



# Never have I ever.....



BAHID WINTER CONFERENCE 2019

Chancellors Hotel, Manchester

22<sup>ND</sup> - 24<sup>TH</sup> November 2019

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 **FORENSICS  
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## **BAHID 2019 Team**

**BAHID Honorary President Elect:** Dr John Clark

**BAHID Officers:** Leigh Evans (Hon. Secretary), Kerry-Ann Milic (Hon. Treasurer)

**BAHID Conference Organising Committee:** Leigh Evans, Kerry-Ann Milic, Carole Davenport (Membership Secretary), Jan Bikker, Kathryn Sloper, Steven Walden, Rose Drew, Benedict Rodbourne, Esther Poulus, Dave Ridgewell, Mike Conway and Roos Eisma (Web Editor).

**BAHID Student volunteers:** Steffi Vasallo and Calil Makhoul

## **BAFA 2019 Team**

**BAFA Chair:** Julie Roberts

**BAFA Organising Committee:** Julie Roberts, Linda Ainscough, Heather Bonney, Jan Bikker, Nicholas Marquez-Grant, Helen Langstaff, Claire Fitton, Calil Makhoul and Amy Rattenbury

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## BAHID Welcome

Welcome to the BAHID 2019 Winter Conference at the Chancellors Hotel in Manchester, our last at this venue that has been home to the winter conference for a number of years. It has been just under 6 months since our last meeting at the Fire Service College and we look forward to catching up with you all, both socially and professionally. The general theme of the meeting is to look at how the field of forensics has developed, whether through research, casework or mistakes. Therefore, there are a range of subjects covered in this meeting, all working towards the goal of developing the fields to provide the most effective methods of investigation possible. We do hope that you will contribute to the graffiti wall, it is anonymous, but can provide the opportunity for confession of our own mistakes, or to put forward ideas for possible areas of research or training in the future.

Our speakers this weekend will show us where things are moving, as they update us on developments in various fields. Presentations will be from established and senior figures in their respective fields, as much as from those just starting out and developing their own research interests. All are equally valued.

There are a number of attendees who are fairly new to the Association but we hope that you still make the most of the expertise and contacts which you will find around you. For the established members please make sure that no-one gets left out, and for the newer ones please do not be backwards in coming forwards. Career pathways can start with the casual conversations of such events, and so please enjoy the weekend and go away all the more enthused. The Council offers a particular warm welcome to our members and guests from further afield. Your interest in joining with us, and the extra effort necessary for you to get here are well noted and appreciated.

*The BAHID Council*



## Timetable of Events

### Friday 22<sup>nd</sup> November

- 19:00 – late** Evening drop-in in the main lounge at the Chancellors Hotel. All delegates are welcome to attend.
- 20:00 – 22:00** Buffet served in the main lounge. Attendees are asked to purchase a ticket in advance.

### Saturday 23<sup>rd</sup> November

- 08:30 - 09:00** **Registration and Coffee**  
The registration desk will be placed outside the Flowers theatre; coffee will be available in the Flowers Foyer.
- Session 1** **Chair: Rose Drew**
- 09:00 - 09:05 Welcome to the Winter Conference by Leigh Evans, BAHID Secretary
- 09:05 - 09:15 Introduction to the Winter Conference by Dr John Clark, BAHID President
- 09:15 - 09:45 Craig Dewar – Forensic Heritage (Evolution of Gold Standards)
- 09:45 - 10:15 Dr Hayley Mickleburgh and Dr Lisette Kootker - A longitudinal actualistic experimental study of human decomposition and skeletonization: exploring the potential of archaeoethanatology in forensic contexts and assessing the effects of decomposition and burial on human hair.
- 10:15 - 10:45 Patricia Dias - Portuguese National Oral Prevention Program vs Forensic Odontology and Human Identification
- 10:45 - 11:15** **Tea/Coffee in the Flowers Foyer**  
Please take this time to view the Poster presentations in the Flowers Theatre
- Session 2** **Chair: Ben Rodbourne**
- 11.15 - 11.35 Veronika Dzetkulicova\* - Identification of human remains using comparison of dermal-epidermal fingerprints collected from Thiel-embalmed bodies.
- 11.35 – 11:55 Mudangawe Pearl Mamathuba\* - Exploring Similarities of Identification on Facial Composites
- 11:55 - 12:15 Rachael Carew\*, Prof Ruth Morgan and Dr Carolyn Rando - 3D printing in forensic anthropology evidence reconstruction: a tangible tool
- 12.15 - 13.15** **Buffet Lunch in the restaurant**  
Please take this time to view the Poster presentations in the Flowers Theatre
- Session 3** **Chair: Esther Poulus**
- 13:15 - 13:35 Samantha De Simone\*, Andrew Ford, Ellen Hambleton, Paul Cheetham and Martin Smith - Cloud Control: exploring the validity of three-dimensional point cloud data for recording complex assemblages of human remains, initial results.

