

Seminar in Forensic Archaeology: Principles, methods, practices

25th-26th Sep 2024

Museum of Archaeology, the University of Stavanger - The Auditorium

Program

25th of September

09:30-10:00 Registration, coffee

10:00-10:15 Welcome and introduction by Hege Hollund

Current forensic practices and status of forensic archaeology

Session chair: Sean Denham

10:15-10:55 Tore André Walstad, Head of the Norwegian DVI department, and Mats Erik Lilleskjæret, Crime Scene examiner, The National Criminal Investigation Service (KRIPOS), Norway: *The work of the Norwegian Disaster Victim Identification Commission*

10:55-11:35 Clara Alfsdotter, Forensic archaeologist, Swedish National Forensic Centre: *Development and implementation of Forensic Archaeology in Swedish Forensic Practice*. Online presentation.

11:35-12:15 Bruno Antunes, forensic biologist and crime scene investigator, the Portuguese judiciary police, *The CSI Approach to Forensic Archaeology – the Portuguese reality*

12:15-13:00 Lunch

13:00 – 13:30: Marie Louise Jørkov, forensic anthropologist, University of Copenhagen: *Forensic Anthropology and Archaeology in Denmark*

13:30-14:00 Chiara Villa, forensic anthropologist, the University of Copenhagen: *Imaging techniques in Forensic Anthropology and Archeology*

Archaeologists in the Field

Session chair: Hege Hollund

14:00-14:30 Hilde Fyllingen, archaeologist, Museum of Archaeology: *How to 'read' soils*.

14:30-14:50 Break (demo of Georadar and 3D scanner)

14:50-15:20 Theo Bell and Massimiliano Ditta, archaeologists, Museum of Archaeology and Stavanger Maritime Museum: *Documentation: 3D scanning and photogrammetry*

15:20-15:50 Grete Moell Pedersen, archaeologist, Museum of Archaeology: *Revealing the unseen: Finding ancient graves and burial grounds with Ground Penetrating Radar in Archaeology*

15:50-16:20 Sean Denham, osteoarchaeologist, Museum of Archaeology: *The excavation of non-cremated/unburnt human remains: procedures and challenges*

18:00 Dinner – optional

26th of September

(Forensic) archaeologists in the laboratory

Session chair: Christian Lykke Ellingsen

09:00-09:30 Maiken Ueland, Forensic scientist, University of Technology Sydney: *Forensic taphonomy and its use in forensic and archaeological investigations*. Online presentation.

09:30-10:00 Mia Lampiainen-Avci, Palaeobotanist and Riikka Elo, entomologist, Turku University: *Plants and insects associated with human remains*

10:00-10:40 Kidane F. Gebremariam, analytical chemist, and Rebecca Cannell, geoarchaeologist: *Soil chemistry by X-ray fluorescence (XRF), graves and cemeteries*.

10:40-11:10 Break (optional visit to the conservation laboratory)

11:10-11:40 Sean Denham, Osteoarchaeologists, the Museum of Archaeology: *Analysis of human remains: reconstructing life and death*

11:40-12:10 Damla Kaptan, palaeogeneticist, Museum of Archaeology: *Population genetics and the challenges of working with degraded and contaminated DNA*

12:10-12:40 Lisette Kootker, isotope archaeologist, the VU university Amsterdam: *Isotopic analyses of human remains for provenance*.

12:40-13:10 Lunch

13:10-13:40 Hege Hollund, researcher and conservator, Museum of Archaeology: *Histotaphonomy: degradation processes in skeletal remains at microscope level*.

13:40-14:10 Patxi Perez Ramallo and Bente Philippsen, archaeologist and physicist, the National Laboratory for Age Determination, University Museum, NTNU: *Radiocarbon dating: opportunities, uncertainties, and sources of error*.

