



**University of
Zurich** ^{UZH}

Institute of Anatomy

Centre for Evolutionary Medicine

Annual Report 2010 (reporting period: 26.10.10 - 31.12.10)

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Dr. Thomas Böni, Co-Head

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1 Management Summary.



ZEM local and international collaborators the Kick-Off Event, October the 26th

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 transdisciplinary 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.

On October the 26th, the ZEM was officially opened at a Kick-Off meeting which brought the Centre's local, national and international collaborators together, honorary committee and advisory board. This was the first time these centre members had met one another face-to-face.

Since the official opening of the ZEM last October, which formally marked the starting phase of the still on-going academic and infrastructural organisation of the centre, one of our focal points was investing into the infrastructure itself.

In fact, together with the Functional Genomics Centre, the ZEM has acquired an Electrospray Mass Spectrometer. Ralph Schlapbach, Head of the FGC, explains on page 4 of this newsletter in which ways this expensive piece of equipment is important in proteomics research and the analysis of proteins in biological samples.

These important investments have been a major point in this beginning phase of the ZEM. Not only to facilitate the working conditions and work of our different groups, but also broaden our scope towards the research in proteomics as a whole. In this same respect, a lot of effort has been put into building our international collaborations to which the first meeting in October was a very successful starting point.

Since then, the ZEM has been able to write a complete course in Evolutionary Medicine together with Macej Henneberg at the University of Adelaide which will be held this semester (Please refer to our website for the complete syllabus) – and we are aiming for the same here in Zürich where we hope to establish post-graduate courses as soon as possible.

Apart from this very important teaching aspect, the first results of our research are being published and the feedback has been excellent so far.

For the next couple of months our main goal is to find ways to deal with the constant shortage of rooms and working space available. The constructions for the new offices for the ZEM are projected to be finished by the end of the summer and new labs on the Irchel Campus will hopefully also be available by this date. And it will be just in time, because we do hope to finish the various appointment sessions for junior and senior positions with the ZEM thanks to the support by the Mäxi foundation by that time as well.

Opening Address by 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!

2 Official ZEM Opening.



Universität
Zürich^{UZH}

Anatomisches Institut

Zentrum für Evolutionäre Medizin (ZEM)

Kick-Off Event

Tuesday, 26th of October 2010

UZH, Campus Irchel, Y10 G03
(above the Anthropology Museum)

10:00 - 10:30

Greeting and General Introduction

Prof. D. Wyler, Vice-President Medicine and Natural Sciences UZH

Prof. K. W. Grätz, Dean Faculty of Medicine UZH

Prof. O. Ullrich, Head Institute of Anatomy UZH

PD F. Rühli, Head ZEM

10:30 - 12:00

«Evolutionary Medicine: An International Perspective»

Speakers:

PD M. Bock

(Deutsches Krebsforschungszentrum, Heidelberg)

Prof. M. Henneberg

(University of Adelaide)

Prof. I. Hershkovitz

(Tel Aviv University)

Dr. Ch. Scheffler

(Universität Potsdam)

Prof. W. Schiefenhövel

(Max-Planck-Institute Andechs)

Prof. N. Tuross

(Harvard University)

PD A. Zink

(Institute for Mummies and the Iceman, Bozen)

Further local and international collaborators: Prof. B. Blümich (University of Aachen), Prof. B. Solomon (Royal Adelaide Hospital), Prof. S. Ikram (American University Cairo), Prof. J. Hodler (USZ), Prof. J. Komlos (LMU Munich), Prof. Ch. Pfirmann (Balgrist UZH), PD D. Schaer, (USZ), Prof. R. Schlapbach (UZH, ETH), Surgeon General A. Stettbacher (Swiss Armed Forces), Prof. G. Székeley (ETH), Prof. U. Woitek (UZH)

Contact: zem.uzh@gmail.com

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With the most generous support of
the Mäxi Foundation

On the 26th and 27th of October 2010, the new 'Centre for Evolutionary Medicine' (ZEM) was officially launched with a kick-off event. The new centre is the first Evolutionary Medicine research unit of its kind in existence worldwide.



