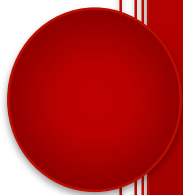


Annual meeting of
Students in Evolution and Ecology

Tübingen
23 November 2018



EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN



StEvE Meeting 2018

The meeting of Students in Evolution and Ecology (Meeting StEvE) provides a yearly opportunity for postgraduate students from within Tübingen to present their research projects, exchange ideas, and receive feedback from senior scientists and fellow students in a pleasant and multidisciplinary atmosphere.

This year's StEvE meeting is organized by the Paleoanthropology group. We have participants both from EVEREST as well as other collaborating institutes in Tübingen (c.f., the list below). Both the oral and the poster presentations scheduled represent a multidisciplinary spectrum surrounding evolution and ecology. This year's keynote lecture will be given by Prof. Dr. Tracy Kivell (University of Kent), who will provide us with rare insights into the discovery of *Homo naledi* and its manipulative skills. The meeting will take place in the Alte Aula, an iconic and historical monument of our town and university. The evening Party is organized in the restaurant Ratskeller, close to the Tübingen Town Hall.

We are looking forward to welcoming you at Meeting StEvE 2018!

*The organizers -- Alexandros Karakostis – Annabelle-louise Lockey – Laura Sophia Limmer -
- Karin Kiessling – Katerina Harvati*



Participating working groups (from the University of Tübingen unless stated otherwise):

Animal Evolutionary Ecology

Biogeology / Senckenberg Centre for Human Evolution and Palaeoenvironment

Comparative Zoology

Department of Anthropology, Michigan State University

DFG Center for Advanced Studies "Words, Bones, Genes, Tools"

Didaktik der Biologie

Earth System Dynamics

ERC project "STONECULT"

Evolutionary Biology of Invertebrates

Evolutionary Ecology

Geoecology

Geologie and Geodynamik

Micropalaeontology

Molecular Biology, Max Planck Institute for Developmental Biology, Tübingen

Paleoanthropology

Parasitology

Plant Ecology

Plant Evolutionary Ecology

Christoph Randler's Lab

Vegetationsökologie / Institut für Evolution & Ökologie

Zooarchaeology

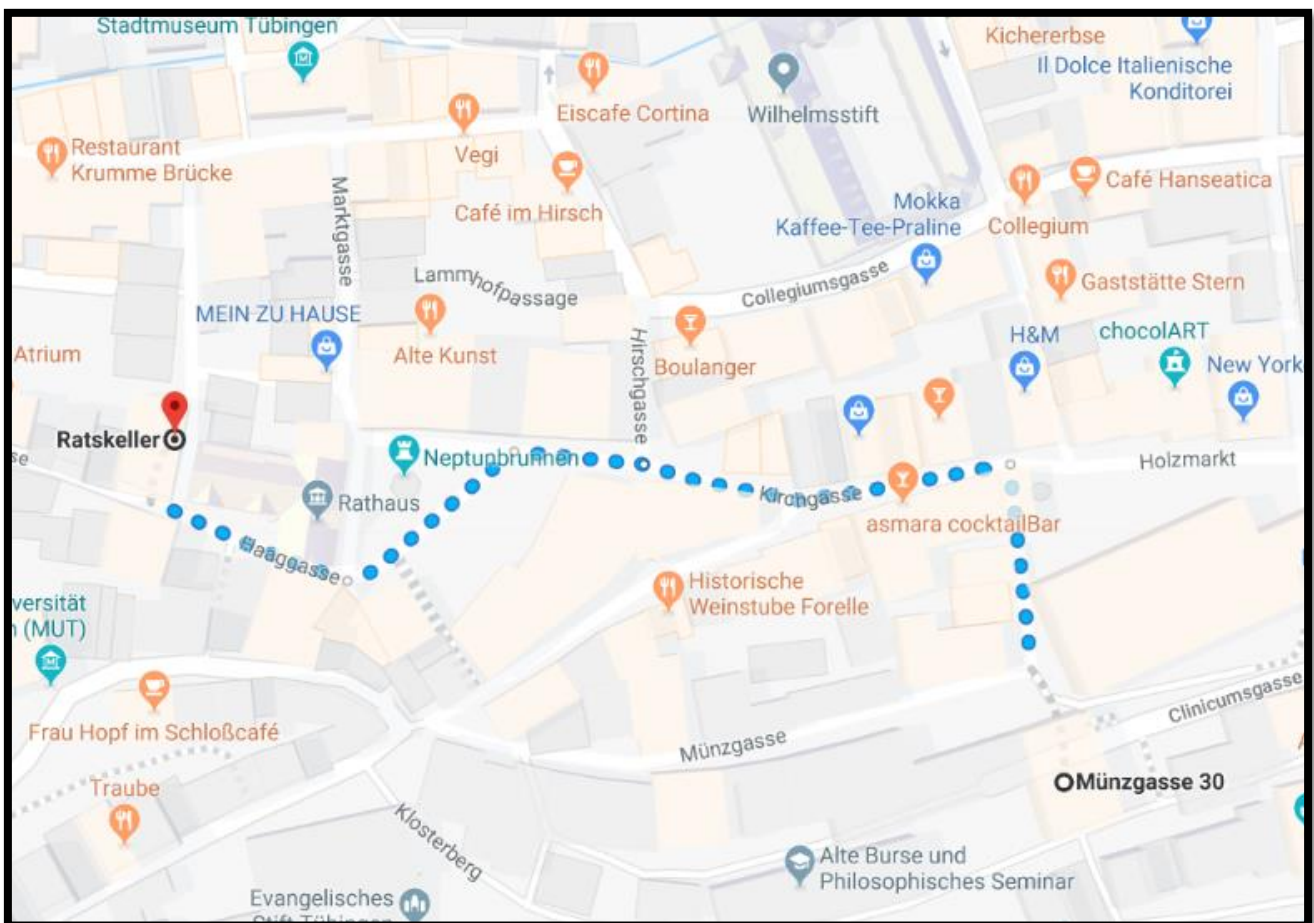
Practical Information

1. Locations

Main Venue (9.00 – 18.15) Festsaal of the **Alte Aula, Münzgasse 30**

- Presentations: **Festsaal, ground floor**
- Coffee break: Entrance hall & Festsaal, ground floor
- Poster sessions: Festsaal, ground floor

Party: (starts 18.30) **Ratskeller, Haaggasse 4**



2. Posters

Portrait, format A0 vertical, to be put up in Festsaal of the Alte Aula on Friday during registration.