13:35 - 13:55	Sally Andrews* - Dental Development in a UK Population: Does Ethnicity Matter?
13:55 - 14:15	Calil Makhoul - From theory to practice: The Roadmap of Forensic Entomology in Lebanon
14:15 - 14:45	Alison Brough - Remote post-mortem radiology reporting in disaster victim identification: experience gained in the 2017 Grenfell Tower disaster.
<b>14:45 - 15:15</b>	<b>Tea/Coffee in the Flowers Foyer</b> Please take this time to view the Poster presentations in the Flowers Theatre
<b>Session 4</b>	<b>Chair: Carole Davenport</b>
15.15 – 16:45	Sanita Nezirovic - Forensic Taphonomy Workshop - a multidisciplinary approach to improve post-mortem interval estimations
16:45 - 17:00	Closing remarks with Honorary President, John Clark, followed by the announcement of the student presentation prize winners
Approx. 17:00	BAHID Annual General Meeting – N.B. would all those present who are <u>not</u> BAHID members please excuse themselves from the Flowers Theatre at this stage during Association business BAHID Council Meeting – Council members only
<b>19:00 - 20:00</b>	<b>Wine and drinks reception in the main lounge</b>
<b>20:00 - late</b>	Dinner in the Chancellors main restaurant, followed by drinks in the lounge

\* Student presentation entries



## BAFA CONFERENCE – Sunday



### Timetable of Events

#### Sunday 24<sup>th</sup> November

<b>09:00 - 09:30</b>	<b>Arrival Tea/Coffee</b>
09:30 - 09:40	Introduction
09:40 - 10:00	Samantha De Simone - Context recording: from traditional to digital methods
10:00 - 10:20	Linda Ainscough and Julie Roberts - Surveying a fire scene
10:20 - 10:40	Alistair Vannan (TBC) - Casework and images for court presentation
<b>10:40 - 11:00</b>	<b>Tea/Coffee break</b>
11:00 - 11:10	CPD Practical briefing
11.15 - 13:00	Practical Workshop – Scattered remains
<b>13:00 - 14:00</b>	<b>Lunch</b>
14:00 - 14:15	Showing the photogrammetric models
14:15 - 14:30	Panel discussion
14:30 - 15:30	BAFA AGM
<b>15:30</b>	<b>Conference close</b>

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## Speaker Abstracts

### Keynote Speaker - Craig Dewar

#### *Forensic Heritage (Evolution of Gold Standards)*

Retiring in May 2019, Craig Dewar was a Forensic Evidence Advisor to the US Embassy in Jamaica, where he advised and assisted in supported projects and the development of Scientific Support in Policing and the Criminal Justice system. In March 2017, Craig Dewar retired as Head of Scenes of Crime, Superintendent of Police in the Jamaica Constabulary Force, Kingston, Jamaica having completed a total of 42 years in policing.

Craig joined the Lothian and Borders Police in June 1975, and moved into scientific support during spring 1986. After completing two 5-year 'apprenticeship' terms he subsequently qualified with dual expertise in fingerprints and the examination of questioned firearms and ammunition (Ballistics) and was authorised as an expert for court purposes by the Secretary of State for Scotland. His training subsequently included the investigation of fires and explosions, Crime Scene Management & Co-ordination and Disaster Victim Identification (DVI). He progressed through various police ranks to become Head of Identification Branch (Scientific Support) in Lothian and Borders Police which included Scenes of Crime, Fingerprints, Photography, Ballistics and Questioned Documents. His subsequent roles included Forensic Co-ordinator in Edinburgh, Scene Examination Manager in Glasgow and South West Scotland and Operations Manager (Crime Scenes) in Scotland East.

Craig's experience has seen involvement in all types of major crime enquiries including the Lockerbie Air Disaster, International war crimes investigations, terrorism, serial and cold case enquiries, Explosions, Disaster Victim Identification and multiple fatal shooting murders. On behalf of the Police Staff College for England & Wales he was involved in establishing Scene of Crime Training for the United Arab Emirates in Abu Dhabi and has lectured on crime scene management at the Police College in Hangzhou Zhejiang province in China.

Craig is a former Team Member of Kenyon's International Emergency Services, the Chartered Society of Forensic Scientists and the International Crime Scene Investigator's Association. Since 2007 he has been an Honorary Fellow of the University of Edinburgh's College of Medicine & Veterinary Medicine, Deanery of Molecular, Genetic & Population Health Sciences, Division of Pathology (Forensic Education) in recognition of his contribution to teaching.

