

# Chapter 11

## Forensic Archaeology in Denmark: A Work in Progress



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**Abstract** There has been formalised collaboration between the Danish National Police and Moesgaard Museum since 2010. While this relationship was initially characterised by happenstance, through personal contacts and close dialogue, it has since undergone progressive development. The cooperation relates to actual criminal investigations but, to an equal degree, also encompasses knowledge sharing through excavation courses and lectures, so that both police and archaeologists are professionally better equipped and qualified in relation to these cases. This close working arrangement is under continual refinement, both professionally and methodologically, and has since 2015 acquired an international aspect in the form of cooperation under the auspices of the European Network of Forensic Science Institutes (ENFSI). A brief account is given here of the Danish museum and police organisations, forensic archaeology and crime statistics in Denmark and the practical nature of the cooperation between archaeologists and the police. The article concludes with a presentation of a number of cases that shed light on various tangible aspects of the collaboration and an assessment of what the future holds.

**Keywords** Forensic archaeology · Historical overview · Crime scene investigation · Viewshed analysis

### 11.1 Introduction

Forensic archaeology is a recent arrival in Denmark, and its application was initially characterised by personal contacts and happenstance. Moreover, as there is no official forensic archaeological training available in Denmark, and relevant cases are relatively few and far between, it is crucial to maintenance of standards and method

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development that it is the same people who undertake the individual investigations. Consequently, a formal collaboration has been established between the Danish National Police, Moesgaard Museum and the Department of Forensic Medicine at the University of Copenhagen. In order to facilitate an understanding of the interaction between archaeologists and the police, the two organisations are outlined below. For information on the Department of Forensic Medicine see Jørkov and Lynnerup (2015).

## **11.2 Archaeology and the Danish Museum Service**

In Denmark, archaeological investigations are undertaken by 27 state-authorised cultural-historical museums, each of which is responsible for a specific geographical area. Collectively, these areas of archaeological responsibility cover the entire country, and the museums have the exclusive right to undertake archaeological investigations. The investigations are carried out by professional archaeologists trained at either Copenhagen or Aarhus University. Most archaeological activities take the form of so-called rescue excavations, which are undertaken in connection with various kinds of development or construction work and are subject to directives in the Museums Act. As a point of departure, it is always the developer in question who must finance the archaeological investigation. Because the museums have a monopoly-like status in this respect, and as the developers are not free to choose who they will work with, the entire area is subject to continual monitoring by a special agency under the Ministry of Culture, which must approve all investigations and ensure that professional standards are upheld. In parallel with this rescue archaeology, most museums also engage in various kinds of archaeological investigations and research excavations which are usually funded by private or state foundations.

Moesgaard Museum, where the author is employed, is one of the aforementioned 27 museums with archaeological responsibility. In addition to archaeology on land, the museum also has responsibility for the marine-archaeological heritage (jointly with four other museums) and for monitoring scheduled ancient monuments (jointly with nine other museums). The museum has close and formal collaboration with Department of Archaeology and Heritage Studies at Aarhus University, with whom it shares premises and office facilities. Even though it receives public funding from both the state and the local municipality, the museum is an independent self-governing institution and has its own governing body. This confers a greater degree of flexibility relative to museums that are municipally or state-owned, and this situation has proved to be particularly advantageous in the formative phase of the collaboration between the police and the museum.

### 11.3 Organisation of the Police

The police in Denmark, the Faroe Islands and Greenland are all part of one police force under the Danish Ministry of Justice, with the incumbent Justice Minister as their ultimate authority. The day-to-day running of the force is undertaken by the National Police Commissioner, together with a number of chief constables. With the implementation of a major police reform in 2006, 54 police districts were reduced to 14, 12 in Denmark, 1 on the Faroe Islands and 1 in Greenland, but the Danish National Police constitute the supreme Danish police authority. The Danish National Police are responsible for the formulation of strategies and for defining the frameworks and direction of the police's activities and for the undertaking of work on a national basis. In day-to-day activities, however, it is primarily the individual police districts that set the agenda, and there can therefore be a relatively large degree of autonomy between them.