Poster stands will not be numbered. Please choose your own.

3. Talk preparation and presentation

All presentations will run from a single computer to prevent time loss while changing speakers. Prepare your presentation in PowerPoint or export it as a pdf (to be shown in full-screen mode). Note that PDFs will run more reliably across platforms than PowerPoint presentations. You can “animate” your pdf by building up changes over several slides rather than within a slide (as you would in ppt). Please use font sizes ≥ 18 pt. Presentations will be run from a Windows computer. We provide a remote control with laser pointer.

! IMPORTANT ! Please hand in your presentation on a USB-Stick at registration (reception desk), so as we can check that your presentation runs properly.

Presentations are 15 min followed by 5 min discussion. The session chair keeps track of time.

4. Beverages during the meeting

We offer free drinks, coffee and snacks (including gluten-free) during the breaks in the entrance hall.

5. Party

Pending prior registration, participants are invited to attend the Party in the Ratskeller in the evening, from 18:30 till 21:30. Participants are offered a free drink (coupons will be provided at registration) as well as a dinner plate with either “chilli con carne” (with meat) or “chilli sin carne” (for vegetarians or vegans).

6. Emergency

For medical and fire emergencies, call 112 (mobile) or 70112 from fixed university phones.

Meeting Program – Friday 23 Nov. 2018 – Morning

8.15 – 9.00 Registration

Session I

Chair: Annabelle Lockey

9.00 – 9.10 Welcome Katerina Harvati

9.10 – 9.30 Lateralized vision in a cryptobenthic marine fish Anne Föllner

9.30 – 9.50 Virtual Reconstruction of the Celtic Prince Carolin Röding

9.50 – 10.10 Effects of forest management on the phenology of early-flowering understory herbs Franziska M. Willems

10.10 – 10.30 Evolutionary shape changes of femoral epicondyles and their impact on bipedalism Anna-Franziska Mandt

10.30 – 11.00 Coffee Break

Session II

Chair: Judith Beier

11.00 – 11.20 To see or not to see - Mating decisions based on visual cues in the Alpine newt, *Ichthyosaura alpestris* Deike Lüdtké

11.20 – 11.40 Was the Balkan Peninsula a refugium? Preliminary results from the zooarchaeological analysis of the Late Pleistocene faunal assemblage from Asprochaliko rockshelter, Greece Effrosyni Roditi

11.40 – 12.00 Reconsidering dental wear as a tool to estimate age in subadult Neanderthals Laura Sophia Limmer

12.00 – 12.20 Stability of semi-natural ecosystems under drought - separating resistance and resilience mechanisms Nicola Lechner

12.20 – 13.20 Lunch Break

Meeting Program – Friday 23 Nov. 2018 – Afternoon

Session III

Chair: Abel Bosman

13.20 – 13.40	Molecular identification and prevalence of tick-borne pathogens in zebu and autochthonous taurine cattle in Central Africa.	Babette Abanda
13.40 – 14.00	Bioarchaeological analysis and social structure of the Bronze Age population of Biniadràs Cave (Menorca, Spain)	Monice Timm
14.00 – 14.20	From space to earth: How satellites could influence political decisions in conservation	Paula. J. Rotter
14.20 – 14.40	Developmental stage of KNM-ER 42700, how young is she/he?	Tommaso Mori
14.40 – 15.00	Inter- and intraspecific variation in response to nutrient fluctuations in annual plants	Ying Deng

15.00 – 16.00 **Poster Session / Coffee Break**

16.00 – 17.15	KEYNOTE: The mysteries of <i>Homo naledi</i> and the evolution of our hands	Tracy Kivell
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17.15 – 17.30 Closing of the Meeting and Awards for Best Talk and Best Poster

17.30 – 18.15 EVEREST Info meeting (for students and scientists)

18.30 – 21.00 **Party in the Ratskeller**

List of Participants

<u>Participant</u>	<u>Research group</u>	<u>Presentation</u>
Abel Bosman	<i>DFG Center for Advanced Studies: "Words, Bones, Genes, Tools"</i>	
Alba Motes Rodrigo	<i>ERC project "STONECULT"</i>	Poster
Alejandra Duque	<i>Molecular Biology, Max Planck Institute for Developmental Biology, Tübingen</i>	
Alexandros Karakostis	<i>Paleoanthropology, Organizing Committee</i>	
Ana Blazquez Caraballo	<i>Plant Evolutionary Ecology</i>	
Anna Kirschbaum	<i>Plant Evolutionary Ecology</i>	Poster
Annabelle Louise Lockey	<i>Palaeoanthropology</i>	Poster
Anna-Franziska Mandt	<i>Palaeoanthropology</i>	Talk
Anne Föllner	<i>Animal Evolutionary Ecology</i>	Talk
Anne Kremmer	<i>Biogeology / Senckenberg Centre for Human Evolution and Palaeoenvironment</i>	
Armando Falcucci	<i>Abteilung Ältere Urgeschichte und Quartärökologie</i>	
Babette Abanda	<i>Molecular Biology, Max Planck Institute for Developmental Biology, Tübingen</i>	Talk
Bence Gaspar	<i>Plant Evolutionary Ecology</i>	
Bengt Droste	<i>Plant Evolutionary Ecology</i>	
Carolin Röding	<i>Palaeoanthropology</i>	Talk
Catherine Bauer	<i>Biogeology / Senckenberg Centre for Human Evolution and Palaeoenvironment</i>	
Chris Baumann	<i>Zooarchaeology</i>	
Christian Kubica	<i>Molecular Biology, Max Planck Institute for Developmental Biology, Tübingen</i>	
Christoph Randler	<i>Christoph Randler's Lab</i>	
Christopher Miller	<i>Geoarchaeology</i>	
Daniel Gonzalez Moran	<i>Plant Evolutionary Ecology</i>	
Deike Lüdtke	<i>Comparative Zoology</i>	Talk
Denise Klein	<i>Plant Evolutionary Ecology</i>	

