

ZEM

Zentrum für Evolutionäre Medizin / Centre for Evolutionary Medicine
Anatomisches Institut, Universität Zürich / Institute for Anatomy, University of Zürich

A Semiannual Newsletter

N° 1 - Autumn 2010

Kick-Off Event

The official opening of the Zentrum für Evolutionäre Medizin will see international and national collaborators united for the first time in Zürich.
Page 1

Organisational Chart

Overview of the ZEM organisational structure.
Page 2

Committee, Board and Collaborators

A list of Honorary Committee and Advisory Board members, Local and International Collaborators
Page 2

Welcome Words

Welcoming words from University Vice-President Prof. D. Wyler to ZEM.
Page 2

ZEM Work Groups

Presentation of the three work groups: The Molecular Group, The Imaging Group and The Morphology Group; and their selected projects.
Page 3

Publications, ZEM Heads, Dates and Contacts

List of the 2010 publications of the ZEM groups, introduction of the ZEM Head, Frank Rühli, upcoming dates and ZEM contact details.
Page 4

Current News

Kick-Off Event

On the 26th and 27th of October the new 'Centre for Evolutionary Medicine' (ZEM) will officially be launched with an event that will bring together local, national and international collaborators.

First plenary meeting

On the 26th and 27th of October 2010, the new 'Centre for Evolutionary Medicine' (ZEM) will be officially launched with a kick-off event. The new centre will be the first Evolutionary Medicine research unit of its kind in existence worldwide. This meeting will bring together the Centre's local, national and international collaborators, honorary committee and advisory board. This will be the first time of these centre members will meet one another face-to-face.

The ZEM collaborators are from as far away as Harvard University, University of Adelaide, Tel Aviv University ... and they are as varied as the new field of Evolutionary Medicine itself. Evolutionary Medicine is a relatively new biomedical scientific discipline. This new research area merges the knowledge of medicine, molecular biology, genetics, evolutionary biology, anthropology and paleopathology into one discipline. Evolutionary Medicine can also be viewed as a medical trans-

disciplinary bridge between the past, the present and the future that studies the medical evolutionary aspects of disease aetiology, disease prevention and novel approaches to therapies.

The two day programme consists of presentations by the international collaborators and work group members; discussions within the three work groups: molecular, imaging and morphology; a guided tour of the ZEM facilities; an aperitif; summary meeting; luncheon meeting; press meeting and social event. The overall goal of this event is not only to bring the people together in Zurich, but also to exchange ideas, formulate research strategies and set future goals for the centre.

The general public is invited to attend the General Introduction and the International Collaborators' presentations. The General Introduction will introduce the guests to the ZEM, its research work and goals. Each of the presenting International Collaborators will highlight their own research related to Evolutionary Medicine.

Thanks to generous support of the Mäxi Foundation, it was possible to create and fund the research work of the 'Centre for Evolutionary Medicine' in Zurich. They recognised the importance of this new research area and its potential impact on the future of medicine.



**Universität
Zürich^{UZH}**

Programme Kick-Off Event

(Section Open to the General Public)