*Craig Dewar, Forensic Evidence Advisor (retired)*

### Dr Hayley Mickleburgh and Dr Lisette Kookter

*A longitudinal actualistic experimental study of human decomposition and skeletonization: exploring the potential of archaeoethanatology in forensic contexts and assessing the effects of decomposition and burial on human hair.*

In this paper we will present some results of an ongoing actualistic experimental study on human decomposition and skeletal disarticulation at Texas State University's outdoor human decomposition facility in San Marcos. In the context of this project (March 2015-present),

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taphonomic data on the natural sequence of joint disarticulation and spatial distribution of bones in buried and surface depositions of 20 willied-donated human cadavers has been collected. The results are used to examine taphonomic models used in archaeoethanatology, a field of study in archaeology that aims to reconstruct mortuary practices in the past, and to explore their potential for use in forensic investigation. As an archaeological science, archaeoethanatology can provide carefully evaluated taphonomic evidence to distinguish natural from anthropogenic processes. However, in the absence of actualistic taphonomic data, it has relied on repeated observation of patterns in the archaeological record. The results thus far have demonstrated that body position and soil properties can strongly affect disarticulation and bone displacement. Current archaeoethanatomical models do not account for the amount of variation and the (combined) effects of different variables.

Bone, tooth and hair samples from five of the willied body donations were collected at different stages throughout decomposition to study the effects of decomposition and deposition environment on isotopic composition of different body tissues over time. The results of analysis of the hair shows that chemical and microbiological degradation occurs rapidly as a result of fungal tunneling and degradation of hair fibres. The results indicate an association between hair degradation and change in isotopic composition of hydrogen, strontium and lead. However thus far no clear correlation between specific histological markers of degradation and isotopic change was found, as the rate of hair degradation and the change in isotopic composition differs. The results are significant in the light of the practice of using isotopic analysis of hair to obtain information on origin and mobility the deceased individual. If highly degraded hairs are unreliable materials for isotopic provenance studies, use of such samples must be avoided. Ongoing work is exploring ways to rapidly and cheaply screen hair for degree of degradation prior to isotopic analysis.

*Hayley Mickleburgh, Texas State University, Linnaeus University*

*Dr. Lisette Kootker, VU University Amsterdam*

## **Patrícia Dias**

### *“Portuguese National Oral Prevention Program vs Forensic Odontology and Human Identification”*

**ABSTRACT:** The Portuguese National Oral Prevention Program began in 2009, for children from 6 -13 years old and in 2016, the program was extended to 18-year-old child. The program consists on giving to all children with a specific age, a voucher by the Health Ministry to do prevention and certain oral treatments, with a specific database of private practitioners.

At the beginning of this program, the Health Ministry beneficiated 144,033 children (6-13 years old) and 24,355 vouchers were used, at this time only children of low-income parents were admitted in the program. Last program age extension was in 2016, embracing till 18-year-old child, a total of 3,315,243 were emitted and 2,093,519 used (2018 records provided by the Health Ministry).

The specificity of the program open doors for error, since one of the parameters is that the children only receives the next voucher if any dental treatment is performed first. But what if, the child has no need to do such procedure? Some dentists change dental charts, adding fake dental treatment so that child can get the next voucher.



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The main goal of this research is to alert medical and scientific community, the problems that a governmental oral health program can cause in cases of AM dental reports to human identification. Being the forensic odontology one of the 3 pillars of human identification, these initiatives can become a huge problem for the forensic odontologist.

What can we as scientific community learn with this and what can we do to help further problems?

**KEY WORDS:** Human Identification, Forensic, Government Health Program, Oral Health program

**BIOGRAPHY:** Patrícia Dias is a Portuguese general dentist practitioner at her private clinic in Portugal. Besides her master's in dental medicine, she also has a postgraduation in Legal Medicine and Forensic Sciences by the Portuguese National Institute of Legal Medicine and Forensic Sciences.

On February 2018 she became a Kenyon Team member, and since 2016 she's been lecturing for PERITIA the Forensic odontology an eLearning course.

*Patricia Dias, Clínica 10 de Agosto, Lda*

## Alison Brough

### *Remote post-mortem radiology reporting in disaster victim identification: experience gained in the 2017 Grenfell Tower disaster*

In June 2017 the worst residential fire since the conclusion of the second world war broke out in a residential block of flats, Grenfell Tower, West London, UK. Seventy-one adults and children died, including one stillbirth. All victims of the Grenfell Tower disaster who died at the scene underwent post-mortem computed tomography (PMCT) imaging using a mortuary-sited mobile computed tomography scanner. For the first time, to our knowledge, the disaster victim identification (DVI) radiology reporting was undertaken remote to the mortuary scanning. Over an 11-week period, 119 scans were undertaken on 16 days, with up to 18 scans a day. These were delivered to a remote reporting centre at Leicester. Using a disaster-specific process pathway, a multi-disciplinary team of 4 reporters, trialled a prototype INTERPOL DVI radiology reporting form. They produced full radiology reports and supporting image datasets for each scan and were able to provide 96% of prototype DVI forms, 99% of image datasets and 86% of preliminary reports to the DVI teams in London within one working day of image receipt. This presentation will describe the first use of remote radiology for DVI and describe the reporting forms that were utilised, including the development and testing of the new INTERPOL radiology reporting form so that others can learn from our experience. The experience gained during this incident will undoubtedly change the way investigations are carried out in the future following major incidents and highlights how remote PMCT reporting can support a DVI process of this scale.