Detlef Weigel	<i>Molecular Biology, Max Planck Institute for Developmental Biology, Tübingen</i>	
Dorothee Drucker	<i>Biogeology / Senckenberg Centre for Human Evolution and Palaeoenvironment</i>	
Effrosyni Roditi	<i>Zooarchaeology</i>	Talk
Emily Milton	<i>Department of Anthropology, Michigan State University</i>	Poster
Fernanda Fadel	<i>Comparative Zoology</i>	
Fiona Paul	<i>Molecular Biology, Max Planck Institute for Developmental Biology, Tübingen</i>	
Franziska Koch	<i>Plant Evolutionary Ecology</i>	
Franziska Willems	<i>Plant Evolutionary Ecology</i>	Talk
Gillian Wong	<i>Zooarchaeology</i>	
Hannah Gelaudie	<i>Plant Ecology</i>	Poster
Hannes Rathmann	<i>Palaeoanthropology</i>	
Heiko Hinneberg	<i>Vegetationsökologie / Institut für Evolution & Ökologie</i>	Poster
Hervé Bocherens	<i>Biogeology / Senckenberg Centre for Human Evolution and Palaeoenvironment</i>	
Hugo Reyes-Centeno	<i>DFG Center for Advanced Studies: "Words, Bones, Genes, Tools"</i>	
Ines Thate	<i>Micropalaeontology</i>	
Jessica Starke	<i>Geologie and Geodynamik</i>	
Jiao Ma	<i>Biogeology / Senckenberg Centre for Human Evolution and Palaeoenvironment</i>	
Jonas Freimuth	<i>Plant Evolutionary Ecology</i>	
Judith Beier	<i>Palaeoanthropology</i>	Poster
Julia Staggenborg	<i>Animal Evolutionary Ecology</i>	
Kantapon Suraprasit	<i>Biogeology / Senckenberg Centre for Human Evolution and Palaeoenvironment</i>	
Katerina Harvati	<i>Palaeoanthropology</i>	
Katja Tielbörger	<i>Plant Ecology</i>	
Korinna Allhoff	<i>Vegetationsökologie / Institut für Evolution & Ökologie</i>	
Kurt Gemeinhardt	<i>Geoecology</i>	
Lara Braun	<i>Vegetationsökologie / Institut für Evolution & Ökologie</i>	
Laura Sophia Limmer	<i>Palaeoanthropology</i>	Talk
Luca Valdivia	<i>Plant Evolutionary Ecology</i>	
Mac Collenberg	<i>Molecular Biology, Max Planck Institute for Developmental Biology, Tübingen</i>	
Matteo Santon	<i>Animal Evolutionary Ecology</i>	
Maximiliane Herberich	<i>Vegetationsökologie / Institut für Evolution & Ökologie</i>	

Melania Ioannidou	<i>Palaeoanthropology</i>	
Michael Buchner	<i>Evolutionary Ecology</i>	
Michal Gruntman	<i>Plant Ecology</i>	
Monice Timm	<i>Palaeoanthropology</i>	Talk
Nadine Kalb	<i>Didaktik der Biologie</i>	
Nicholas Conard	<i>Abteilung Ältere Urgeschichte und Quartärökologie</i>	
Nico Michiels	<i>Animal Evolutionary Ecology</i>	
Nicola Lechner	<i>Plant Ecology</i>	Talk
Niek Scheepens	<i>Plant Evolutionary Ecology</i>	
Nils Anthes	<i>Animal Evolutionary Ecology</i>	
Nina Van Schepdael	<i>Palaeoanthropology</i>	
Oliver Bossdorf	<i>Plant Evolutionary Ecology</i>	
Or Shalev Skriptchak	<i>Molecular Biology, Max Planck Institute for Developmental Biology, Tübingen</i>	
Paula Rotter	<i>Comparative Zoology</i>	Talk
Robert Rauschkolb	<i>Plant Evolutionary Ecology</i>	Poster
Ronja Ratzbor	<i>Plant Ecology</i>	
Sarah Meinekat	<i>Geoarchaeology</i>	Poster
Shaddai Heidgen	<i>Micropalaeontology/ Senckenberg Centre for Human Evolution and Palaeoenvironment</i>	
Sireen, El Zaatari	<i>Palaeoanthropology</i>	
Tommaso Mori	<i>Palaeoanthropology</i>	Talk
Ying Shirley Deng	<i>Plant Evolutionary Ecology</i>	Talk
Yun-Ting, Jang	<i>Comparative Zoology</i>	

Abstracts

- Talks

Title: Lateralized vision in a cryptobenthic marine fish

Authors: Anne Föllner, Matteo Santon, Nico Michiels

Affiliations: Animal Evolutionary Ecology, Institute of Evolution and Ecology, University of Tübingen

Abstract: The asymmetric use of eyes is a specialization that can provide a selective advantage, especially if both eyes can be moved independently. We assess the eye movement of the small cryptobenthic triplefin (*Tripterygion delaisi*) while reflecting downwelling light sideways using the iris. Such "ocular sparks" have been suggested to illuminate the shaded surrounding to enhance prey detection. Since triplefins can move their eyes independently, we hypothesize that they show an asymmetric use of ocular sparks and thus a lateralized vision. Both eyes of each fish were recorded separately while live prey items were presented in front of the left or right side of the head. There was no strong association between the proportion of observed ocular sparks and the presence of prey in front of that eye. Yet, there was a clear asymmetry between eye usage: The left eye showed significantly more ocular sparks than the right eye. This is the first indication of lateralization of the visual system in this species.