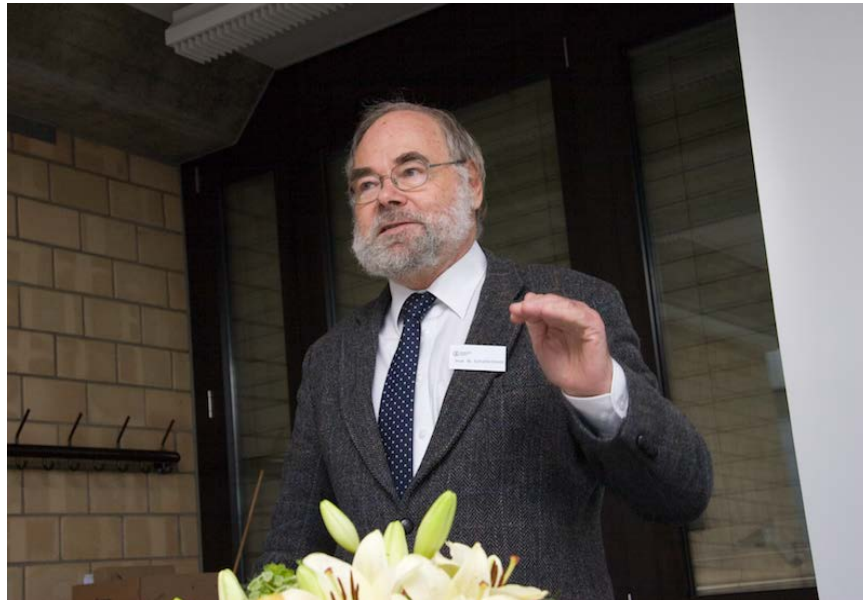
Prof. D. Wyler, Vice President "Medicine & Natural Sciences" UZH, member of the Honorary Committee, addresses the public at the opening event of the ZEM.

The ZEM collaborators 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. This included:

Prof. B. Blümich	Rheinisch-Westfälische Technische Hochschule, Aachen
PD M. Bock	Deutsches Krebsforschungszentrum, Heidelberg
Prof. M. Henneberg	Anatomical Sciences, University of Adelaide
Prof. I. Hershkovitz	Anatomy and Anthropology, Faculty of Medicine, Tel Aviv University
Dr. Ch. Scheffler	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, EURAC, Bozen

The two day programme consisted 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 was 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 was invited to attend the General Introduction and the International Collaborators'

presentations. The General Introduction introduced the guests to the ZEM, its research work and goals.



Prof. W. Schiefenhövel, Human Ethology Group, Max-Planck-Institute, Andechs, international collaborator of the ZEM, gives a presentation at the opening event of the ZEM.

The ZEM also received a warm welcome from the University of Zürich itself, as the President Prof. Dr. Andreas Fischer, addressed the ZEM collaborators a few words:

