

# Forensic Anthropology Research Centre (FARC)

## 2017 Year-End Report

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# 1. Introduction

This report serves as an account of research, education and community services activities for the period of January 2017 to November 2017 for the Forensic Anthropology Research Centre (FARC) in the Department of Anatomy at the University of Pretoria.

This year, the members of FARC published 25 articles in ISI-indexed, accredited and peer reviewed journals, with 9 more in print or under review. Researchers were invited to write 4 book chapters on various topics in human variation and forensic anthropology. Various members of FARC and/or postgraduate students presented at 13 national and international conferences and symposia.

In terms of teaching, we have managed to modify undergraduate human osteology, palaeoanthropology and forensic anthropology curricula with the aim of encouraging critical and relativistic thinking among our students so as to prepare them for postgraduate studies. The development of critical thinking skills also sets students up for being better able to become experts in their chosen disciplines (e.g., Daley 1999; Elvira et al. 2017). Future plans are set to incorporate new education designs for BSc Honours year with an emphasis on the development of expertise. This is aligned with the medical education research project (SAFRI) of Prof EN L'Abbé. For postgraduates in 2017, 3 BSc Honours research projects were completed. Three MSc and 5 PhD students are still in the process of completing their degrees.

FARC, and the University of Pretoria, were visited by numerous international students and postdoctoral fellows who are in the process of completing their research, notably a large delegation from France under the AESOP+ grant of Prof AC Oettlé.

The FARC lab received 41 forensic cases from the South African Police Service (SAPS).

## 1.1. Research and Funding

### 1.1.1. Manuscripts Published or in Print

1. **Beaudet, A.** and Bruner, E., 2017. A frontal lobe surface analysis in three archaic African human fossils: OH 9, Buia, and Bodo. *Comptes Rendus Palevol*.
2. **Beaudet, A.**, 2017. The emergence of language in the hominin lineage: perspectives from fossil endocasts. *Frontiers in Human Neuroscience*, 11, p.427.
3. Berg, G.E. and **Kenyhercz, M.W.**, 2017. Introducing Human Mandible Identification [(hu) MANid]: A Free, Web-Based GUI to Classify Human Mandibles. *Journal of Forensic Sciences*.
4. **Botha, D.**, Steyn, M., **Scholtz, Y.** and Ribot, I., 2017. Revisiting historical Khoe-San skeletal remains in European collections: A search for identity through craniometric analysis. *HOMO-Journal of Comparative Human Biology*.
5. Byrnes, J.F., **Kenyhercz, M.W.** and Berg, G.E., 2017. Examining Interobserver Reliability of Metric and Morphoscopic Characteristics of the Mandible. *Journal of Forensic Sciences*.
6. **Cazenave, M.**, Braga, J., **Oettlé, A.**, Thackeray, J.F., de Beer, F., Hoffman, J., Endalamaw, M., Redae, B.E., Puymérail, L. and Macchiarelli, R., 2017. Inner structural organization of the distal humerus in Paranthropus and Homo. *Comptes Rendus Palevol*, 16, pp.521-532.
7. Colman, K.L., Dobbe, J.G., **Stull, K.E.**, Ruijter, J.M., Oostra, R.J., van Rijn, R.R., van der Merwe, A.E., de Boer, H.H. and Streekstra, G.J., 2017. The geometrical precision of virtual bone models

derived from clinical computed tomography data for forensic anthropology. *International Journal of Legal Medicine*, 131(4), pp.1155–1163.