26th Oct. 2010

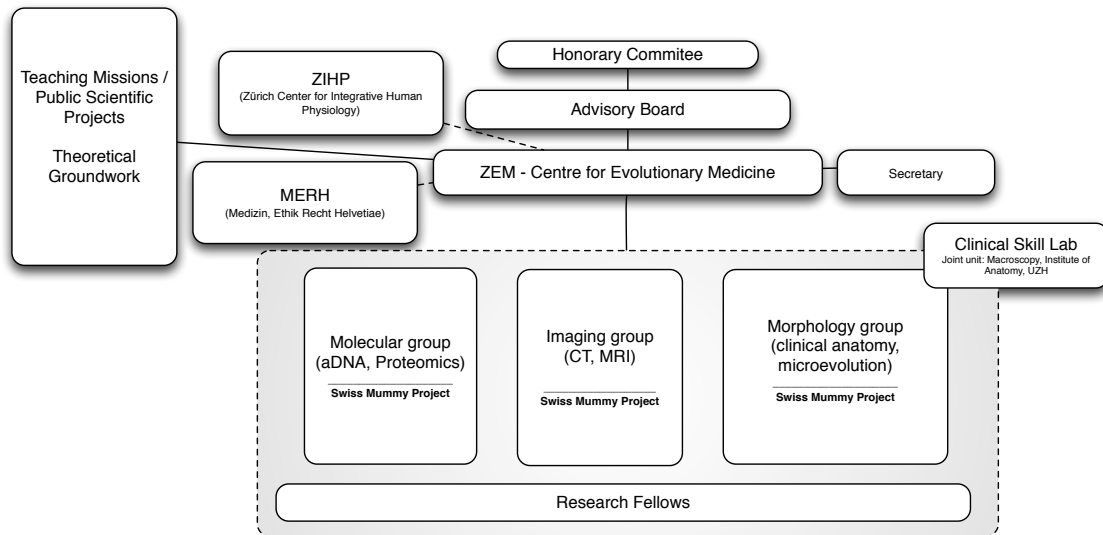
10:30

Greetings and General Introduction

10:30 - 12:00

Presentations by the International Collaborators





Honorary Committee

| | |
|----------------------------|---|
| Dr. T. Heiniger | Regierungsrat Kanton ZH |
| Prof. F. Gutzwiller | Ständerat ZH |
| Prof. D. Wyler | Prorektor Medizin und Naturwissenschaften UZH |
| M. Coninx | Geschäftsführer "Finanz und Wirtschaft" Tamedia AG |
| M. Prenosil | VR Präsident Sprüngli AG, Präsident City Vereinigung |

Advisory Board

| | |
|--------------------------------|--|
| Prof. K. Grätz | Dekan Medizinische Fakultät, UZH |
| Prof. M. Hengartner | Dekan Mathem.-Naturwiss. Fakultät UZH |
| Prof. W. Bär | Direktor Institut für Rechtsmedizin UZH |
| Prof. M. Gassmann | Direktor Institut für Veterinärphysiologie, Zurich Center for Integrative Human Physiology, UZH |
| Prof. S. Gay | Rheumaklinik, Institut für Physikalische Medizin USZ |
| Prof. Ch. Gerber | Chefarzt Orthopädie Balgrist ZH |
| Prof. B. von Rechenberg | Direktorin Center for Applied Biotechnology and Molecular Medicine UZH, Vetsuisse |

Prof. M. Rudin

Prof. C. van Schaik

Prof. B. Tag

Prof. O. Ullrich

International Collaborators

Prof. B. Blümich

PD M. Bock

Prof. M. Henneberg

Prof. I. Hershkovitz

Prof. S. Ikram

Prof. em. J. Komlos

Dr. Ch. Scheffler

Institute for Biomedical Engineering ETH
Direktor Anthropologisches Institut UZH
Rechtswissenschaftliches Institut UZH, Vorsitzende Kompetenzzentrum Medizin - Ethik - Recht Helvetiae
Direktor Anatomisches Institut UZH

Rheinisch-Westfälische Technische Hochschule, Aachen
Deutsches Krebsforschungszentrum, Heidelberg
Anatomical Sciences, University of Adelaide
Anatomy and Anthropology, Faculty of Medicine, Tel Aviv Univ.
Department of Egyptology, American University Cairo
Volkswirtschaftliches Institut, LMU München
Institut für Biochemie und Biologie, Universität Potsdam

Prof. W. Schiefenhövel **Human Ethology Group, Max-Planck-Institute, Andechs**
Prof. B. Solomon **Department of Orthopaedics, Royal Adelaide Hospital**
Prof. N. Tuross **Department of Human Evolutionary Biology, Harvard University**
PD A. Zink **Institute for Mummies and the Iceman, Bozen**

