Martin Luther University Halle-Wittenberg
Central Natural Science Collections (ZNS)
Museum of domesticated animals

75th EAAP Annual Meeting, Virtual Online Meeting, 1/5 September 2024

Session 40 “Zooarchaeological research lessons for contemporary livestock management, conservation and genetics”
Abstract #2212644

What does the past tell us about the future - examinations of remains from domestic livestock -

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Archaeozoology - Zooarchaeology

- researching history without written sources
- determine animal bones from archaeological excavations

This skeleton of an Aurochs from Haßleben near Weimar was found in 1821, restored under Johann Wolfgang von Goethe as a Petrefact and examined by Ludwig Heinrich Bojanus as *Bos >taurus< primigenius* in 1827

Followed by Henry Christy (UK) & Édouard Lartet (France) and Ludwig Rütimeyer (Switzerland)

Robison (1987) and Landon (2009) clustered the history of Zooarchaeology in a **Formative Periode** (1860s-1951), a **Systematization Period** (1951-1969) and at last an **Integration Period** (1969-present)

Archaeozoology - Zooarchaeology

- Formative Periode

  Starting with naturalists, zoologists, and palaeontologists the new science grew very slowly

  In order to identify animal findings from archaeological excavations, it is helpful to be able to use all conceivable species as reference objects

- Systematization Period

  Specialists were able to establish themselves because of their access to necessary comparative collections.

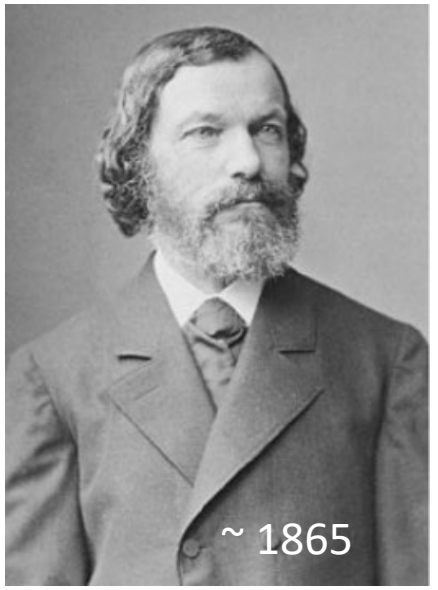
  Furthermore, corresponding collections were created

  First methods were established: weight, minimal numbers or individuals, fragments and measurements

like Elisabeth Reiz & Elizabeth Wing (USA), Joachim Boessneck (Germany), Ina Plug (South Africa), Nils-Gustav Gejvall (Sweden), Hans Rudolf Stampfli (Switzerland), Don Brothwell & Juliet Clutton-Brock (UK), László Bartosiewicz (Hungary)

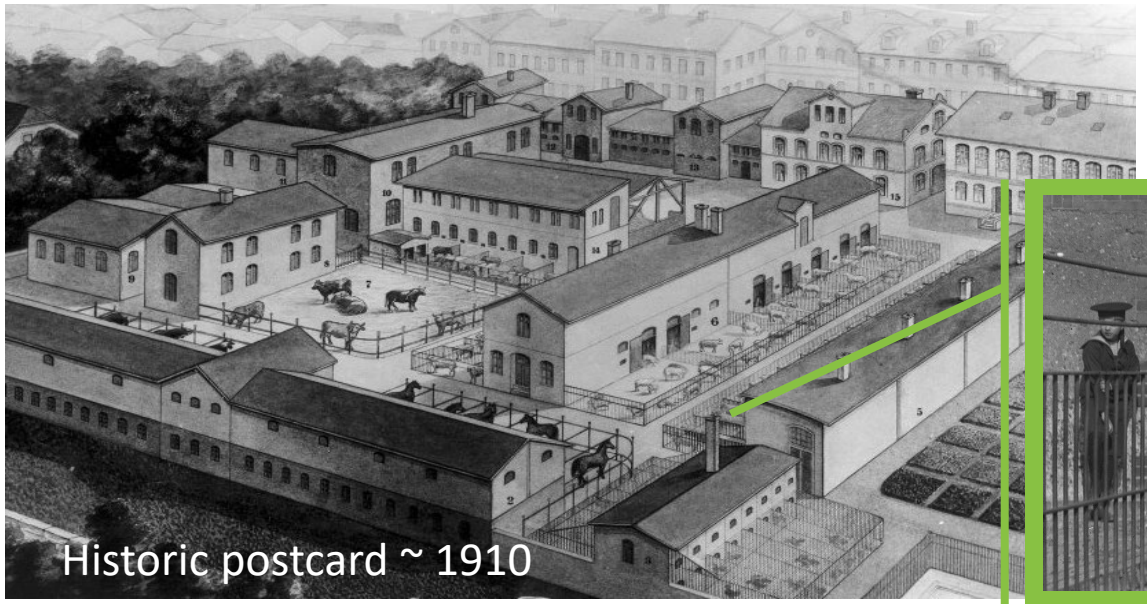
e.g. Hans-Peter Uerpmann (Tübingen/Germany) or Jesús Altuna Etxabe (San Sebastian/Spain)