8. Congram, D., **Kenyhercz, M.** and Green, A.G., 2017. Grave Mapping in Support of the Search for Missing Persons in Conflict Contexts. *Forensic Science International*.
9. **Dussault, M.C.**, Hanson, I. and Smith, M., 2017. Blast injury prevalence in skeletal remains: Are there differences between Bosnian war samples and documented combat-related deaths? *Science & Justice*.
10. **Hagg, A.C.**, Van der Merwe, A.E. and Steyn, M., 2017. Developmental instability and its relationship to mental health in two historic Dutch populations. *International journal of paleopathology*, 17, pp.42-51.
11. **Jagesur, S.**, Wiid, A., Pretorius, S., Bosman, M.C. and **Oettlé, A.C.**, 2017. Assessment of the variability in the dimensions of the intact pelvic canal in South Africans: A pilot study. *HOMO-Journal of Comparative Human Biology*, 68(1), pp.30-37.
12. **Kenyhercz, M.W.**, Klales, A.R., Rainwater, C.W. and Fredette, S.M., 2017. The optimized summed scored attributes method for the classification of US Blacks and Whites: a validation study. *Journal of forensic sciences*, 62(1), pp.174-180.
13. **Kenyhercz, M.W.**, Klales, A.R., **Stull, K.E.**, McCormick, K.A. and Cole, S.J., 2017. Worldwide Population Variation in Pelvic Sexual Dimorphism: A Validation and Recalibration of the Klales et al. Method. *Forensic Science International*.
14. Keough, N., **Myburgh, J.** and Steyn, M., 2017. Scoring of Decomposition: A Proposed Amendment to the Method When Using a Pig Model for Human Studies. *Journal of forensic sciences*, 62(4), pp.986-993.
15. **Krüger, G.C.**, **L'Abbé, E.N.** and **Stull, K.E.**, 2017. Sex estimation from the long bones of modern South Africans. *International journal of legal medicine*, 131(1), pp.275-285.
16. Marais-Werner, A., **Myburgh, J.**, Becker, P.J. and Steyn, M., 2017. A comparison between decomposition rates of buried and surface remains in a temperate region of South Africa. *International Journal of Legal Medicine*, pp.1-9.
17. Marais-Werner, A., **Myburgh, J.**, Meyer, A., **Nienaber, W.C.** and Steyn, M., 2017. Decomposition patterns of buried remains at different intervals in the Central Highveld region of South Africa. *Medicine, Science and the Law*, pp.115-123.
18. **Myburgh, J.**, Staub, K., Ruhli, F.J., Smith, J.R. and Steyn, M., 2017. Secular trends in stature of late 20th century white South Africans and two European populations. *HOMO - Journal of Comparative Human Biology*.
19. **Nienaber, W.C.**, Bvocho, G., Swanepoel, E. and Steyn, M., 2017. Preliminary findings on the archaeological context of the Monk's Kop ossuary remains: the Mbagazewa Hill cultural landscape, Mutoroshanga Area, Northern Zimbabwe. *South African Archaeological Bulletin*, 72 (205), pp.38–48.
20. **Oettlé, A.C.**, Demeter, F.P. and **L'Abbé, E.N.**, 2017. Ancestral Variations in the Shape and Size of the Zygoma. *The Anatomical Record*, 300(1), pp.196-208.
21. Pan, L., Thackeray, J.F., Dumoncel, J., Zanolli, C., **Oettlé, A.C.**, de Beer, F., Hoffman, J., Duployer, B., Tenailleau, C. and Braga, J., 2017. Intra-individual metameric variation expressed at the enamel-dentine junction of lower post-canine dentition of South African fossil hominins and modern

humans. *American Journal of Physical Anthropology*.

22. **Stull, K.E., L'Abbé, E.N.** and Ousley, S.D., 2017. Subadult sex estimation from diaphyseal dimensions. *American Journal of Physical Anthropology*, 163(1), pp.64-74.
23. Van Schoor, M., **Nienaber, W.C.** and Marais-Werner, A., 2017. A controlled monitoring study of simulated clandestine graves using 3D ground penetrating radar. *Near Surface Geophysics*, 15(3), pp.274-284.
24. Zanolli, C., Schillinger, B., **Beudet, A.**, Kullmer, O., Macchiarelli, R., Mancini, L., Schrenk, F., Tuniz, C. and Vodopivec, V., 2017. Exploring hominin and non-hominin primate dental fossil remains with neutron microtomography. *Physics Procedia*, 88, pp.109-115.

