

## Hågerup Bioarchaeology Field School, Denmark

*Course ID: ARCH XL 159*

*May 14– June 17, 2017*

### FIELD SCHOOL DIRECTORS:

**Dr. Julia Gamble**, Department of Anthropology, University of Toronto, [Julia.gamble@utoronto.ca](mailto:Julia.gamble@utoronto.ca)

**Prof. Jesper Boldsen**, Institute of Forensic Medicine and Department of Anthropology (ADBOU), University of Southern Denmark, [jboldsen@health.sdu.dk](mailto:jboldsen@health.sdu.dk)

**Prof. George Milner**, Department of Anthropology, Pennsylvania State University, [ost@psu.edu](mailto:ost@psu.edu)

**Mrs. Dorthe Pedersen**, ADBOU, University of Southern Denmark, [dopedersen@health.sdu.dk](mailto:dopedersen@health.sdu.dk)



### INTRODUCTION

This project involves the systematic, research driven excavation and bioarchaeological investigation of human skeletal remains from the cemetery of Hågerup, which spans the period from the 12th through to the 16th centuries CE in Denmark. The project will take place over the course of the next 5–8 years, and involves collaboration between ADBOU (the University of Southern Denmark), Øhavsmuseet in Fåborg and the University of Toronto. As a research-driven project, it provides researchers (and students) with the unprecedented opportunity to collect valuable information from an untouched medieval cemetery. Collaboration between ADBOU and Øhavsmuseet in Fåborg will allow a contextual, landscape approach to be incorporated into the bioarchaeological investigation of the cemetery.

Core research goals of the project:

1. To gain insight into temporal changes in health and demographic signatures of a rural community, using cutting edge techniques through excavation and palaeodemographic analysis to attain fine resolution on birth cohorts on an unprecedented scale
2. To gain insight into the temporal patterns in migration, with particular focus on changes post mid-14th century CE
3. To integration of a landscape perspective into site interpretation in order to improve our understanding of the social history of the area
4. To integrate systematic sampling techniques throughout the excavation in order to address issues concerning palaeoepidemiology
5. To apply advanced excavation techniques tailored to the Danish bioarchaeological context in order to gain greater insight into questions such as changes in height and body proportions and more tailored growth curve data for this medieval population.

Students will gain first-hand experience in the excavation and analysis of human skeletal remains, which will include training in human osteology and in bioarchaeological excavation and analysis. This experience will provide students with unprecedented experience working with a large cemetery excavation, and benefitting from an extensive excavated bioarchaeological collection at ADBOU (University of Southern Denmark).

#### ACADEMIC CREDIT UNITS & TRANSCRIPTS

**Credit Units:** Attending students will be awarded 12 quarter credit units (equivalent to 8 semester units) through our academic partner, UCLA Extension. UCLA is a top ranked research university and its archaeology program is ranked amongst the best in the country. All IFR field schools instructors and curricula are approved both by the corresponding academic department and the Academic Senate at UCLA. This field school provides a minimum of 192 direct instructional hours.

**Transcripts:** Transcripts are available through UCLA UnEX and instructions for ordering transcripts may be found at <http://bit.ly/2bD0Z3E>. Grades will be posted and transcript available usually within six weeks after the end of this field school. All IFR field schools are designated XL classes – courses that are equivalent to undergraduate courses offered by the UCLA regular session. All XL courses are transferable for unit and subject credit toward the Bachelor's Degree at all campuses of the UC and CSU systems. Classes numbered 100 to 199 are considered upper division (junior/senior). For more information, go to <http://bit.ly/2bjAqmy>.

**UCLA students:** Students can take classes through UCLA Extension to complete requirements. However certain considerations must be taken into account. For more information, go to <http://bit.ly/2bJWeHK>.

**Credit Units Transfer:** Most universities accept UCLA credit units – there are very few exceptions. Students are strongly encouraged to discuss the transferability of the credit units with school officials BEFORE attending the field school.