In the event of more serious crimes, the individual police districts are though obliged to contact the Danish National Police. The latter have a dedicated support function in relation to criminal investigations in the police districts and are responsible for ensuring that national strategies are followed. Similarly, it is the Danish National Police who supply the necessary specialist competences and possess the methods, tools and techniques that are necessary for the investigative work.

Forensic archaeology and archaeologists are part of the Danish National Police's "toolbox", and forensic archaeology and anthropology can be included in the detection work to the extent that the Danish National Police consider relevant. As each police district has its own budget, which they obviously take care to manage closely, problems of authority may arise if the Danish National Police recommend or require the use of forensic archaeological support in a particular case, because it is not the Danish National Police who must finance this support, but the actual police district involved.

### 11.4 Forensic Archaeology

It is not possible to train specifically as a forensic archaeologist in Denmark as there is no dedicated course. Neither is there an official job title of forensic archaeologist, either in the museum world or within the police force or the judicial system. It is up to the police, or rather the Crown Prosecution Service, to evaluate whether information and indications (circumstantial evidence) resulting from a forensic archaeological investigation are to be included as evidence in potential legal proceedings. But as there are no rules, practices or legislation defining who can be employed as an expert witness, for example, a self-taught forensic archaeologist with no official accreditation like the author, it is exclusively up to the judge in each individual case to assess whether an expert can be used as a witness.

## 11.5 Crime Statistics

At present, it is unfortunately not possible to obtain a clear and manageable overview of criminal cases in Denmark, including those involving homicide. Denmark's central statistics office (Statistics Denmark) extracts information via the Police Record System (POLSAS), but the figures are subject to a degree of uncertainty, for several reasons: For some periods, including 2001–2009, there are simply errors in the data extracted from POLSAS,<sup>1</sup> but the police's way of recording cases involving homicide also has an influence. For example, a corpse will only be recorded as a homicide case if lesions (i.e. injuries) can be demonstrated that can unequivocally be linked to the cause of death. This applies even if the body has been buried! In other words, the official statistics contain a number of dark figures, and the actual number of homicide cases is probably slightly greater than that indicated by the official statistics. Despite these caveats and various statistical uncertainties, the figures display a remarkable consistency: They show that, over the last quarter of a century, there has been very precisely c. 1 homicide per 100,000 inhabitants per year (the Danish population is currently c. 5.7 million).

In addition to the information on criminal offences extracted by Statistics Denmark, the Research Division of the Ministry of Justice produces reports and statistics and undertakes research within a broad area of the ministry's activities, including a forensic approach. All their reports are freely accessible on the Ministry of Justice's web page, but unfortunately in most cases, they are written in Danish with no English summary.<sup>2</sup> There is currently no official report on homicide cases where the corpse was completely or partially buried. However, the author expects this situation to be rectified in the near future because Asser Hedegård Thomsen, specialist in forensic medicine at the Department of Forensic Medicine, Aarhus University, has, as part of his PhD thesis, examined all homicide cases from 1992 to 2016.<sup>3</sup> From his preliminary research, it is evident that in approximately 1.7% of all recorded cases of homicide, the victim was buried, giving an average of one case per year. Bearing in mind the aforementioned statistical uncertainty, and that a number of people are reported missing each year, some of whom may have been killed and buried but have not yet been discovered, it is not unreasonable to conclude that there are, on average, one or two cases each year where the victim has been buried. The distribution of this special kind of homicide case does not, however, appear to be even over time, as no clandestine graves have been discovered during the last 7 years. But this does not mean that there have been no cases where the victim was buried. Several individuals have been reported missing during this period, and some of these must, based on information and circumstantial evidence, be presumed to have been killed and possibly buried but have yet to be discovered. For examples of these, see below.

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<sup>1</sup> <https://www.dst.dk/da/Statistik/dokumentation/statistikdokumentation/ofre-for-anmeldte-forbrydelser/sammenlignelighed>

<sup>2</sup> <http://www.justitsministeriet.dk/arbejdsomraader/forskning/rapporter-vedr-forskningspuljen>

<sup>3</sup> Asser Hedegård Thomsen is thanked for the following information.