**KEY WORDS:** Grenfell tower, Mass fatality, Disaster victim identification, post-mortem computed tomography, remote radiology reporting

*Dr Alison Brough, Cellmark Forensic Services*

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## Calil Makhoul

### *From theory to practice: The Roadmap of Forensic Entomology in Lebanon*

**ABSTRACT:** Forensic entomologists are frequently asked to determine the minimum postmortem interval (minPMI), or time since death, whenever arthropods are recovered from human remains. The assessment of the minPMI has been established based in the arthropod development rates and its community succession. Although theories and technologies of forensic entomology are increasingly rich, many problems remains in the research and practice. According to Daubert Standard, the reliability and accuracy of estimating minPMI need more demands. However, building the bridge for basic research and forensic practices to provide higher accuracy for estimating the minPMI has tremendously evolved in Lebanon for the past of six years. Furthermore, based on species compositions and development of necrophagous insects recovered from dead bodies as well as infesting animal models decomposing in various conditions, pioneer Lebanese researches on ecology, quantitative genetics, population genetics, molecular biology, microbiology in the practice of forensic entomology have been conducted Raising awareness about the importance of forensic entomology in the Lebanese forensic investigations was the bedrock for the research development and it was officially implied in 2015. Nevertheless, Lebanon is the smallest country on the Levantine coast (10457 km<sup>2</sup>) and has a variety of ecological conditions throughout the country, it is important to have the data on the influence of geographic location on species composition and development of necrophagous insects. However, further steady steps towards forensic entomology research must be developed to provide a full comprehensive entomological database and understand thoroughly the intrinsic and extrinsic factors that influence the entomofaunal succession.

**KEY WORDS:** Entomofaunal succession, Lebanon, forensic entomology, animal models, human corpses.

**BIOGRAPHY:** Calil Makhoul is the student representative on the BAFA Committee. He is a forensic entomologist and current PhD student in Forensic Anthropology. His doctoral work explores the individualization of burned human remains, particularly, in scattered and commingled contexts. He is a C-FASE certified Level II. Calil gives lectures in Human rights and Forensic Anthropology.

*Calil Makhoul, University of Coimbra*

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## Workshop Abstract

**Sanita Nezirovic**

*Forensic Taphonomy Workshop: The reliability of visual taphonomic descriptors for PMI estimations*

Decomposition is a holistic process where the entire necrobiome needs to be studied. Although the rate and pattern of decomposition have been studied extensively over the past decade with numerous conditions and variables being explored to give way to enhanced predictive models to determine a time since death of unknown victims. Still taphonomic research is limited by its methodological approach of small sample sizes, using pig carcasses as human analogues, and the tendency to focus only one variable leaves an undefined PMI prediction with little to no certainty. This workshop will provide an overview of the visual taphonomic descriptors used in body scoring techniques as a tool for a more robust method of determining the post-mortem interval.

*Sanita Nezirovic, University of Derby*

## Student Oral Presentation Abstracts

**Veronika Dzetkucicova\***

*Identification of human remains using comparison of dermal-epidermal fingerprint collected from Thiel-embalmed bodies.*

**ABSTRACT:** Direct comparison of dermal and epidermal fingerprints may be vital to the identification of bodies that have been in water for long periods of time where the epidermal skin layer is no longer available. Epidermal desquamation occurs during the fixation of a body in Thiel embalming fluid revealing dermal surface of the skin which provides an opportunity to compare dermal and epidermal fingerprints from one individual. The aim of the study is to compare the quality of epidermal and dermal fingerprints collected from Thiel-embalmed bodies and report on first comparisons of epidermal and dermal fingerprints conducted by fingerprint examiners. Fingerprints were collected from bodies bequeathed to the Centre for Anatomy and Human Identification, University of Dundee, using black powder and photography prior to embalming (epidermal) and after the completion of embalming (dermal). Epidermal and dermal fingerprints (N<sub>total</sub> = 3393) were assessed for quality by an untrained observer. The quality was assessed in 80 epidermal-dermal fingerprint pairs (N<sub>powder</sub> = 40, N<sub>photo</sub> = 40) by experienced fingerprint examiners (N<sub>expert</sub> = 5). The fingerprint examiners also analysed and compared the paired fingerprints to establish an identification outcome. The fingerprint quality assessment results show the epidermal fingerprints have higher level of quality when compared to dermal fingerprints regardless of fingerprint collection technique. Preliminary results of fingerprint comparison show the fingerprint examiners were able to match a pair of fingerprints (positive identification) in 10 to 15 % of cases and they were able to establish fingerprint pairs as non-matching in 30 to 45 % of cases.

