provided the expertise and toolkits for methods to be applied successfully in investigations, with archaeological evidence presented in trials.

There is then an inseparable connection between destruction of people manifested in their concealment in mass graves and destruction of their cultural heritage and landscapes. Investigations must plan for a coordinated documentation of a breadth of physical evidence that reflects a wide range of crimes under international law and therefore a broad range of potential indictments.

Remotely Watching, Remotely Gathering

The utilisation of geospatial imagery to pinpoint disturbance and assess change over time is proven as one of the more important ways to find and define mass graves. The capacity to find what has been hidden from archived imagery now has a more than 100 years of data to work with. The future potential to resolve the fate of millions lies in access to such archives.

The scope for remote evidence recovery through geospatial remote sensing, aerial imagery analysis and digital imaging collation has expanded, sitting alongside other evidence types such as documents; eye-witness accounts; intelligence (such as radio intercepts; statistical data (such as demographics) as well as physical evidence. In combination, they corroborate events and link perpetrators, victims and crime scenes. The increasing ability to provide links is an important one. Prosecutions have failed because of the inability to directly link the accused to crimes they were indicted for, for example the Nazi war crimes trials concerning events at Serniki.¹⁵⁹

Developing Archaeological Capacity and Contributions

Since WWII, there has been a clear progression in the application of archaeological and forensic sciences to international investigations.¹⁶⁰ What physical evidence can provide in forensic terms has evolved, especially with the recent rapid progress within the field of genetics, combined with anthropological, archaeological and crime scene analysis. The increasing potential for evidential recovery has been realised during excavation providing direct matching and comparison, reconstruction of events, dating and cause and manner of death. Excavation has also fed intelligence back into investigations and recognised new avenues of evidence gathering to pursue. The full potential of physical evidence directly relevant to indictments cannot be known when investigations begin. What remains sealed in mass graves, waiting, can only be determined by careful exposure and recovery. One high standard of evidence gathering, excavation and analysis, can be implemented for multiple purposes. There is no class of evidence recovered from mass graves that does not have potential to contribute as criminal evidence, to assist in identifying the missing or corroborate dating of events.¹⁶¹ The degree to which archaeological sciences can be applied and implemented to answer specific investigative questions- whatever the timeframe in the past - is constantly expanding.¹⁶² 'To deliver justice to the victims... is to expose the individual criminal responsibility'¹⁶³ and this requires exposing the criminal evidence of individual crimes. We now have the capability and understanding to gather physical evidence in such detail from mass graves.

Finding the Missing and Justice for the Dead

The physical evidence recovered and analysed from mass graves and presented in ICTY trials not only provided extensive and detailed criminal evidence, it was essential for accurate identification of the missing. This resulted in thousands of individuals being repatriated to their families. In this sense recent mass grave excavations have provided a physical as well as documentary testimony to crimes, in a way that the trials at Nuremberg did not. They also provide the physical manifestations of evidence that refute counter narratives of events, narratives that begin when crimes are still underway. Investigators must also be vigilant to perpetrators undertaking new ways to disguise atrocities, deny involvement, or organise and time atrocities to escape international attention and focus.¹⁶⁴ There is clear potential for forensic science and geospatial intelligence to counter such developments.

The political manipulation of mass graves can clearly be recognised as a consistent phenomenon in the examples provided in this paper: they are potent symbols in the historic landscape. In many cases, there may be as many people who wish mass graves to remain closed as there are who wish them to be opened. Investigators must be aware of the considerable implications and gravitas within the context of the specific work they do. There should always be a foundation for investigation in the legal process, the scientific process and the process to account for the missing. The identification, protection and archaeological excavation of mass graves remains an extremely important element in the investigation of crimes and the upholding of human rights under international law: 'if perpetrators cannot always be punished it is imperative to find proof of their crimes, and at the very least to search and identify victims' remains so the dead may be honored'.¹⁶⁵

Resilience

In current and future conflicts, the scope, ability and support to recognise and record events of destruction is now available. The implementation of new applications of evidence gathering and analysis continues. There should be an expectation nationally that adequate resources will be needed to address these overwhelming events, whether through investigation, or programs of deterrence and prevention, and whether at home or abroad. The deaths, destruction and deletion of communities and their heritage are global issues, impacting everyone. Governments, judiciaries and contributors to investigations should be aware of, and plan for, responses to such events as part of their strategies for resilience in the face of disaster, civil conflict and war.

Notes

¹ Cox *et al* 2008, 10, see wider discussions in Klinkner and Smith, 2023 and the *Report of the Special Rapporteur*, 2020.