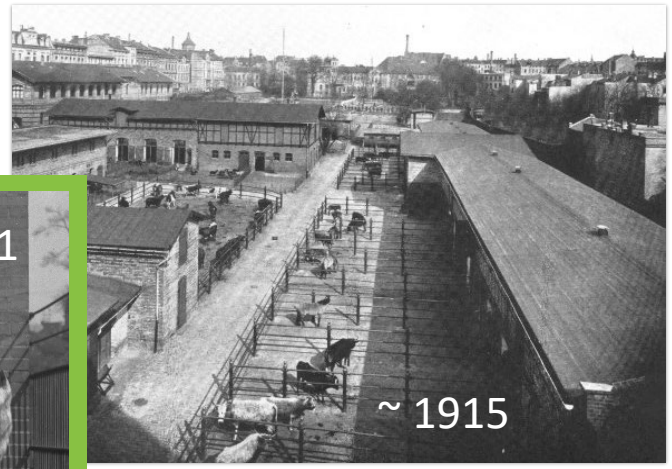
Livestock Garden in Halle



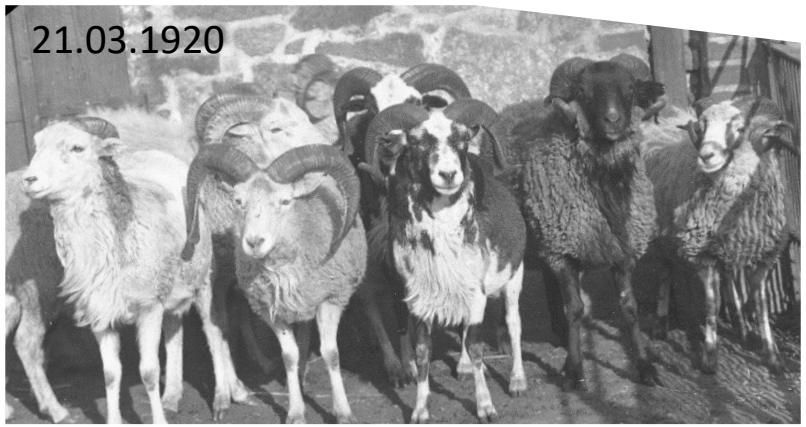
Julius Kühn (1825-1910)
as founder of university studies in agriculture in Germany appointed as the first professor at the University of Halle in 1862

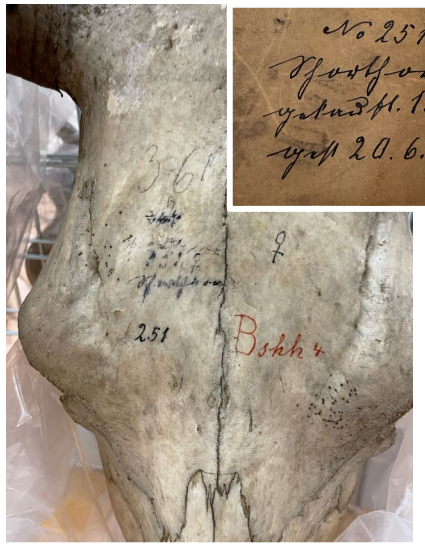
“In addition to imparting theoretical knowledge, a university institute absolutely needs appropriate illustrative material”