14:10-14:45 Discussion: *How to promote forensic archaeology in Norway – education, research, practices?*

Abstracts and bios

The work of the Norwegian Disaster Victim Identification Commission

Tore André Walstad and Mats Erik Lilleskjæret, the National Criminal Investigation Service, Norway

This talk will present the background for the Norwegian DVI Commission to be established, authorizations for the work, how we are organized, cases we have assisted in, and how we collaborate with other players in major incidents.

Mats Lilleskjæret is a Crime Scene examiner, based at Kripas, National Criminal Investigative Service (NCIS), Norway. His work primarily involves conducting crime scene investigations, with a specialization in bloodstain analysis. He is part of the national DVI-team, responsible for identifying victims in major accidents and events. His role is collection and documentation and post-mortem data – information about the found body or body part.

Tore Andre Walstad is based at Kripas, the National Criminal Investigation Service (NCIS), in Oslo. His regular work over 20 years has been as a fingerprint expert, with a focus on crime scene work, securing fingerprints and searching for prints in the NCIS fingerprint computer system. He has been a permanent member of the DVI Commission since 2008, and the last 3 year full-time as leader. On behalf of the DVI Commission, he has carried out identification work at several major incidents in Norway and abroad.

The formalization of forensic archaeology and anthropology within the Swedish Police Authority

The first attempts to incorporate forensic archaeological and anthropological work into the Swedish Police Authority dates back to the 1990's. While some successful collaborations occurred with academia, the initiatives were heavily reliant on the work of single individuals and did not amount to formalized professions within the Police. Later on, in 2018, a first person was employed as a forensic archaeologist at the National Forensic Center, a national division within the Police Authority. Today, three people are employed in this national capacity, including capacity in forensic anthropology. Currently, the formalization of the discipline(s) is taking place within the Police. At the same time, formalization work of forensic anthropology is taking place at the National Board of Forensic Discipline. This presentation will expand on these ongoing processes and what they entail for the disciplines in Sweden.

Clara Alfsdotter, Ph.D., is a forensic archaeologist at the Swedish Police Authority, and a researcher in forensic anthropology and taphonomy at the National Board of Forensic Medicine. She has over a decade's experience of contract led forensic archaeology and osteology, and specialized in forensic taphonomy and anthropology during her Ph.D. studies. She is an affiliated researcher at the Forensic Anthropology Center, Texas State university, where she has conducted decomposition research since 2018. Her research interest spans forensic anthropology /taphonomy, mortuary archaeology, and postmortem agency.

The CSI Approach to Forensic Archaeology – the Portuguese reality

Bruno Antunes

This presentation will briefly present the Portuguese approach to forensic archaeology, carried out in a more police-oriented approach and focused on evidence and solving crimes.

Bruno Antunes started working in the Scientific Police laboratory of the Portuguese Judiciary Police in 2004 as an Expert in forensic biology. He has been working as a Crime Scene Investigator since 2006, where he carries out the following tasks, among others: Approach, analysis, research, detection, collection, packaging and transport of all existing evidence at any crime scene. Scientific-forensic interpretation of the facts that occurred in them and carrying out reports of these same crime scenes examination. Responsible for carrying out examinations of crime scenes using Geophysical methods including ground penetrating radar (GPR). Archaeological mapping and field recovery and excavation of clandestine burials and body recovery using archaeological methods. Arson Investigations. Examination of Post-Explosion Crime Scenes. Reconstitution of firearm projectile trajectories in the context of forensic ballistics. Carrying out examinations and interpretation of crime scenes based on blood pattern analysis, based on the terminology of the International Association of Bloodstain Pattern Analysts, of which he has been a full member since 2009.

Antunes is an effective member of the Disaster Victim Identification Team of Portuguese Scientific Police. In 2019 he worked as an International Forensic Consultant in the Field of Crime Scene Investigation for the United Nations Office on Drugs and Crime (UNODC) (Cape Verde) and in 2016 for the Office of the Prosecutor (OTP) of the International Criminal Court (ICC) in Central African Republic.