**KEY WORDS:** dermal fingerprints, identification, Thiel embalming

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**BIOGRAPHY:** I received my BSc in Forensic and Applied Biology from the University of Worcester in 2013. Subsequently I gained MSc degree in Anatomy and Advanced Forensic Anthropology at the Centre for Anatomy and Human Identification (University of Dundee) in 2014. I am currently a full-time PhD student at the Leverhulme Research Centre for Forensic Science at the University of Dundee studying the relationship between epidermal and dermal fingerprints.

*Veronika Dzetkucicova, Leverhulme Research Centre for Forensic Science, University of Dundee*

### **Mudangawe Pearl Mamathuba\***



#### *Exploring similarities of Identification on facial Composites*

**ABSTRACT:** The presentation will discuss the findings of research conducted by the researcher under the title mentioned above. The project explored facial identification similarities between target images, facial composites and sketches. The aim was to match target images with composite images. The study also explores how over the years facial composites have developed from traditional sketches to digital 2D computer generated images, the choice to use traditional drawings and a 2D digital system proved to be enough for comparison between two facial composite techniques. Automated face systems are used in different countries for compilation of a person of interest's likeness. The choice to use black male South African faces was fitting for this project as little research is done on ethnic differences. The project consisted of 41 participants. Access to study participants was through emails and word of mouth. An invitation email was sent out and those who responded were sent a second email with the participation information and a schedule of the interview date and time was allocated to minimize disruptions. The study adopted the data triangulation approach, interviews, documentary reviews and observation. It was found that the participants with an artistic background who form part of the MSc Forensic Art & MSc Medical Art program had more confidence in producing and describing the target image which created an exceptionally good composite. It was further found during the naming process that most participants were either familiar with target images or could not identify the celebrities by name. The presentation will discuss the findings of research conducted by the researcher under the title mentioned above. The project explored facial identification similarities between target images, facial composites and sketches. The aim was to match target images with composite images. The study also explores how over the years facial composites have developed from traditional sketches to digital 2D computer generated images, the choice to use traditional drawings and a 2D digital system proved to be enough for comparison between two facial composite techniques. Automated face systems are used in different countries for

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compilation of a person of interest's likeness. The choice to use black male South African faces was fitting for this project as little research is done on ethnic differences. The project consisted of 41 participants. Access to study participants was through emails and word of mouth. An invitation email was sent out and those who responded were sent a second email with the participation information and a schedule of the interview date and time was allocated to minimize disruptions. The study adopted the data triangulation approach, interviews, documentary reviews and observation. It was found that the participants with an artistic background who form part of the MSc Forensic Art & MSc Medical Art program had more confidence in producing and describing the target image which created an exceptionally good composite. It was further found during the naming process that most participants were either familiar with target images or could not identify the celebrities by name.

**KEY WORDS:** Facial composite, automated face system, forensic art

**BIOGRAPHY:** I am a Police Officer working for the South African Police Service Forensic Unit. I am appointed as a Facial Identification personal with responsibilities of attending to case with eyewitness evidence for the construction of facial composites and facial comparison cases with CCTV evidence which are presented in court. I have been working in this field for the past 5 years. I recently completed a Master of Science in Forensic Art and Facial Identification at the University of Dundee in Scotland academic year (2018/2019). I also hold a National Diploma in Fine Art from the University of Johannesburg (South Africa) and a Post Graduate Diploma in Arts and Cultural Management from the University of Witwatersrand (South Africa). In my work accomplishments I have been awarded the best Facial Identification personal in my provincial area which comprises ±150 police stations, which service a population of ±5,405 million.

*Mudangawe Pearl Mamathuba, The South African Police Service (Forensic Unit)*

### **Rachael Carew\***

#### *3D printing in forensic anthropology evidence reconstruction: a tangible tool*

**ABSTRACT:** 3D printed replicas of human remains have been shown to be useful tools in courtroom demonstrations of evidence and have been used in several court cases internationally. 3D prints provide a medium that users (such as expert witnesses or jurors) can hold, touch, rotate and even use to mimic mechanisms of injury. Consequently, it is believed that using 3D prints as visual aids may assist laypeople in their understanding of expert/medical testimony. We will introduce the theme of 3D printing in forensic anthropology and provide examples where prints have been used in courtrooms demonstrations. We will present our initial research that established 3D printed bone replicas to be accurate and robust representations of skeletal elements<sup>[1]</sup>, as well as a recent study investigating the viability of applying age and sex estimation methods and an assessment of the surface quality of 3D printed bones. This research utilises computed tomography (CT) scanning for digital recording of archaeological human remains, open-source software (3D Slicer and Blender) for the reconstruction of CT data and explores a variety of 3D printing techniques. This presentation will present empirical research towards validating the process of 3D printing in forensic anthropology, and discuss the challenges and limitations associated with 3D printing bones. 3D printing technology is under-researched and under-reported in the forensic sciences,

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nevertheless it can be affordable and attainable and delivers a tangible medium that can assist users with the interpretation and presentation of forensic materials.