Title: Virtual Reconstruction of the Celtic Prince

Authors: Carolin Röding

Affiliations: Paleoanthropology, Senckenberg Centre for Human Evolution and Palaeoenvironment, University of Tübingen, Germany

Abstract: The Celtic Prince from Frankfurt am Main, Germany, was excavated in 1966/67 and represents a remarkable discovery [1]. An almost complete skeleton as well as grave goods were found in an undisturbed burial mound. The osteological remains are fragile but allowed for an age estimation of around 50 years at death and the sex was estimated as male. The archaeological material is dated to around 700 B.C. and therefore around 250 years older than the famous Celtic finds from Glauberg, Germany. However, so far making the find from Frankfurt accessible to the public was hindered by the absence of a portrayal. The fragmented nature of the cranium did not allow many museum visitors to identify with the Celtic Prince. State of the art geometric morphometric methods were used to create a virtual reconstruction of the entire cranium. All preserved cranial fragments were virtually separated and manually realigned. Fragments only preserved on one side were mirrored and remaining gaps in the reconstruction were closed by a landmark-based deformation of a modern human reference cranium. On the one hand, this new reconstruction will help to make the Celtic Prince more accessible to the museum visitors and allow a facial reconstruction. On the other hand, it enables a new analysis and contextualization of observed pathologies including the posterior cranial base, left clavicle and left arm.

Reference:

1. Rehbach, N.-J., Willms, C., Flohr, S., Hammerl, J. & Protsch von Zieten, R. Der Keltenfürst aus Frankfurt am Main - eine anthropologische und paläopathologische Analyse. *Beitr. z. Archäozool. u. Prähist. Anthrop.* 4, 57-59 (2003).

Acknowledgements: Dr. Liane Giemsch & the Archäologisches Museum Frankfurt, Dr. Heike Scherf & Prof. Dr. Katerina Harvati.

Title: To see or not to see - Mating decisions based on visual cues in the Alpine newt, *Ichthyosaura alpestris*

Authors: Deike Lüdtkke, Katharina Foerster

Affiliations: Comparative Zoology, Institute for Evolution and Ecology, University of Tübingen, Germany.

Abstract: Male mate choice based on female secondary sexual traits is increasingly reported, even in species with otherwise conventional sex roles. However, empirical evidence of male mate preference remains scarce for vertebrate species other than birds and fish. I will present the results of a study where we examined male mating investment in response to female coloration in the Alpine newt, *Ichthyosaura alpestris*. In this experiment, males had a choice between females that varied in the redness of the belly (red versus yellow). We recorded multiple parameters indicative of male preference, and the female's response. Additionally, we performed these preference trials in different light conditions (control and blue filter) to test whether male choosiness depends on the female's colour signal. I will further discuss the results of a second investigation about the diurnal mating activity of the alpine newt. Here, we observed mating activity in a large-group semi-natural enclosure with natural photoperiod. We recorded the number of mating pairs at every full hour over the course of four days, during light and dark conditions. Both studies highlight the importance of visual cues during alpine newt mating decisions. From the first study, we learned that males courted red and larger females longer than yellow and smaller females, regardless of the red or large female's response. Nevertheless, if yellow (not small) females were responsive, males invested as much courtship time as for red females. However, female body size and belly colour positively correlated and both cues may confer similar information. Additionally, we further detected that less colourful males tended to invest more spermatophores for red females than males that were colourful themselves. From the second investigation, we learned that most matings occurred during light conditions where males were able to properly guide and presumably assess females with visual cues. Taken together, our results provide evidence that males choose specific females based predominantly on visual cues and select a specific female coloration and size. However, our results also reveal that interactions may be complex and multiple cues as well as female responses may influence male choice.

Title: Was the Balkan Peninsula a refugium? Preliminary results from the zooarchaeological analysis of the Late Pleistocene faunal assemblage from Asprochaliko rockshelter, Greece

Authors: Effrosyni Roditi, Britt M. Starkovich

Affiliations: Zooarchaeology, University of Tübingen.

Abstract: Compared to other parts of Eurasia, the southern Balkan Peninsula had a relatively stable climate during the Late Pleistocene. The area retained favorable environmental conditions and provided sufficient means for the survival of hominin populations during periods of climatic deterioration. Aiming to investigate the region's character as a refugium, we present preliminary results from the ongoing analysis of the zooarchaeological materials from the Asprochaliko rockshelter in northwestern Greece. In this study, we provide evidence for hominin subsistence strategies in the Middle and Upper Paleolithic by employing taxonomic abundance and diversity indices to investigate hominin prey choice, while taphonomic observations provide further information on resource exploitation. We complement our results with published faunal studies from Klissoura 1, Lakonis 1, and Kalamakia caves in southern Greece and discuss the methodological approach used to investigate the extent to which climate influenced resource availability and diversity in the region, stimulating shifts in hominin subsistence.

Title: Evolutionary shape changes of femoral epicondyles and their impact on bipedalism

Authors: Anna-Franziska Mandt

Affiliations: Palaeoanthropology, University of Tübingen.

Abstract: Reconstructing the transition to habitual terrestrial bipedality is fundamental in understanding the evolution of the early hominin lineage. The distal femoral end may be particularly informative for understanding an individual's locomotor pattern. This study focuses on the differences in shape parameters of ellipses that are fitted to the outlines of femoral epicondyles, with special interest on *Australopithecus afarensis*. Results on the lateral epicondyle showed a differentiation between apes and hominins, with *A. afarensis* being similar to modern humans, whereas the medial epicondyle is very diverse within and between species, with no clear taxonomic separation. Evolution towards bipedalism thus only mainly affected the lateral one.

Title: Effects of forest management on the phenology of early-flowering understory herbs

Authors: Franziska M. Willems, S. Block, A. Lampei Bucharova, M. Sehart, J.F. Scheepens, O. Bossdorf

Affiliations: Plant Evolutionary Ecology, Institute of Evolution & Ecology, University of Tübingen.