² Meyer *et al* 2015.

³ Schroeder *et al* 2019.

⁴ Rosenblatt 2010, 948.

⁵ Nerard 2021.

⁶ 'The Soviet secret police masked mass graves by erecting houses, radio stations, as well as building roads on those sites'. Fox 1999, 68.

⁷ Sanford 2005, 109.

⁸ Locations of suspected mass graves including Kharkov, Ukraine were identified by USA and Polish investigators in the 1980s, many from assessing Luftwaffe aerial imagery. Some of these sites have not been examined. See Fox 1999, plates 9-11.

⁹ 'From 1941 to 1944, the Luftwaffe flew 17 sorties in the Smolensk area, some of which included the Katyn Forest. There, recorded on film, were "snapshots" of the area taken before, during, and after the German occupation' in Fischer 2002, 3. See also Fox 1999.

¹⁰ Sandford, 2005, 107.

¹¹ Fox 1999, 1-3.

¹² Diary of Joseph Goebbels; Translated by Lochner 1948, 487.

¹³ 'Katyn Massacre: General Soprunenko's Role' in HC Deb 1990, 753-4.

¹⁴ BBC 2010

¹⁵ INFOX News 2010

¹⁶ Radio Free Europe 2019.

¹⁷ The Moscow Times 2022.

¹⁸ United States Holocaust Memorial Museum, 2019. Access to the Soviet film of atrocities shown at Nuremberg Trials.

¹⁹ Mant 1987, Mant 1962, Mant 1950.

²⁰ O'Donnell 2018.

²¹ Wright 2010, 100.

²² Richard Wright noted at the Serniki excavation: “I vividly remember finding the first body, two metres down – the skull of a woman with the exit hole of a bullet, and plaited down to her waist – and that certainly made me feel I had a big adjustment problem ahead, as well as a big physical excavation problem”. Wright, 1990.

²³ Discussions on the difficult conditions of such work for archaeologists are discussed in Wright and Hanson, 2016, Wright 2010, 106 and Hanson, 2007.

²⁴ Jammik, 2015.

²⁵ In 1945, The British Army in Austria handed over tens of thousands of fleeing Axis soldiers and other into Partisan and Soviet hands, many to their doom. See Gottfried *et al*, 2016.

²⁶ Gottfried *et al*, 2016.

²⁷ See details of the Slovenian Concealed War Gravesites and Victims Burial Act and Cultural Heritage Acts, and case studies in Jammik, 2015.

²⁸ Set up in 2009, by 2010 190 potential mass sites had been documented, relating to 55,000 victims. Funded by international donors, the national collation of archives released from official secrecy restrictions provides a vast documentation to assess. See Mitric, 2011.

²⁹ See examples in Konczewski, 2020.

³⁰ For example, see the tabulated estimates in relation to Croats and others in the Yugoslav region 1939-1948, including from camps and the Bleiburg repatriations. An estimate one to two million died from all causes. In Geiger, 2012.

³¹ Abramov *et al* 2015.

³² Clegg, 2021.

³³ Tradii, 2023.

³⁴ Hausmair *et al*, 2021.

³⁵ See a summary of Halacha law and the political and cultural tension concerning holocaust mass graves in Colls and Colls, 2023. 3, pp.25-30.

³⁶ Reports and proceedings of the 8 April European public hearing on “Crimes Committed by Totalitarian Regimes”, see Jambrek, 2008.

³⁷ See ‘Legal Frameworks Related to Mass Grave Preservation and Documentation’ in Hanson *et al*, 2023, 457-458.

³⁸ Hanson *et al*, 2015, 24.

³⁹ Described in ICTY trial judgement, *Prosecutor v Banovic* [28 October 2003] Sentencing Judgment, IT-02-65/1-S at 9.

⁴⁰ Dusko Sikirica was the commander of Keraterm camp in 1992 and arrested 25th June 2000, see Washington Post, 2000. He was sentenced to 15 years in prison in 2001, see ICTY 2001.

⁴¹ Archaeological terminology uses the words 'robbed' and 'robbing' to describe features such as graves or walls which have had their original filling material intentionally removed. Discussed in *Prosecutor v Tolimir* [12 December 2012] Judgment, T-05-88/2-T at 214, footnote 2106; *Prosecutor v Popovic et al* [10 June 2010] Judgment, IT-05-88-T at n4.