## 11.6 Collaboration Between Police and Archaeologists

There has been formal collaboration between the Danish National Police and Moesgaard Museum since 2010. Prior to this, however, there were several cases where police and museums worked together. For example, Nordjyllands Historiske Museum in Aalborg and Museum Lolland Falster in Nykøbing Falster have both occasionally aided police investigations. Cooperation between the police and Moesgaard Museum arose, as such things often do, almost by chance. A colleague, who is head of the Department of Environmental Archaeology and Conservation at Moesgaard Museum, has an acquaintance in the police who he invited, together with his colleagues, for a guided tour. His clandestine hope was that the police would perhaps be interested in making use of some of the department's classic archaeological skills in connection with their investigative work, for example, pollen analysis or plant macrofossil analysis. To flesh out the programme, the author was asked to give a lecture about forensic archaeology and the positive contributions that archaeologists could perhaps make to the work of the police. The lecture, naturally, dealt primarily with how archaeology can help in relation to buried corpses, but it also touched upon survey work, use of drones and the application of geophysics. No attempt was made to hide the fact that author's experience of police work was strictly theoretical and mostly based on reading a book by Hunter and Cox (2005) that was in the museum's library. In conclusion, it was mentioned that the author would of course be very willing to assist with future cases and that he would encourage the police to find a collaborative partner in whom they had confidence and then make consistent use of them in future cases, thereby ensuring the professional upgrading of competences and development of the field.

The lecture must, in some way or other, have made an impact, because shortly afterwards Moesgaard Museum was invited to become involved in the first police cases. In the beginning, the initiative came from the local police districts, but very quickly the collaboration began to go via the Danish National Police's official expert in burial cases,<sup>4</sup> and subsequently it became significantly more targeted and focused. One of the first actions was to establish contact and begin collaboration with the Danish National Police Dog Training Centre<sup>5</sup> and jointly setting up a series of courses in excavation techniques for forensic officers. The aim of these courses was not that the police should take over the work of the archaeologists but that they should become familiar with the basic principles behind archaeological practices so that they are able, on a qualified basis, to make demands and requests in connection with individual investigations. The first courses began in 2014, and by the end of 2017, all the forensic officers in Denmark had participated.

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<sup>4</sup>Police inspector Henrik Hougaard Jensen, Danish National Forensic Service (NKC).

<sup>5</sup>Detective inspector Jette Hardrup from NKC has been responsible for contact to the Danish National Police Dog Training Centre, initially via Ove Danielsen and since 2014 via police inspector Steen Stausholm.

The courses were, from the outset, made as realistic as possible. Various objects, for example, suitcases containing clothes, blood and decomposition fluids from corpses, are buried well in advance of the start of the course. The special cadaver dogs, systematically used for this type of case in Denmark, then get to work. The dogs react to corpse odour and to burials in general. Indications can therefore come in response to other kinds of burials, for example, weapons, or, as has happened on one occasion, the dogs may react to an unused grave or a grave that for some reason or other has not been completely dug. In most cases the dog picks up the scent along the cut edges of the grave, but if it is sited close to a perimeter drain or a sewer or in particular types of soil, the scent can wander from the actual place of burial and several metres out to the side. With time, it becomes increasingly difficult for the dogs to locate the grave, and other more customary archaeological methods must be employed, for example, removal of the surface soil by an excavator. When the grave has been located, the area is cordoned off, and other dogs (i.e. tracker dogs) search the immediate surroundings for relevant objects that can be significant for resolution of the case. It is first when possible objects have been found and secured that an access route is established to the grave and archaeologists and forensic scientists/officers are allowed on to the scene.

In recognition of the fact that these courses are intended for people who have very little or no prior experience of archaeological methods, very simple excavation-related principles are employed. There is great emphasis on the fact that the work undertaken should be easily comprehensible visually and that the resulting evidence must ultimately convince a judge and possibly a jury who have perhaps never seen an archaeological excavation. The approach employed involves special use of surfaces, both vertical and horizontal, in order to demonstrate and visualise what is inside the grave and what is outside it. Similarly, we work with emptying the grave from one side rather than from the top. We are well aware of the fact that traces left by the digging implements on one of the sides of the grave may be disturbed as a consequence, but we believe that the resulting greater degree of visual clarity outweighs these disadvantages. That said, it is important to emphasise in the courses that it is crucial to maintain an open approach to excavation methods and practices: It is always the individual case and the police's investigation that should form the basis for the choice of excavation methods. If the situation or circumstances demand, methods should be changed or adjusted in the process, so they are more appropriate to the observed conditions. As archaeology is clearly a destructive process, it is important to employ working procedures which ensure that the excavation method can be changed underway, if conditions prove to deviate from those originally assumed. Consequently, procedures are applied whereby work begins by only excavating a part of the grave and does not continue until there is complete assurance that the conditions have been fully understood in the particular situation (Fig. 11.1). Part of the course naturally deals with recording practices, and there is training in 3D recording with the aid of a method known as Structure from Motion (SfM), which has the advantage that it requires no special equipment other than a camera. In time, however, there is little doubt the Danish police will also begin to make use of various forms of handheld 3D scanners.



