

SEMINAR

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# Occasional paternal inheritance of the germline-restricted chromosome in songbirds

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Songbirds have one special accessory chromosome, the so-called germline-restricted chromosome (GRC), which is only present in germline cells and absent from somatic tissues. Earlier work on the zebra finch (*Taeniopygia guttata castanotis*) showed that the GRC is inherited only through the matriline - like the mitochondria - and is eliminated from the sperm during spermatogenesis. Here, we show that the GRC can also be paternally inherited. Confocal microscopy using GRC-specific FISH probes indicated that a considerable fraction of sperm heads (1-19%) in zebra finch ejaculates still contained the GRC. In line with these cytogenetic data, sequencing of ejaculates revealed that males from two families differed strongly and consistently in the number of GRCs in their ejaculates. Examining a captive-bred male hybrid of the two zebra finch subspecies (*T. g. guttata* & *T. g. castanotis*) revealed that the mitochondria originated from a castanotis mother, whereas the GRC likely came from a guttata father. Moreover, analyzing GRC haplotypes across nine castanotis matriline (estimated to have diverged for up to 250,000y) showed surprisingly little variability among GRCs. This suggests that a single GRC haplotype has spread relatively recently across all examined matriline. A few diagnostic GRC mutations that arose since this inferred spreading suggest that the GRC has continued to jump across matriline boundaries. Our findings raise the possibility that certain GRC haplotypes could selfishly spread through the population via occasional paternal transmission, thereby outcompeting other GRC haplotypes that were limited to strict maternal inheritance, even if this was partly detrimental to organismal fitness.

#### About the Speaker

Dr. Yifan Pei is a Postdoctoral researcher from the Centre for Molecular Biodiversity Research, Museum Koenig Bonn (Germany) as well as the Department of Organismal Biology - Systematic Biology, Uppsala University (Sweden). Dr. Pei first studied Oceanography at the Shanghai Ocean University in China. She subsequently discovered that her true research interest lay in evolutionary biology and birds during a one-year exchange undergraduate study at the Hokkaido University. Dr. Pei then proceeded to embark upon a Masters degree at the Munich University in Germany studying the macroevolution of activity times in owls and hawks. Her PhD was on the evolutionary genetics of reproductive performance in the zebra finch at the Max-Planck Institute for Ornithology in Germany - it was during her doctoral research that she discovered the presence of unusual germline-restricted chromosomes in zebra finch sperm, which is the topic of her first and current post-doctoral research stint.