Forensic Anthropology and Archaeology in Denmark

Marie Louise Jørkov

Marie Louise Jørkov will provide a brief overview of the status of forensic anthropology and forensic archaeology in Denmark. She will introduce how the organization and collaboration work between the Danish Police, the three Departments of Forensic Medicine, and other consultant partners in connection with crime scene investigations.

Marie Louise Jørkov is a bioarchaeologist and forensic anthropologist. She manages the Laboratory of Biological Anthropology and the Anthropological Collections at the Globe Institute and serves as a consultant in Forensic Anthropology for the Department of Forensic Medicine at Copenhagen University. In addition, Marie Louise is part of the Danish National DVI team and the specialized group for forensic archaeology headed by the CSI division of the Danish Police.

Imaging techniques in Forensic Anthropology and Archeology in Denmark

Chiara Villa

The presentation will provide a brief overview of how CT scanning and photogrammetry can be used in forensic anthropology and forensic archaeology in Denmark. In particular, an example will be shown where such 3D technologies were implemented for documenting and interpreting graves and human remains excavated in Ilulissat, Greenland.

Chiara Villa is a forensic anthropologist specializing in medical imaging and 3D technologies. She works as an Associate Professor in the Department of Forensic Medicine at the University of Copenhagen (DK). She uses several 3D techniques – CT scanning, MRI, surface scanning, photogrammetry, and 3D printing – to understand how bones change with age, disease, and trauma. She has worked with bones from archaeological and forensic contexts, as well as mummies from around the world. She is also involved in studies of paleontology, veterinary science, and cultural heritage.

How to «read» soil

Hilde Fyllingen

The job of an archaeologist is to identify human activity. A big part of this is understanding what took place and in which order. We work on sites that sometimes reveal thousand of years of activity so an important part is “reading” the soil in order to identify activity both in time and space. In my talk I will introduce you to this method and how this might be applied to forensic studies.

Hilde Fyllingen is cand.philol. in archaeology and has 29 years of experience as a field archaeologist. She works as a researcher at the Museum of Archaeology, University of Stavanger.

Documentation: 3D scanning and photogrammetry

Theo Gil Bell

This presentation will cover the routines and our experiences with photogrammetry in field archaeology. Photogrammetry is a powerful tool for creating highly accurate 3D models of excavation sites and artifacts. It enables detailed documentation of spatial relationships and structures in situ, preserving a digital record that can be analyzed and shared long after the physical site has been altered or closed. The technique enhances the precision of measurements, reduces the risk of data loss, and provides a valuable resource for further research and public dissemination.

Theo Gil Bell, who holds an MA in Archaeology from the University of Salamanca (Spain), has over 20 years of experience in field archaeology. He is a researcher, project leader, and GIS coordinator at the Cultural Heritage Management department of the Archaeological Museum at UiS.

Massimiliano Ditta

This talk will provide a general overview of the use cases and challenges of documenting archaeological materials with handheld 3D scanners. In recent years, structured light scanners have become more accessible and effective, rendering them indispensable tools for archaeological

documentation, especially in Nautical Archaeology. Thanks to their easy transportability, fast processing, and accuracy, they are ideal for the bulk documentation of objects or even complex sites. The presentation will discuss the methodology's workflow, results, and applications and its added value for research and other uses.

Massimiliano Ditta is a Maritime archaeologist at the Stavanger Maritime Museum (Norway) and a PhD fellow at the University of Stavanger.

His research interests and specialisations are boat- and shipbuilding technology, from prehistory to modern times, and digital documentation methods for nautical archaeology.