**Fig. 11.1** Forensic officers on an excavation course. First the grave is clearly identified in plan, after which it is excavated, beginning at the narrow end. Initially only one half of the grave is excavated. (Photo: Moesgaard Museum)

In parallel with the many courses and lectures, collaboration between the Danish National Police and Moesgaard Museum has become ever closer, and the forensic-archaeology group now encompasses five members from the Danish National Police and two from Moesgaard Museum, who meet on a regular basis.<sup>6</sup> This close collaboration is of crucial importance for the development of the field and has, since 2015, acquired an international perspective via participation in ENFSI. Moreover, both the police and the museum have participated in European Meetings on Forensic Archaeology (EMFA) and have taken part in, and arranged, excavation courses for European colleagues.

## 11.7 Presentation of Selected Cases

Over the last 7 years, there have been several cases where archaeologists from Moesgaard Museum have, in one way or another, aided the police: Brief accounts of several of these cases have been published previously. An account is given below

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<sup>6</sup>In addition to the aforementioned Henrik Hougaard Jensen, Jette Hardrup and Steen Stausholm, the group comprises police inspectors Michael Fønsskov and Sidsel Nielsen, all from NKC, and museum curator Camilla Bjarlø from Moesgaard Museum.

of closed or current cases that give an impression of the nature and extent of this collaboration.

The case that has demanded the greatest resources to date is from northwest Zealand. It relates to a minor who was sexually abused by several of her family members and other involved individuals over a number of years. The investigations revealed conclusively that the girl had given birth to a child in secret. According to information from the abused, the child was born in her childhood home, killed by the family members and subsequently buried in the garden in an area between two trees. The witness also stated that the grave was about  $1 \times 1$  m and of considerable depth, perhaps as much as 1 m, and that the baby was buried in a blue bag. The burial was said to have taken place 5–6 years prior to the beginning of the investigation in 2011. Before the actual excavation work, the area was scanned with ground-penetrating radar (GPR) by a private company. But these efforts gave very poor results, primarily as a consequence of the soil conditions but possibly also due to the use of outdated equipment. The indicated area was then investigated with a mechanical excavator, whereby very thin layers of soil were slowly and systematically removed (Fig. 11.2). An astonishing number of burials of household refuse were encountered, but most remarkable were the many animal burials: dogs, calves and even hens and chickens had been buried in the garden. The latter indicate that the soil conditions were of a character that even very small bones were preserved. There is consequently little doubt that even the bones of an infant would still be present in the soil. No grave was however encountered, even though the investigation area was massively extended. Ultimately, after three excavation campaigns, all accessible



**Fig. 11.2** Forensic search for the grave of an infant. Eventually the entire plot was investigated. (Photo: Moesgaard Museum)



areas on the plot had been archaeologically investigated. Consequently, the conclusion had to be reached that, at the time of the investigations, there was no grave. Whether there had previously been a grave is unknown. It is possible that the infant's body had been moved on a later occasion or that the grave had been destroyed by animals (foxes?). Two men were remanded in custody, but due to the lack of evidence, the charges were subsequently dropped.