Abstract: Ongoing anthropogenic global change influences species and ecosystems. One of the most compelling types of evidence for this are shifts in the timing of phenological events. Plants, in particular, may respond with phenological shifts, e.g. via changes in the start of flowering, the time of peak flowering, and the total duration of the flowering period. While the impact of climate change on flowering phenology is well documented, knowledge about the impacts of other global change drivers, such as land use, is still scarce. In temperate forests, management changes alter tree species composition and stand structure, and therefore light conditions and their seasonal patterns. Thus, forest management should affect the phenology of forest understory herbs. To test this, we have recorded the phenology of 20 early-flowering herbs on the 100 forest plots within the Biodiversity Exploratories Hainich-Dün and Schwäbische Alb. All chosen species have a distinct flowering period and are therefore particularly suited for studying phenological changes. We are using these data to disentangle the effect that forest management (tree species, stand structural attributes and management intensity) has on plant phenology either directly or indirectly through changes in microclimate. Thereby, we seek to gather further insights into ecological, as well as evolutionary responses of plants to anthropogenic environmental change that have far-reaching consequences for ecological communities and long-term evolution.

Title: Molecular identification and prevalence of tick-borne pathogens in zebu and autochthonous taurine cattle in Central Africa.

Authors: Babette Abanda^{1,2}, Archile Paguem^{1,2}, Mbunkah Daniel Achukwi³, Mamoudou Abdoulmoumini⁴, Elisabeth Ngo Bum⁵, Manchang Tanyi Kingsley⁶, Alfons Renz¹, Albert Eisenbarth¹

Affiliations: 1- Institute of Evolution and Ecology, Department of Comparative Zoology, University of Tübingen; 2- Programme Onchocercoses field station of the University of Tübingen, Ngaoundéré Cameroon; 3- Trypanosomosis Onchocerciasis Zoonoses Association for Research & Development, P.O. Box 59, Bamenda, Cameroon; 4- Department of Parasitology and Parasitological Diseases, University of Ngaoundéré Cameroon; 5- Department of Biological Sciences, University of Ngaoundéré, Ngaoundéré, Cameroon; 6- Institute of Agricultural Research for Development (IRAD), Ngaoundéré, Cameroon.

Abstract: Piroplasmoses and rickettsioses are diseases reducing the value of ruminant in the world, therefore having a high economic impact on livestock and farmer life style. Known as vector borne diseases, piroplasmoses (*Babesia* and *Theileria*) and rickettsioses (*Anaplasma*, *Ehrlichia* and *Rickettsia*) are transmitted by ticks which are assumed to be the second most important vectors after mosquitoes to transmit pathogens to humans and animals. Tick species harbor a broad range of pathogens like viruses, bacteria, protozoa and helminths.

Each positive status can be from a primary or chronic infection, or of a carrier stage detectable by thick blood smear or molecular methods. Due to the environmental factors and the vector pressure, cattle can be infested by one or more tick-borne pathogens. The commonly used diagnostic techniques such as conventional or real-time polymerase chain reaction (RT-PCR) have shown limitations both in the detection scope and sample capacity.

The PCR-based reverse line blot (RLB) and next generation sequencing are therefore appropriate methods addressing the limitations of the previously used techniques. The latter is a powerful tool in terms of detection rate, number of screened species and samples, including quantification. However this high throughput requires advance laboratory infrastructure and bioinformatics capacity, difficult to achieve in developing countries. The “low density” microarray RLB technique is accordingly an approach of choice for laboratories with limited infrastructure to allow rapid, sensitive and specific pathogens detection.

The LCD microarray based hybridization technique has been used for tick-borne pathogen detection on a reusable membrane which requires a long work flow including the treatment of the membrane by the user. In the present study we develop and test a prototype DNA microarray chip for piroplasmids and rickettsiales bacteria to genotyping cattle and tick field samples from Cameroon in Central Africa.

Title: Reconsidering dental wear as a tool to estimate age in subadult Neanderthals

Authors: Laura Sophia Limmer

Affiliations: Paleoanthropology, Senckenberg Centre for Human Evolution and Paleoenvironment, Eberhard Karls University of Tübingen.

Abstract: Age and sex estimations are basic tools in Paleoanthropology to understand past populations' lives. Teeth are often used for analysis since they preserve well due to their chemical composition. Assessment of the developmental status is used on growing dentitions whereas dental wear is the only approach to age older individuals. However, estimating age in Neanderthals, especially in isolated teeth, is difficult and often based on recent modern human populations. As several studies show accelerated growth and maturation processes in Neanderthals, this leads to hypotheses about faster life history. Following these assumptions, former age estimation methods need to be reevaluated. A system developed by Trinkaus is the only approach to estimate age in adult Neanderthal dentitions based on their occlusal wear [1]. Starting at the age of 20, this method leaves out wear in the permanent teeth of younger individuals. This pilot study explores dental wear as a tool to estimate age in subadults and reevaluates Trinkaus' 1995 methodology. The subadult sample includes European Neanderthals Engis 2, La Quina H18, Scladina I-4A and Le Moustier 1 between 3 and 12 years of age in order to observe dental wear from its onset in the first permanent teeth. Wear stages were calibrated by recently available age estimations from virtual histology studies of the same individuals, which allowed for a precise estimation of crown formation times [2].

Preliminary results support a faster life history due to early eruption times for permanent teeth and advanced wear on the occlusal surfaces. The rate of wear fits neither modern human estimations nor does it connect to the Trinkaus system.

References:

1. Trinkaus, E. Neanderthal mortality patterns. *Journal of Archaeological Science* 22, 121-142 (1995).
2. Smith, T. M. et al. Dental evidence for ontogenetic differences between modern humans and Neanderthals. *PNAS* 107, 20923-20928 (2010).

Title: Bioarchaeological analysis and social structure of the Bronze Age population of Biniadràs Cave (Menorca, Spain)

Authors: Monice Timm

Affiliations: Paleoanthropology, Institute for the Cultures of the Ancient Near East (IANES), University of Tübingen.