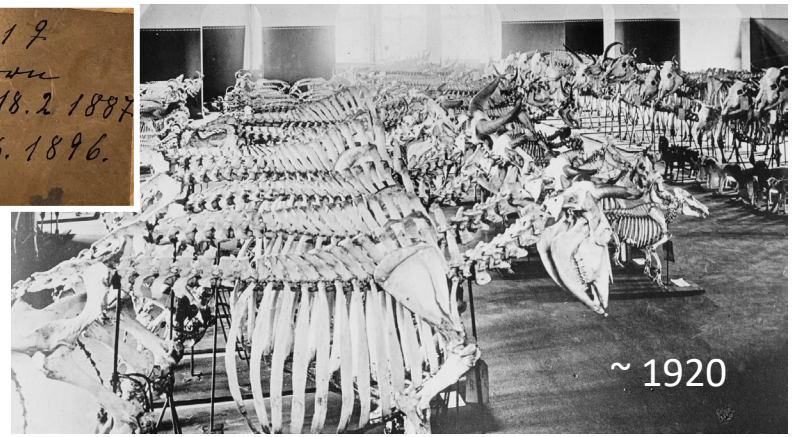


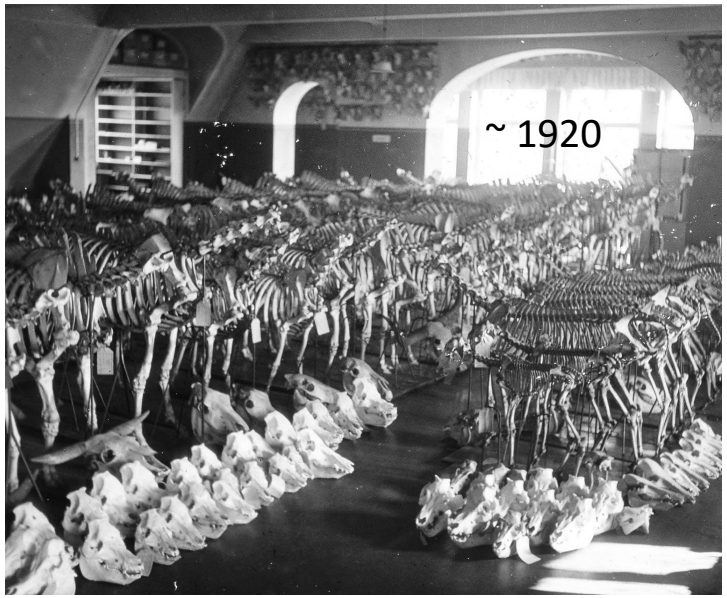


Scientific Collection in Halle







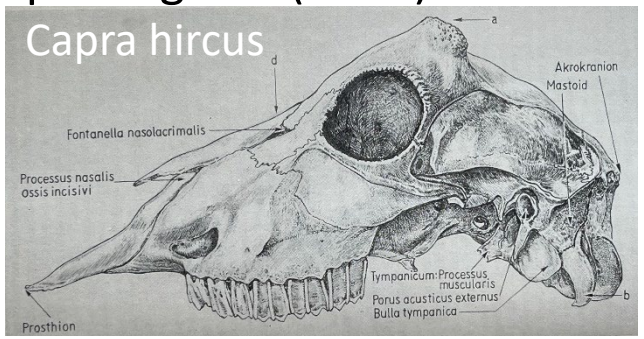


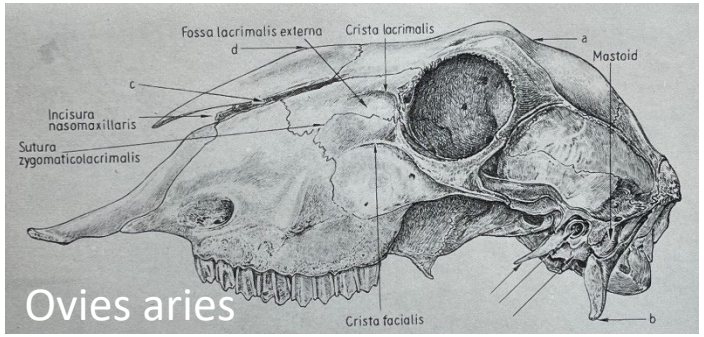
Archaeozoology in Halle

Manfred Teichert (Systematization Period)

starts using the Collection for archaeozoological research in 1958;

Joachim Boessneck (Munich), Hanns-Herrmann Mueller (Berlin) and Manfred Teichert (Halle) published a methodological paper to differentiate between sheep and goats (1964)





Teichert became curator of the Kühn-Collection (1970 to 1993)
and with its precisely documented individuals it grew to a key instrument

- Determination of withers height from long bones (pigs: 1969 and sheep: 1975)
- Comparison of measured and calculated withers height (cattle: 2005)

