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Ana's research interests lie at the interface of ecology, biogeography and evolution. In particular, she is interested in understanding the long-term dynamics of species and ecosystems in response to environmental change, and in developing methods that can advance this understanding. Ana has recently obtained a DPhil degree from the University of Oxford where she focused on examining the ecological responses of lowland tropical rainforests of Southeast Asia to past climatic changes using fossil pollen and lipid biomarkers from lacustrine sediments. Prior to this, she received a BSc in Ecology from the University of Zagreb in 2008 and a MSc in Biodiversity, Conservation and Management from the University of Oxford in 2009. Ana will take up a postdoctoral position with Professor Eske Willerslev at the University of Cambridge in January 2017.

Talk abstract

Why should we try high-throughput single-pollen aDNA sequencing?

Reconstruction of plant abundance holds a central position in the study of ancient environments. For the last hundred years, the most commonly used methods for determining past abundances of plant taxa were based on the morphology of fossilized plant remains (e.g. pollen, seeds, phytoliths). Taxonomic limitations of these methods have prompted a search for novel approaches, and ancient DNA (aDNA) has been put forward as a promising new proxy for studying late Quaternary environments. However, while existing aDNA methods (e.g. sedimentary DNA) allow identification of thousands of plant species in the fossil record, they provide little information about the changes in species abundance over time. In this talk I will discuss the rationale for developing a new method for reconstructing past abundances of plant species based on high-throughput single-pollen aDNA sequencing, give a brief overview of the underlying technologies and discuss some immediate advances that such a method would bring to the palaeosciences.

Mikkel Winther Pedersen

Post doctoral researcher at the Centre for GeoGenetics

Mikkel is a physical geographer of training, with a strong interest in archaeology, climate and environmental science. He has since 2008 focused on using ancient environmental DNA as a proxy for uncovering past environments and their changes, extracted from ancient natural and cultural sediment deposits. Performing each step from fieldwork and sampling to DNA extraction and bioinformatic analysis personally, Mikkel has gained knowledge that bridges gaps between else traditionally separate disciplines. Now as post doctoral researcher at the Centre for GeoGenetics at the Natural History Museum of Denmark, he continues to investigate and explorer the possibilities of ancient environmental DNA in various contexts.

Ancient environmental DNA from lake sediments

For more than a century micro- and macrofossils from plants and animals imbedded in lake sediments have been used to reconstruct past environments. Recently, molecular techniques, such as environmental DNA analysis, have been found useful to access both the fossilized as well as non-fossilized plant and animal remains from the same 'ancient' lake sediments. In this talk I will introduce you to the field of ancient environmental DNA in lake sediments and present the latest results from two studies. The first, a lake record from the Capitol of Denmark (Copenhagen), covering the past 360 years, in which we used DNA, fossils and geobio-chemical analysis to reconstruct the pollution, environmental and disease history of the urban transition from a small medieval city to a post-industrialized metropol. In the second study we investigated the biological timing and viability, of the North American 'ice-free corridor', a proposed migration route of the first humans entering America. We used shotgun metabarcoding on DNA from lake sediments combined with macro- and microfossil analysis from two lakes. We found no plants or animals prior to an *Artemisia* (sagebrush) steppe environment established at 12.6 thoussands years ago calibrated (cal. kya) which included bison and mammoth. The earliest humans which already were in South-America by ~14 cal. kya, could therefore not have colonized America using the ice-free corridor, and therefore must have used an alternative route. With the results from these two studies I will argue that DNA analysis on lake sediments is a highly suitable and complementary tool for tracking and reconstructing past environments.