### 1.1.2. Invited Book Chapter(s) Published or in Print

1. **Dussault, M.C.**, Brown, M. and Osgood, R., 2017. A Soldier's Story: Forensic Anthropology and Blast Injury. In: Schotsmans, E.M.J., Márquez-Grant N., Forbes, S.L. *Taphonomy of Human Remains: Forensic Analysis of the Dead and the Depositional Environment: Forensic Analysis of the Dead and the Depositional Environment*, John Wiley & Sons: UK, pp.445-451.
2. **Kenyhercz, M.W.** and Berg, G.E., 2017. Evaluating Mixture Discriminant Analysis to Classify Human Mandibles With (hu)MANid, a Free, R-Based GUI. In: Latham, K., Bartelink E., Finnegan M., eds. *New Perspectives in Forensic Human Skeletal Identification*. Elsevier: USA, pp. 35-43.
3. **Krüger, G.C., Liebenberg, L., Myburgh, J., Meyer, A., Oettlé, A.C., Botha, D., Brits, D.M., Kenyhercz, M.W., Stull, K.E., Sutherland, C., L'Abbé, E.N.**, 2017. Forensic Anthropology and the Biological Profile in South Africa. In: Latham, K., Bartelink E., Finnegan M., eds. *New Perspectives in Forensic Human Skeletal Identification*. Elsevier: USA, pp. 313-321.
4. Spradley, M.K. and **Stull, K.E.**, 2017. Advancements in Sex and Ancestry Estimations. In: Latham, K., Bartelink E., Finnegan M., eds. *New Perspectives in Forensic Human Skeletal Identification*. Elsevier: USA, pp. 13-21.

### 1.1.3. Submitted Manuscripts

1. Corny, J., **Galland, M.**, Arzarello, M., Bacon, A-M., Demeter, F., Grimaud-Hervé, D., Higham, C., Matsumura, H., Kim Thuy, N.T., Lan Cuong, N., Oxenham, M., Sayavongkhamdy, T., Sémah, F., Shackelford, L.L., Viet, N., Détroit, F. Dental phenotypic shape variation supports multiple dispersals of anatomically modern humans in Southeast Asia. *Journal of Human Evolution* (under review, March 2017).
2. **Liebenberg, L., Krüger, G.C., L'Abbé, E.N. and Stull, K.E.**, Postcranial Sex and Ancestry Estimation in South Africa: A Validation Study. *International Journal of Legal Medicine*.
3. **Ridel, A.F., Demeter F., Galland, M., L'Abbé, E.N., Vandermeulen, D., Oettlé, A.C.** Automatic landmarking as a convenient prerequisite for geometric morphometrics. Validation on cone beam computed tomography (CBCT) - based shape analysis of the nasal complex. *Forensic Science International*.
4. **Ridel, A.F., Demeter, F., L'Abbé, E.N., Vandermeulen, D., Oettlé, A.C.** Skeletal dimensions as predictors for the shape of the nose in a South African sample: a cone-beam computed tomography (CBCT) study. *Forensic Science International*.
5. **Theye, C.E.G.**, Hattingh, A., Cracknell, T., **Oettlé, A.C.**, Steyn, M., Vandeweghe, S. Critical dental and periodontal parameters for immediate first molar implant placement: a micro-CT study. *Clinical Oral Implants Research*.

## 1.2. Conference Attendance/Presentations

Several of our staff and students attended and presented posters or oral presentations at multiple national and international conferences in 2017.

### 1.2.1. National conferences:

- 45<sup>th</sup> Annual Conference of the Anatomical Society of Southern Africa; 23-26 April 2017
- Faculty day of the Faculty of Health Sciences, University of Pretoria; 22-23 August 2017
- Sefako Makgatho Health Sciences University Research Days, Pretoria; 22-24 August 2017
- 3rd Annual Flexible Futures Conference: Higher Education Innovation Conference and Expo, CSIR Convention Centre, Pretoria; 5-6 September 2017
- The Association of Southern African Professional Archaeologists, University of Pretoria, Pretoria; 5-7 July 2017
- 3rd Conference on Imaging with Radiation (Imgrad2017), Evolutionary Studies Institute, University of the Witwatersrand, Johannesburg; 14-15 September 2017

### 1.2.2. International conferences:

- 6th Biennial Meeting of the East African Association of Paleoanthropology and Paleontology, Addis Ababa, Ethiopia; 30 July – 2 August 2017
- 17th Biennial Meeting of the International Association of Craniofacial Identification, Brisbane, Australia; 15-19 July 2017
- 69th Annual Meeting of the American Academy of Forensic Sciences, New Orleans, Louisiana, USA; 13-18 February 2017
- 86th Annual Meeting of the American Association of Physical Anthropologists, New Orleans, Louisiana, USA; 19-22 April 2017
- Anthropological Society of Paris, Paris, France; January 2017
- 7th Annual European Society for the Study of Human Evolution Meeting, Leiden, Netherlands; 21-23 September 2017
- XXII Congresso dell'associazione antropologica italiana, Roma, Italy; 6-8 September 2017

