Excavating Justice: A Fifty-Year Perspective on Forensic Anthropology and Mortuary Archaeology

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Abstract

Two distinct academic disciplines and areas of practical activity – archaeology and biological anthropology – evolved in parallel until recent decades, probably having significant synergies in paleoanthropology only. However, the combination of expertise in these two fields became in high demand. Reasons included the identification and legal evaluation of victims of mass disasters, wars, and civil conflicts of the twentieth century, with Europe being a particular arena of such state-sponsored conflicts that caused millions of deaths, not only among combatants but also among civilians. Demands for interdisciplinary collaboration have transformed archaeology into a research field in which specialists from multiple disciplines, especially bioanthropology, jointly contribute to a more comprehensive understanding of violations of international law, including war crimes, crimes against humanity, and genocide. Discipline often covers a specific "grey zone" between humanitarian and human rights investigations: humanitarian investigations typically conclude without judicial proceedings, whereas human rights investigations are grounded in judicial processes that may occur at the national level (under domestic law) or at the international level (under international law or human rights law). European experience is being summarised and discussed regularly on a couple of specialised platforms. However, a set of ethical concerns and professional standards has not been formally established.

Keywords: forensic anthropology, forensic archaeology

Introduction

During the 17th and 18th centuries, notably in England and Scandinavia, cemeteries began to be appreciated as important historical locations. This recognition led to the foundation of mortuary archaeology as a specialized discipline. Subsequently, systematic recording protocols were created, facilitating the identification of variations in burial practices. By the middle of the 20th century, with bioarchaeology established as a separate subfield, burial grounds provided insights not only into funerary rituals but also into the reconstruction of past ways of life, health status, dietary habits, mobility, and reasons for death.

Kadikinaitė-Mickė J, Čičiurkaitė I, Jankauskas R. Excavating Justice: A Fifty-Year Perspective on Forensic Anthropology and Mortuary Archaeology. In: Kaczmarek M, Mascie-Taylor CGN, editors. Humans in Context: Integrative Perspectives on Growth, Evolution, Health, and Adaptation. Amsterdam: European Anthropological Association, Poznań: Bogucki Wydawnictwo Naukowe; 2026. p. 216–223. ISBN 978-83-7986-598-7. https://doi.org/10.12657/978-83-7986-598-7-23

The European Anthropological Association, Amsterdam • Bogucki Wydawnictwo Naukowe, Poznań

The twentieth century witnessed not only technological but also moral ruptures. Global conflicts and the mass deaths caused by totalitarian regimes left countless mass graves worldwide, Europe being no exception. This prompted the development of forensic archaeology and mass grave investigation methodologies focused on identifying human remains, reconstructing burial contexts, and systematically collecting evidence. At the same time, it triggered the fast growth of forensic anthropology, initially defined as the application of biological anthropology to legal processes. Growth of the field was driven by the increasing need for expertise in mass disasters, war crimes, and cases involving decomposed and/or skeletal remains [1]. Concurrently, the understanding of skeletal manifestations of violence expanded, enabling the more complex analysis and the conceptualisation of social trauma, coercion, and collective memory. This way, the role of forensic anthropology became increasingly relevant in the study of modern conflicts and mortuary archaeology [2]. The cumulative outcome was the establishment of interdisciplinary collaboration, transforming archaeology into a research field in which specialists from multiple disciplines jointly contribute to a more comprehensive understanding of human history. The primary purpose of this chapter is to present the co-evolution and future of forensic anthropology and mortuary archaeology as interconnected disciplines, to discuss the shift in the understanding of this field while presenting some most significant cases around Europe, where forensic anthropology and forensic archaeology worked hand in hand to provide society with better understanding of violent events as well as disclosure of truth and providing hard evidence for justice.

Co-evolution and synergies

The origins of forensic anthropology as a distinct scientific field are linked to biological anthropology and date back to the 19th century in Europe, when anthropologists and/or anatomists started to be involved in solving forensic cases [3]. By the mid-20th century, the discipline consolidated and was perceived as distinct rather than an extension of anatomy. The modern era began when the term 'forensic anthropology' came into use to refer to experts in the field. The modern era also marked a shift from academia to applied science, providing the opportunity to develop this field, create and apply modern methodologies, and employ forensic anthropologists for hands-on case work. The modern-day period, however, is more complex and requires additional attention. Alongside many technical developments and methodological advances, the 21st century has once again shifted the understanding of forensic anthropology. The now-standardised discipline has much broader responsibilities, no longer limited to the identification of human remains. These responsibilities include additional human skeletal analysis with a focus on an individual's life, death, and post-mortem experience [4]. This takes into consideration not only skeletal analysis, but also the forensic contexts of where the remains were placed post-death [4]. This raises awareness of forensic taphonomy where expertise in archaeology is needed, and highlights the importance of collaboration between forensic anthropology and archaeology in crime scene investigation and exhumation of remains, as well as in such collaborations [5].