#### COURSE OBJECTIVES

This course will provide students with foundational skills in bioarchaeological practice, including excavation, post-excavation processing, and osteological analysis and interpretation. Students will engage in all stages by following an individual from their excavation through to post-excavation curation and analysis. Finally, students will receive instruction on the ethical handling and curation on human skeletal remains, on the bioarchaeology of the Danish medieval period, on palaeodemography and palaeoepidemiology, on current scientific approaches in bioarchaeology, and on the foundational statistical analysis in bioarchaeology. Through this, students will be introduced to the challenges and

potentials in the field, and be encouraged to think critically about core areas of bioarchaeological inquiry. Students will gain direct, hands-on experience in bioarchaeological:

**Conservation and Ethics:** Throughout the field school, students will be working directly with excavated human remains and will be instructed on appropriate, ethical handling at all stages.

**Human Osteology:** Students will be trained initially with the large collection of human skeletal remains at ADBOU. This will include training in bone identification, and the collection of data on age, sex, metrics, and pathology. Students will then apply this knowledge and continue to learn over the course of their work in the field and with post-excavation work on the individuals they excavate.

**Excavation:** Students will be involved directly in the systematic excavation of human skeletal remains

**Sampling:** Students will receive training on the types of samples which might be collected in bioarchaeological research and in the information which can be gained from such sampling. They will learn how to collect such samples and will be able to put this into practice during excavation.

**Recording:** Throughout excavation and post-excavation analysis, students will gain experience in detailed recording techniques necessary for optimum information recovery. This will include detailed GPS recording of each burial for digital mapping and the collection of osteological information such as stature, age, and sex information *in situ* before valuable information might be lost.

**Photogrammetry:** Students will be taught the foundations of photogrammetry and practice it by maintaining a photogrammetric record of the burials they excavate.

**Post-excavation analysis:** Students will first gain experience with post-excavation analysis during the first week at ADBOU when they will work with previously excavated human remains. They will then gain further practice in the post-excavation analysis of the individuals they excavate.

**Foundational statistical analysis:** Students will be trained in basic database management and will receive instruction on some of the ways in which advanced statistical techniques are being used to answer key bioarchaeological questions. They will learn basic techniques for summarizing the data they collect during the field school in order to compile their final reports.

#### **DISCLAIMER – PLEASE READ CAREFULLY**

Students should note that this is an active field project and should come expecting to engage in a high level of outdoor physical activity, including walking, lifting, shoveling, troweling, and kneeling. This may take place in a range of weather conditions (from very wet and rainy to sunny and hot), and participants should plan accordingly.

Students should also note that as they will be working in soil and with human remains which have been buried in the soil. Having an up-to-date tetanus shot is required. All injuries (however minor) should be reported to one of the field school directors.

If you have any medical concerns, please consult with your doctor. For all other concerns, please consult with the project director – as appropriate

#### **PREREQUISITES**

Students should have equivalent of second year Human Osteology ideally. At a minimum, students should have successfully completed an introductory bioanth course that has a lab component with a module on the human skeletal system. This is a hands-on course and there will be extensive on-the-ground training, but a basic foundation is critical. Students should come prepared to fully involve themselves in archaeological excavation, which requires a high level of physical activity in a range of

weather conditions. Enthusiasm, dedication, and an appreciation and respect for the human remains is essential. Students will also be representing their home countries and universities, and are expected to behave respectfully in their capacity as academics and visitors to Denmark at all times.

### LEARNING OUTCOMES

On successful completion of this course, students will be able to:

1. Recognize and identify human skeletal remains
2. Excavate human skeletal remains in an ethical, systematic way according to modern standards
3. Appreciate and discuss the importance of methodical sampling and recording in excavation and post-excavation work
4. Maintain detailed excavation and bioarchaeological records
5. Conduct foundational skeletal analysis involving the maintenance of a skeletal inventory, and the identification of age, sex, metric components, and pathology
6. Successfully manage a basic Access database and use foundational statistical techniques for data analysis
7. Formulate bioarchaeological results into a written research report which integrates primary academic sources both drawn from a reading list and identified independently

### GRADING MATRIX

Assessment	Date	Value
<b>Test: Human Osteology</b>	Beginning of Week 2	25%
<b>Participation</b>	Throughout course	20%
<b>Field Journal</b>	Final day of course	25%
<b>Final Report</b>	End of Week 5	30%

**Test:** This will be a lab-based test in which students will be assessed for their understanding of how to identify the different bony elements in the human skeleton. The methodological elements (how to assess sex, age, and stature) will be assessed through the lab methods assignment.