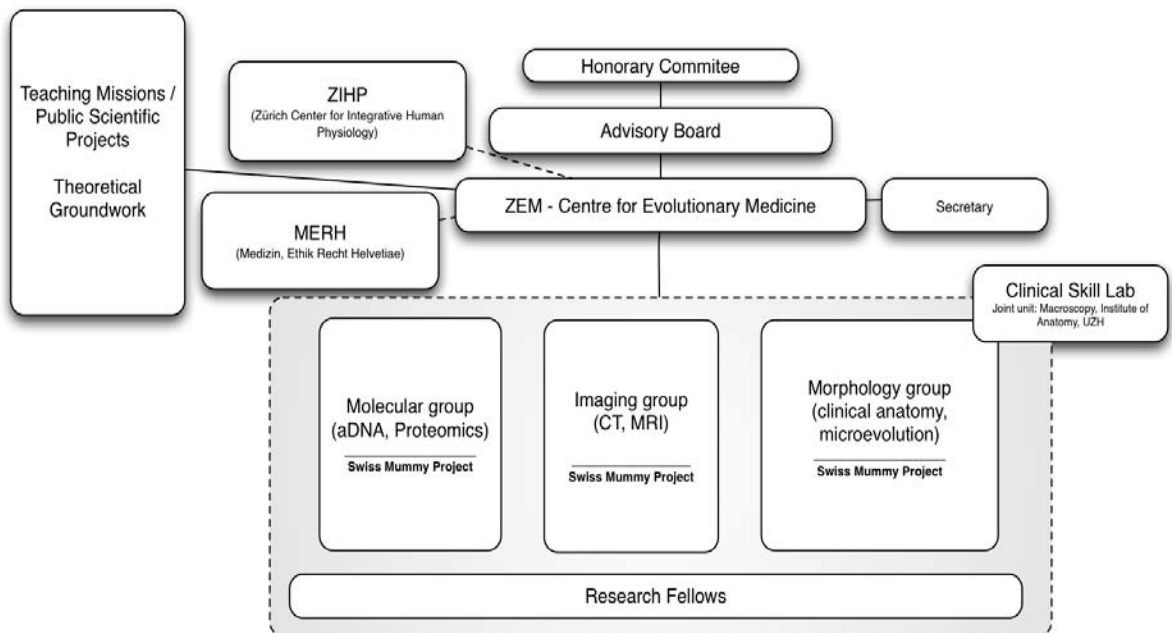
Ladies and Gentlemen

Congratulations on the opening of the new Centre for Evolutionary Medicine (ZEM)! The university is happy to have ZEM within its Institute of Anatomy – not just because this kind of centre is unique in the world, but because ZEM reflects the diversity of our university, its high-quality research and its spirit of innovation.

In studying evolutionary aspects of disease, the ZEM conducts basic research which is at the same time interesting for scientists and relevant to the well being of our society. The ZEM benefits from the close co-existence of various disciplines within UZH, ranging from anthropology to proteomics research and paleopathology. It makes these disciplines work together and develop new challenging perspectives in medical research. Moreover, the ZEM is a platform for cooperations between national and international experts as well as between the university and private partners. As for the latter, we are especially grateful to the Maxi Foundation for its support.

The ZEM investigates the past in order to find solutions for the present and the future. This is a promising approach. On behalf of the Executive Board of the University, I wish the ZEM every success.

3 The Centre.



As a transdisciplinary bridge between the past, the present and the future, researchers at the ZEM will study the general evolutionary aspects of, e.g. disease aetiology (contributing factors such as lifestyle or infectious environmental factors) and disease patterns (prevalence, socio-economic stratifications, etc.). Primarily, musculoskeletal and joint diseases as well as the molecular evolution of disease pathogens will be studied.

Some general research questions:

- How does clinical medicine benefit specifically from the evolutionary perspectives of disease?
- How do evolutionary vulnerabilities of human anatomy / physiology contribute to disease?
- How do ancient samples such as skeletons and mummies act as a major source for the study of the evolution of disease, e.g. pathogen pandemics?

Evolutionary Medicine represents the best interdisciplinary science, which has significance, for specialized clinicians and general practitioners. At the ZEM, researchers from fields as varied as anthropology, paleopathology, ancient DNA and proteomics research, veterinary sciences, human morphology and imaging shall work together.

One of the centre's main interests is historical human remains and/or mummified tissue. The ZEM also favours a continuous reflection about ethical standards relative to highly invasive procedures and the ethical dilemmas that arise from dealing with historical remains.

The centre includes three main research units: a "molecular", "an "imaging" and an "anatomico-morphological" research group.

A "Clinical Skill Lab" for transitional clinical research is also attached to the Centre, as are multiple local and international collaborations. An regular scientific project review meeting shall be established.

The ZEM is organised as follows:

Honorary Committee

Dr. M. Dell Ambroggio, Secretary of State for Education and Research, Federal Swiss Government
 Dr. T. Heiniger, Member of the governing council of the canton Zürich
 Prof. F. Gutzwiller, Member of Swiss Senate for the canton Zürich
 Prof. D. Wyler, Vice President Medicine and Natural Sciences of the University of Zürich
 M. Coninx, Managing Director of "Finanz und Wirtschaft" Tamedia AG
 M. Prenosil, Chairman Sprüngli AG, President of the City Association Zürich

Advisory Board

Prof. K. Grätz, Dean Medical Faculty, University of Zürich
 Prof. M. Hengartner, Dean Mathematics and Natural Sciences Faculty, University of Zürich
 Prof. W. Bär, Director Institute for Forensic Medicine University of Zürich
 Prof. M. Gassmann, Director Institut für Veterinäre Physiologie, Center for Integrative Human Physiology, UZH
 Prof. S. Gay, Rheumatology, Institute for Physical Medicine University of Zürich
 Prof. Ch. Gerber, Chief Doctor Orthopedics Clinic Balgrist University of Zürich
 Prof. B. von Rechenberg, Director Center for Applied Biotechnology and Molecular Medicine UZH, Vetsuisse
 Prof. M. Rudin, Institute for Biomedical Engineering ETH
 Prof. C. van Schaik, Director Institute for Anthropology University of Zürich
 Prof. B. Tag, Institute of Law University of Zürich, Chairwoman Centre of Competence Medicine – Ethics – Law Helvetiae
 Prof. O. Ullrich, Director Institute of Anatomy, University of Zürich

