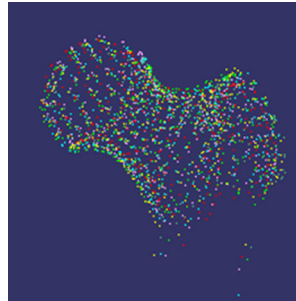
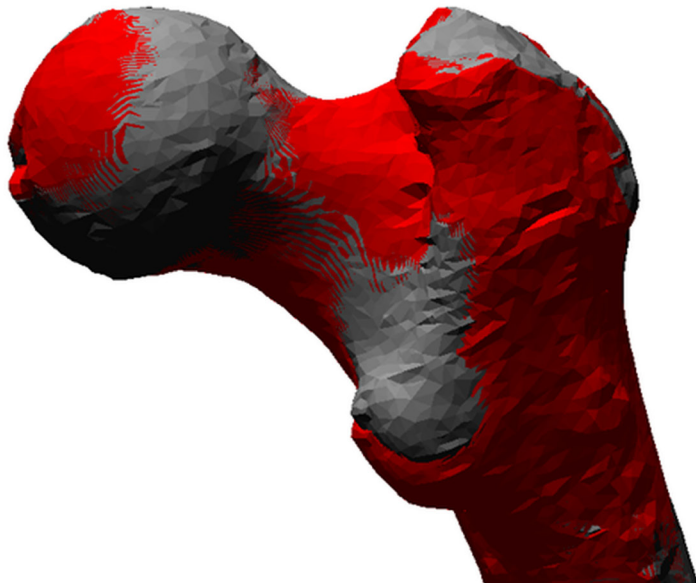




ZEMNews



A superimposition of the human proximal femur of a female aged 35-55 years (grey) and a male aged 45-55 years (red) [Dahlheim collection from NW Germany (dated ca. 1300 AD)]

Superimposed image shows a generalised procrustes analysis (GPA) of the human proximal femur.

Spotlight on the ongoing ZEM research:

Shape analysis of the human proximal femur *(Hila May)*

The morphology of the human femur is of use for forensic, anthropological and clinical studies and practice. Geometric morphometric (GM) based on landmarks, curve semi-landmarks and surface semi-landmarks preserves the geometry of the landmark configurations throughout the analysis and thus permits to represent statistical results as actual shapes independently from the object size, position and orientation. Therefore it has the ability to provide new insights into patterns of biological shape variation that could not be evaluated by traditional methods.

Landmark-based geometric methods have the ability to provide new insights into patterns of biological shape variation that could not be evaluated by traditional methods, thus geometric morphometric

techniques are useful for the study of intraspecific morphological variation, such as the variation among human populations.

In the following two years, as part of my Post Doc project at the ZEM, I would like to establish a novel morphometric methodology to characterize the femoral shape.

Working at the ZEM provides me in an interdisciplinary environment access to advanced technologies for surface scanning, access to imaging facilities and advanced 3D image processing software.

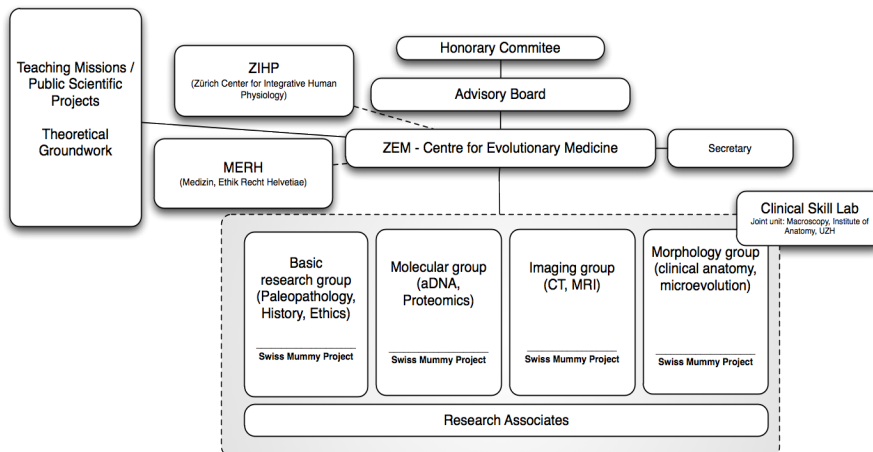
This will enable us to reveal the differences in femoral shape between males and females, understand the changes in femoral shape that occur with age and understand how different physical activities affect the proximal femoral shape.