**Participation:** This component will be assessed over the duration of the course and will reflect engagement both in the excavation and post-excavation components. Appropriate conduct, work ethic, and teamwork will all be evaluated.

**Field Journal:** The field journal will be a daily journal maintained to record observations, thoughts, conclusions, etc. It can contain information on the excavation and post-excavation work. It can also include observations and notes on things learned / experienced in the historical excursions we will be doing over the duration of the field course. It can include sketches and drawings and / or photographs. Further specifications will be provided at the beginning of the field school.

**Final Report:** Reports will be due at the end of the field course, and should consist of a formal academic paper. Each report should be 10 – 12 pages in length and follow the assignment guidelines in terms of format and referencing (see formatting guide). These reports should include the full skeletal inventories each student was responsible for (as appendices and not part of the page count) and discussion of their results. Students will also have input their information into the shared database and each student will be responsible for summarizing the results from one component of the analysis (ie, sex or age or pathology) in their report. Results should be discussed in relation to the archaeological and cultural context of the medieval period in Northern Europe, bringing in the academic literature. Reports will be due at the end of week 5, to be submitted electronically as .doc/.docx files.

Successful completion of this course requires the student to a) complete all assignments and tests and b) attend and participate in all excavation and laboratory activities. Participation will involve regular

recording and data entry. ***If you do not demonstrate adequate effort in these activities or if there are unaddressed concerns in your handling of human remains, marks may be deducted from your overall mark in this course.*** All assignments apart from the test will be submitted electronically.

Notes on the Appropriate Handling of Human Remains:

Over the duration of the course, you will be handling REAL human remains in the laboratory. Please keep this in mind at all times. Material must always be treated with the appropriate care and respect which is due human remains.

- No food or drink is permitted while you are conducting laboratory work
- Please do not use the writing tip of a pen or pencil, etc. for pointing at any osteological material. There is too much risk of it marking the material.
- IF there is any concern that an osteological element has fallen from the table while working in the lab, ask everyone around you to STOP moving and to check the floor carefully.
- When handling cranial material, please hold it by the base of the cranium. DO NOT insert fingers into orbits, nasal areas, or through the foramen magnum (ie, through any hole or opening on the cranium).
- Images can be taking of the osteological material can only be taken for the purposes outlined as part of this project. They are not for personal use and should not be posted on public forums unless such posting is pre-approved and for the purposes of this project.

Failure to abide by any of these points of practice could result in suspension of activities in the field school and in review of further penalties.

#### **TRAVEL & MEETING POINT**

All students are responsible for arranging their own transportation to Odense, Denmark and arrive on Sunday, May 14. The recommended method of travel is to fly to Copenhagen International Airport (CPH) and take a train from there to Odense. Trains leave directly from the airport to Copenhagen Central Station. From there, regular trains leave to Odense. Train tickets can be booked in advance via the DSB website (DSB.dk). Upon arrival in Odense, students will be met by a member of the project team at the central train station on May 14 at 1pm and then again at 4pm by project staff. The meeting point will be at the bottom of the escalators by the 7-Eleven. Students should ensure that they have sent their time of arrival to Dr. Gamble in advance.

This program concludes on Friday, June 16 afternoon. Students may depart for their return home, or onward travel, anytime on Saturday, June 17.

If you missed your connection or your flight is delayed, please call, text or email project director immediately. A local emergency cell phone number will be provided to all enrolled students.