⁴² Described in ICTY trial evidence from the *Prosecutor versus Milosevic* [29 May 2003]: Transcript of Testimony of Witness B-1775, IT-04-54-21319-21383 and the *Prosecutor versus v Seselj* [09 January 2009] Transcript of Testimony of Witness B-1775 -IT-03-67-T-13207-13211.

⁴³ Excavation summarised in ICMP 2008b.

⁴⁴ Described in Krikler, 2023, 8.

⁴⁵ See testimony of Riedlmayer, 2006, para 64.

⁴⁶ Report of Richard Wright, 1999 and discussed in *Prosecutor versus v Jeljic* [02 September 1999] Trial Transcript, IT-95-10 763-777.

⁴⁷ See Riedlmayer, 2002: Appendix 7. Brčko 7.2. Sava Mosque, 1-4. Available at: <https://heritage.sensecentar.org/assets/bosnia-herzegovina/sg-5-05-destroyed-buildings-eng.pdf> . Accessed 30-07-23.

⁴⁸ Excavation summarised in ICMP 2008.

⁴⁹ See descriptions of the Brcko mass grave and ICTY legal process in McDowall, 2009a.

⁵⁰ See summaries of destroyed religious buildings in Cano, 2008.

⁵¹ See trial testimony during cross examination in *Prosecutor versus Karadzic* [09 December 2011]: Transcript of Testimony of Andreas Riedlmayer, IT-04-54-22572-22575.

⁵² The properties of robbed graves are discussed in Hanson 2023, 64-65.

⁵³ Report of Richard Wright, 2000

⁵⁴ Excavation summarised in ICMP 2008a.

⁵⁵ Described in ICTY trial evidence from the *Prosecutor versus Karadzic* [20 February 2014]: Transcript of Testimony of Witness Momcilo Gruban, IT-04-54-47478.

⁵⁶ See for example indictments issued concerning Zecovi village in: Prosecutor's Office of BiH, 2017, and concerning Carakovo in: Prosecutor's Office of BiH, 2012.

⁵⁷ See The Guardian for examples of families searching for the missing concerning Carakovo village and related mass graves, in Vulliamy, 2016.

⁵⁸ For trial judgement summaries relating to these events, graves and arguments, see *Prosecutor versus Karadzic* [24 March 2016] Public redacted version of judgement, IT-95-5/18-T, 2175-2180.

⁵⁹ Questions raised by the accused in cross-examination. See *Prosecutor versus Karadzic* Transcript of Testimony of Richard Wright, IT-95-5/18-T 22308-23314.

⁶⁰ The "asanacija" term was applied by perpetrators to the clandestine removal of bodies from the primary graves, see ICTY trial judgement *Prosecutor versus Tolimir* [12 December 2012], Public Judgement, IT-05-88/2-T 12, at 560 and footnote 2468. See cross examination arguing for presence of combat casualties in secondary graves in *Prosecutor versus Mladić*, Transcript of Testimony of Dean Manning [11 July 2013] IT-09-92-T-14252-14256 and 14260-14265.

⁶¹ Described in trial judgements. See *Prosecutor versus Mladic* [22 November 2017] Public version of judgement with confidential annexes, Volume III of V, IT-09-92-T, 1580-1583.

⁶² Excavation summarised in ICMP 2008b.

⁶³ See Hanson 2023.

⁶⁴ See Salihbegović et al 2018; *Prosecutor versus Mladić*, Transcript of Testimony of John Clark [1 July 2015] IT-09-92-T-36586-36591.

⁶⁵ See Baraybar and Gasior, 2006.

⁶⁶ See trial testimony in *Prosecutor versus Mladić*, Transcript of Testimony of Thomas Parsons [29 June 2015] IT-09-92-T-36413-36469.

⁶⁷ See trial testimony in *Prosecutor versus Mladić*, Transcript of Testimony of Ewa Tabeau [07 July 2015] IT-09-92-T-36735-36736.

⁶⁸ The way ‘the perpetrators treated their victims after they killed them’ as part of a specific intent to destroy and conceal, including the moving and destruction of bodies, and claims they are combatants to refute allegations, is dealt with extensively in Fournet, 2019 ‘Nothing Must Remain’, 241–55.

⁶⁹ See details of the case including primary grave locations, cause of death and impacts of movement and burial in Haliti et al, 2023.

⁷⁰ Described in Stojanovic, 2020.

⁷¹ Excavation described in detail in Djuric and Starovic, 2015, 149-152.

⁷² Stojanovic and Bami, 2020

⁷³ See details of karstic cave formation and case studies in Simmons, 2002, 263-275.