Local Collaborators

Prof. J. Hodler **Institut für Diagnostische Radiologie, USZ**
Prof. Ch. Pfirrmann **Radiologie, Uniklinik Balgrist, UZH**
PD D. Schaer **Klinik und Poliklinik für Innere Medizin, USZ**
Prof. R. Schlapbach **Functional Genomics Center, UZH, ETH Zürich**
Divisionär A. Stettbacher **Oberfeldarzt, Schweizer Armee, Bern**
Prof. G. Székeley **Institut für Bildverarbeitung, ETH Zürich**
Prof. U. Woitek **Institut für Empirische Wirtschaftsforschung, UZH**

WELCOME WORDS: PROF. D. WYLER, VICE PRESIDENT "MEDICINE & NATURAL SCIENCES" UZH

Dear readers,

It is my pleasure to greet you, on behalf of the University of Zurich, to the official opening of the new **Centre for Evolutionary Medicine (ZEM)** at the University of Zurich.

Thanks to a very large donation by a private foundation, Frank Rühli and his team will be able to operate a large transdisciplinary centre with impact far beyond Zurich in the coming years. Already during the past few months this team has designed, with great effort and passion, created a unique academic institution from scratch. I would like to take the opportunity to express my sincere thanks to the donor who made this project possible. The University of Zurich is proud of this new centre and I hope that it will become a permanent landmark of our institution.

The central goal of the centre is to examine human disease evolution from a wider than usual perspective. For me, as a physicist, who is used to asking fundamental questions, this is a very promising approach. The key questions, the goals and intentions of the centre are of interest to all of us. The issues remain the same, yet the form of addressing them has changed and the ZEM will offer a new perspective on these issues. Why do we become ill? How do human pathogens evolve? What can we learn from ancient human mummy tissues? These and other issues that lie at the very core of the human life condition will be investigated at the ZEM.

I wish the new centre and its members all the best and look forward to many stimulating research results!





The Imaging Group

Lena Öhrström, med. pract.
Dr. Dr. Roger Seiler
Johann Wanek, MSc Med Phys

Current Projects and Goals with the ZEM:

X-ray imaging and its impact on ancient DNA. A Monte Carlo based Simulation

Problem: Validation of simulation models with real DNA preservation?

Goal: Predict probability of ancient DNA fragmentation

X-ray absorption-based Imaging and its limitations in Differentiation of Ancient Mummified Tissue (DSCT, MicroCT)

Problem: Spatial discrimination of various ancient dry tissues by multiple clinical modalities

Goal: expand knowledge of physico-chemical properties of various mummified tissues

Improve terahertz imaging of ancient mummies

Problem: Spatial resolution / penetrability of various ancient dry tissues by terahertz waves

Goal: frequency-dependent evaluation of various samples, increase tissue penetration

Feasibility of terahertz imaging for ancient mummies and bone

General 2D/3D visualization (AMIRA®, OsiriX) of CT data of ancient mummies

Future evaluation of CT vs. MR imaging of ancient dry tissue and correlation with GCMS

CT-based assessment of pathologies in Iranian Salt Mummies (2500-1500 BP)

Non-invasive Determination of bone density by a mobile MRI unit

Dental pathologies of the Neolithic Iceman, ca 5300 BC

Swiss Mummy Project: State-of-the-art CT visualisation of dentition / dental pathologies



The Molecular Group

Dr. Natallia Shved
Dr. Christina Warinner

Current Projects and Goals with the ZEM:

DNA taphonomy in artificial mummification of human tissue

Problem: DNA preservation in non-mineralized tissues is poorly explored

Goals: Forensic and non-forensic data for artificial mummified tissue

Protocol optimization of aDNA and protein extraction procedures

Problem: Limited body of data on best practices for aDNA and protein extractions from diverse tissue types

Goal: Develop robust, high yield aDNA and protein extraction protocols for both human and pathogen targets

Protein identification and quantification from mummified soft tissues

Problem: Limited knowledge of non-structural protein preservation at molecular level

Goal 1: Isolate and identify tissue-specific human protein profiles from archaeologically and experimentally mummified remains

Goal 2: Isolate and identify pathogen antigens

Iranian Salt Mummy Project (2500-1500 BP)