#### **VISA REQUIREMENTS**

All students are required to have a valid passport when travelling to Denmark. US citizens should ensure that their passport is valid for 6 months after their planned trip before travelling to Denmark. No visa is required for travel to Denmark for the purposes of this Field School by US citizens, Canadian citizens, or members of the EU. Citizens of other countries are asked to consult the Danish Embassy website at their home country for specific visa requirements.

#### **ACCOMMODATIONS**

Accommodation for the duration of this field school will be at the Dalum Agricultural College which is a student residence through the year. Students will be lodged in dorm rooms which are basic but clean and furnished with a bed, desk, wardrobe, and sink. There is one bed per room. There are shared toilets down the hall, as well as shared showers in a separate room. Wifi will be available at the college.

All meals will be communal with breakfast and dinner served at the college. Each student will be responsible for packing a lunch from food served during dinner or breakfast. Breakfast generally consists of a range of breads, cheese, cold-cut meat, cereals, fruit, and cold vegetables / salad. Dinner usually includes salad and/or vegetables, and a meat or hot dish. Meals are generally well balanced and substantial and will include a range of traditional Danish foods to accommodate the students at the agricultural college who are often from farming backgrounds. You will see the primary meats being pork, fish, and some chicken.

Vegetarian diets are easily accommodated with vegetables / salad, cheese, eggs, and bread being readily available at most meals. There is no guarantee that vegan diets will be accommodated through the Dalum kitchen, but in such circumstances particularly the protein component can be supplemented through the local grocery store located very close to the college. No other dietary condition can be accommodated in this project unless first cleared by the field school director – Dr. Julia Gamble

## **COURSE SCHEDULE**

This is a condensed course in which there will be scheduled activities in the field and / or lab 6 days of the week. In some cases, one of the 6 work days will involve organized cultural excursions. You will have one free day each week as part of this field school. Please refer to the schedule for further details.

### **May 14, 2016**

Arrive in Odense. Students to be met at the train station upon their arrival.

#### **Week 1:**

##### **Day 1**

7:30 Breakfast at the Dalum Agricultural College

8:30 Walk together over to ADBOU

9:00 Introductions to the team at ADBOU and to the lab collections and facilities

10:00 Lecture (introduction to the site and project, ethics of working with human remains) (*White and Folkens 2005*)

12:00 Lunch at ADBOU

1:00 Introductory activities to working with and handling human skeletal remains (*White and Folkens 2005*)

2:30 Coffee / tea break

3:00 Introduction to bioarchaeological analysis and interpretation (*Boldsen and Milner 2011*)

5:00 Return to Dalum Agricultural College for dinner

##### **Day 2**

7:30 Breakfast at the Dalum Agricultural College

8:30 Walk together over to ADBOU

9:00 Lecture (human skeletal biology and developmental osteology: theory, methods, and practice interspersed with hands-on work with subadult remains) (*White and Folkens 2005; Schaefer et al. 2009*)

12:00 Lunch at ADBOU

1:00 Lecture: Osteological recording techniques and database management (*ADBOU Osteological Methods 2015*)

2:30 Coffee / tea break

3:00 Practical work completing skeletal inventories and data entry  
5:30 Return to Dalum Agricultural College for dinner

### **Day 3**

7:30 Breakfast at the Dalum Agricultural College  
8:30 Walk together over to ADBOU  
9:00 Lecture (palaeodemography and skeletal age estimation part 1: Juveniles) (*White and Folkens 2005; Schaefer et al. 2009; ADBOU 2015*)  
10:00 Practical work in age estimation from subadult remains, including recording techniques and data entry  
12:00 Lunch at ADBOU  
1:00 Lecture (palaeodemography and skeletal age estimation part 2: Adults) (*ADBOU 2015; Brookes and Suchey 1990; Lovejoy et al 1985; Meindl et al. 1985*)  
2:00 Practical work in age estimation from subadult remains, including recording techniques and data entry  
3:00 Coffee / tea break  
3:30 Cleaning and curation of human skeletal remains, instruction and preliminary practice (*White and Folkens 2005*)  
5:30 Return to Dalum Agricultural College for dinner