⁷⁴ See ‘Croatia Moves to Expose Its Ugly Secret’ in Smith, 2000.

⁷⁵ “Now we may have a problem” Croatian officials were quoted as saying on exposure of recognisable victims in the grave. Described in Wright, 2010, 103.

⁷⁶ See press release summary for *Prosecutor versus Tihomir Orešković and Others* Judgment and Decision [02 June 2004] No. I Kž 985/03-9.

⁷⁷ The ICTY ‘will assist all other judicial organs on the territory of the former Yugoslavia, including those in Serbia and Montenegro, in their efforts to try crimes, given that it is expected that local courts will be precisely the ones to try crimes committed by citizens of their government’. In *View from the Hague, trial against Mirko Norac*, ICTY, 2004, 6-7.

⁷⁸ See Karcic, 2023 for examples from Balkans conflicts.

⁷⁹ See journalist’s account of burial ceremony and history of events in Harden, 1991.

⁸⁰ Prebilovci and the impact of exhuming WWII mass graves after Tito’s death described in Judah, 1997, 133.

⁸¹ A review of over 3000 body bags in 12 mortuaries across BiH was undertaken by prosecutors supported by ICMP. See details of this ‘NN’ review in Hanson *et al* 2016, 664-666.

⁸² This first systematic use of such environmental evidence used in a major war crimes investigation is described in Brown, 2006.

⁸³ ‘Church Accused of ‘Senseless Provocation’ in Srebrenica’ in Jukic, 2013.

⁸⁴ Trial judgments have concluded between 1508 and 1708 victims were buried at the Branjevo Farm (Pilica) mass grave. See *Prosecutor versus Mladic* [22 November 2017] Public version of judgement with confidential annexes, Volume III of V, IT-09-92-T, 115673.

⁸⁵ Hanson, 2013.

⁸⁶ See ‘Bosnia: Fight Over Church Spreads Tension’ in Pazarac, 2005.

⁸⁷ See ‘Demolition Begins of Church Illegally Built in Bosnia's Republika Srpska’ in *RFE/RL's Balkan Service*, 2021.

⁸⁸ A detailed analysis of geospatial intelligence used to locate Srebrenica massacre graves can be found in Netherlands Institute for War Documentation, 2002,

⁸⁹ Summarised in *Prosecutor versus Mladic*, Public version of judgement with confidential annexes, Volume III of V IT-09-92-T [22 November 2017 at 2572-2573.

⁹⁰ The images used to locate graves were submitted as evidence in trials was collated by the Prosecutor's Office, ICTY. See *Srebrenica Mass Graves Primary and Secondary Mass Grave Aerial Imagery*, ICTY evidential document, 69.

⁹¹ The use of imagery to interpret anomalies and compare to excavation results is described in trial testimony See *Prosecutor versus Blagojevic and Jokic* [5 February 2004] Transcript of Testimony of Dean Manning IT-02-60-T-7154-7163.

⁹² A series of images presented in ICTY trials showing the Branjevo Farm mass grave, including figure 3. can be found in *Srebrenica Mass Graves Primary and Secondary Mass Grave Aerial Imagery*, ICTY evidential document, 69, images 16-19.

⁹³ Sharper photos than those provided to ICTY of Branjevo Farm mass grave were seen by NIOD staff during research that clearly showing a larger and a smaller group of bodies, lorry tracks and digging operations. See Netherlands Institute for War Documentation (2002), 311.

⁹⁴ Excavation summarised in ICMP, 2011.

⁹⁵ Imagery showing disturbed earth at Konjevic Polje, presented in ICTY trials. Available at: <https://aleph.occrp.org/datasets/182?cslimit=30&csq=disturbed%20earth#mode=search&preview%3Aid=2122420.5bf1cbffbb7d13697b007f9677eb316de90ffc88&preview%3Aprofile=true> .Accessed 01-08-23.

⁹⁶ There is a 120-year precedent for repatriation of war dead (see Hanson *et al* 2023) and consistent familial interest in finding and identifying the missing even after a century. Details of the Fromelles work can be found in Loe *et al*, 2014.

⁹⁷ See research by Babic *et al*, 2001.

⁹⁸ See ‘No Remorse: A Croatian WWII Camp Commander on Trial’, Milekic, 2018.

⁹⁹ See, ‘How Croatia's Jasenovac Camp Turned Men into Brutal Killers’ in Kjerte, 2023.