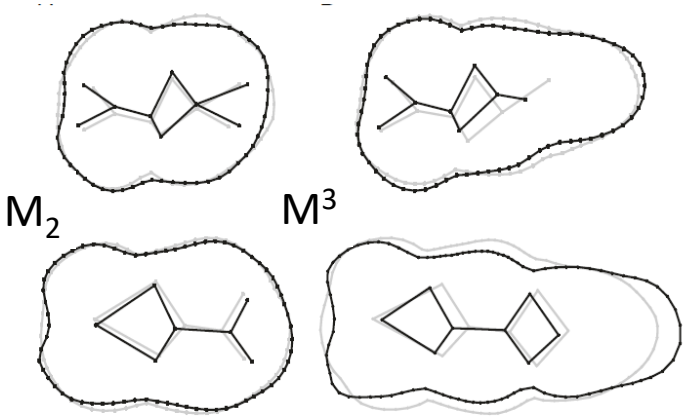
Geomorphometry (GMM)

(Integration Period)

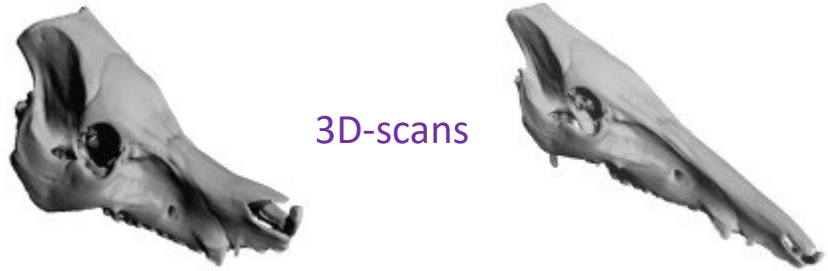
When traditional bone measurements fail
GMM works with small differences in shape or size

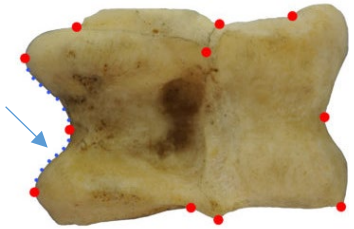
well known livestock animals are needed to investigate new methods

- GMM to differ between domestic and wild
  - 2+3rd molar in pigs (Evin et al. 2013, 2015)
  - 3D-skull-models in pigs (Owen et al. 2014)
  - astragalar in sheep (Pöllath et al. 2019)
- sorting ancient flock to sheep and goats
  - lower 3rd molar (Jeanjean et al. 2022)

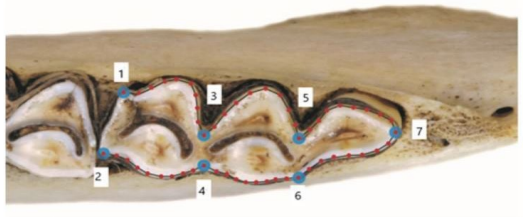


domestic pig wild boar





sheep – astragalus
landmarks/semilandmarks



sheep/goat – M_3
landmarks/semilandmarks

GMM & ZooMS (Zooarchaeology by Mass Spectrometry)

(Integration Period)

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2023

Research

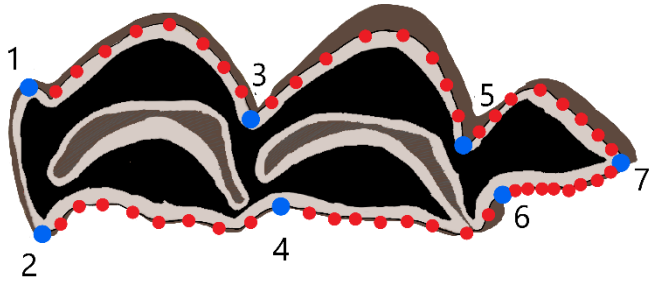
Check for updates

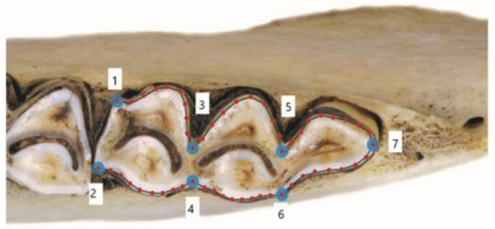
Cite this article: Jeanjean M *et al*. 2023 ZooMS confirms geometric morphometrics species identification of ancient sheep and goat. *R. Soc. Open Sci.* **10**: 230672. https://doi.org/10.1098/rsos.230672