Another case relates to a young Syrian divorcee and mother of two who was reported missing in 2015. Various circumstantial evidence gave reason to suspect that her ex-husband, also from Syria, could have had something to do with her disappearance. Furthermore, it was presumed that she had been killed and perhaps buried: Newly acquired digging tools were found in the accused's possession which he had great difficulty in explaining. But then he was generally very incommunicative with respect to the police. Based on circumstantial evidence, various woods were searched with dogs. In 2016, the dogs reacted to a small grave-like pit in a small wood located south of Vordingborg, after which Moesgaard Museum was sent for. There was no doubt that digging had taken place at the site, but only in the upper topsoil. This is very probably because the subsoil here is unusually hard and even with a mechanical excavator digging was difficult. The conclusion reached here was that a person or persons had attempted to dig a grave but had been forced to give up because they did not have the appropriate tools. Subsequently, the ex-husband was, based on circumstantial evidence, convicted of homicide and after serving his sentence will be subject to permanent deportation. The body has still not been found.

In 2009, a woman disappeared from her home in the Aarhus area in what later came to be known as the Lisbet case. A former boyfriend was remanded in custody but shortly afterwards committed suicide in his cell. Despite extensive investigations, a body was never found. Based on new information received in 2017, Moesgaard Museum was asked to assist in the search of a water-retention basin located near a motorway. Despite the exceedingly difficult excavation conditions, involving a more than 1-m-deep layer of mud and silt, the presence of a body could be conclusively dismissed.

In a series of minor investigations, graves have been searched for without any being encountered: One of these cases was in eastern Zealand in 2011. A witness stated that a missing and presumed murdered person had been buried and possibly also dismembered in a wood to the south of Køge. A police dog handler had, prior to his, searched the area without finding any trace. Manual exposure of the area revealed a number of minor disturbances, all of which proved to stem from the dog handler's exploratory excavations in the places where he believed his dog had indicated. No grave was encountered.

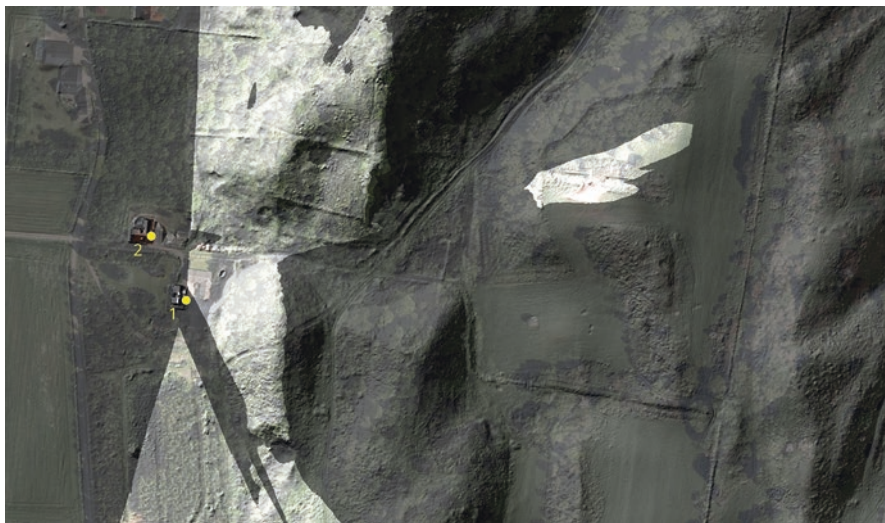
In 2014, at an asylum centre in northern Zealand, an asylum seeker confessed to the murder of another asylum seeker and pointed out the place where he allegedly had buried his victim. Even though the perpetrator did not appear particularly credible, the information was nevertheless taken seriously, not least because it was not possible to make contact with the presumed victim. It should however be said that it is not unknown for asylum seekers to disappear from asylum centres. The surface soil in the indicated area was removed with a mechanical excavator, and it very

quickly became apparent that no digging had taken place previously in this particular place. The conclusion was reached that the “perpetrator”, who was scheduled for deportation due to a number of serious assaults, was attempting to be imprisoned in Denmark, rather than be deported and serve his sentence in his homeland.

