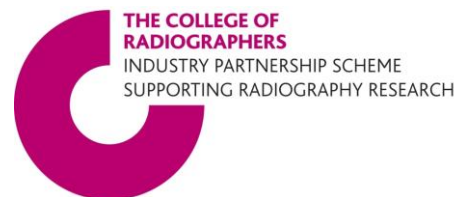


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# College of Radiographers Industry Partnership Research Grant

## Final Report Form – 13<sup>th</sup> December 2021

<b>1. Principal Investigator</b>	James Elliott
<b>2. Project Title</b>	Best practice in projectional radiography of human dry bone specimens – A literature review and confirmatory research using an archaeological assemblage
<b>3. Amount of Grant</b>	£5000.00
<b>4. Did you spend the money as indicated in your proposal (if not why)?</b>	
<p>The total spending for the project was £5000.00</p> <p>This comprised of:</p> <ul style="list-style-type: none"><li>- Equipment costs £351.98</li><li>- Travel costs £99.00</li><li>- Research time (22 days) £3,671.58</li><li>- Open Access publishing costs within Radiography (£877.44)</li></ul> <p><u>Reason for not spending funds as intended:</u></p> <ul style="list-style-type: none"><li>• Equipment costs<ul style="list-style-type: none"><li>○ Blank DVD's x 100 (£20.00).<ul style="list-style-type: none"><li>▪ These were not needed as the investigator sourced discs elsewhere free of charge.</li></ul></li><li>○ DVD wallet for capacity 100 (£10.00).<ul style="list-style-type: none"><li>▪ These were also not required as the investigator found suitable alternatives.</li></ul></li><li>○ Photographic scales of various lengths (£10.00)<ul style="list-style-type: none"><li>▪ A free alternative was found online which could be printed onto A4 paper, cut out and used during photography.</li></ul></li></ul></li><li>• Travel costs<ul style="list-style-type: none"><li>○ Travel to Canterbury Christ Church University (via Canterbury West train station) (£200.00).<ul style="list-style-type: none"><li>▪ The number of trips were substantially reduced due to covid restrictions. Wherever possible, the project was completed remotely.</li><li>▪ The number of days required for primary data collection (at Canterbury Christ Church University, CCCU) was reduced due to collaborative efforts with Adelina Teoaca from Canterbury Archaeological Trust (CAT). More details below.</li></ul></li><li>○ Travel to London for conference presentation (£20.00)<ul style="list-style-type: none"><li>▪ Results of the project were presented at the British Association for Biological Anthropology and Osteoarchaeology (BABAO) conference. As this was an online event there were no travel costs associated.</li></ul></li></ul></li></ul>	

- Research time
  - 25 research days (£166.89 per day).
    - The initial desk-top research proceeded according to plan but the 10 research days set aside for primary data collection benefitted from unexpected additional help.
    - An osteoarchaeologist from CAT joined efforts to radiograph the assemblage of skeletal remains for the CoRIPS project. Originally the CoRIPS project had been planned to involve only one investigator for logistics and imaging (JE). Adelina kindly offered to transport the remains to CCCU from CAT and assist with imaging so that she could use the data for her Masters thesis (Forensic Osteology and Recovery Methods). Adelina sought imaging of long bones for the assessment of Harris lines, whilst I used the experience to reflect upon radiographic technique.
    - With the additional support the primary data collection phase was completed in half the time (5 days). These surplus days are the main reason for having a large remaining balance.
- Open Access publishing within *Radiography*
  - The second phase of the research involved primary data collection. A reflective account exploring the process and radiographic technique needed for human dry bones was written and submitted to *Radiography*.
  - The article was accepted following minor amendments. With the permission of Professional and Education Administration Team, the remaining funds (£877.44) were used to offset the cost of Open Access fees. The total cost was £1800.00 (including VAT), with the difference being met by the author.

#### 5. Did you reach your intended project outcomes (if not why)?

The project was successful despite the national restrictions in travel and social distancing measures due to the coronavirus. However, the length of time taken to complete the project was adversely affected. Nevertheless, the following outcomes have been achieved:

- Scoping review of literature concerning projectional radiography of dry human bones (more details below).
- Generation of recommendations based on literature (and investigator's experience).
- Primary data collection using 92 medieval / post-medieval skeletons from an archaeological excavation in St Alban's, United Kingdom.
  - 502 radiographs of 426 long bones.
  - Photographs to demonstrate radiographic technique
  - Reflective account accepted for publication within *Radiography*.