## 1.3. Funding

Funding received in 2017:

- UP postgraduate bursary: **RLV Holgate** (R 75 000)
- UP postgraduate bursary: **C Theye** (R 75 000)
- UP senior postdoctoral fellowship: **MC Dussault** (R300,000)
- AESOP+ funding (3 years - PhD): **A Ridel** (€18 000 p.a. = R290 000)
- AESOP+ funding (3 years - PhD): **M Cazenave** (€18 000 p.a. = R290 000)
- NRF KIC travel grant: **M Cazenave** (R19,093.00)
- AESOP+ funding (1 year – Post Doc): **Manon Galland** (€21 600 = R338 000)

- NIJ Grant: **KE Stull** (approx. R600 000)
- NRF Incentive funding: **EN L'Abbé** (R40 000)
- NRF Competitive programme for rated researchers (2017-2019): **EN L'Abbé** (R330 000)
- NRF Scarce Skills bursary for PhD: **C Sutherland** (R160,000)
- Research Assistantship in Faculty of Health Sciences: **C Sutherland** (R40,000)
- NRF Scarce Skills bursary for MSc: **O Sapo** (R90,000)

## **2. Research in Education**

### **2.1. Undergraduate Education**

As part of the Physical Anthropology section of the Department of Anatomy, the members of FARC are responsible for teaching undergraduate human osteology, palaeoanthropology and forensic anthropology. In 2016, the research centre has taken steps towards transforming these undergraduate modules, and has continued this progress into 2017. In accordance with the curriculum transformation framework of the University of Pretoria and the University's inquiry-based and hybrid learning model, the courses are being transformed in order to be relevant to a South African context and on par with international standards. We are also ensuring that our students become self-regulated learners and are prepared for research related tasks in physical anthropology and other disciplines.

This paradigm shift takes into consideration the need for educators to be educated in education, and not just in their own field of expertise. Therefore, in addition to producing subject-specific research, FARC is also continuing with education-focused research in 2017. Members of staff are therefore exploring new and innovative ways to incorporate hybrid learning, and, as is relevant to an inquiry-based system, undergraduate and post-graduate students are more involved in their own education, through action research. Examples include a current PhD in medical education, participation of postgraduate students in teaching, and a volunteer programme for third year BSc students who are interested in physical/forensic anthropology.

### **2.2. Postgraduate education and research projects in FARC**

We have 3 BSc Honours, 4 MSc and 5 PhD students and 3 Postdoctoral Research Fellows within the FARC. Prof EN L'Abbé and Dr KE Stull are also subject specialists on the PhD committee of Ms. Colman at the University of Amsterdam. Ms. Colman is likely to submit her degree for examination in 2018. Prof EN L'Abbé is on the examination committee for the PhD of Ms. C Hulse at the University of Nevada, Reno.

#### **2.2.1. BSc Honours**

##### ***Validation of the Cranial-Postcranial Method for Ancestry and Sex Estimation among Modern South Africans***

Ms JY Cronjé used cranial and postcranial measurements to validate the combined cranial-postcranial approach to ancestry and sex estimation among modern South Africans under the supervision of Ms L Liebenberg and co-supervision of Prof EN L'Abbé.

### ***Secular trends in sexual dimorphism and cranial morphoscopic traits of modern South Africans***

Ms M Pitso assessed morphoscopic traits of the skulls typically used to estimate sex to test for the presence of secular changes in the traits in modern South Africans. The project was completed under the supervision of Ms GC Krüger and co-supervision of Dr J Myburgh.

### ***Sex estimation from the scapula of white South Africans***

Ms ZN Msibi used metric characteristics of the scapula to study sex differences in South African white individuals under the supervision of Ms Y Scholtz and the co-supervision of Dr MC Dussault.

## **2.2.2. MSc**

### ***Estimating Ancestry among South African Ethnic Groups***

Mr O Sapu has obtained MSc committee clearance and ethical approval to assess cranial differences among South African ethnic groups. He is in the process of collecting data from the Pretoria Bone Collection. The research is supervised by Prof EN L'Abbé and co-supervised by Dr KE Stull.