¹⁰⁰ See discussions concerning the ‘controversies, manipulations and politics of memory’ of Jasenovac in Pavlakovic and Kuznar, 2023, and concerning the wider typical ‘political milieu’ of mass graves in the Balkans in Djurić and Pavlović, 2021.

¹⁰¹ *Elie Wiesel Genocide and Atrocities Prevention Act of 2018*, Congress.gov text- S.1158.

¹⁰² In the *Geospatial Support for Atrocity Accountability Act*, Congress.gov. H.R.7758 and the *James M. Inhofe National Defense Authorization Act for Fiscal Year 2023*, Congress.gov. H.R.7776.

¹⁰³ Summarised in the press release for the introduction of the Geospatial Support for Atrocity Accountability Act, 12 May 2022 at. <https://stefanik.house.gov/2022/5/stefanik-spanberger-introduce-geospatial-support-for-atrocity-accountability-act>

¹⁰⁴ Developing coordination to undertake ‘effective action to anticipate, prevent, and respond to atrocities, in coordination with partner governments, and international, civil society, and local partners’ is discussed in *Bureau of Conflict and Stabilization*, 2022 and ‘increasing awareness of these approaches’ in *HC 992*, 2023.

¹⁰⁵ In Hanson, 2022.

¹⁰⁶ Described in Hanson, 2013.

¹⁰⁷ See excavation findings in Wright, 2001 and image 6 in ICTY 2012.

¹⁰⁸ Defined in Edward Harris, *Principles of Archaeological Stratigraphy* (Academic Press 1979), 30-39.

¹⁰⁹ *ibid* 40-41.

¹¹⁰ Concern over forensic science standards has been summarised in several national reports and codes of practice that outline principles, see for example, 'Strengthening Forensic Science in the United States', National Academy of Sciences, 2009 and the United Kingdom House of Commons Science and Technology Committee 'Forensic Science on Trial', HC 96-I, 2005.

¹¹¹ For example, the 'single context recording system' described in MOLAS, 1994.

¹¹² For examples of the description and discussion of published best practice, stratigraphic principles and methods of excavation during testimony see *Prosecutor versus Mladić* [24 and 25 June 2015] Transcript of Testimony of Ian Hanson IT-09-92-T-36245-36247 in relation to the Tomasica mass grave.

¹¹³ See for example, testimony of archaeological evidence for robbing *ibid*, 36277-36286, and queries by judges and defense, *ibid*, 36299-36303.

¹¹⁴ See excavation findings in Haglund, 1996 and Peccerelli, 2000a.

¹¹⁵ Lazete mass grave findings described in *Prosecutor v Tolimir* [12 December 2012] Judgment, T-05-88/2-T at 425-439.

¹¹⁶ See for example Evis *et al* 2016.

¹¹⁷ Described in detail in Djuric and Starovic, 2015, 152-153.

¹¹⁸ Re-excavation of mass graves in Bosnia, including Lazete (2000), Branjevo Farm (2013), Tomasica (2013), Jakarina Kosa (2015), Kozluk (2015) and Koricanske Stijene (2017).

¹¹⁹ See *Prosecutor versus Mladic* [23 October 2014] Decision on prosecution motion to re-open its case-in-chief. IT-09-92-T.

¹²⁰ Detailed in ICMP, 2015 and Dzidic, 2015.

¹²¹ Paraphrasing 'excavation the unrepeatable experiment' in Barker, 1993, 1-2.

¹²² See for examples Wright *et al* 2005, Cox *et al* 2008.

¹²³ The positions of bodies recorded through digital survey were presented as three-dimensional rotatable images using bespoke software 'Bodies3D' developed for the task by Richard Wright. Available at: <https://app.box.com/s/lpvstj4kz88na1xg92zk> . Accessed 06-08-23.

¹²⁴ For example, the Srebrenica Kozluk primary grave, see figures 3,4, 5 and 5b in Wright, 2000a.

¹²⁵ See for example Yazedjian and Kesetovic, 2008 and Sarzinski, 2018

¹²⁶ ICMP DNA bone sampling procedures have developed as a result, and have been disseminated widely to other organisations. See Hines *et al*, 2014.

¹²⁷ See *Srebrenica Figures*, ICMP, 2023.

¹²⁸ Described in the Hedley, 2001.

¹²⁹ Surface distributions of shell casings and cranial fragments indicating execution sites were surveyed at the Petkovici Dam (1998), Kozluk (1999 and 2015), Lazete (Orahovac) 1 and 2 (2000), Kravica Warehouse (2000) and Branjevo Farm (2013). See for example distribution maps in Peccerelli 2000 and 2000a.