Revealing the unseen: Finding ancient graves and burial grounds with Ground Penetrating Radar in Archaeology
Grethe Moéll Pedersen

In this talk, she will show how The Museum of Archaeology in Stavanger, UiS, has been using Ground Penetrating Radar to locate, document, and explore ancient church sites in Norway. Since the advent of Christianity, thousands of churches have been built in Norway, with up to 2000 constructed during the Middle Ages alone. Some of these churches fell out of use even in the medieval period. Using Ground Penetrating Radar, a non-invasive method, it has become possible to map ruins, graves, and other elements at these ancient church sites without the need for large and costly interventions into cultural heritage sites. Our georadar group at the Museum of Archaeology has investigated various church sites, and the findings will be presented in this seminar.

Grethe Moéll Pedersen works as archaeologist and researcher at the Museum of Archaeology.

The excavation of non-cremated/unburnt human remains: procedures and challenges
Sean Denham

This talk will look at routines for the excavation and documentation of human remains as well as considerations when evaluating the information potential of various aspects of the burial context. It will also look at some of the challenges which can arise due to variation in preservation levels.

Sean Denham is a Senior Researcher and osteoarchaeologist at the Museum of Archaeology, University of Stavanger. He received his BA from Tufts University (USA) and his MSc and PhD from Queen's University Belfast (Northern Ireland). While he works with human and animal remains from a range of time periods and archaeological contexts, most of his work in recent years has focused on health in medieval Norway. Dr. Denham is also the head of Norway's National Committee for Research Ethics on Human Remains.

Forensic taphonomy and its use in forensic and archaeological investigations

Maiken Ueland

In this talk Dr Ueland will discuss the use of forensic taphonomy and the role of taphonomic facilities known as “Body Farms” for investigations. She will discuss how to locate missing persons, determine time since death, and understand the grave environment, with a special focus on biomarker exploration.

Maiken Ueland is a Senior Lecturer in Chemistry and the Director of The Australian Facility for Taphonomic Experimental Research (AFTER). She is a leader in the field of forensic taphonomy and human decomposition chemistry. Her research focuses on markers in tissue and odour and their use in criminal investigations, including locating missing persons and estimating time since death.

Plants and insects associated with human remains

Mia Lempiäinen-Avci and Riikka Elo

The study of flora and fauna found in human graves may add crucial information in identifying and understanding the circumstances and surroundings of the burial. For example, in archaeological studies the plant macrofossils (seeds) and pollen are often analyzed in graves and may reveal e.g. the timing of the death, the food consumption of the deceased person and funeral rituals. Moreover, insects which consist of 90% of the global species richness, are often associated with plants or fungi and may add valuable information to the studies. However, the insects and other invertebrate remains are often left out in archaeological studies due their difficult identification. With new methods via paleogenomics the fauna and flora of graves may also be analyzed in detail with DNA methods (sedaDNA, DNA barcoding) which may reveal species that are not detected via fossils.

PhD Mia Lempiäinen-Avci is an archaeobotanist and post doc researcher in the Herbarium of the University of Turku, Finland. In her research she has focused on morphological identification of plants and archaeology. PhD Riikka Elo is an entomologist and post doc researcher in the Zoological museum in the University of Turku, Finland. In her research she has focused on DNA-based identification of insects and also sedimentary DNA studies.

Soil chemistry by X-ray fluorescence (XRF), graves and cemeteries

Kidane F. Gebremariam

The presentation deals with my experience in the investigation of soil samples from graves and related ones, primary based on XRF analysis covering the different aspects of the investigation from preparation of the samples to interpretation and presentation of the results. The advantages and drawbacks of the analytical methodology will be pointed out. The importance of application of complementary analytical techniques to support the characterization of the soil samples will also be highlighted with some examples.

Kidane Gebremariam is associate professor at the Museum of Archaeology, UIS, currently working in the areas of archaeometry and conservation science. He has analytical chemistry background and been engaged in the investigation of diverse cultural heritage materials for the past 15 years through

the applications of multiple analytical techniques. Besides cultural heritage materials, he is also involved in characterization of geological and geopolymer materials.