Today, archaeology is increasingly integrated into forensic sciences. However, until the late 20th century, forensic investigation focused predominantly on laboratory analyses, while crime scene examinations were often neglected. Shifts in perspective regarding the importance of *in situ* investigation and the contribution of archaeological methods were initially driven by anthropologists and archaeologists in the United States and the United Kingdom. By the 1970s,

North American forensic anthropologists began advocating for archaeology as a discipline capable of providing critical contextual information about the *in situ* positioning of human remains [6]. This also addressed concerns that non-professionally conducted exhumations frequently resulted in the loss or destruction of evidence. Consequently, by the final decades of the 20th century, archaeological methods were incorporated into forensic medicine, though typically within the framework of forensic anthropology [7]. The earliest steps in this discipline involved individual cases in which archaeologists and anthropologists were called upon to assist law enforcement in locating buried evidence or human remains. Between 1990 and 2000, the first university-level training programs were established, and scholarly articles and monographs appeared analysing the applications of archaeology within forensic science.

The first investigations that laid the groundwork for contemporary forensic archaeology are considered to be the exhumations of victims of mass killings during the Second World War. Although earlier military recovery operations are known – for example, the British Army's searches and exhumations of soldiers' remains in France and Belgium between 1919 and 1921, conducted by military personnel without forensic or medical training – these activities were primarily humanitarian rather than legal in purpose. Written procedural guidelines issued in 1919 specified the location of graves, the exhumation of remains, and the recovery of personal effects for identification purposes [8]. The aim was to locate, identify, and reinter the deceased rather than collect evidentiary material or determine the cause of death.

Exhumations conducted during the Second World War differed from those of 1919–1921 in both purpose and the provenance of the burial sites. They also involved victims of state-led, institutionalised repression. Former exhumations are often described as "humanitarian exhumations" to relocate remains from temporary, deteriorated, or unmarked graves to formal cemeteries. Burial sites of repression victims, in contrast, were typically unmarked, clandestine, and lacked documentation regarding cause, time, or number of deaths. Investigating these graves yields both evidence of crimes committed and historically significant data. Consequently, Second World War exhumations of repression victims aimed primarily to collect evidence and identify those responsible for atrocities. While certain forensic evidence was documented, attention to individual identification was often limited. A notable early instance of using buried evidence to substantiate war crimes was the 1943 investigation of the Katyn Massacre in the Katyn Forest (Smolensk region, Russia) by a joint team of German and International Red Cross specialists [6].

Thus, the origins of forensic archaeology, as it is understood today, can be traced to the Second World War in the Eastern and Central Europe, the so-called *Bloodlands,* as described by T. Snyder, where territories experienced three occupations and were subjected to institutionalised violence perpetrated by multiple totalitarian regimes. Initially, victim investigations were driven more by propaganda than scientific or humanitarian aims. The disciplinary breakthrough for forensic archaeology occurred in 1984, following the fall of Argentina's military dictatorship, when searches for the Disappeared (*Desaparecidos*) were initiated to establish their fates. Multidisciplinary teams of local and international experts were assembled under the leadership of Dr. Clyde Snow, leading to the formation of the first forensic anthropology team, the *Equipo Argentino de Antropología Forense* (EAAF). Although earlier human rights investigations exist – such as the 1979 *Killing Fields* project in Cambodia, which sought judicially admissible evidence of Khmer Rouge crimes and to commemorate victims – these were organised by local authorities without international participation.

Sometimes forensic archaeology is described as a *career by mistake,* noting that, until the 1990s, the discipline did not exist in any organised form and only emerged following several events that highlighted the value of archaeological methods within forensic investigations: the ethnic cleansing during the Bosnian War (1992–1995), collaborations between UK law enforcement and archaeologists in homicide investigations, and the growing public interest in forensic experts through television programs from the early 2000s [9]. Although media coverage increasingly disseminated knowledge about forensic science, the most significant contributions to the discipline's development came from technological advances and the proliferation of scientific publications. Since 2000, there has been a rapid expansion of case studies, analyses of new methodological applications, practical exemplars, manuals, and standards. The availability of methodological guidelines has facilitated the establishment of forensic archaeology even in smaller countries.