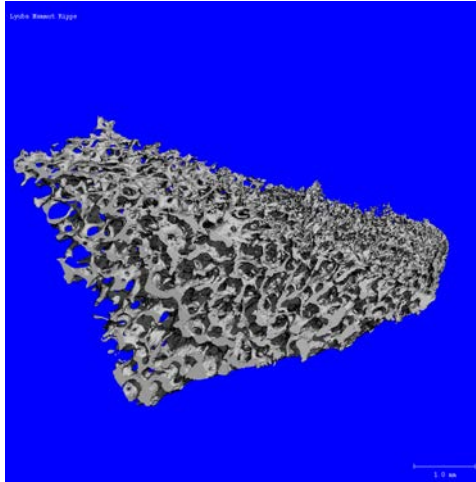
International Collaborators

Prof. B. Blümich, Rheinisch-Westfälische Technische Hochschule, Aachen
 PD M. Bock, Deutsches Krebsforschungszentrum, Heidelberg
 Prof. M. Henneberg, Anatomical Sciences, University of Adelaide
 Prof. I. Hershkovitz, Anatomy and Anthropology, Faculty of Medicine, Tel Aviv University
 Prof. S. Ikram, Department of Egyptology, American University Cairo
 Prof. em. J. Komlos, Volkswirtschaftliches Institut, LMU München
 Dr. Ch. Scheffler, 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, EURAC, 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

Research Groups.



Micro-CT analysis of Mammoth baby Lyuba's rib 43'000 BP (Dr. vet. Karl Link, PhD)

3.1 The Molecular Group

Dr. Natallia Shved

Dr. Christina Warinner



The state of art aDNA Lab at the ZEM, University of Zürich, Irchel Campus.

- 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 (see DNA taphonomy)
- Genomic evolution of human infectious disease
 Investigation of sequence and amino acid changes in bacterial and viral pathogens recovered from archaeological remains
- Haemoglobin associated pathology - mechanisms, biomarkers and novel therapeutic strategies

3.2 The Imaging Group

Lena Öhrström, med. pract.

Dr. Dr. Roger Seiler

Johann Wanek, MSc Med Phys



3D reconstruction of a CT Scan of the Ice Man's frontal region (Dr. med. dent. Dr. phil. R. Seiler)

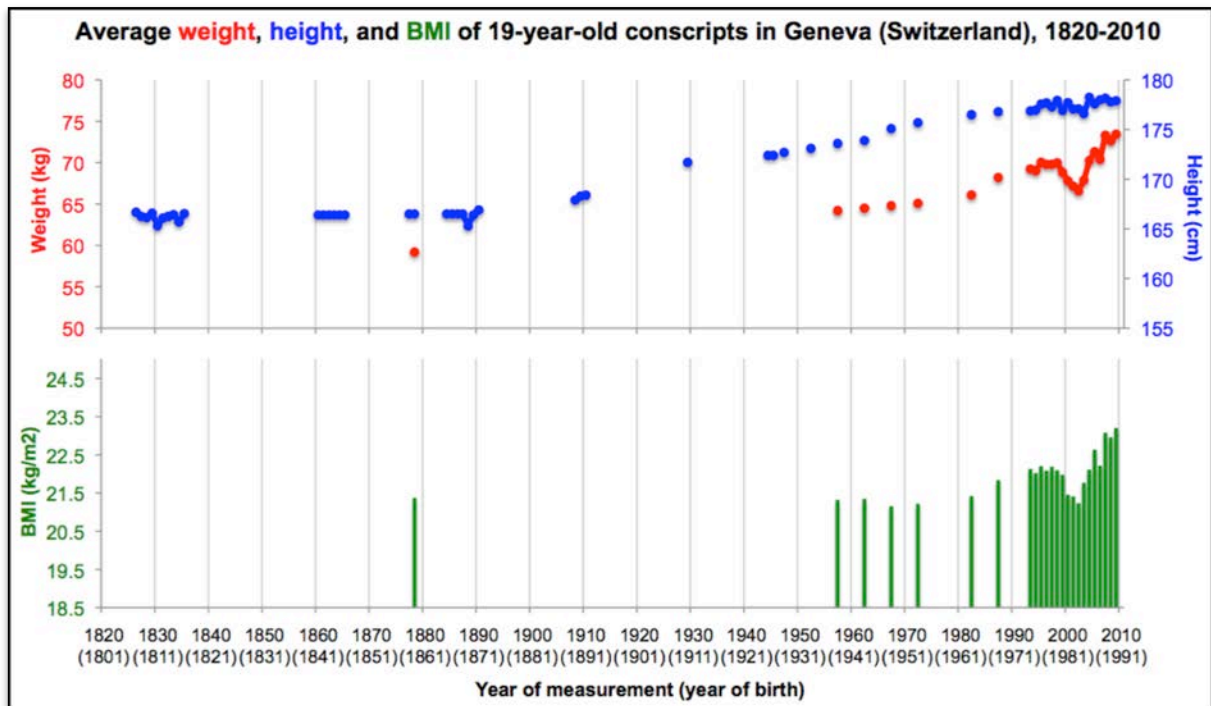
- X-ray imaging and its impact on ancient DNA. A Monte Carlo based Simulation
Problem: Validation of simulation models with real DNA preservation?
Goal: Predict probability of ancient DNA fragmentation
- X-ray absorption-based Imaging and its limitations in Differentiation of Ancient Mummified Tissue (DSC, 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
- Evaluate the 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