Rebecca J. S. Cannell

The flexibility of portable XRF allows the user to tailor sampling and analysis to the questions that need answering, and the conditions they encounter. Through two different case studies connected to detecting human burials, I will illustrate how pXRF can be used in different ways to answer questions in archaeological contexts, which methods can or should be combined with pXRF data, and issues related to data interpretation. The first case study is a rural medieval cemetery in Hedemark, where minimally intrusive methods were used to define the area used for burial, where they were most disturbed by ploughing, and the potential location of the medieval church building. The second case study is the ship burial at Gjellestad, Østfold, where differing intensive sampling and analysis aimed to identify the presence of organic remains and objects that were within the burial, but had been subsequently removed in the past. What the case studies have in common is not just pXRF, but soil as the material being analysed. Issues connected to the variations in soils will be discussed, and how this can impact upon data interpretation.

Rebecca J S Cannell is an archaeologist and researcher who specialises in soils in archaeological contexts from both analytical and theoretical perspectives. Her PhD (2017) focused on methodological issues relating to pXRF analysis of soils in archaeological contexts. Her subsequent research has seen her continue her work on soils in archaeology, with a focus on Viking Age burials. Over the past ten years, she has worked extensively with combining geophysical data with coring data in commercial and research projects to develop minimally invasive approaches, and applying different analytical methods to soil analysis. She has also worked as a soil researcher in modern agrarian landscapes, with a focus on soil classification systems.

Analysis of human remains: reconstructing life and death

Sean Denham

This talk will look at the use of skeletal remains to recreate an individual's life history. While the standard demographic categories (e.g. sex, age-at-death, body size) are important, other factors, such as health, activity and physical trauma play a vital role in this process. Although presented with the framework of archaeology, the methodologies and theory are equally applicable to forensic anthropology.

Sean Denham is a Senior Researcher and osteoarchaeologist at the Museum of Archaeology, University of Stavanger. He received his BA from Tufts University (USA) and his MSc and PhD from Queen's University Belfast (Northern Ireland). While he works with human and animal remains from a range of time periods and archaeological contexts, most of his work in recent years has focused on health in medieval Norway. Dr. Denham is also the head of Norway's National Committee for Research Ethics on Human Remains.

Population genetics and the challenges of working with degraded and contaminated DNA

Damla Kaptan

Population genetics is a critical field that investigates the genetic diversity within and between populations, providing insights into evolutionary processes, adaptation, and migration patterns. When studying historical or forensic samples, researchers often encounter degraded and contaminated DNA, which poses significant challenges. Degraded DNA, characterized by fragmentation and chemical modifications, complicates accurate sequencing and analysis, while contamination from modern DNA or environmental sources can lead to misleading results. We will explore the impact of these challenges on population genetics studies, discussing the strategies used to mitigate the effects of degradation and contamination. Advanced techniques in DNA extraction, amplification, and bioinformatics are employed to recover and interpret genetic data from compromised samples. Despite these advances, the field continues to face limitations in data reliability and resolution. Here we highlight the ongoing efforts to refine methodologies, ensuring that population genetics research remains robust and accurate, even when dealing with degraded and contaminated DNA.

Damla Kaptan obtained her bachelor's and master's degrees in molecular biology and Genetics from Bogazici University in Istanbul, Turkey, where she developed a strong foundation in genetic research. Driven by a passion for exploring the complexities of biology, she pursued her Ph.D. at the Max Planck Institute of Cell Biology and Genetics in Dresden, Germany, where she expanded her expertise in metabolomics and aging in the model organism *C. elegans*. After completing her Ph.D., Damla Kaptan returned to Turkey to undertake a postdoctoral project at Middle East Technical University in Ankara. There, she specialized in ancient DNA studies, focusing on unravelling the genetic history of human and animal populations in Anatolia. This worked marked a significant transition in her career, as she applied her knowledge of molecular biology to emerging field of paleogenetics.