### ***Sexual dimorphism using the dentition of a modern South African population***

Ms GP Shakoane has obtained MSc committee clearance and ethical approval to assess sex differences in the dentition of modern black, white and coloured South Africans. She has completed data collection from the Kirsten Collection (Stellenbosch University) and is in the process of collecting data from the Raymond A. Dart Collection and the Pretoria Bone Collection. The research is supervised by Dr MC Dussault and co-supervised by Prof EN L'Abbé.

### ***Transition analysis of age-related changes to the distal radius and ulna in a modern South African population***

Ms N Coetzee has obtained MSc committee clearance and ethical approval to assess age-related changes to the epiphyses of the radius and ulna from radiographs in order to evaluate current age estimation standards and create population-specific models for South African sub-adults. The research is supervised by Ms L Liebenberg and co-supervised by Prof EN L'Abbé.

## **2.2.3. PhD**

### ***The relationship between DISH and diet in human skeletal remains from South Africa: a carbon and nitrogen stable light isotopic analysis***

The purpose of this research is to diagnose and characterize the development and possible dietary cause of DISH using stable light isotopic analysis, (namely  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ) in three cadaver-derived South African skeletal assemblages, namely the Pretoria Bone Collection (PBC), the Raymond A Dart Collection (RDC) and the Kirsten Collection (KC). Permission to access and take samples from a rib and femur of individuals diagnosed with DISH and a control group from all skeletal collections has been granted. Permission from the ethics research committee at the University of Pretoria has been granted. Prof Steyn is the supervisor, while Prof EN L'Abbé is the co-supervisor. Ms Holgate has obtained all the necessary approvals, has obtained samples from all three skeletal collections and has started to receive her preliminary results post-processing. She is working with senior technician Dr Grant Hall at the Stable Isotope Laboratory at the Mammal Research Institute at the University of Pretoria to obtain her isotopic results and has worked with Mr Jakobus Hoffman at the South African Nuclear Energy Corporation (NECSA) to obtain micro-CT images to look at the underlying structure of the osteological manifestations of DISH. Ms Holgate is currently writing up the project and is hoping to finish by the end of 2017.



### ***The effects of aging and tooth loss on the microstructure of the mandible in South Africans***

The main purpose is to assess and describe in detail the microstructural changes in the mandible with advancing age, across various dentition patterns, as relevant in forensic anthropological investigations and restorative dentistry. The second purpose of the study is to investigate if the age-related microstructural changes in the mandibular cortical bone and the age-related changes in the cortical bone of the femoral neck are analogous. Ms C Theye, under the supervision of Dr. AC Oettlé, has obtained ethical clearance and approval by PhD committee. Ms Theye has completed data acquisition and is in the process of analysing the cone-beam computed tomography (CBCT) scans collected during 2017. She is expecting to submit her thesis in 2018.

### ***An automated computer assisted approximation of the nose in South Africans from CBCT (Cone Beam Computed Tomography) scans***

The aim of this study was to create a method to predict the position of the surface landmarks on the nose in South Africans based on the method described by Lee *et al.* (2014). The results of this study allow us to gain understanding of the South African nose variability in order to define a specific region of interest for the automatic computer-assisted method. Ms A Ridel, under the supervision of Prof EN L'Abbé and co-supervision of Dr AC Oettlé and Dr F Demeter, has obtained ethical clearance and PhD committee approval. CBCT scans were collected at the Oral and Dental Hospital at the University of Pretoria and at the Wits Oral Health Center and the majority of the statistical analyses have been completed. The introduction, literature review and the materials and methods sections of the final thesis have been completed and reviewed. Ms. Ridel has also submitted two papers for publication.

### ***Investigating curriculum evolution in an undergraduate physical anthropology module at the University of Pretoria***

Ms Sutherland has been busy with her PhD study since February 2016. She completed a Postgraduate Certificate in Higher Education (PGCHE, Cum Laude) in 2016. During 2017, she completed her PhD proposal and obtained approval from both the Faculty of Health Sciences PhD Committee and Faculty of Health Sciences Research Ethics Committee. She is currently writing a systematic review on education in physical anthropology for publication and as part of her literature review. The main portion of her data collection will happen in the first semester of 2018 and she aims to complete the study by the end of 2019. The study is supervised by Prof EN L'Abbé and co-supervised by Prof P du Toit (Dept. of Education).