¹³⁰ See details of the assessment of evidence in Hanson 2023, 70-74.

¹³¹ See *Prosecutor versus Popovic et al* [10 December 2010] Transcript of Testimony of Dean Manning IT-05-88-T-18954.

¹³² See the findings concerning ‘burial operations’ in *Prosecutor versus Mladic* [22 November 2017] Public version of judgement with confidential annexes, Volume III of V, IT-09-92-T, 1574-1583.

¹³³ Summaries of the grave locations, aerial images, evidential links, and number of DNA profiles per grave related to Srebrenica graves were summarised by the prosecution. See Manning 2000 and 2007, and Janc, 2010.

¹³⁴ Described in trial testimony *Prosecutor versus Mladić* [24 and 25 June 2015] Transcript of Testimony of Ian Hanson IT-09-92-T-36283-26285.

¹³⁵ For example, see ‘Legal Obligations’ published by the United Kingdom Forensic Science Regulator, 2014, with ‘Standards and Guidance for Forensic Archaeologists’ published by Cifa, 2014, and the United States ‘Daubert Standards’ concerning anthropologists, discussed in Lesciotto, 2015.

¹³⁶ See Klinkner, 2016.

¹³⁷ Cifa, 2014, 14.

¹³⁸ See examples provided in MOLAS, 1994 and Cox *et al*, 2008, 26-35 and ICMP, 2014.

¹³⁹ See Wright *et al*, 2005, 153.

¹⁴⁰ Cifa 2014, 15-19.

¹⁴¹ See *Prosecutor versus Jeljsic* [02 September 1999] Trial Transcript, IT-95-10 at 773, 2-20.

¹⁴² See *Prosecutor versus Mladić* [24 June 2015] Transcript of Testimony of Ian Hanson IT-09-92-T-36288-36291.

¹⁴³ See for example defence objections concerning expert reports related to the Tomasica mass grave in *Prosecutor versus Mladic* [22 December 2014]. Defense rule 94bis notice and objection relative to proposed prosecution notice of disclosure of expert reports related to the Tomasica mass grave pursuant to rule 94bis and motion to enlarge word count. IT-09-92-T.

¹⁴⁴ See details of the Unified Court Records Database, IRMCT, 2020.

¹⁴⁵ Brown, 2011, 1. There must always be a presumption that reviews of records and archives will take place in the future.

¹⁴⁶ See discussions in Ward, 2022.

¹⁴⁷ As a prompt for such considerations, the author uses a context recording form (based on the widely used version from MOLAS 1994) that asks for written justification for interpretations.

¹⁴⁸ Discussed in Klinkner, 499, with investigative summaries in Manning 2000.

¹⁴⁹ Discussed in detail in Fournet, 246-249.

¹⁵⁰ ‘The surviving topography, alterations, deposits, artefacts and materials left in the natural and / or cultural landscape within a given timeframe, concerned with and related to a specific sequence of unlawful events.’ Defined in Hanson *et al* 2023, 452.

¹⁵¹ Discussed in Krikler, 2023, 2.

¹⁵² See the summary of Riedlmayer's testimony in *Prosecutor versus Mladic* [22 November 2017] Public version of judgement with confidential annexes, Volume III of V, IT-09-92-T, at 2403.

¹⁵³ *ibid*, at 3415.

¹⁵⁴ Powderly, 2022, 438.

¹⁵⁵ Discussed in detail in Krikler, 2023, 5.

¹⁵⁶ *Prosecutor versus Mladić* [25 June 2015] Transcript of Testimony of Ian Hanson IT-09-92-T-36359, 16-18, with possible reasons for partial robbing discussed in Hanson 2023, 65, footnote 97.

¹⁵⁷ See Janc, 2012, 2-6.

¹⁵⁸ See Fournet, C. (2017).

¹⁵⁹ O'Donnell 2018, 373-376.

¹⁶⁰ \For a summary see the introduction in Groen *et al*, 2015.

¹⁶¹ See table 1, 'The uses of classes of physical evidence recovered from mass graves' in Hanson *et al* 2023, 455-456.

¹⁶² See for example 'The archaeologist as detective', Henderson, 2004, 147-158.

¹⁶³ From the opening statement of the ICTY Prosecution in the trial of General Radislav Krstic. See Mark Harmon's presentation in McDowall, 2009, 38.

¹⁶⁴ See conclusions on 'perpetrator learning' in Straus, 2016, 234.

¹⁶⁵ See preface in Fox 1999, vi.

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