**KEY WORDS:** 3D printing, courtroom presentation, evidence reconstruction

**BIOGRAPHY:** Rachael Carew is currently studying part-time for a PhD at University College London (UCL), where she is investigating the metrology and ethics of 3D printing for forensic anthropology evidence reconstruction. She is also teaching as a PGTA at UCL's Institute of Archaeology. Rachael completed her bachelor's degree in forensic science before specialising via a master's degree in forensic archaeology and anthropology. She is a fellow of the Royal Anthropological Institute, an associate of the Chartered Society of Forensic Science and a member of several professional organisations (BABAO, BAHID, BAFA). Rachael is a Deployment Coordinator with the Cranfield Recovery and Identification of Conflict Casualties (CRICC) team, having been deployed on several European missions to assist with the recovery of US Aircrew from WW2 crash sites. She has also worked on several modern conflict investigations excavating and assessing human remains.

*Rachael Carew, University College London*

### **Samantha De Simone\***

*Cloud control: exploring the validity of three-dimensional point cloud data for recording complex assemblages of human remains, initial results*

**ABSTRACT:** Following recent advances in digital technologies, the three-dimensional (3D) digital documentation of archaeological sites and human burials has become common practice. An issue with particular relevance to the forensic community that remains unresolved is whether such technologies offer sufficiently accurate recording for the presentation of evidence in a courtroom. Additional challenges are presented when working with human remains resulting from mass disasters and human rights violations. In these scenarios, the remains of large numbers of individuals may be placed in mass graves creating complex deposits displaying a high level of disarticulation, fragmentation and commingling.

The current study focuses on creating a permanent record of such burials in three-dimensions (3D). It explores the applicability and limitations of 3D point cloud data, generated through structure-from-motion multi-view-stereo (SfM-MVS) photogrammetry, for recording complex deposits of human remains. Such digital method preserves by record the excavation sequence in a form inaccessible using conventional techniques, so there is a need to fully understand how to process the data to know, for example, which parameters to use to generate the point cloud.

In particular, this paper presents the preliminary results of pilot studies analysing successive point cloud datasets generated from the same assemblage of replica human skeletons assemblage in a simulated mass grave. The raw image data were captured twice. The first set of images was captured during deposition and the second during excavation. Among the factors evaluated are the effects of backfilling, settling and excavation on the position of the bones, photographic strategy, and the choice of equipment for data capture.

**BIOGRAPHY:** She has received her BA(Hons) in Cultural Heritage from the University of Bologna and her master's degree in Forensic Archaeology and Anthropology from the

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University of Dundee, in 2017. She is a certified forensic anthropologist (FA-III) and she is involved in both commercial and research archaeological projects both as an excavator and as photogrammetrist. She is currently living in England conducting her PhD in the use of point cloud data for the recording of complex assemblages of human remains in mass graves.

*Samantha De Simone, Bournemouth University*

## **Sally E Andrews\***

### *Dental Development in a UK Population: Does Ethnicity Matter?*

**ABSTRACT:** The research tests the null hypothesis that there is no ethnic difference in the timing of dental development in Black British and White British children and young adults. Highly significant differences in third molar development between these ethnic groups were found. Ethnic differences in tooth maturation are poorly represented in the literature. Data were collected from digitised Dental Panoramic Tomographs (DPTs) from a London teaching hospital archive (2005 – 2019). The sample currently represents 5275 subjects. The main inclusion criterion was a self-assigned ethnicity in the hospital records. All of those reporting Black ethnicity were included in the Black British group. For both Black British and White British ethnicities, the DPTs of up to 50 male and 50 female subjects, in half-year age bands with an age range of 11 to 24 years, were examined using the Anglo-Canadian (Demirjian) eight-stage scoring system. Datasets for third molars of males and females of the two ethnic groups were compared. In the Black British group, all stages of third molars developed significantly earlier in both males (0.74 to 1.77 years; Stages A-G) and females (0.67 to 2.05 years; Stages A-G).

In conclusion, differences between Black British and White British groups indicate that ethnically appropriate reference datasets are essential for age assessment throughout childhood and young adulthood. This is relevant to assessment of skeletal remains, for example, as well as the living but may be particularly important in decision-making regarding the 18-year-old threshold.

**KEY WORDS:** Third molar development, ethnic variation, Dental Age Estimation

**BIOGRAPHY:** Sal qualified as a dentist from Guy's Hospital Dental School in 1982 and worked in the Paediatric Dentistry and Orthodontics Department before going to live in Turkey between 1984 and 2001 and being limited to voluntary work as a non-Turkish National. Sal returned to the UK in 2001 to enjoy postgraduate training, general practice in rural Gloucestershire from 2002 to 2017 including at an HMP & Young Offenders Institution from 2009 to 2012 where an interest in dental age estimation began. Sal has an MSc degree in Forensic Odontology from the University of Glamorgan awarded in 2011 and a Diploma in Forensic Human Identification (AFMS). Having taken part in mentoring programmes for dental identification and bite mark cases, Sal has worked independently, excluding bite marks, since September 2016 and is a member of the UKDVI team. Following on from an MSc study on clinical observation of third molars in male young offenders, Sal is currently a PhD candidate at the University of Cambridge and Honorary Clinical Observer for Clinical Dental Research at Guy's and St Thomas' NHS Trust studying ethnic factors in dental development which may be relevant to dental age estimation.