The application of forensics (including all modern technologies) cannot be limited to strictly performing the requested tests for legal authorities. A more holistic approach is needed, as individual test results provide only short answers, especially when analysed separately; the science is more useful when a complete picture is provided by applying different approaches and combining their details [10]. Forensic archaeology is most commonly associated with investigations of violations of international law, including war crimes, crimes against humanity, and genocide. However, there is no clear boundary between general archaeology and forensic archaeology. Addressing the remains of victims of mass killings is particularly complex when extended periods – often fifty years or more – have elapsed under regimes responsible for the crimes, leaving little opportunity for investigation. The *right to know the truth* obliges states to conduct thorough inquiries to determine what occurred, why it happened, and who is responsible [11]. Assigning such remains solely to classical archaeology raises additional heritage management issues. A primary distinction exists between humanitarian and human rights investigations: humanitarian investigations typically conclude without judicial proceedings, whereas human rights investigations are grounded in judicial processes, which may occur at the national level (under domestic law) or at the international level (under international law or human rights law). Human rights violations necessitating the involvement of forensic anthropologists or archaeologists generally concern the right to life and/or the right to justice, both of which are protected under the Universal Declaration of Human Rights [12].

Over the past fifty years, cemetery archaeology has evolved from a specialised field focused on burial practices into a truly interdisciplinary domain, integrating advanced technologies and expertise from multiple disciplines to understand both specific and global historical events. Established within forensic science, it has become an essential component of investigations into armed conflicts and mass graves, serving not only states concerned with the fate of their military dead but also the academic community and broader society. Today, such burial sites reveal not only individual life histories but also form a foundation for collective memory among communities that have experienced repression.

The European experience

Case studies from around the globe demonstrate the importance of applying forensic anthropology and archaeology in investigating violent historical events. No doubt, an interdisciplinary approach is crucial to locating missing soldiers from the First and Second World Wars [13]. Moreover, such an approach is essential not only for identifying individuals but also for better

understanding the impact of war on society and researching war crimes or crimes against humanity. Therefore, it serves both historical and forensic purposes [13]. At the same time, it is important to remember that war is not just a geopolitical event; it also has a personal impact on individuals. Forensic sciences, especially archaeology and anthropology, working hand in hand, can help us better understand this and restore historical justice, even if it does not result in immediate legal action.

A great example of an interdisciplinary approach to searching for the deceased can be seen in the research into the Spanish Civil War, in which around 11,000 victims were recovered by 2021 [14]. The research not only provides identifiers (biological profiles and DNA), but also information on execution patterns and the manner of death in Spain during this period through trauma analysis. This topic became particularly important in the former Soviet bloc, especially in Soviet-occupied regions where post-war partisan resistance occurred. When the Soviet Union collapsed, people spontaneously began to look for their deceased loved ones. In Lithuania and Poland, for example, forensic anthropologists, archaeologists, and historians work together to find and identify not only those whose families are still looking for them, but also those without living relatives who sacrificed their lives for their homeland in an unequal fight, and this process is supervised by state institutions [15,16].

European experience is summarised and discussed on platforms such as the Forensic Anthropology Society of Europe [1] and the regular European Meetings on Forensic Archaeology (EMFA). National and international experiences are summarised in books such as [1,17].

Ethical concerns

Ethical concerns are important when working with human remains, and each individual must be treated with the utmost respect. Forensic anthropology carries an even greater responsibility in this field. Firstly, when working with identified (or to-be-identified) individuals, experts are not only working with their remains, but also with their relatives and sensitive information. As forensic anthropology and archaeology are relatively new disciplines, with many changes in understanding occurring in recent years due to technological advances and improved interdisciplinary communication, the development of ethical codes and understanding may seem a bit delayed [18]. While this does not mean that forensic work is performed unethically, it is notable that clearer guidelines regarding the research, teaching, publication, and presentation of forensic cases are needed [19].

Another issue is that, despite its great importance, forensic anthropology analysis in Europe is sometimes still performed without the involvement of anthropologists or osteologists, as it is considered to be a part of pathological examination. At the same time, there is a lack of education to prepare forensic anthropologists and archaeologists to work on such cases [2]. While this is understandable given that the discipline itself is relatively young, it raises another important question about work ethics in the field: who is qualified to perform such analyses and provide expert opinions on the circumstances surrounding an individual's death? Although the Forensic Anthropology Society of Europe (FASE) is trying to create standards for forensic anthropologists' work and develop a certification process for such specialists, the FASE certification may not be accepted by certain countries' legal systems, and vice versa.