3.3 The Morphology Group

Dr. Dr. Karl Link

Dr. Kaspar Staub

Olia Bolshakova, med.dent.



Development of Body Mass Index in conscripts in the city of Geneva (Dr. phil. K. Staub)

- 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 prevalence (“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 analyse 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

3.4 The Clinical Skill Lab

The establishment of the Clinical Skill Lab as a joint facility with the Institute of Anatomy has progressed nicely in the first months since the opening of the ZEM and we are hoping of accommodating the first courses in summer 2011 after the necessary infrastructural changes have been made in the localities here at the University of Zürich, Irchel Campus.

4 Past dates with ZEM participation.

November, 4th: Bodensee Hochschulkonferenz IBH (PD Dr. Frank Rühli)

November, 8th: 4. Symposium präklinische Notfallmedizin, USZ (PD Dr. Frank Rühli)

November, 17th: International Workshop, Ruhr-Universität Bochum: The Saltmen of Iran (PD Dr. F.J.Rühli)

November 27th: The Swiss Mummy Project: Antike Mumien und modern medizinische Forschung. Jahresmitgliederversammlung der Schweizerischen Malignen Hyperthermie Vereinigung, Zürich (PD Dr. F.J.Rühli).

November, 28th, 2010: 18th Aschauer Soirée: Diversity in auxology: between theory and practice (Dr. Kaspar Staub)

December, 1st, Fortbildung SRO-Spital, Langenthal: Tutanchamun und Ötzi: Medizinische Forschung an Mumien (PD Dr. F.J.Rühli)

5 Publications.

5.1 Scientific (Published between October and December 2010)

Without 'informed consent'? Ethics and ancient mummy research. Kaufmann IM, Rühli FJ
J Med Ethics, 2010, Oct;36(10):608-13.

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.

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; HOMO: Journal of Comparative Human Biology. 2010, 61(4):277-284.

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.

5.2 Press.



Mummies for Medicine

Most med students dissect cadavers, not mummies. Now Swiss researchers plan to use ancient DNA to attack some of the modern world's most pressing medical problems. They're part of a small but growing movement to unravel the mysteries of disease from a surprising new angle: evolution.

Officially launched in late October, the University of Zurich's new Centre for Evolutionary Medicine will investigate both how diseases evolve and how humans become vulnerable to them. Some of their biggest questions involve changes in human anatomy, says the center's director, Frank Rühli, such as whether an increasingly sedentary lifestyle may have weakened spinal columns, causing back pain. They'll also take DNA from ancient remains, such as Egyptian mummies (see photo), to compare genomes of ancient pathogens with those of modern ones—a valuable tool for detecting how fast diseases evolve and how environmental changes can affect them. Knowing how maladies flourish, says Rühli, will give scientists a much better idea of how to combat them.