### **Day 4**

7:30 Breakfast at the Dalum Agricultural College  
8:30 Walk together over to ADBOU  
9:00 Lecture (palaeodemography and skeletal sex estimation theory)(*Hoppa and Vaupel 2002a; Milner and Boldsen 2012a, 2012b*)  
10:00 Practical work on sex estimation  
11:00 Cleaning and recording of human skeletal remains in the ADBOU collection  
12:00 Lunch at ADBOU  
1:00 Lecture (palaeoepidemiology, skeletal pathology, and distinguishing taphonomic changes) (*Wood et al. 1992; Ortner 2007; Milner et al. 2015; Lynnerup and Boldsen 2011; Boldsen and Freund 2006; DeWitte and Stojanowski 2015*)  
2:00 Lab work on differential diagnosis, the identification and recording of pathology  
3:00 Coffee / tea break  
3:30 Cleaning and curation of human skeletal remains, instruction and preliminary practice  
5:30 Return to Dalum Agricultural College for dinner

### **Day 5**

7:30 Breakfast at the Dalum Agricultural College  
8:30 Walk together over to ADBOU  
9:00 Leave for first planned excursion – Ladby Ship Burial  
9:45 Arrive at Ladby  
11:00 Leave Ladby for Nyborg Castle  
12:00 Packed lunch at Nyborg  
1:00 Nyborg Castle  
3:00 Return to ADBOU for coffee tea break before lecture  
3:45 Lecture (excavation techniques and recording) (*Boldsen 1984; White and Folkens 2005*)  
5:00 Return to Dalum Agricultural College for dinner

### **Day 6**

8:00 Breakfast at the Dalum Agricultural College  
9:00 Walk together over to ADBOU  
9:30 Open lab for review and continued work on cleaning and curation  
11:00 Test  
12:00 Lunch at ADBOU  
1:00 Post-excavation work with ADBOU collections  
3:00 Coffee / tea break  
3:30 Lecture (scientific methods in bioarchaeology: inquiry, methods, and practice) (*Adler et al. 2015; Barnes et al. 2006; Ortner 2007; Rasmussen et al. 2008; Yoder 2010*)  
5:00 Return to Dalum Agricultural College for dinner  
7:00 Field school planning meeting to go over any additional business and talk about the plan for the following week

### **Weeks 2 – 4:**

#### **Day 1**

7:00 Breakfast at Dalum Agricultural College  
8:00 Leave for Hågerup by minibus  
9:00 Site orientation and establishment at excavation units  
9:30 Excavation  
12:00 Packed lunch on site  
1:00 Excavation  
2:30 Afternoon break  
4:00 Packing up  
4:30 Return to ADBOU by minibus  
5:30 Return to Dalum Agricultural College for dinner  
7:00 Field school planning meeting to go over any critical business from the day

*The following describes the daily schedule for the next three weeks of the field school, with one schedule being applied during excavation days at Hågerup and the other being applied during post-excavation days at ADBOU. Students will rotate between excavation work at Hågerup and post-excavation work at ADBOU. Once finished the excavation of a burial, the remains will be transported back to ADBOU on the evening of the day excavation is completed and the student will begin post-excavation work at ADBOU the next day rather than going back out to Hågerup. Once post-excavation processing and recording is completed on this individual, the student will return to Hågerup to begin the next burial.*

Excavation Schedule (Hågerup)	Post-Excavation Schedule (ADBOU)
7:00 Breakfast at Dalum Agricultural College	7:00 Breakfast at Dalum Agricultural College
8:00 Walk over to ADBOU	8:30 Walk over to ADBOU
8:30 Leave for Hågerup	9:00 Post-excavation work at ADBOU
9:00 Excavation at Hågerup	12:00 Lunch at ADBOU
12:00 Packed lunch on site	1:00 Post-excavation work at ADBOU
1:00 Excavation	
2:30 Afternoon break	2:30 Afternoon break
4:00 Packing up	3:00 Post-excavation work at ADBOU
4:30 Return to ADBOU by minibus	
5:30 Return to Dalum Agricultural College for dinner	5:30 Return to Dalum Agricultural College for dinner