Abstract: Menorca's past is well-known for its monumental architecture, and it represents one of the best-studied islands of the Balearics. This research thesis applies a bioarchaeological approach to investigate the cave of Biniadràs in order to explore the social structure during the Bronze Age on Menorca. The non-metric traits showed a close biological relationship between the buried individuals. In addition to that, the bones present an outstanding robustness with a high amount of extreme muscle skeletal markers in both sexes and all ages. This research supports the hypothesis of a well-organised community and a complex funerary system with a high degree of attentiveness to the deceased relatives.

Title: Stability of semi-natural ecosystems under drought - separating resistance and resilience mechanisms

Authors: Nicola Lechner, Katja Tielbörger

Affiliations: Plant Ecology, University of Tübingen.

Abstract: Global alterations in climate pose a challenge to ecosystems worldwide. Due to ongoing climate change, temperatures will increase globally and precipitation patterns are going to change.

To test the response of temperate vegetation to decreasing summer precipitation we established field experiments in forests and grasslands along a gradient of natural water availability on the Swabian Alb. To simulate different drought scenarios and test for ecosystem resistance and resilience we established rainout shelters which reduce precipitation by either 30% or 50%. We simulate permanent moderate drought, short-term extreme drought and long-term extreme drought in each experimental site. To control for the ecosystem response, vegetation response, which is plant biomass, diversity and community composition, is recorded every year. We also apply a diversity manipulation where species are removed to decrease diversity and increase evenness to see if the community response is different with different levels of diversity. Additionally, we look at plasticity and intra-specific variability in certain species between locations. We hypothesize that plant communities that are adapted to variability in water availability are slightly more resistant to moderate drought than non-adapted communities while adapted communities are highly more resilient to extreme drought than non-adapted communities. We further predict a change in species composition with ongoing drought. After two years of rainfall manipulation, we found a significant change in diversity between years in different ecosystems. Nevertheless, we did not see any differences between locations or treatments. Species communities are probably highly resistant to drought and differences between years are due to natural variation in precipitation. Aboveground biomass decreased slightly with stronger drought. But as changes often do not occur immediately, further investigations in the following years could show unexpected changes.

Title: From space to earth: How satellites could influence political decisions in conservation

Authors: Paula. J. Rotter, J. C. Geue, H. A. Thomassen

Affiliations: Comparative Zoology, Institute of Evolution and Ecology, University of Tübingen.

Abstract: The efficient protection of the diversity of habitats requires detailed and accurate maps of habitat heterogeneity. The EUNIS habitat classification system provides guidelines to classify habitats in Europe. In addition, it provides maps with habitat types created with the help of expert knowledge and field surveys. However, mapping has not extended beyond a relatively coarse level, where climate and remote sensing data have largely been ignored. I aimed to 1) refine the EUNIS classification for Romania and Bulgaria using climate and remotely sensed data; 2) test whether reserve design solutions based on EUNIS versus a classification based on remote sensing data are similar; and 3) test whether existing NATURA2000 sites comprise the entire habitat diversity I found for Romania and Bulgaria. My approach combines 15 freely available data layers obtained from remote sensing and climate observations at 100m resolution. The data mining algorithm BIRCH was used to cluster similar values into 16 distinct habitat categories. By overlaying the BIRCH classification with EUNIS and biogeographical regions I defined unique, more detailed habitat classes. Subsequently, I used the reserve design software Marxan to identify a network of protected areas. Results showed a large overlap between reserves based on new versus existing classification, suggesting that my approach could be transferred to countries where no habitat maps are available. This greatly reduces costs and the time needed to conduct habitat classifications using survey methods. Finally, my results suggest that the existing NATURA2000 sites are not sufficient to protect the diversity of habitats in these countries type, and I recommend expanding the network in order to reach the conservation targets set by EU legislation.

Title: Developmental stage of KNM-ER 42700, how young is she/he?

Authors: Tommaso Mori, Katerina Harvati

Affiliations: Palaeoanthropology, Senckenberg Centre for Human Evolution and Palaeoenvironment, University of Tübingen.

Abstract: An important aspect that must be considered when studying fossil human specimens is their developmental stage. In fact, it can be difficult to investigate the taxa affiliation and phylogenetic relationships of subadult specimens. For this reason, it is important to know “how young” a fossil individual is before further analysis. A case in point is the partial cranium KNM-ER 42700, described by Spoor et al. [1] as an exceptionally small *Homo erectus s.l.* individual. Because of its incomplete closure of the spheno-occipital synchondrosis this specimen is also known to be not fully adult. However, it is unclear how much its young age could influence its morphology. Our study developed a comparative basis for assessing the developmental stage of KNM-ER 42700 based on the ontogenetic pattern of the ectocranial surface of the basicranium in modern humans and chimpanzees.

A total of 33 3-D landmarks were collected from a sample of modern humans (80), chimpanzees (51), and nine individuals classified as *Homo erectus s.l.* We then used common ontogenetic aspects between the two extant taxa to infer the developmental stage of the *Homo erectus s.l.* sample. This shape component can discriminate age group irrespective of size and is no longer related to size when static allometry is considered. Developmental stages of *Homo erectus s.l.* were correctly assigned for the specimens of known age: KNM-WT15000 was correctly attributed to the late juvenile age group and adult specimens to the adult, with D2700 falling in the region of overlap between two. KNM-ER42700 fell within the adult variability despite its incompletely fused spheno-occipital synchondrosis and extremely small overall size.

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Title: Inter- and intraspecific variation in response to nutrient fluctuations in annual plants

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Abstract: Driven by global environmental change and land use change, plants may experience temporal fluctuations of soil nutrient availability. Previous experimental studies found that species and populations within species may differ in their response to environmental variability, yet so far no study has tried to bring these two aspects together to look at both inter- and intraspecific variation in response to fluctuating nutrient supply. We carried out a greenhouse experiment to look at the effect of changes in overall nutrient mean and variability and a competition treatment on functional plant traits. We used 11 common annual species with seed material from different origins to test for both species differentiation and intraspecific variation.

Our results showed both inter- and intraspecific variation in response to nutrient variability treatments. In terms of aboveground biomass, four species favored high variability, one favored low variability, and six did not respond. The general positive effect of nutrient variability on aboveground biomass across species was modulated by nutrient mean and competition. Within four species nutrient variability induced significant variation in aboveground biomass with respect to plant origins. Our study suggests that nutrient variability may drive species turnover and population shifts in grassland communities.