Moesgaard Museum’s wet-sieving equipment has also been put to good use on several occasions. In a very high-profile case near Odense, known as the double murder in the thousand-year forest, a married couple were completely wantonly gunned down with a machine pistol and further fired upon as they lay on the grass. Danish special forces undertook a metal-detector search of the area, but there was a suspicion that not all the projectiles had been found and Moesgaard Museum was contacted. The area was then searched again with metal detectors, and it quickly became apparent that there were several projectiles buried in the ground. An attempt was made to see if it was possible, through careful removal of the surface soil, to demonstrate the direction of fire for the individual projectiles. However, due to the soil conditions and the dense root mat formed by the grass, this idea had to be abandoned. Instead, the soil was transported to Moesgaard Museum where it was wet-sieved, and the remaining 8 of in all 32 projectiles were recovered. The perpetrator has since been convicted and imprisoned Bang (2014).

The museum’s sieving equipment has also been used in arson cases, involving either small amounts of material being transported to Moesgaard or the entire sieving set-up being transported to the scene of the crime. The latter was the case with an arson murder in western Jutland on New Year’s Eve 2015–2016. A woman was strangled with an electrical cord, and the house subsequently set on fire and burnt down. About 10 m<sup>3</sup> of material was wet-sieved, and parts of a mobile phone, important for the investigation, were recovered. A man, who incidentally had a previous conviction for murder, was subsequently convicted of the murder.

The last case that will be mentioned here is very recent, from late 2017, but has its roots much further back in time. In the 1940s, a man living in a very hilly area of western Zealand was involved in the resistance movement against the occupying German forces. One of his tasks was to take care of weapon consignments dropped from planes over Denmark by the Allies. At some time in 1944, there was apparently a fear that the Germans would pick up on these illegal activities. As a consequence, a large quantity of weapons, weighing possibly as much as a tonne, was buried in the hills to the east of the house where the family lived. The police focus on the case now, so many years later, is due to the interest of several criminal groups in the story and the risk that the weapons could once again come in circulation if these groups succeed in finding out where they were buried. It is evident from early aerial photographs that at the time the weapons were buried, the hills were largely treeless. With time, however, from the 1950s onwards, they became increasingly covered by woodland. The area today appears completely afforested, and in some places, access is difficult. According to an account passed down via the resistance man’s grandchild, there is potentially a large area where the weapons could lie buried. Combined with the difficulty of access, locating the weapons was therefore no easy task. The grandchild had though a couple of supplementary pieces of information. According to what he had been told, from the place where the weapons were



**Fig. 11.3** LiDAR scanning of an area where, in 1944, a large quantity of weapons was buried. In principle, the weapons could lie anywhere to the east of the resistance member's house (no. 2 on the plan). According to his grandchild, from the burial site, it was possible to see the gable of the house (no. 2) and the kitchen window of the neighbouring house (no. 1). A viewshed analysis based on this information has limited the potential area considerably. (Peter Jensen, Archaeological IT, Moesgaard Museum/Aarhus University)

buried, it was possible to see both the gable of the family's house and the kitchen window of the neighbouring house. Using this information, a viewshed analysis of the area was performed which limited the potential burial area substantially (Fig. 11.3). A survey was subsequently carried out, based on this analysis, and several areas were identified as being of potential interest. The investigations are still ongoing, so it is unknown whether the initial evaluations were correct.

## 11.8 The Future

In the only review of forensic archaeology in Denmark published to date, the previously mentioned article by Jørkov and Lynnerup (2015), it is stated in the conclusion that "it is difficult to see a more substantial use of forensic archaeology in Danish casework, and probably not in terms of archaeologist specialising in forensics". As is evident from the above, increasing use is being made of archaeologists by the police, not just in connection with the excavation of graves but also in other types of criminal investigations. And even though it is generally said in Denmark that *it is difficult to make predictions, especially about the future*, I nevertheless believe that forensic archaeology is here to stay – also in a Danish context. It is also to be expected that archaeological methods can be applied in other aspects of police

work. In particular, there appears to be a potential in relation to buried narcotics and weapons (terror), both of which are offences carrying a range of sentences comparable with those for homicide. Similarly, the author believes that excavation with archaeological methods will be able to make a positive contribution to the detection work in certain types of arson cases, especially those where everything has been burnt to the ground. That said, it should be made clear that the organisation which has been built up around forensic archaeology in Denmark is a fragile construction based primarily on personal contacts, and a serious lack of institutional anchorage is still felt. In this respect, work in progress under the auspices of the ENFSI to produce a Best Practice Manual and the possibility of obtaining accreditation as a forensic archaeologist will undoubtedly help.