**Excursion Days will be planned for every Friday, as follows:**

**Week 2: Friday (Jelling and Moesgaard)**

7:30 Breakfast at the Dalum Agricultural College  
8:30 Walk together over to ADBOU  
9:00 End of week planning meeting at ADBOU  
9:30 Leave for first planned excursion in minibus and travel to Jelling  
10:30 Arrive at Jelling  
12:00 Leave Moesgaard by minibus, packed lunch on route  
1:00 Arrive at Moesgaard museum  
4:30 Return to Odense, going directly to Dalum Agricultural College for dinner

**Week 3: Friday (Horsens and Om Kloster)**

7:30 Breakfast at the Dalum Agricultural College  
8:30 Walk together over to ADBOU  
9:00 End of week planning meeting at ADBOU  
9:30 Lecture (the bioarchaeology and culture history of Denmark)  
10:30 Leave for first planned excursion in minibus and travel to Horsens Museum  
11:30 Arrive in Horsens for an early lunch  
12:30 Horsens Museum  
2:00 Leave for Om Kloster by minibus  
2:30 Arrive at Om Kloster  
4:30 Return to Odense, going directly to Dalum Agricultural College for dinner

**Week 4: Friday (Roskilde)**

7:30 Breakfast at the Dalum Agricultural College  
8:30 Walk together over to ADBOU  
9:00 End of week planning meeting at ADBOU  
9:30 Leave for first planned excursion in minibus and travel to Roskilde  
10:30 Arrive at Roskilde Viking Ship Museum  
12:00 Packed lunch at Roskilde Viking Ship Museum  
1:00 Walk to visit Roskilde Cathedral (15 - 20 minute walk)  
2:00 Walk to Roskilde Museum (10 min walk)  
3:00 Return to ADBOU  
4:00 Lecture and discussion (bioarchaeological research and compiling the final report)  
5:30 Return to Odense, going directly to Dalum Agricultural College for dinner

Rest Days will take place on every Saturday

**Week 5**

Week 5 will involve daily work to complete all elements of this years' project as follows

**Sunday to Wednesday:**

All students will be moved to the field for final excavation of burials. They will follow the set excavation schedule as in weeks 2 – 4.

**Thursday:**

Backfilling and completion of all activities at Hågerup by all members of the field school. Follow the weeks 2-4 excavation schedule for meals and breaks, and for travel to and from the site.

**Friday (Final Day):**

7:30 Breakfast at Dalum Agricultural College

8:30 Walk together over to ADBOU  
9:00 Lecture (conclusions to field season, summarizing important findings and placing them in the context of the broader project)  
10:30 Final post-excavation work at ADBOU and finalization of the reports  
12:00 Lunch at ADBOU  
1:00 Final post-excavation work at ADBOU and finalization of the reports  
2:30 Coffee / tea break at ADBOU  
3:00 Final post-excavation work at ADBOU and finalization of the reports  
5:30 Return to Dalum Agricultural College for dinner

**Saturday, June 17 :**

Students leave Dalum Agricultural College and travel home or to whatever destination they wish to travel next.

**EQUIPMENT LIST**

All of the following items should be brought with students to the field school

- Good walking / work boots
- Sunscreen and hat
- Raincoat / rain gear
- Water bottle
- Any required medication for the duration of the field school
- Passport
- Health card
- Student card
- Archaeological-standard trowel (Marshalltown Pointing Trowel – 5” by 2” or WHS trowel)
- Leaf trowel for finer work
- Dental picks and wooden picks
- Plumb bob
- Measuring tape
- Line level
- Paintbrushes in a range of sizes for excavation and cleaning purposes
- A set of digital calipers (preferably carbon fibre to avoid damage to bone)
- Notebook, pencil, pen, eraser.
- Laptop or workable tablet
- White and Folkens (2005) textbook

**MANDATORY READINGS**

ADBOU. 2015. Human Osteological Methods.