With 11 researchers in Zurich and some 20 local and international collaborators, Rühli says the center will be larger than any other institute in the burgeoning field. He hopes its clinical—rather

than theoretical—approach will help convince skeptics that an evolutionary perspective could have practical value. "We all think that biological evolution has stopped," he says. But when anatomy can change in just a few decades, "that's not true."

High-Grade Hog

It may be "the other white meat," but to find out which cuts of pork are the juiciest, food scientists are looking at all the colors in the spectrum.

Last week, researchers at McGill University in Montreal, Canada, announced their invention of a machine that uses spectroscopy—the same technique used to examine the molecular makeup of faraway stars and planets—to assess pork quality. The meat's texture, color, and moisture content all affect the wavelengths of light reflecting off its surface. Now the scientists have discovered how to parse that data to quickly assess whether the meat is tender or tough, fatty or lean.

That allows pork producers to market their meat more accurately to the right customers, says lead researcher and bioengineer Michael Ngadi. For instance, Japan likes pigging out on

Europe's First Far

Skilled migrants—or perhaps invaders—from western countries ignited the agricultural revolution in Europe, analysis of DNA from German skeletons up to 7300

Some scholars previously thought European neighbors in the Near East, where agriculture originated, tell a different story. Researchers led by Australia compared DNA sequences of the 22 ancient skeletons from Europe and countries in the Near East. Their results, published online in *PLoS Biology* on 9 November, suggest not mere technology transfer, but migration. "The lineage of the

Science, 330, November 2010.

- Radio Interview und Beitrag: Radio DRS "Echo der Zeit" 27. Oktober 2010

SONNTAGSBlick 31. Oktober 2010 Aktuell **blick** 15



Ötzi beim Schweizer Zahnarzt

Er war flink wie ein Wiesel und zäh wie eine Schildkröte. Aber er litt schon an einer Zivilisationskrankheit: Ötzi hatte wohl Karies.

4,5 Kilo schwer war der Eismann zu Lebzeiten. Die Mumie wiegt noch 13,5 Kilogramm.

Ötzi im Mund geschaut: Das Gebiss des Eismannes in einer Computeranimation.

«Ötzi hat viel verarbeitetes Getreide gegessen, wohl eine Art Brot»
Abert 268

Mumienforscher leistet Pionierarbeit
Der international bekannte Zürcher Mumienforscher Frank Rühli (im Bild links) hat gemeinsam mit einem elfköpfigen Team letzte Woche in Zürich das Zentrum für Evolutionäre Medizin (ZEM) eröffnet. Das ZEM ist punkto Grösse und Ausrichtung weltweit ein Pionierprojekt. Mit modernsten Methoden gehen die

an Ort und Stelle, sagt der Südtiroler Wissenschaftler Albert Zink, der das Research Institute for Mummies and the Ice Man leitet. Das Institut in Bozen (I) wurde extra für die Erforschung der berühmten Gletschermumie gegründet.

Jetzt entdecken Zürcher Forscher ein neues, wichtiges Detail. In den letzten Monaten nahm eine Gruppe um den Mumienforscher Frank Rühli (siehe Box) die Computertomogramme des Steinzeit-Gebisses unter die Lupe. Zahnarzt Dr. Dr. Roger Seiler war überrascht: Die Bilder zeigen nicht jenes makellos-gesunde Gebiss, von dem doch so viel die Rede war, als man Ötzi fand. Nein, da waren Spuren von Karies – sehr deutliche Spuren so-

gar. In die Zähne des Eismannes hatten sich Löcher gefressen, so der vorläufige Befund.

Da fragt man sich sofort: Warum diese Karies, Jahrtausende bevor der Mensch die süsse Macht des kristallisierten Zuckers entdeckte?

fe gibt es kaum wissenschaftlichen Fortschritt. Ein Dilemma! Also redet bei der Frage, wer den Eismann wie untersuchen darf, sogar die Südtiroler Regierung mit. Zink hofft, dass er die Endoskopie noch dieses Jahr durchführen kann.

So oder so wird Ötzi weitere Geheimnisse preisgeben. Forscher haben sein Genom entschlüsselt, sein Erbgut also. In den nächsten Jahren werden sie den Baustein analysieren. So hofft man herauszufinden, welche Augenfarbe Ötzi hatte. Ob er heute noch Nachkommen hat. Oder ob es Veranlagungen zu Krankheiten in sich trug. Diabetes etwa. Ötzi steht also ganz im Dienste der modernen Medizin, wie Rühli sagt: «Er hilft uns, das Entstehen von Erbkrankheiten besser zu verstehen.»