DNA extraction and quality assessment; genetic ancestry testing

Genomic evolution of human infectious disease

Investigation of sequence and amino acid changes in bacterial and viral pathogens recovered from archaeological remains

Hemoglobin associated pathology - mechanisms, biomarkers and novel therapeutic strategies



The Morphology Group

Olia Bolshakova, med. dent.
Dr. Dr. Karl Link
Dr. Kaspar Staub

Current Projects and Goals with the ZEM:

Secular trend of stature 1865-210, Body mass index 1865-2010, Evolution of body shape types (Swiss Armed Forces)

Problem: Changes in socio-economic influences on body mass

Goal: Target future risk groups (preventive medicine)

Retrograde estimation of body shape (modern Swiss Armed Forces data)

Problem: Lack of body weight data in the past

Goal: Produce equations for weight estimations based on various body parameters

Evolution of individual disease prevalences ("Untauglichkeitsgründe")

Problem: Impact of various disease loads is unknown

Goal: Reconstruct differential morbidity and mortality from metabolic data and body mass (Swiss Armed Forces)

Histological analyses of ancient mummified tissues (Iranian Salt mummies, mammoth baby Lyuba)

Variability of clinical appearance of bone diseases (e.g. femur fractures, degenerative diseases)

Problem: Historic reference samples of bone disease are rare

Goal: to analyze selected sample series from the Galler bone reference collection

Metabolic data and body mass (Swiss Armed Forces)

Problem: Obesity world wide approaches epidemic proportions (metabolic syndrome)

Goal: Demonstrate a relationship between growth hormones / IGF, leptin and BMI; endocrine disruptors (environmental pollutants) and BMI

Build-up full scale bone histology laboratory in combination with planned Micro-CT facility

Publications

Selected peer-reviewed original articles of the ZEM groups 2010

Without 'informed consent'? Ethics and ancient mummy research.

Kaufmann IM, Rühli FJ
J Med Ethics, 2010
Oct;36(10):608-13.

Confirmation of micro-evolutionary increase in spina bifida occulta among Swiss birth cohorts.

Lee YC, Solomon LB, Rühli FJ, Schiess R, Ohrström L, Sullivan T, Alkadhi H, Henneberg M
Eur Spine J. 2010 Jul 15. [Epub ahead of print]

Technical note: Terahertz imaging of ancient mummies and bone.

Ohrström L, Bitzer A, Walther M, Rühli FJ.
Am J Phys Anthropol. 2010 Jul;142(3):497-500.

Seawater and freshwater challenges affect the insulin-like growth factors IGF-I and IGF-II in liver and osmoregulatory organs of the tilapia.

Link K, Berishvili G, Shved N, D'Cotta H, Baroiller JF, Reinecke M, Eppler E.
Mol Cell Endocrinol. 2010 Oct 7;327(1-2):40-6.

Brief communication: tissue isotopic enrichment associated with growth depression in a pig: implications for archaeology and ecology.

Warinner C, Tuross N.
Am J Phys Anthropol. 2010 Mar;141(3):486-93.

Growth variation, final height and secular trend. Proceedings of the 17th Aschauer Soiree, 7th November 2009.

Hermanussen, M; Godina, E; Rühli, F J; Blaha, P; Boldsen, J L;

van Buuren, S; Macintyre, M; Aßmann, C; Ghosh, A; de Stefano, S F; Sonkin, V D; Tresguerres, J A; Meigen, C; Meigen, C; Geiger, C; Lieberman, L S
HOMO: Journal of Comparative Human Biology. 2010, 61(4):277-284.

BMI distribution/ socialstratification in Swiss conscripts from 1875 to present.

Staub K, Rühli FJ, Woitek U, Pfister C
Eur J Clin Nutr. 2010 Apr; 64(4): 335-40.

X-ray absorption-based Imaging and its limitation in Differentiation of Ancient Mummified Tissue

Wanek J., Székely G., Rühli F.
Skeletal Radiol. In Press.

Charlemagne was very tall, but not robust

Rühli F.J., Blümich B., Henneberg M.
Econ Hum Biol, 2010 Jul;8(2):289-90.