#### 6. What are your significant findings?

- Scoping review
  - A scoping review of radiographic technique related to human dry bones was conducted to may existing literature. The review included articles from archaeology, anthropology and forensic investigation.
  - Due to the inability to collect primary data during national lockdown, the results were written for publication within *Radiography* but ultimately rejected by the reviewers and Editor. A copy of the search protocol and results accompany this document.
  - The primary reason was the perceived incompatibility between the three disciplines. One

recommendation was to re-write with a focus upon archaeology as a single discipline. Nevertheless, the findings are shown below in brief -

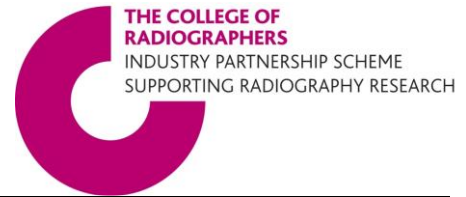
- The scoping review identified 29 studies which provide methodological recommendations for radiographic technique with human dry bones.
- Studies in anthropology, archaeology and forensic science use projectional radiography with human dry bones, although research goals typically differ.
  - Victim identification
  - Diagnosis or characterisation of pathologies
  - Diagnosis of biological stress indicators
  - Assessment of bone mineral density
  - Documentation of remains prior to disposal/reburial
  - Biological profiling
  - Dental assessment
- **Confirmatory research**
  - The primary data collection relied upon an archaeological assemblage from St Albans. Access to the skeletal remains was possible due to the collaborative efforts with Adelina Teoaca. A radiographic survey of tibiae, femora, humeri and radii was performed using the clinical radiography teaching room at CCCU. Significant findings include -
    - *Value of multidisciplinary teamwork* – Having an experienced osteoarchaeologist was critical to the success of the primary data collection. Her intimate knowledge of human dry bones exceeded my own and increased the speed and accuracy of the radiographic survey. Of note, the correct identification of fragmented or juvenile bones required a level of knowledge of osteology beyond my experience as a radiographer.
    - *Clearly defined roles and systematic process for imaging* – An effective system of locating, imaging and recording the radiographic survey was developed using an iterative process. Details of which shall be in the publication.
    - *Use of radiolucent foam pads for positioning* – Whereas the anterior-posterior view was easily obtained in most cases, the medio-lateral view required judicious use of foam pads for accurate positioning and stability.
    - *Exposure factors for human dry bones* – Through experimentation and reference to the available literature, exposure values of 55kV and 5mAs were used for all adult bones irrespective of anatomy. This produced images of suitable penetration and exposure. Slight reductions for juvenile bones were made.
    - *Use of archaeological remains for learning* – Direct handling of human bones increased knowledge of osteology that may benefit radiographers (or those with a particular interest in forensics). Archaeological remains are more accessible than comparable forensic remains for radiographic practice (due to legal sensitivities). As such, there is potential for further pedagogic research for the use of archaeological remains in diagnostic radiography.

#### 7. Have you submitted the work for publication (if so where)?

- **Scoping review**
  - Submitted for peer review within *Radiography* but rejected on grounds of incompatibility between archaeology, anthropology and forensic investigation for synthesis of radiographic technique. Also concerns regarding heterogenous nature of research goals

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- between disciplines, leading to difficulties in commonality.
- Suggested for re-submission within an archaeology-specific journal.
  - Currently submitted, awaiting response.
- **Confirmatory research** (reflective account)
  - 'Radiography of human dry bones: A reflective account with recommendations for practice'
  - Submitted for peer review within *Radiography* and accepted subject to amendments.
  - Resubmitted 25<sup>th</sup> September 2021.
  - Accepted 11<sup>th</sup> October 2021.
  - Published online (In Press, Corrected Proof) and awaiting volume/page numbers.
  - <https://doi.org/10.1016/j.radi.2021.10.011>

**8. Have you presented the work at a national/international event (if so where)?**

**British Association for Biological Anthropology and Osteoarchaeology**

Title: *Radiographic assessment of archaeological long bones: Experiential feedback on technique*

Authors – James Elliott and Adelina Teoaca

A recording of the presentation can be viewed at: [https://youtu.be/A6kPC\\_3zekE](https://youtu.be/A6kPC_3zekE)

**9. Please provide an executive summary of your work (two sides of A4 maximum)**

**N.B. If you already have a draft or final version of the proposed publication please attach this to the report.**

Files attached:

Journal article

'Radiography of human dry bones: A reflective account with recommendations for practice'

Scoping review – Search protocol and results.

**9. Return of final report form**

Please return this form to:

Professional and Education Administration Team  
The Society & College of Radiographers  
207 Providence Square  
Mill Street  
London  
SE1 2EW

Or by email at [pande@sor.org](mailto:pande@sor.org)