<http://www.adbou.dk/fileadmin/adbou/manualer/humostman2015.pdf>

Adler CJ, Haak W, Donlon D, Cooper A. 2011. Survival and recovery of DNA from ancient teeth and bones. *J Archaeol Sci* 38:956–964.

Barnes I, Thomas MG. 2006. Evaluating bacterial pathogen DNA preservation in museum osteological collections. *Proc R Soc B Biol Sci* 273:645–653.

Boldsen JL. 1984. A Statistical Evaluation of the Basis for Predicting Stature from Lengths of Long Bones in European Populations. *Am J Phys Anthropol* 65:305–311.

Boldsen JL, Freund UH. 2006. Osteological leprosy: Epidemiology and diagnosis. *Scand J Forensic Sci*:67–72

Boldsen JL, Milner GR. 2011. An Epidemiological Approach to Paleopathology. In: Grauer AL, editor. *A Companion to Paleopathology*. Wiley-Blackwell. p 114–132.

- Brookes S, Suchey JM. 1990. Skeletal age determination based on the os pubis: a comparison of the Acsádi-Nemeskéri and Suchey-Brooks methods. *Hum Evol* 5:227–238.
- DeWitte SN, Stojanowski CM. 2015. The Osteological Paradox 20 Years Later: Past Perspectives, Future Directions. *J Archaeol Res* 23(4):1–54.
- Hoppa RD, Vaupel JW. 2002a. The Rostock Manifesto for paleodemography. In RD Hoppa and JW Vaupel (eds.) *Paleodemography: Age distributions from skeletal samples*. Cambridge: Cambridge University Press, pp. 1–8.
- Lovejoy CO, Meindl RS, Pryzbeck TR, Mensforth RP. 1985. Chronological metamorphosis of the auricular surface of the ilium: A new method for the determination of adult skeletal age at death. *Am J Phys Anthropol* 68:15–28.
- Lynnerup N, Boldsen J. 2011. Leprosy (Hansen’s disease). In: Grauer AL, editor. *A Companion to Paleopathology*. Wiley-Blackwell. p 458–471.
- Meindl RS, Lovejoy CO, Mensforth RP, Walker RA. 1985. A revised method of age determination using the os pubis, with a review and tests of accuracy of other current methods of pubic symphyseal aging. *Am J Phys Anthropol* 68:29–45.
- Milner GR, Boldsen JL. 2012a. Skeletal Age Estimation: Where We Are and Where We Should Go. In DC Dirkmaat (ed) *Companion Forensic Anthropology*. Chichester: John Wiley & Sons. pp 224–238.
- Milner GR, Boldsen JL. 2012b. Transition analysis: a validation study with known-age modern American skeletons. *Am J Phys Anthropol* 148:98–110.
- Milner GR, Boldsen JL, Weise S, Lauritsen JM, Freund UH. 2015. Sex-related risks of trauma in medieval to early modern Denmark, and its relationship to change in interpersonal violence over time. *Int J Paleopathol* 9:59–68.
- Ortner DJ. 2007. Differential Diagnosis of Skeletal Lesions in Infectious Disease. In: R Pinhasi and S Mays. *Advances in Human Palaeopathology*. Chichester: Wiley-Blackwell (John Wiley & Sons Ltd.). p 189–214.
- Petersen HC. 2011. Technical note: A re-evaluation of stature estimation from skeletal length in the grave. *Am J Phys Anthropol* 144:327–330.
- Rasmussen KL, Boldsen JL, Kristensen HK, Skytte L, Hansen KL, MÅ, Jholm L, Grootes PM, Nadeau M-J, Eriksen KMF. 2008. Mercury Levels in Danish Medieval Human bones. *J Archaeol Sci* 35:2295–2306.
- Schaefer M, Black SM, Scheuer L. 2009. *Juvenile osteology: a laboratory and field manual*. Amsterdam: Academic Press.
- White TD and Folkens PA. 2005. *The Human Bone Manual*. London: Elsevier Academic Press.
- Wood JW, Milner GR, Harpending HC, Weiss KM, Cohen MN, Eisenberg LE, Hutchinson DL, Jankauskas R, Česnys G, Katzenberg MA, others. 1992. The osteological paradox: problems of inferring prehistoric health from skeletal samples [and comments and reply]. *Curr Anthropol* 33:343–370.
- Yoder C. 2010. Diet in medieval Denmark: a regional and temporal comparison. *J Archaeol Sci* 37:2224–2236.