- Posters

Title: Individual learning suffices for the re-emergence of a potential cultural behavior in captive task naive chimpanzees: Tool excavation for USOs

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Abstract: Social learning mechanisms are responsible for the behavioral differences found in neighboring chimpanzee groups that share genetic and environmental backgrounds. However, it remains unclear if behaviors are transmitted via social learning directly or if instead social learning catalyzes the manifestation of a behavior in other individuals, thereby increasing the frequency of that behavioral form in the group. One such behavior, so far only described using indirect evidence in two chimpanzee populations (Ugalla, Tanzania and Bandafassi, Senegal), is tool excavation to obtain edible underground storage organs of plants (USOs). This pattern of absence vs. presence despite common ecological opportunism and genetic background (a.k.a. method of exclusion), is used to classify animal behaviour as cultural. Furthermore, tool excavation for USOs is considered to have played an important role in human evolution, as it has been hypothesized that USOs were important fallback foods for early hominins. The aim of this study was to determine if tool excavation develops in naive chimpanzees, and if so, how it occurs, using direct evidence for the first time. In this study, we tested two captive groups of chimpanzees (total n=10). Subjects in both groups spontaneously used wooden tools to excavate food items that we had previously buried in natural soil in the chimpanzees' outdoor exhibit. Excavation was composed of six different tool use actions, four of which appeared in both groups: probing, perforating, digging and pounding. Our study demonstrates that tool excavating (a cultural behavior according to the method of exclusion) can be individually reinvented and it is not dependent on copying social learning to emerge. Finally, this study provides new behavioral data for modelling USOs extractive foraging by early hominins.

Title: Evolution of plant phenotypic plasticity in response to grassland management

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Abstract: Phenotypic plasticity (PP) is one of the key mechanisms by which plants respond to environmental changes. As there is heritable variation in PP in most plants, PP can evolve where it is adaptive. One such situation might be grassland management: Mowing, grazing and fertilization create temporally variable environmental conditions, which should favour and thus select for PP, in particular the ability of plants to rapidly exploit temporary nutrient pulses, and the ability to regrow after damage. Previous studies on the evolution of PP remained limited in their spatial and temporal extent and mostly only focused on strong environmental contrasts. However, the effects of common land-use practices, such as fertilization, mowing and grazing, as agent of selection for plasticity have only rarely been addressed.

We carried out controlled common garden experiments with three widespread grassland species to test relationships between PP and land-use management. Seeds for these experiments have been sampled from 67 grassland plots from the Biodiversity Exploratories, which vary in mowing, grazing and fertilization intensity.

We measured trait responses to fertilization and clipping treatments as well as plant fitness to investigate whether plastic responses are adaptive and whether they have a fitness cost. Furthermore, we will test for correlations of PP with plot-level spatial and temporal heterogeneity. Finally, we will link our phenotypic data to existing molecular marker data to examine correlations of PP with neutral genetic diversity and gene flow.

Title: Mandibular incisor variation in Sima de los Huesos hominins.

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Abstract: The application of micro CT observations to the study of internal structures of fossil teeth has gained increasing momentum, favoured for its accurate, systematic and non-destructive nature [1]. This method is commonly applied to phylogenetic, behavioural, and biomechanical analysis. Despite this, incisors are rarely the focus of investigation, with an obvious dearth of data for Middle Pleistocene specimens. Sima de los Huesos (SH) (Sierra de Atapuerca, Burgos, Spain) dated to 430,000 has contributed a minimum of 28 individuals, both geographically and temporally constrained, to the fossil record, with significant implications for the evolution of the *Homo neanderthalensis* lineage [2]. The SH sample here consists of a subset of central (6) and lateral (8) mandibular incisors analysed using micro CT. Our dataset also includes a comparative sample of Neanderthal (7) from Krapina (Croatia) and Ehringsdorf (Germany), and *Homo sapiens* from a recent Spanish population (35). We investigated both 2D and 3D variables for mandibular incisor dental tissue proportions. Results show sexual dimorphism levels analogous to those of modern humans in the crown dental tissue proportions of SH, with a significant difference between SH specimen designated as males and females in dentine area ($p=0.04$). An F-test showed that the only significant difference in population homogeneity existed in the enamel between SH and modern humans ($p=0.019$), as supported by a Levene test ($p=0.024$). Overall, SH mandibular incisor morphology has greater affinity to Neanderthals [2], yet can be characterised as having similar levels of sexual dimorphism and population homogeneity as a recent modern human population. Our results are consistent for current data sets which apply micro CT to extract dental tissue proportions for Neanderthals and modern humans.

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Title: Herbivory induces clonal foraging for nutrient in plants.

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Abstract: In response to resource heterogeneity, plants have been shown to exhibit foraging behaviour by the selective placement of resource-acquiring organs within resource-rich patches. However, it is still unclear if environmental stressors, such as herbivory, can affect the foraging decisions of plants. This study examined how simulated herbivory affects clonal foraging for nitrogen and nitrogen sharing among ramets in the plant *Arabidopsis halleri*, which uses nitrogen-based compounds (glucosinolates) as herbivore defence. To that end, two connected *A. halleri* ramets were grown with one ramet in a high-nutrient pot with labelled nitrogen and the other in a low-nutrient pot. These ramet pairs experienced either no herbivory or simulated herbivory in the high or low-nutrient pot, by applying jasmonic acid on the leaves. We predict that simulated herbivory on leaves of *A. halleri* will induce increased root proliferation in the high-nutrient pot as well as increased nitrogen uptake and nitrogen sharing among ramets.