\*Presentations are student prize eligible.

## Poster Presentation Abstracts

Emily Fisher\* – University of Derby

*The influence of leaves and woodland debris on rate and pattern of cadaver decomposition*

**ABSTRACT:** The stages of decomposition are known to relate to a range of taphonomic drivers, such as temperature, body size and insects (Mann et al, 2015). This poster will report findings of a study looking at the impact of woodland debris and leaves on the rate and pattern of decomposition of piglet carcasses. Four experimental piglets were concealed in a pile of woodland debris and leaves and compared against two control piglets. The rate using accumulative degree days by Moffatt et al. (2016), and pattern (total body score) by Keough et al. (2017) were used to record data every 24 hours over 6 weeks with environmental data. Anova tests were conducted to compare the results.

It was concluded that the leaves effected the moisture of the piglet. The extremities did not dry out, and the skin and hair became darker from the leaves, making it difficult to identify any decomposition-induced colour changes. It became apparent that the maggots did not enter the body within the orifices, instead they ate the skin from the outside first. Therefore, there was no bloating and discoloration/marbling of the carcass. This process also separated the skin layers of the piglets and lead to a bright green discoloration on the under layers of skin, caused by leaking of microbiomes and chemicals from the decomposition of the leaves into the piglet's skin. The findings of the study will have implications for accurate calculations of post-mortem interval and further taphonomic research.

Taylor Flaherty\* – University College London

*Dehydration Induced Morphological Alterations to Bones and Associated Sharp Force Trauma: A Quantitative Analysis*

**ABSTRACT:** There is a general understanding that taphonomic processes affect the presentation of human remains in a forensic context. Though dehydration is one taphonomic agent which affects almost all human remains it is virtually ignored in the forensic literature. As human bone is composed of 15-20% water, it has been suggested that dehydration causes dimensional and volumetric alterations to bone; it has also been suggested that dehydration alters sharp force trauma striations in soft tissue. To quantify the effects of the dehydration process to bone and associated sharp force trauma, this study created a controlled experiment which subjected sectioned domestic pig radii (n = 47) to laboratory induced dehydration after being inflicted with sharp force trauma. All samples were photographed pre- and post-dehydration, allowing quantitative data for bone section and kerf mark length, width and area to be collected using ImageJ. Inter- and intra-observer error tests were completed to ensure consistency in landmark identification and measurements. Paired T-Test results indicated that dehydration significantly ( $p < 0.001$ ) altered all measurements, with kerf marks being more



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drastically affected. These results illustrate that quantitative data obtained from dehydrated bones and associated sharp force trauma may not accurately represent the dimensions of the original bones and wounds, thus negatively impacting forensic analysis. Further, these results demonstrate the demand for future considerations into the effects of dehydration on the morphology of bones and bone trauma.

**KEYWORDS:** Dehydration, sharp force trauma, forensic anthropology, taphonomy

**Calil Makhoul\*** – University of Coimbra

*Entomofauna Succession in a Bird Model Carcass in Aveiro, Portugal*

**ABSTRACT:** The study of arthropod succession during cadaveric decomposition is relevant to estimate the minimum Postmortem Interval (minPMI). Calliphoridae and Sarcophagidae are ecologically and forensically important, due to the fact that the larvae of many species feed on dead organic matter, acting as decomposers and potential indicators of the postmortem interval. The objective of this study is to identify the different stages of decomposition and to verify the forensic entomological succession on bird carcass. A bird carcass was used in an open environment in the University of Aveiro. Daily observation and meteorological conditions were recorded to relate to the decomposition stages of the corpse. The arthropods were collected and transported to the laboratory for identification.

Five phases of cadaveric decomposition were observed. Diptera and Coleoptera were the most frequently collected arthropods, according to forensic entomological succession patterns. In comparison with forensic entomological studies with mammalian models, it is verified that the phases of decomposition and the succession of arthropods are generally concordant. However, there are variables that can influence the decomposition time of the cadaver, such as its size and meteorological conditions. These two variables should be explored in a more developed study. Model - specific animals of birds can be used for succession studies of cadaveric entomofauna with obvious advantages from a logistic point of view, allowing the development of regional studies which should guard against the influence of climatic and ecological variables related to the scene of crime.

**KEYWORDS:** forensic entomology; arthropod; post-mortem interval; bird model

**Ofelia Meza-Escobar\*** – The University of Sheffield

*Testing the validity of sex estimation through metacarpal measurements on a Scottish population*

**ABSTRACT:** Several studies have addressed sex estimation using metacarpal measurements, with varying results. The aim of the present research was to test the validity and accuracy of metacarpal measurements to estimate the sex of individuals of a small recent Scottish population.