## RECOMMENDED READINGS

- Agarwal, Sabrina C., and Bonnie A. Glencross. 2011. *Social bioarchaeology*. Chichester, West Sussex, U.K.: Wiley-Blackwell.
- Aufderheide AC and Rodriguez-Martin C. 1998. *The Cambridge encyclopedia of human paleopathology*. Cambridge, UK: Cambridge University Press.
- Benedictow OJ. 2004. *The Black Death 1346-1353: The Complete History*. Woodbridge: Boydell Press.
- Bennike P. 1985. *Palaeopathology of Danish skeletons: a comparative study of demography, disease and injury*. Copenhagen, Denmark: Akademisk Forlag.

- Boldsen JL. 1990. Height variation in the light of social and regional differences in medieval Denmark. In: Austin D, Alcock L, editors. *From the Baltic to the Black Sea: Studies in Medieval Archaeology*. Boston: Unwin Hyman. p 181–187.
- Boldsen JL. 1993. Height variation in Denmark A.D. 1100-1988. In: *Populations of the Nordic countries: Human population biology from the present to the Mesolithic. Proceedings of the Second Seminar of Nordic Physical Anthropology*. Lund: Institute of Archaeology. p 52–60.
- Boldsen JL. 1998. Body proportions in a medieval village population: effects of early childhood episodes of ill health. *Ann Hum Biol* 25:309–317.
- Boldsen JL. 2007. Early Childhood Stress and Adult Age Mortality - A Study of Dental Enamel Hypoplasia in the Medieval Danish Village of Tirup. *Am J Phys Anthropol* 132:59–66.
- Boldsen JL, Mollerup L. 2006. Outside St. Jorgen: Leprosy in the Medieval Danish City of Odense. *Am J Phys Anthropol* 130:344–351.
- Boldsen JL, Rasmussen KL, Riis T, Dittmar M, Weise S. 2013. Schleswig: Medieval leprosy on the boundary between Germany and Denmark. *Anthropol Anz* 70:273–287.
- Buikstra JE, Ubelaker DH. 1994. *Standards for data collection from human skeletal remains*. Arkansas: Arkansas University Press.
- Grauer AL (ed.). 2012. *A Companion to Paleopathology*. Chichester: Wiley-Blackwell (John Wiley & Sons Ltd.)
- Hybel N and Poulsen B. *The Danish resources c. 1000-1550: growth and recession*. Leiden: Brill
- Kowaleski M. 2014. Medieval people in town and country: new perspectives from demography and bioarchaeology. *Speculum* 89:573–600.
- Lovejoy CO. 1985. Dental wear in the Libben population: its functional pattern and role in the determination of adult skeletal age at death. *Am J Phys Anthropol* 68:47–56.
- Ortner DJ. 2003. *Identification of Pathological Conditions in Human Skeletal Remains*, 2nd Edition. San Diego: Academic press
- Ortner DJO and Aufderheide AC (eds.). 1991. *Human paleopathology: Current syntheses and future options*. Washington: Smithsonian Institution Press.
- Pinhasi R and Mays S. 2008. *Advances in Human Palaeopathology*. Chichester: Wiley-Blackwell (John Wiley & Sons Ltd.)
- Roberts, Charlotte A., and Keith Manchester. 2005. *The archaeology of disease*. Ithaca, N.Y.: Cornell University Press.
- Rogers T, Saunders S. 1994. Accuracy of sex determination using morphological traits of the human pelvis. *J Forensic Sci* 39:1047–1056.
- Rogers T, Saunders S. 1994. Accuracy of sex determination using morphological traits of the human pelvis. *J Forensic Sci* 39:1047–1056.
- Waldron T. 2009. *Palaeopathology*. Cambridge: Cambridge University Press