### ***Relation of the variation in the form of the bony pelvis to the skull in South Africans***

Ms S Jagesur will be using digitised landmarks from the bony pelvis and the skulls to assess form variations between the two skeletal elements in modern South Africans. She is currently working on her protocol to obtain PhD committee clearance and ethical clearance for the research. The project is supervised by Prof EN L'Abbé and co-supervised by Dr M Galland.

## **2.2.4. Postdoctoral Research**

### ***Estimating ancestry among South Africans and other African populations using molar teeth***

The aim of the study is to assess dental variation as a means to estimate ancestry among South African and other African populations. Dr MC Dussault has spent a successful period learning new techniques such as the process of collecting and analysing odontometric data, from January to April 2017. Currently, a large portion of the data (approximately 650 individuals) has been collected, including odontometrics and geometric morphometrics information. A successful trip to the Kirsten collection was undertaken at

the end of July and was followed by a second trip in mid-September. Data collection from the Dart collection was approved and was undertaken from 21 August to 1 September 2017. Data collection from the Pretoria Bone collection was approved and is being continued currently. Ethics approval was granted for the project (390/2016) for a duration of 3 years. A formal collaboration has also been established with the University of Nevada, Reno with Professor M. Pilloud and Prof G.R. Scott to share data and contribute to a worldwide analysis of dental data for forensic estimation and integration into FORDISC 3.1. The collaboration forms part of a National Institutes of Justice grant awarded in October 2016 (2017-DN-BX-0143) entitled: “A Dental Anthropological Databank for Use in the Statistical Estimation of Ancestry and Sex in Forensic Anthropology”.

### ***Skull and pelvic shape variations among recent South Africans: Impact of population history and biological factors***

The main aim of Dr M Galland’s postdoctoral research is to chart variation in craniofacial and pelvic morphology, to detect historic and sex-related patterns among South Africans and to evaluate the impact of aging, sex, head size, stature and ancestry on pelvic morphology. Investigating the processes among these populations is of great importance for understanding the variability of recent South Africans and the adaptive biocultural evolution of modern humans. Dr Galland is in the process of obtaining ethical approval for the study.

Dr Galland is also working on birth canal data previously collected on intact cadaver pelves from both the University of Pretoria and Sefako Makgatho Health Sciences University by Ms. Anja Y. Wiid. The study underlined the complexity of the correlation between pelvic canal dimensions, stature and sex-ancestral groups from South Africa. Results have been presented at the Faculty Days of the University of Pretoria and at Sefako Makgatho Health Science University.

### ***Development of guidelines for facial approximations in the South African context***

Dr F Demeter has obtained ethical clearance for the research and is in the process of completing the project. Dr Demeter is also conducting co-supervision of a PhD student, Alison Ridel and was appointed as an Extraordinary lecturer from January 2017 to December 2019. His completed work is as follows for 2017:

- 1) A comprehensive and representative number of CBCT scans have been collected and segmented in preparation of the derivation of algorithms to be used in the approximation of the face. This CBCT database is composed of three main ancestry groups: Africans, Europeans and Asians.
- 2) The whole procedure from the scan of a given skull to the reconstruction of the face is automatized. The complete procedure has been defined.
- 3) The algorithm that will be used for the facial approximation has been written in collaboration with the University of Leuven.
- 4) International collaboration with the following universities has been set up:
  - University of Leuven (Belgium)
  - University of Khon Kaen (Thailand)
  - School of Stomatology, Shanghai Jiao Tong University
- 5) Got ethical clearance.
- 6) Collection of CBCT’s from Faculty of Dentistry, University of Pretoria.
- 7) Collection of CBCT’s from Faculty of Dentistry, Khon Kaen University.
- 8) School of Stomatology, Shanghai Jiao Tong University
- 9) Definition and use of modules in Mevislab freeware used to manipulate the CBCT’s.
- 10) Coding of the algorithm in collaboration with University of Leuven.
- 11) Testing the whole automatized procedure for facial reconstruction.

12) Co-supervision with Prof. Oettlé and L'Abbé of PhD candidate Alison Ridel funded by AESOP+.

