

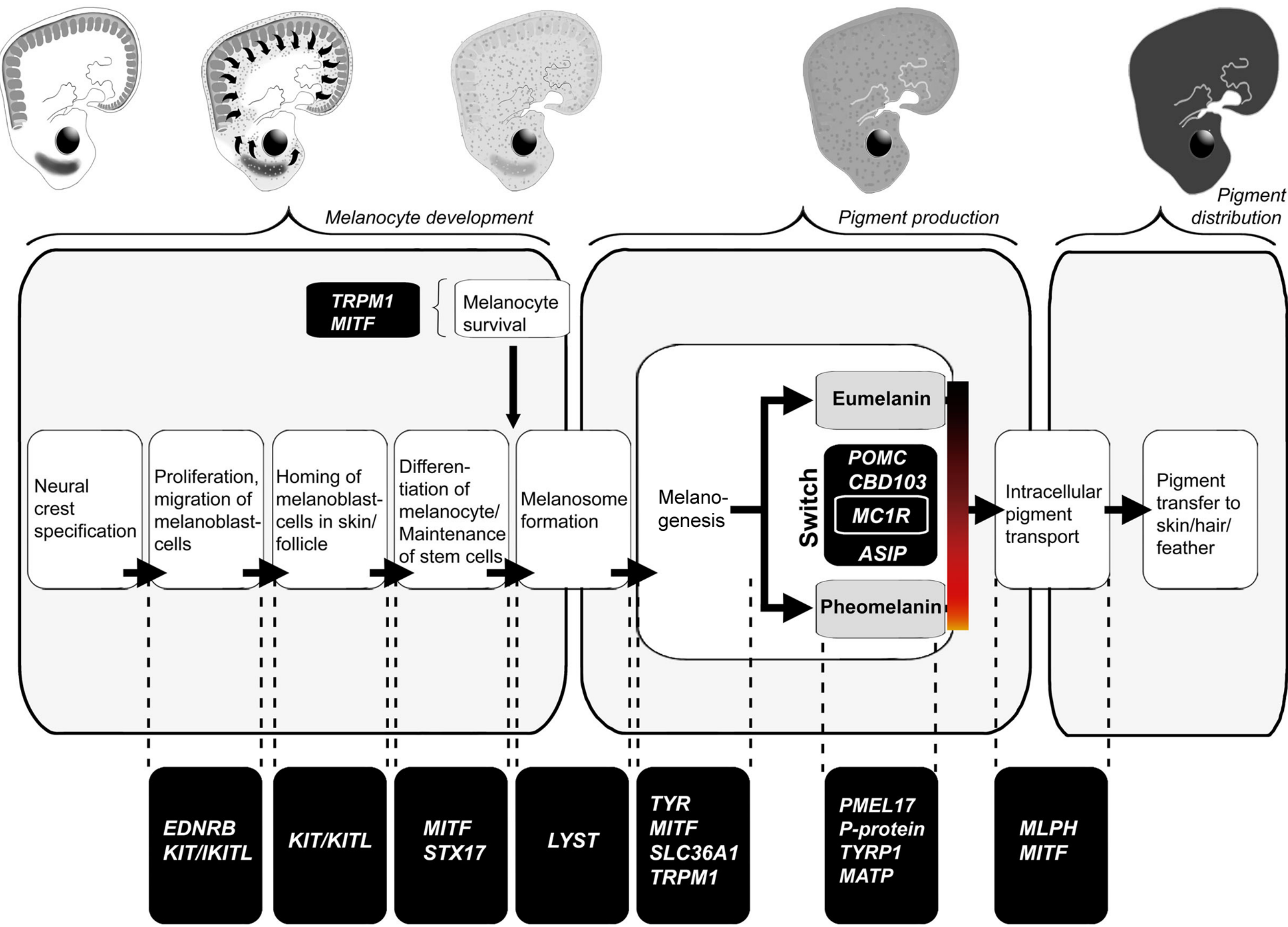


From Bones to Phenotypes - How Ancient DNA Analyses reveal the History of Coat Colors in Horses

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Background

Although domestication of horses was a key event in human history, time and place are under discussion for the initial transfer from wild to domestic horses. Coat coloration - a character of specific human interest - differs widely between wild and domestic animals and is therefore a valuable tool for the identification of early domestic animals. Using a novel SNP approach, ancient bones and teeth (max. 25,000 YBP) were genotyped for their coat color phenotypes. More than 150 coat-color related genes have been identified so far. Additionally, another 150 coat color associated loci are under discussion.