Revealing the differences and variability in proximal femoral shape has a great clinical importance. Till now the design of femoral prostheses was often based on the assumptions that age and sex do not heavily affect proximal femoral shape. Revealing those differences may improve the design of these prostheses and improve the recovery chances and rehabilitation of patients who underwent hip replacement.

This method will also have a great contribution for the forensic medicine and anthropological studies. Although sex identification is fundamental in forensic and anthropological studies it's not always feasible as the most significant skeletal remains for sexing (i.e., skull and pelvis) are frequently missing. However, isolated long bones are often found.

Therefore establishing a method for sex identification, independent of size effect is essential for many disciplines.

ZEM Organigramm



The current composition of the ZEM committees and collaborators.

Honorary Committee:

Dr. M. Dell Ambroggio
Staatssekretär für Bildung und Forschung

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Regierungsrat Kanton ZH

Prof. F. Gutzwiller
Ständerat ZH

Prof. D. Wyler
Prorektor Medizin und Naturwissenschaften UZH

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Geschäftsführer "Finanz und Wirtschaft"
Tamedia AG

M. Prenosil
VR Präsident Sprüngli AG, Präsident City
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Advisory Board:

Prof. K. Grätz
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Prof. M. Thali
Direktor Institut für Rechtsmedizin UZH

Prof. M. Gassmann
Direktor Institut für Veterinärphysiologie,
Vetsuisse Faculty, UZH

Prof. S. Gay
Department of Rheumatology, USZ

Prof. Ch. Gerber
Chefarzt Orthopädie Balgrist Zurich

Prof. B. von Rechenberg
Direktorin Center for Applied Biotechnology
and Molecular Medicine UZH, Vetsuisse

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Institute for Biomedical Engineering ETH

Prof. C. van Schaik
Direktor Anthropologisches Institut UZH

Prof. B. Tag
Rechtswissenschaftliches Institut UZH, Vor-
sitzende Kompetenzzentrum Medizin - Ethik
- Recht Helvetiae

Prof. O. Ullrich
Direktor Anatomisches Institut UZH

Local Collaborators:

Prof. J. Hodler
Institutsdirektor Institut für Diagnostische
und interventionelle Radiologie, USZ

Prof. Ch. Pfürmann
Chefarzt Radiologie, Uniklinik Balgrist UZH

PD D. Schaefer
Klinik und Poliklinik für Innere Medizin, USZ

Prof. R. Schlapbach
Functional Genomics Center, UZH, ETH

Divisionär A. Stettbacher
Oberfeldarzt, Schweizer Armee, Bern

Prof. G. Székeley
Institut für Bildverarbeitung, ETH

Prof. U. Woitek
Institut für Empirische Wirtschaftsforschung,
UZH

International Collaborators:

Prof. B. Blümich
Rheinisch-Westfälische Technische Hoch-
schule, Aachen

Prof. M. Bock
Radiologisches Department Universitätskli-
nik Freiburg im Breisgau

Prof. B. Bogin
School of Sport, Exercise & Health Sciences,
Loughborough University

Prof. M. Henneberg
Anatomical Sciences, University of Adelaide

Dr. E. Cappellini
Centre for GeoGenetics, Natural History
Museum & University of Copenhagen

Prof. T. Gilbert
Centre for GeoGenetics, Natural History
Museum & University of Copenhagen

Prof. I. Hershkovitz
Anatomy and Anthropology, Faculty of
Medicine, Tel Aviv University.

Prof. S. Ikram
Department of Egyptology, American Uni-
versity Cairo

Prof. em. J. Komlos
Volkswirtschaftliches Institut, LMU Mün-
chen

Dr. Ch. Scheffler
Institut für Biochemie und Biologie, Univer-
sität Potsdam

Prof. W. Schiefenhövel
Human Ethology Group, Max-Planck-Insti-
tute, Andechs

Prof. B. Solomon
Dept. of Orthopaedics, Royal Adelaide
Hospital

Prof. N. Tuross
Department of Human Evolutionary Biolo-
gy, Harvard University

PD A. Zink
Institute for Mummies and the Iceman,
EURAC, Bozen

Prof. J. Tutkuviene
Dept. of Anatomy, Histology and Anthropol-
ogy, Faculty of Medicine, Vilnius University

Prof. R. Jankauskas
Dept. of Anatomy, Histology and Anthropol-
ogy, Faculty of Medicine, Vilnius University

Dr. D. Piombino-Mascalì
Dept. of Cultural Heritage and Sicilian
Identity, Palermo

Amàlia Valls Martínez
Instituto de Estudios Científicos en Momias
(IECIM), Madrid

Mercedes González Fernández
Director at Instituto de Estudios Científicos
en Momias (IECIM), Madrid

Prof. A. Nebel
Institut für Klinische Molekularbiologie,
Christian-Albrecht-Universität Kiel

Prof. Dong Hoon Shin
Dept. of Anatomy/Institute of Forensic Me-
dicine, Seoul National University

Prof. Maria Teschler-Nicola
Dept. of Anthropology, MNH, Vienna

Words from a local collaborator

Prof. Gabor Szekely - Medical Image Analysis and Visualization Group, Computer Vision Laboratory, ETH Zurich - about the impact of interdisciplinary cooperation



We have an interesting and inspiring collaboration with the Centre for Evolutionary Medicine since it started its operation in 2010.