Gewisse Behauptungen, die über Ötzi verbreitet wurden, möchten die Forscher dagegen sofort aus der Welt schaffen. Ewa, dass er auf dem Gletscher bestattet wurde, wie römische Archäologen behaupten. Das sei völliger Quatsch, lässt Albert Zink durchblicken: «Die Haltung und der Zustand der Mumie schliessen diese These absolut aus.»

Dinshaw
Die besten Bilder über den berühmtesten Gletschermumie der Welt
www.sonntagsblick.ch
ÖTZI

Mumienforscher leistet Pionierarbeit

Der international bekannte Zürcher Mumienforscher Frank Rühli (im Bild links) hat gemeinsam mit einem elfköpfigen Team letzte Woche in Zürich das Zentrum für Evolutionäre Medizin (ZEM) eröffnet. Das ZEM ist punkto Grösse und Ausrichtung weltweit ein Pionierprojekt. Mit modernsten Methoden gehen die



Forscher der Frage nach, wie sich Krankheitserreger über Jahrhunderte entwickeln und warum der Mensch überhaupt krank wird. Dabei spielen Mumien eine wichtige Rolle. Rühli will künftig noch enger mit Albert Zink zusammenarbeiten, dem weltweit führenden Ötzi-Experten (rechts im Bild). ●

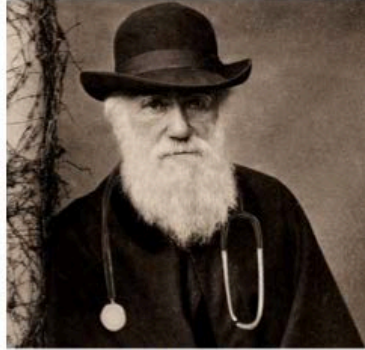
Sonntagsblick, 31. Oktober 2010.

Universities evolve, looking to Darwin for new medical insights

Humans are the products of millions of years of evolution through natural selection. Yet when it comes to the treatment of disease, physicians and biomedical researchers have long neglected our evolutionary pasts. Now, a number of research institutes are attempting to remedy that by launching new research centers dedicated to the burgeoning field of evolutionary medicine.

The newly minted Center for Evolutionary Medicine at the University of Zurich opened its doors in late October. Backed by a \$10 million donation from the private Zurich-based Mäxi Foundation, the center will focus on analyzing ancient DNA and bones as well as dissecting microevolutionary changes in human morphology to better understand modern diseases. "It's medical research, but it's looking from an evolutionary perspective," says the center's director Frank Rühli, a physician who has studied ailments such as atherosclerosis in Egyptian mummies.

In the US, the Center for Evolutionary Medicine and Informatics—one of ten research centers at Arizona State University's Biodesign Institute in Tempe—has been up and running since the beginning of the year. Under the direction of molecular evolutionary biologist Sudhir Kumar, the center is primarily focused



From finches to flu: Medical research adapts.

on understanding disease through retracing the evolution of DNA sequence changes. "I think evolutionary medicine is exciting because of genomics," says Kumar. "Genomics allows one to ask ultimate causes of disease—like, why do some people get sick and others do not?"

Randolph Nesse, a psychiatrist at the University of Michigan–Ann Arbor who coined the term 'Darwinian medicine' nearly two decades ago, applauds the new centers' efforts. "The field really needs recognition that evolution has many different uses in

medicine," he says.

But evolutionary biologist Stephen Stearns, another pioneer in the field from Yale University in New Haven, Connecticut, notes that both new centers are narrowly focused—primarily on the study of infections in ancient contexts in the case of Zurich, and on phylogenomics in Arizona. "I'd say that each of those [areas] is one fiftieth of evolutionary medicine," Stearns says, arguing that the discipline reflects a much broader application of basic evolutionary thinking to clinical practice and public health. "Evolution touches medical issues at many points."

Although neither new center is focused on medical or graduate training, many institutions around the world have created stand-alone courses to teach students about evolutionary medicine (*Nat. Med.* 15, 1338, 2009), and Case Western Reserve University in Cleveland is taking the education approach one step further. According to Glenn Starkman, an astrophysicist and director of Case Western's interdisciplinary Institute for the Science of Origins, the university plans to launch a formal graduate program in evolutionary medicine in September 2012. "It's time that medical education gets more focused on evolution," he says.