Title: Plant life history under drought

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Abstract: Climate change is considered a major challenge for mankind of the twenty-first century. The frequency of summer droughts is predicted to increase during future decades across Southern and Central Europe. Drought-induced changes in the phenology and productivity of grassland plants might have far-reaching consequences for the functioning of ecosystems. Even if perennial plant species account for a high proportion in many temperate grasslands, information about their response to extreme drought events is very limited yet. Simulating severe summer drought in a manipulative pot experiment, we studied the drought response of four common perennial grassland species. Phenological traits, biomass and reproductive allocation were measured and compared between treatments and home sites. Drought responses were species-specific, but across all studied species there was a clear trend towards a delayed phenology, a decrease in plant productivity and a reduction of the reproductive investment under drought. Altogether, our results suggest strong drought-induced phenological shifts and a fitness loss in currently abundant grassland species and highlight that summer droughts are likely to pose a severe threat to the functioning of temperate grassland systems under a changing climate.

Title: Cranial trauma prevalence in Neanderthals and early Upper Paleolithic modern humans

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Abstract: Neanderthals (NEA) have commonly been depicted as living dangerous and stressful lives, contrary to Upper Paleolithic anatomically modern humans (UPH). This view builds upon traumatic lesions thought to occur in remarkably high frequencies on skeletal remains of Neanderthals, variously attributed to violent behaviours, dangerous hunting practices and demanding lifestyles. However, such interpretations are mainly based on narrative, case-by-case evidence, while quantitative studies at the population level are scarce. Here, we assess whether NEA exhibit a higher cranial trauma prevalence than UPH. Aiming at a population-level approach, we compiled an exhaustive database from the literature comprising 114 NEA and 90 UPH cranial specimens (corresponding to 295 NEA and 541 UPH single cranial elements) with and without traumatic lesions from sites all over western Eurasia dating to ca. 80-20 ka BP. We used generalized linear mixed models employing a Markov chain Monte Carlo algorithm to examine how trauma prevalence co-varies with various explanatory variables, including taxon, age-at-death, sex, and skeletal preservation, while accounting for variation between geographic locations and cranial elements. We found a similar overall cranial trauma prevalence in NEA and UPH, rejecting the hypothesis of higher trauma prevalence in NEA crania. Moreover, results showed a higher prevalence for males in both taxa and that trauma prevalence was affected by the preservation status of cranial remains. Beyond these similarities, we found species-specific differences in age-related trauma prevalence, suggesting possible differences in the likely age of trauma acquisition and/or differential mortality risks of trauma survivors. Our results contribute to the discussion about Paleolithic trauma patterns and the behavioural and lifestyle attributes thought to underlie the proposed exceptional Neanderthal trauma prevalence.

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Title: Back to the Future - Seed banks as a tool to investigate recent adaptation to global change

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Abstract: Plants have to cope with many different environmental changes e.g. climate change. In future, these changes are going to be equal or even stronger. Regarding to this issue it is interesting to investigate how plants have already adapted to former changes. There are lots of studies focusing on adaptations due to manipulated conditions in greenhouse experiments but till this day only little is known about whether plants had already adapted. To reach this research aim we want to compare seed material from five European seedbanks with material recollected from the same population in 2018. The accessions we want to use in this project should be older than 20 years and the original location should be known. In total, we want to include 60 accessions from three different European biogeographic regions in a first greenhouse experiment where we want to compare plants germinated from the old seeds from the seedbanks and germinated from the seeds collected in 2018. Here we want to focus on differences in phenology and morphological traits. After this first experiment, we want to use seeds from these plants to set-up a second experiment with 12 species where we are able to get a deeper insight into underlying genetic features of the observed morphological differences by using quantitative genetics.

These two experiments may provide information about general changes in European flora, which have already occurred. Furthermore, as we use different species from different functional groups and different regions we can quantify which species may be able to adapt to ongoing environmental changes.

All in all, this method we want to use called resurrection approach is quite an innovative way to use stored seed material for research projects focusing on rapid evolution and potential of population to adapt to changing conditions.

Title: From the Coast to the Mountains: a geoarchaeological investigation of Paleoindian settlement dynamics in the Peruvian Andes

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Abstract: The peopling of the western hemisphere was one of the final steps in the biogeographic expansion of humans out of Africa. The first Americans encountered previously uninhabited territory that presented an extraordinary range of diverse and extreme environments: from glaciers to rainforests and from rugged coastlines to snow-capped peaks of some of the world's tallest mountains. Here, we propose to use geoarchaeological techniques to investigate how pioneering populations of mobile hunter-gatherers settled the unforgiving landscapes of the Andes. In particular, we will investigate when and how people first began living at extreme high altitude in Peru by studying a series of Terminal Pleistocene and Early Holocene sites distributed across an altitudinal transect of the Andes, from the arid coast to the high-altitude plateau. Recent archaeological discoveries in the Pucuncho Basin of southern Peru, at ca. 4500m asl, have identified several sites with clear evidence for human presence by 12.4 kya. These discoveries have significantly changed our understanding of the first settlement of the Andes and demand further investigation. Therefore, we have developed a research project to 1) investigate the timing and nature of interzonal connections between the coast and highlands, and 2) to test whether the early occupation of the Pucuncho Basin is unique across the Andes, or if human use of high-altitude environments during the Pleistocene was more widespread than previously assumed. By combining intensive radiocarbon dating with high-resolution geoarchaeological analysis, we will build robust chronological and site formation models to assess the timing and nature of the earliest occupation of the Andean highlands.

Title: Digital and geospatial investigations at a threatened early maritime site in the Americas, Quebrada Jaguay 280

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Abstract: Quebrada Jaguay 280 (QJ-280) is an early American maritime site located on the west coast of southern Peru. The site was originally discovered and dated in the 1970s by Frédéric Engel and formally excavated twice in the 1990s by Daniel Sandweiss. A current mining project in the adjacent Quebrada bed has severely damaged the site and now threatens to destroy it completely. In 2017, our team re-located QJ-280 to record and re-excavate the site to obtain a new chronology and spatial information. We applied advanced geospatial and digital curation techniques, including ground penetrating radar (GPR), drone mapping, and piece-plotting of artifacts and features. Our results include high-resolution plan maps documenting the anthropogenic damages to the site and spatial data recording the new chronology and associated artifact assemblage. Together this work demonstrates the powerful potential of geospatial and digital methods for field and salvage archaeology.