Imaging is one of the fundamental tools for investigating human disease evolution and the quantitative interpretation of the collected data is a key technology for fully utilizing the information provided by the large amount of acquired images. Such problems could only be successfully addressed by the mutually stimulating interdisciplinary cooperation between the Centre and the Computer Vision Laboratory.

We also strongly profited from the unique opportunity to gain access not only to spectacular imaging data, but also to the know-how to understand the most relevant practical problems, allowing to focus our research efforts accordingly.

This experience also opens the door to joint, future efforts for conceiving and implementing new imaging procedures, optimally adjusted to the specific needs of evolutionary medicine research.

I am very much looking forward to our continuing collaboration on this fascinating research area.

ZEM-Research

insight into one of the ongoing PhD projects

Giada Ferrari MSc

Unlocking the molecular potential of preserved human soft tissues

Palaeomicrobiology is the study of past human infections by the characterisation of microorganisms that can be isolated from ancient remains. This new discipline is taking great advantage of the improvement in high-throughput sequencing methodologies. While initial studies have focused on skeletal remains, soft tissues are more and more coming into the spotlight, in the form of fixed tissue samples from museums and pathological collections, autopsy material, and mummified tissues.

My PhD project at the ZEM is part of the University Research Priority Program «Evolution in Action» and focuses on the molecular evolution of human pathogens. I will characterise historic mutations and recombination events in viruses and bacteria using a high-throughput sequencing approach on historic and forensic soft tissue samples.

I am a geneticist by training and I completed my Masters degree at the Institute of Molecular Life Sciences at the University of Zurich. Before starting my PhD I also collaborated on a great ape genomics project at the Anthropological Institute at the University of Zurich and on an insect virology project at the Institute of Evolutionary Biology at the University of Edinburgh.

What attracted me to this research project was the opportunity to collaborate in an interdisciplinary environment with archaeologists, MDs, anthropologists and evolutionary biologists, allowing me to work at the intersection of these fields.



New International Collaborator



We are proud to welcome Prof. Maria Teschler-Nicola, Head of the Department of Anthropology at the Museum of Natural History in Vienna.

She provides crucial human tissue samples for the molecular study of the evolution of disease (PhD-project Giada Ferrari).

ZEM-Publications Selected publications since last ZEM News 5/2013

Haas C, Shved N, Rühli F, Papageorgopoulou C, Krawczak M, Purps J, Willuweit S, Roewer L. Y-chromosomal analysis of skeletal remains of Swiss national hero Jörg Jenatsch (1596-1639). *Forensic Sci Int Genet.* 2013 Dec;7(6):610-7.

Holloway K, Staub K, Rühli F, Henneberg M. Lessons from history of socioeconomic improvements: A new approach approach to treating multi-drug-resistant tuberculosis. *J Biosoc Sci.* 2013 Oct 8:1-21.

Panzer S, Borumandi F, Wanek J, Papageorgopoulou C, Shved N, Colacicco G, Rühli F. Modelling Ancient Egyptian embalming: Radiological Assessment of Experimentally Mummified Human Tissue by CT and MRI. *Skeletal Radiol.* 2013 Nov;42(11):1527-35.

Landis S, Haeusler M. The pathology of the proximal femur MLD 46 (*Australopithecus africanus*). *Proceedings of the European Society for the study of Human Evolution 2:129.*

Wanek J, Speller R, Rühli F. Short Note on Our Research in Cancer: Cell and DNA Damage from the Point of View of a Medical Physicist. *J. Mol Genet Med* 2013, 7:4.

Saniotis A, Henneberg M. Evolutionary Medicine and Future of Humanity: Will Evolution Have the Final Word? *Humanities* 2013, 2, 278-291.

Schaer CA, Deuel JW, Bittermann AG, Rubio IG, G Schoedon, Spahn DR, Wepf RA, Vallelian F and Schaer DJ. «Mechanisms of haptoglobin protection against hemoglobin peroxidation triggered endothelial damage» *Cell Death and Differentiation* (2013) 20, 1569-1579.