Preservation of cell structures in a medieval infant brain: a paleohistological, paleogenetic, radiological and physico-chemical study.

Papageorgopoulou C., Rentsch K., Raghavan M., Hofmann MI., Colacicco G., Gallien V., Bianucci R., Rühli F.
Neuroimage, 2010 Apr 15;50(3):893-901.

Two case examples of pelvic fractures in medieval populations from central Europe.

Hofmann MI, Papageorgopoulou C, Böni T, Rühli FJ.

J Anthropol Sci. 2010;88:179-88.

Open Positions at the ZEM:

Head of Morphology Group

- Microevolutionary studies (dissection, histology, clinical imaging) of the musculo-skeletal system
- Anthropometric studies / evolution of body morphology
- Studies on the biological standard of living based on large data sets

Head of ancient DNA lab/proteomics

- Molecular evolution of disease, molecular genetic analysis of ancient mummified tissue
- Establish new aDNA extraction methods
- Protocols for ancient soft tissue studies on mummification-based protein modification

Head of Imaging Group

- Diagnostic evaluation of various imaging modalities to study ancient mummy soft tissue / pathologies
- Evolutionary aspects / imaging of bone morphology / disease
- Diagnostic imaging of musculo-skeletal disease

For more detail and further information, please refer to
<http://www.anatom.uzh.ch/zem>

Current News

Frank Rühli, ZEM Head



With great appreciation and thanks, I am delighted to announce that via the very generous support of the Swiss Mäxi-Foundation, the Centre for Evolutionary Medicine (ZEM) can be established at the University of Zurich, Switzerland.

The goal of the ZEM is to be a medico-transdisciplinary bridge between the past, the present and the future. Researchers at the centre shall study the medical evolutionary aspects of disease aetiology and general disease patterns.

The centre shall specifically investigate the occurrence, appearance, frequency, transformation and causes of diseases during the course of evolution with a particular focus on musculo-skeletal disease. Also, the research goal of the ZEM is to learn more about the continuing development of current clinically relevant diseases, e.g. infectious pandemics. Ancient and modern data samples (tissues, body measures) will help us to learn more

about the various interactions between humans, their environment and possible diseases / pathogens.

Within the next few years, the basic groundwork for 'evolutionary medicine' at the UZH should be realized for such disease evolutions. At the beginning of the project, the intention is to establish three research groups with the following wider research themes: 'molecular evolutionary medicine', 'clinical-diagnostic imaging research' and 'anatomical microevolution'. Further interfaces within the Institute of Anatomy can be expected, in particular between the Macroscopic Anatomy Unit and the 'Clinical Skill Lab', which is a joint facility with the ZEM. It serves clinicians to incorporate anatomical infrastructure and knowledge into their research. Finally, with strong international collaborators we hope to build-up a long lasting research and teaching network within this field of science. We look forward to many stimulating research projects and would be happy to receive any input from your side, too!

Upcoming dates with ZEM participation:

- | | |
|-----------------------|--|
| November, 4th | Bodensee Hochschulkonferenz IBH (Frank Rühli) |
| November, 8th | 4. Symposium präklinischer Notfallmedizin, USZ: Vortrag Dr. F. Rühli |
| November, 28th | 18th Aschauer Soirée: Diversity in auxology: between theory and practice (Kaspar Staub) |
| April 2011 | Annual Meeting of the American Association of Physical Anthropologists Minneapolis (various contributors) |
| June 2011 | World Mummy Congress, San Diego (various contributors) |

Address

Zentrum für Evolutionäre Medizin
Anatomisches Institut
Winterthurerstrasse 190, CH-8057 Zürich, Switzerland
zem.uzh@gmail.com
<http://www.anatom.uzh.ch/zem>

Administrative Services ZEM:

PD Dr. PhD Frank Rühli, Head
Dr. Thomas Böni, Co-Head

Bettina M. Kreissl Lonfat, Admin. Assistant +41 44 635 5605
Christoph Fellner, IT Support