The sample was 39 white adult individuals (19 females, 20 males) from the Bequeathal Programme of the Centre for Anatomy and Human Identification, University of Dundee. Six variables of length and widths were measured on the 2nd, 3rd, 4th and 5th right and left metacarpals (1680 measurements in total). As there was not statistically significant difference between right and left metacarpals, the sample was analysed regardless side.

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Discriminant function analysis was used to classify individuals by sex. For the complete sample and partial samples (per metacarpal) the stepwise DFA method was performed to select the combination of variables (measurements) that best discriminate between male and female individuals. The correct sex classification ranged from 80.1% for the complete sample's selected variables, to 93.6% for the 4th metacarpal selected variables, with all correct classification rates exceeding 80%.

The results suggest that metacarpals are a useful element to estimate sex in this sample, but the accuracy rates and variables selected as most predictive differ from previous studies. Overall, the most predictive variables for this sample were the transverse dimensions (widths) of metacarpals head and base, in contrast with other previous studies that stated the length as the most predictive variable. This suggests a sample-specific approach for this metric estimation method.

**KEYWORDS:** Forensic anthropology, sex estimation, metacarpal, Scottish population

**Charlotte Primeau \*** – Robert Gordon University

*Can latent fingerprint residue indicate if an unknown individual is a male or a female?*

**ABSTRACT:** This study examined the potential of determining the biological sex from latent fingerprint residue. Twenty-two males and 22 females donated three replicate samples. Fingerprint samples were collected on microscopic slides and samples were analysed using GC-MC (Gas chromatography–mass spectrometry). A total of 132 compounds were identified, however many in low abundance or non-identifiable. This left 44 compounds in the study. A large proportion of compounds were esters and fatty acids with only three alcohols and two terpenes. MANOVA analysis was conducted on the means of the three replicates of the 44 compounds. Results indicated that only two compounds (both alcohols) showed a statistical significance between the sexes ( $p < 0.05$ ). This study shows that latent fingerprint residue from an unknown individual has the potential to discriminate between male and female sex from chemical analysis.

**KEYWORDS:** Discriminant function, sex determination, fingerprint, latent prints, chemical analysis

**Megan Robbins\*** – University of Derby

*The accuracy of using accumulated degree days as a technique for post mortem interval estimations.*

**ABSTRACT:** The estimation of a post mortem interval (PMI) within forensic investigations is critical as this could help with identification of the deceased or narrow down the pool of suspects involved by giving a time frame of when the death occurred. The application of total body scores (Megyesi, 2005) to find an estimated accumulated degree days (ADD) is increasingly popular. The most commonly used body scoring methods are Megyesi (2005) and Moffatt (2016), however research into their accuracy is debated and therefore this project aims to investigate the accuracy of these two models side by side, for a comparison of both. The decomposition of three pigs was observed to find an estimated ADD using Megyesi et al. (2005) and Moffatt et al. (2016). These ADD values were compared to the real ADD values to

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find which of the two data sets were more accurate using a paired samples t-test. Statistical test showed no significant difference between the estimated ADD values and the real ADD values which would suggest that the equations by Megyesi et al. (2005) and Moffatt et al. (2016) are accurate. However, observations of the data show extreme differences between the ADD values within weeks three and four which would suggest that the equations can't give a reliable ADD estimation once a body has reached the advanced stages of decomposition. Further research is required to find out which factors may cause these equations to be so unreliable within the final weeks of decomposition.

**KEYWORDS:** Post mortem interval (PMI), body scoring methods, accumulated degree days (ADD)

**Steffi Vassallo\*** – University of Dundee

*Estimation of sex from metric measurements of human scapulae from a modern Italian population.*

**ABSTRACT:** Despite the growing literature on metric sex estimation methods, little research has been carried out to determine the true potential of the human scapulae. This is of some concern, as the scapulae tend to be intact when recovered at crime scenes. The left and right scapulae from 180 modern Italian individuals (94 male and 86 female) were therefore metrically analysed using standard anthropometric instruments. Six scapular measurements were evaluated using statistical analyses including discriminant function analyses (DFA).

The results support the existence of pronounced sexual dimorphism, which is likely attributed to genetic, environmental and socio-cultural factors. Direct and stepwise discriminant functions show higher accuracy results (~88 - 96%) in contrast to univariate ones (~65 - 89%). Based on the obtained findings, it is recommended that the maximum width of the coracoid process should not be included within future metric methods, as it was shown to be the least sexually dimorphic trait. Concerning bilateral asymmetry, only 3 measurements in both sexes showed statistically significant results. This is of forensic relevance, as these left and right measurements should only be input into their designed equation, so as to increase accuracy rates. In conclusion, the population-specific equations may be useful for the estimation of skeletal sex, when the recovered osteological material is shown to be of Italian descent.

**KEYWORDS:** sex estimation, adult, scapulae

**\*Presentations are student prize eligible.**

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## NOTES

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