Panczak R, Woitek U, Rühli F, Staub K. Regionale und sozio-ökonomische Unterschiede im Body Mass Index (BMI) von Schweizer Stellungspflichtigen 2004-2012. *Final Report for the Federal Office of Public Health* 2013.

Rühli F, Ikram S. Purported medical diagnoses of Pharaoh Tutankhamun, c. 1300 BC. *HOMO - Journal of Comp Human Biology*; Volume 65, Issue 1, February 2014, Pages 51-63.

Olsen KC, White CD, Longstaffe FJ, von Heyking K, Mc Glynn C, Gruppe G, Rühli F. Intraskelletal isotopic compositions ($\delta^{13}C$, $\delta^{15}N$) of bone collagen: Nonpathological and pathological variation. *Am J Phys Anthropol*, in press.

Grantham PJ, Staub K, Rühli F, Henneberg M. Modern Diet and Metabolic variance: A recipe for disaster? *Nutrit J*, in press.

Scheffler C, Gniosdorff B, Gierloff S, Staub K, Rühli F. Skeletal robustness and bone strength as measured by anthropometry and ultrasonography as a function of physical activity in young adults. *Am J Hum Biol*, in press.

Krüttli A, Bouwman A, Akgül G, Della Casa P, Rühli F, Warinner C. Ancient DNA analysis reveals high frequency of European lactase persistence allele (T-13910) in medieval Central Europe» *PLoS One.* 2014 Jan 23;9(1).

Dageförde K, Vennemann V, Rühli F. Evidence-based paleopathology: Meta-analyses of Pubmed -listed scientific studies on Pre-columbian, South American mummies *HOMO - Journal of Comp Human Biology*, in press.

Habicht M, Bouwman AS, Rühli FJ. Canopic Jars: A New Source for Old Questions. *Proc Pal Archs Journal of Archeology of Egypt/ Egyptology*, in press.

Schiess R, Böni T, Rühli F, Haeusler M. Revisiting Scoliosis in the KNM-WT 15000 homo erectus skeleton. *J Hum Evol*, in press.

Staub K. Der vermessene menschliche Körper als Spiegel der Ernährungs- und Gesundheitsverhältnisse am Ende des Ersten Weltkrieges. In: Pfister C, Segesser D, Krämer D (eds.): *Krise, Krieg und Verletzlichkeit: Die Schweiz und die Herausforderungen der Jahre 1916-1918.* Schwabe Verlag, in press.

Upcoming dates with ZEM participation

- February 17th: Workshop on Disease, Immunity and ancient DNA. Organized by the ZEM, University of Zurich, Irchel
- April 7-8, 2014: Paleopathology Association, (PPA), 41st annual North American meeting, Calgary, Alberta, Canada
- April 9-11, 2014: American Association of Physical Anthropologists (AAPA) Meeting, Calgary, Alberta, Canada
- April 26-29, 2014: Annual meeting, American Association of Anatomists (AAA), San Diego, USA
- August 26-29, 2014: European Meeting of the Paleopathology Association (PPA). Lund, Sweden

New MSc and PhD students

The ZEM is happy to welcome the following new student to the group:

- Nicolas Newcomb (Dr. med.-Project, Univ. of Melbourne & Zürich)

Selected ZEM media and press reports

Print/Online:

- Tagesanzeiger, 2. September 2013.
- Sonntagszeitung, 3. November 2013
- Le Matin Dimanche, 3. November 2013
- Der Bund, 4. November 2013
- Neue Zürcher Zeitung, 4. November 2013
- Berner Zeitung, 4. November 2013
- Blick, 4. November 2013
- Basler Zeitung, 6. November 2013
- Aachener Zeitung, 29.2.2014
- Zeit online, 29.1.2014
- Neue Zürcher Zeitung, 31. Januar 2014

Television:

- SRF Fernsehen, 11. Oktober 2013
- Tagesschau, SRF Fernsehen, 3. November 2013
- Giacobbo/Müller, SRF Fernsehen, 3. November 2013

Radio:

- SRF Radio Regionaljournal, 5. November 2013
- Peter Schneider, SRF Radio, 9. November 2013
- SR online.de, 29.1.2014

Editor:
Centre for Evolutionary Medicine,
Institute of Anatomy, University of Zürich,
Winterthurerstr. 190, 8057 Zürich, Switzerland

<http://evolutionarymedicine.ch>
<http://swissmummyproject.ch/>

<https://facebook.com/uzh.zem.ch>
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