Elie Dolgin

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Medienmitteilung vom 27.10.2010

Zentrum für Evolutionäre Medizin (ZEM) an der UZH eröffnet

An der Universität Zürich gibt es neu ein Zentrum für Evolutionäre Medizin. Unter der Leitung des Mediziners und Mumienforschers Frank Rühli werden menschliche Krankheiten und deren Ursachen im Laufe der Evolution erforscht. Dieses einzigartige Wissenschaftszentrum ist Dank einer privaten Spende entstanden.

Das neu gegründete Zentrum für Evolutionäre Medizin (ZEM) ist einzigartig für die Schweiz, bezüglich Grösse und Ausrichtung ist es weltweit ein Pionierprojekt: Evolutionäre Medizin befasst sich als Forschungsgebiet unter anderem mit der Evolution von Krankheitserregern und den Grundlagen, warum der Mensch überhaupt krank wird. Weltweit erlangt sie einen immer wichtigeren wissenschaftlichen Stellenwert. Ihre Erkenntnisse gewinnt sie unter anderem aus historischen Mumiengewebsproben. Das Zentrum für Evolutionäre Medizin (ZEM) an der Universität Zürich (UZH) bildet gleichsam eine medizinisch-transdisziplinäre Brücke zwischen Vergangenheit, Gegenwart und Zukunft, denn die mittels heutiger Forschung an historischen Geweben gewonnenen Ergebnisse werden auch für aktuelle und künftige klinische und präventivmedizinische Anwendungen nützlich sein.

Drei thematische Schwerpunkte und ein weltweites Netzwerk

Auf drei Themenbereiche fokussiert sich zu Beginn die Arbeit der Hauptforschungsgruppen des ZEM. Gemeinsam untersuchen sie Häufigkeit, Wandel und Ursachen diverser Krankheiten im Verlauf der Evolution. Die Arbeiten auf dem Gebiet der Molekularen Evolutionären Medizin widmen sich unter anderem der Gewinnung von Erbsubstanz aus alten Mumien und Skeletten (so genannter «ancient DNA»). Sie schaffen damit die Grundlage für Studien zur molekularen Entwicklung von infektiösen Krankheitserregern wie Viren oder Bakterien. Für diese wiederum steht am ZEM ein hochspezialisiertes Labor zur Verfügung. Der zweite Themenbereich, die Radiodiagnostische Forschung, widmet sich vorwiegend der röntgenbasierten Bildgebung in der Diagnostik von historischen Geweben, beispielsweise der Bestimmung von Knochendichten oder Weichteilkrankheiten. Im Forschungsfeld der Mikroevolution schliesslich sollen vorwiegend kurzzeitige Veränderungen menschlicher Anatomie und Krankheitsmuster studiert werden. Beispiele hierfür sind der spezifische Bau der menschlichen Wirbelsäule oder auch die Zunahme von Körpergewicht.

Die Zürcher Wissenschaftler des ZEM arbeiten eng mit Forschenden aus aller Welt zusammen. Nebst lokalen Kooperationen sind internationale Partner beispielsweise der Harvard University (USA), der Tel Aviv University (Israel), der University of Adelaide (Australien) oder vom Deutschen Krebsforschungszentrum in Heidelberg (D) am Netzwerk des ZEM beteiligt.

Organisatorisch ist das Zentrum für Evolutionäre Medizin am Anatomischen Institut der Universität Zürich angegliedert und gehört damit zur Medizinischen Fakultät. Sein Betrieb wird durch eine grosszügige Spende einer privaten Stiftung unterstützt. Das hochspezialisierte Labor für die molekularen Studien erhielt eine Unterstützung des Schweizerischen Nationalfonds.

Medienmitteilung Universität Zürich, 27.10.2010

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(jpg, 1593 KB)

Frank Rühli untersucht altägyptisches Mumiengewebe (Bild: P. Pfister)

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6 Goals ZEM 2011.

- Complete additional senior and junior appointments
- Get new rooms and labs within the University of Zürich
- Intensify national and international collaborations
- New data collection
 - Iranian Salt Mummies samples
 - Body shape data
 - Mitochondrial and nuclear DNA of humans and pathogens
- Publish first results of the ZEM research 2010/11
- Establish a new post-graduate course in Evolutionary Medicine

Impressum.

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