Currently, Damla Kaptan is a postdoctoral researcher at the University of Stavanger Archaeology Museum in Norway, where she contributes to the Future-Past project. Her research centers on understanding the diagenesis of bone and DNA in various environmental conditions, a crucial aspect of preserving and interpreting ancient material.

Histotaphonomy: Degradation processes in skeletal remains at microscopic scale.

Hege Hollund

Taphonomy can also be described as the post-mortem history of biological remains. This presentation will introduce the audience to the method histotaphonomy: taphonomy of skeletal remains at microscopic scale. This is a method that has seen growing applications in archaeology and forensics in recent years, as it can aid in the reconstruction of what occurred after death and before recovery. This is essential for the correct interpretation of sequences of events, both before death and post-mortem.

Hege Hollund is a conservation scientist based at the Museum of Archaeology, University of Stavanger. Her expertise is on bone taphonomy and diagenesis, and she specializes in histotaphonomic studies; applying bone histological analysis to assess and study preservation and degradation processes in skeletal remains.

Isotope Forensics: a cutting-edge addition to the forensic toolbox?

Lisette Kootker

Forensic isotope analysis has emerged as a revolutionary tool in medico-legal cases, providing exciting new insights into the origins and movements of both victims and suspects. This presentation will delve into the (im)possibilities of isotope geochemistry in forensic cases, showcase a few case studies and highlight the necessity of collaboration to further advance the field of isotope forensics.

Lisette Kootker is an assistant professor at the Vrije Universiteit Amsterdam, department of Earth Sciences, Faculty of Science. She completed a MSc in Geoarchaeology at the VU and holds a PGDip. in Osteoarchaeology (Bournemouth University, UK). During her postdoctoral tenure, she directed her focus towards utilizing radiogenic and stable isotope systems (Sr-Pb-O-H-C-H) in both archaeological and forensic contexts, with the aim of elucidating dietary and mobility patterns. Her research encompasses isotopic characterization of natural archaeological and modern landscapes (isoscaples), alongside investigating the impact of diagenesis on tissue isotopic integrity within forensic settings. Actively engaged in actualistic taphonomic experiments, she collaborates with the Forensic Anthropology Research Facility (FARF) in Texas, USA, as well as ARISTA in Amsterdam. Her isotope research aids in the identification process of unidentified victims in cold-case and recent forensic investigations, collaborating closely with the Netherlands Forensic Institute and various international law enforcement agencies.

Radiocarbon dating: opportunities, uncertainties, and sources of error

Bente Philippsen and Patxi Perez Ramallo

Radiocarbon dating is a standard method for determining the age of organic remains, including human skeletons. Forensic cases present some special challenges: the turnover rate of bone collagen, the influence of a marine diet, which can make the date appear “too old”, and the influence of anthropogenic radiocarbon from nuclear bomb testing up to the 1960s. We will show examples of and solutions for those problems.

The National Laboratory for Age Determination at NTNU in Trondheim provides research collaboration and services within the fields of radiocarbon dating, dendrochronology and stable isotope analysis. We build chronologies for archaeologists and historians, reconstruct past life and environment, or study the life history of modern plants and animals. We use radiocarbon concentrations as proxies to measure the sustainability of different carbon-containing compounds, such as fuels. Our absolute chronologies from radiocarbon and dendrochronology link developments in climate, environment and culture, thus allowing us to disentangle causes and effects. In the study of human remains (both for archaeological, historical and forensic cases), we use stable isotope measurements to determine the proportion of marine diet, which helps us to correct for the marine reservoir effect. In our laboratory, we combine expertise from archaeology, biology, chemistry, conservation, geology and physics. In addition to our personal experience, we have an archive of all radiocarbon dates measured at our laboratory since 1956. Our dendrochronology archive comprises samples of trees and wooden buildings from all over Norway, allowing us to continually enhance the tree ring chronologies for the different regions of Norway.