Summing-up and future prospects

Over the past fifty years, cemetery archaeology and forensic anthropology have evolved from specialised fields focused on burial practices and person's identification into a truly interdisciplinary domain, integrating advanced technologies and expertise from multiple disciplines enabling to understand both specific and global historical events. Established within forensic science, it has become a central component of investigations into armed conflicts and mass graves, serving not only states concerned with the fate of their military dead but also the academic community and broader society. Today, such burial sites reveal not only individual life histories but also form a foundation for collective memory among modern communities. For a long time, the focus of forensic science was narrowed down to the "object" itself – the body or the murder weapon – and the subsequent laboratory analysis. However, as archaeologists and anthropologists highlighted the frequent destruction of evidence during recovery, the integration of archaeological methods into forensics began. This shift ensured that context became as vital as the find itself. Archaeology brought a crucial perspective to the field: the ability to see the *process*, not just the *result*. Once the "how to excavate" problem was addressed, a second vital question emerged: "where to find?" Initially, the search for remains relied on chance or witness testimonies. Occasionally, intuitive attempts were made using metal probes to feel for softer patches of earth. Here too, archaeology provides answers, as the discipline is inherently designed to analyse landscapes for subtle anomalies. Shortly after a body is buried, the landscape may exhibit irregularities in terrain or shifts in vegetation. In the final decades of the 20th century, geophysical methods – such as Ground Penetrating Radar (GPR), magnetometry, and electrical resistivity – were introduced, allowing for soil assessment without destructive intervention. These advancements led to the formation of standardised search guidelines. The process typically begins with remote sensing: evaluating the area via satellite imagery, historical orthophotography, or LiDAR (Light Detection and Ranging) data. Once potential sites are localised, they are surveyed using geophysical tools, followed only then by probing. These stages are not a universal panacea; every search is subject to unique environmental variables that can either help or hinder, meaning methodologies must always be adapted to the specific site [20]. Despite decades of use, modern geophysical surveys and traditional probing have not replaced one another. Consequently, the search for remains has evolved from an intuitive task into a rigorous scientific field. These modern advancements have allowed us to move away from "brute force" methods, such as using excavators that destroy stratigraphy and micro-evidence. Ultimately, the goal is not merely to find the remains as quickly as possible, but to preserve the evidence, requiring a search strategy tailored to the specific natural, urban, and geological conditions of the site.

Forensic anthropology also has expanded greatly since the beginning of the 21st century, with trauma analysis being a key focus. This is because determining traumatic events (ante-, peri-, and post-mortem) is the responsibility of forensic experts. Great attention is also given to studying the taphonomy of the deceased, which plays a huge role in the interdisciplinary approach of forensic science as a whole [21]. However, not only anthropological-archaeological collaboration is relevant to forensic science. Recent studies demonstrate how isotope analysis can provide a clearer picture of the deceased's origin [22]. This approach is becoming increasingly relevant in today's cosmopolitan world, where ancestry or ethnicity does not always accurately reflect the homeland of the investigated individuals. The application of genetics and DNA has also had a dramatic impact on the field, as the identification process has become more

structured, clear and, most importantly, accurate [23]. Another notable development is forensic facial imaging. While DNA analysis is the primary tool for identification, it is important to find leads on whom to compare the deceased's genetic information, or in cases when such genetic information is not available [24]. For this reason, not only biological profile, past traumas and diseases is studied, but craniofacial comparison can also be used as an effective way of excluding potential matches from the missing persons database [22]. For this specific task, another high technological achievement – artificial intelligence (AI). Although AI conclusions still require reevaluation and approval by forensic experts, and forensic work remains highly manual, an increasing number of tools are becoming available to assist forensic anthropologists in their daily work [25].

This way the forensic work (including all above-mentioned methods) is not limiting itself to strictly performance of the inquiries for legal authorities. A more holistic approach is emerging, as individual test results only provide short answers, especially when analysed separately; the science itself is more useful when a full picture is provided by applying different approaches and combining their details [26]. Such modern requirements point to the necessity of more effective system when legal experts, forensic anthropologists and archaeologists are closely collaborating [1].

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Authors' contributions

JK-M data on forensic anthropology collection and synthesis; IČ data on forensic archaeology collection and synthesis; RJ concept development, writing and editing final text. The authors read and approved the final version of the manuscript, and agree to be accountable for all aspects of the work.

The authors declare no conflicts of interest.