Development of pigment cells, synthesis of pigments, intracellular pigment transport and transfer whereas the white boxes show stages of the pigmentation process and the black boxes the active core genes

Ancient Sampling

Although ancient DNA studies are into vogue, the amplification length is still a limitation of most paleogenetic analyses. Routinely only fragments are amplified below 200 bp significantly reducing the content of genetic information. In this study SNP detection on a pyrosequencer and single molecule capture are used for definition of coat color phenotypes.



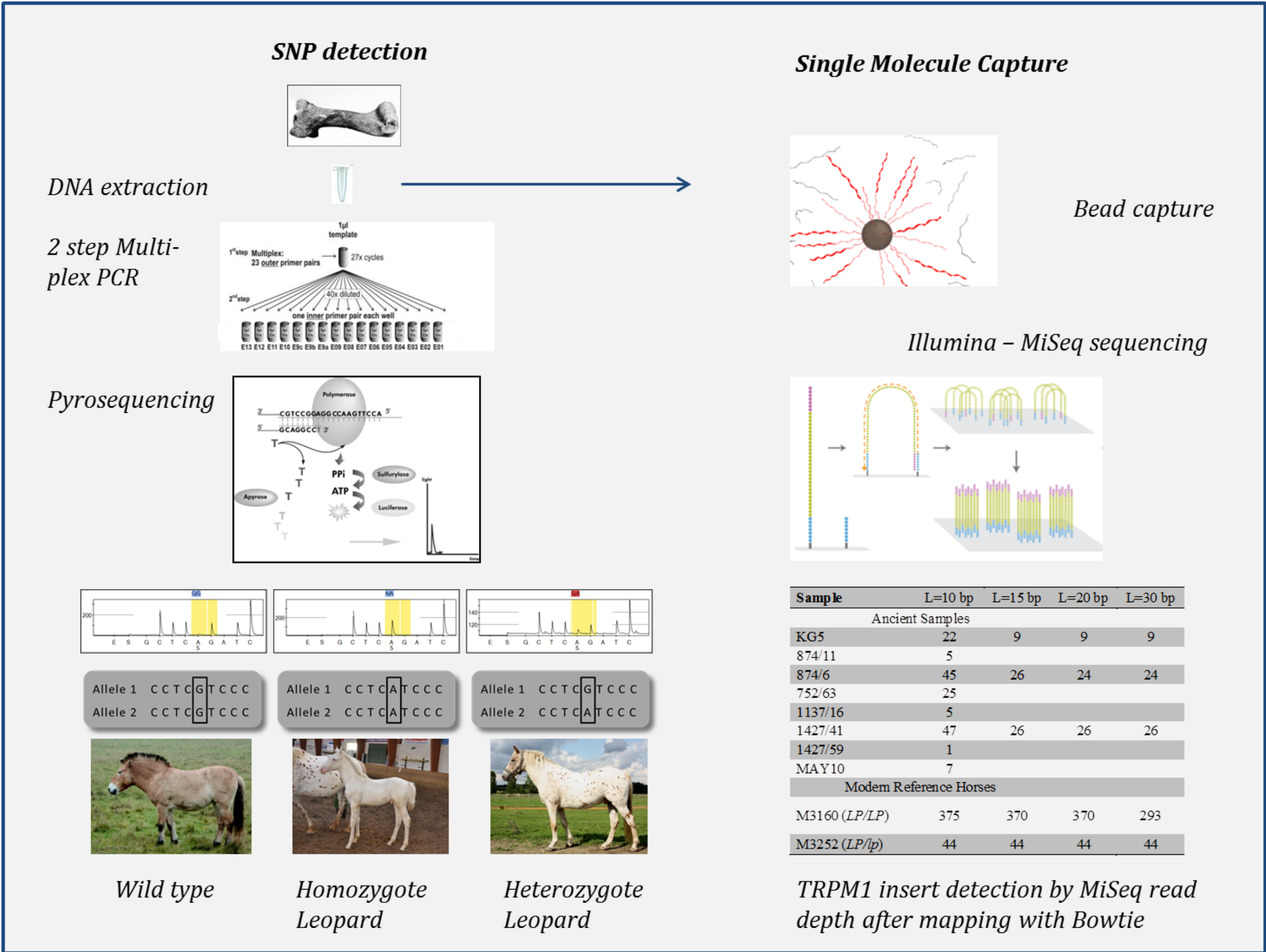
Ph. D. student at work in the trace lab



Excavation in Arzan, Russia (Photo: Hochmuth, DAI)