### **2.2.5. PhD Exchange Students and Non-UP Students (AESOP Grant, Dr. AC Oettlé)**

#### ***Three-dimensional functional imaging and quantitative comparative characterization of the cancellous network and cortico-trabecular patterns of the postcranial skeleton in South African fossil hominins***

The general aim of the project is to comparatively characterise the micro inner structure of different skeletal elements of fossil remains attributed to *P. robustus* in order (i) to provide a comparative framework with respect to *Homo* for the assessment of isolated fossil specimens, (ii) to identify sex-related differences, if any, and (iii) to deconstruct the adaptive functional requirements having shaped inner bony conformation at various sites and joints of the appendicular skeleton. Using high-resolution micro-CT scanning, Ms M Cazenave has scanned early hominin fossils and comparative human, chimpanzee and gorilla samples composed by humeri, ulnae, innominates, femora and patellae have been scanned at Necsa (South African Nuclear Energy Corporation), providing a unique comparative sample of individuals with various ages, origins and sexes. From that sample, using specific protocol created and shaped according to the fossil specimens investigated in our project, the humerus, femur and patella have been virtually assessed so far by means of 3D imaging technics. While some inner structures and patterns have been previously pointed out by colleagues, the current study identified inner structural organisation specific to *Paranthropus robustus* compared to early *Homo*, extant humans and chimpanzees. As a whole, the first results of the ongoing project provide critical information of taxonomic, functional and biological value. The project is supervised by Prof J Braga and co-supervised by Prof AC Oettlé.

### **2.2.6. Other International Visitors for Postgraduate Education/Research**

Ms Jessica Lam and Mr Etienne Pillin from the School of Archaeology & Ancient History, University of Leicester, UK, spent four weeks (9 October to 8 November 2017) in the Pretoria Bone Collection, obtaining three-dimensional scans from the skulls of modern black and white South Africans for Ms Lam's PhD entitled: Using Novel 3D Comparative Techniques to Assess Skeletal Remains.

Ms Sara Getz and Prof George Milner from Pennsylvania State University, Pennsylvania, USA, as well as Ms Svenja Weise and Prof Jesper Boldsen from ADBOU, Denmark, spent two weeks (7 to 18 August 2017) in the Pretoria Bone Collection, collecting age-related data for research in the development, validation, and application of an improved method of adult age-at-death estimation for human skeletons using Transition Analysis and a large suite of traits distributed throughout the skeleton.

## **3. Community Service**

### **3.1. FARC Bioarchaeology and Archaeological Geophysics Field School**

An archaeological field school was held in the Department of Anatomy, University of Pretoria from 26-30 June 2017. Mr. WC Nienaber led the field school, which was held at the Miertjie Le Roux Experimental Farm. Our BSc Honours students and one undergraduate BSc MedSci student attended the field school.

### **3.2. FARC Osteology and Forensic Archaeology Training for Zimbabwean Human Rights Group**

In the second half of 2016, FARC undertook a community service initiative to train a group of Zimbabwean delegates in forensic excavation, advanced human osteology and establishment of the biological profile in forensic anthropology. In June, July and September of 2017, the Zimbabwean delegates spent a few weeks in the Pretoria Bone Collection to revise and apply the information they had learned in 2016. These Zimbabwean delegates also attended the Bone Trauma Course held in September 2017 and presented by Profs SA Symes and L'Abbé.

### **3.3. Professional anthropological and archaeological services**

#### **3.3.1. Forensic Anthropology**

A total of 41 new cases were received from SAPS and forensic pathologists in 2017.

- From 01 January to 14 November 2017, 41 cases were analysed.
- A further 10 cases may be received for maceration and analysis during the November and December 2017 period

The total number of cases completed is half of our yearly workload at FARC. We had difficulty this year with expiration and renewal of the maceration and analysis of human remains contract with the SAPS. According to personal communications with Colonel Roussouw, a back log of at least 80 cases are being retained at the CSIR which are in need of analysis. E@UP has been in communication with the SAPS, but we have yet to receive information regarding renewal of the above-mentioned contract. We received a case at the end of November which we will complete in December 2017 or early January 2018. However, no contract currently exist to cover the expenses of this case or several of the previous, completed cases.

#### **3.3.2. Archaeology**

Mr. WC Nienaber resigned in October of 2017. He closed down the BA3G Unit at the end of June of 2017. No work was completed during the 2017 period. Dr Myburgh has been working with Prof Steyn (University of Witwatersrand) and Prof Lombard (University of Johannesburg) as to the possible removal of the breccia from its long term storage at the University of Pretoria. We will start again with archaeological excavations in 2018 through collaborations with the Archaeology/Anthropology departments at UNISA and UP.



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