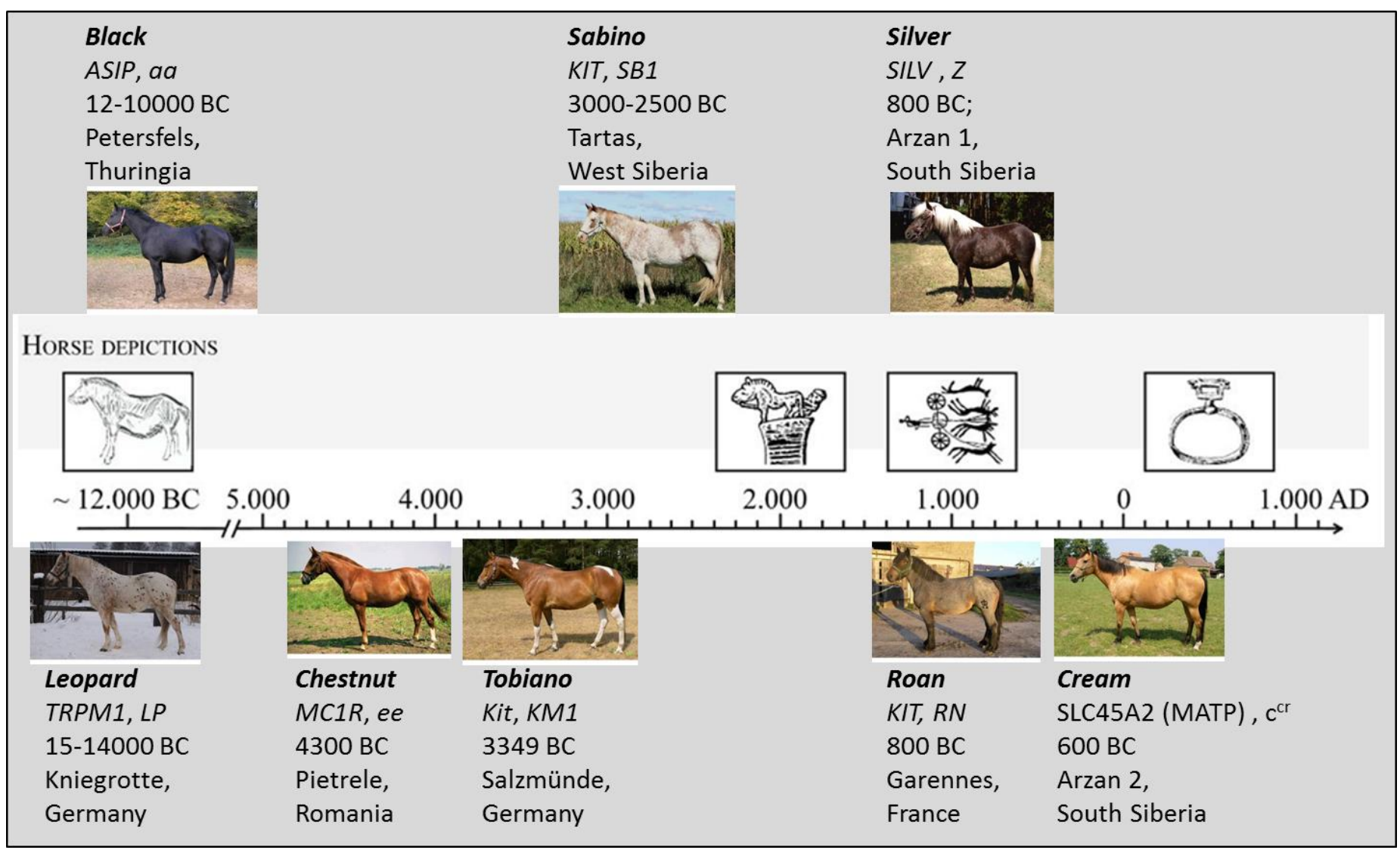
Samples (n = 120) cover a period from the Pleistocene (ca. 25,000 years ago) to medieval times (10th century) and a geographic range from Siberia to the Iberian Peninsula.

Protocol



Results and Conclusions

- Phenotypes in pre-domestic times matches exactly with Paleolithic paintings
- Cave paintings are realistic depictions of environment



- Pinpointing place and time of the initial domestication event to West Siberia about 3,500 BC
- Number of phenotypes increased significantly in early domestics

- Specific variants with negative pleiotropic effects arrived with domestication
- Valuable marker for differentiation of wild/pre-domestic and early domestic animals

Colleagues and Partners

S. Wutke, M. Cieslak, D. Förster & M. Pruvost (IZW), N. Benecke (DAI), M. Reissmann (Humboldt-Univ. Berlin), M. Hofreiter & J.L.A. Paijmans (Univ. York), A. Morales (Univ. Madrid) and some more

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Notable Publications

Ludwig et al. 2009 Science 324: 485.
Pruvost et al. 2011 PNAS 108: 18626-30.
Bellone et al. 2013 PlosOne 8: e78280.