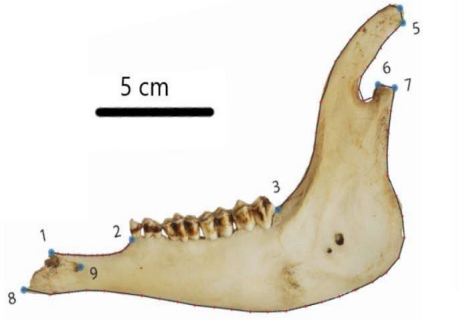
ZooMS confirms geometric morphometrics species identification of ancient sheep and goat

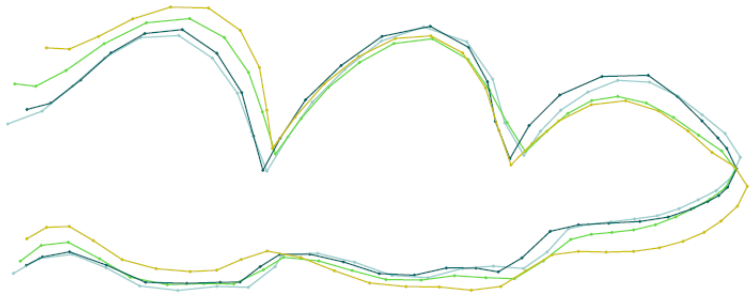
Marine Jeanjean[1], Krista McGrath[2], Silvia Valenzuela-Lamas[3], Ariadna Nieto-Espinet[4], Renate Schafberg[5], Pere Miquel Parés-Casanova[6], Sergio Jiménez-Manchón[3], Claude Guintard[7,8], Faiza Tekkouk[9], Rania Ridouh[9], Cyprien Mureau[1] and Allowen Evin[1]

sheep/goat – M_3
landmarks/semilandmarks







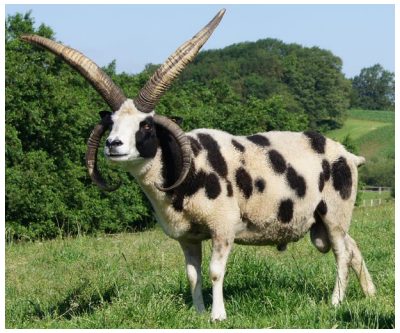


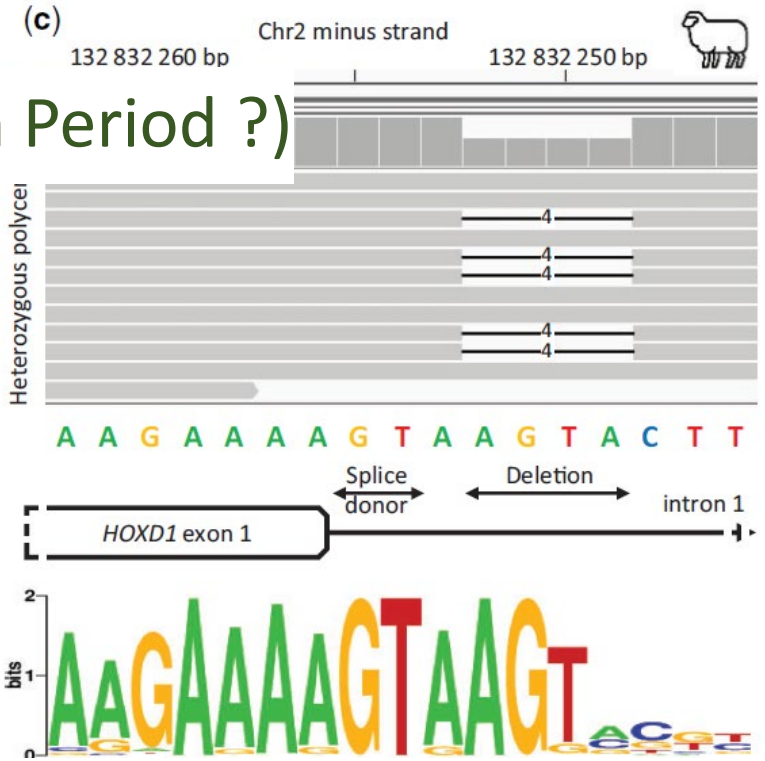
GMM & Genomics (Integration Period ?)

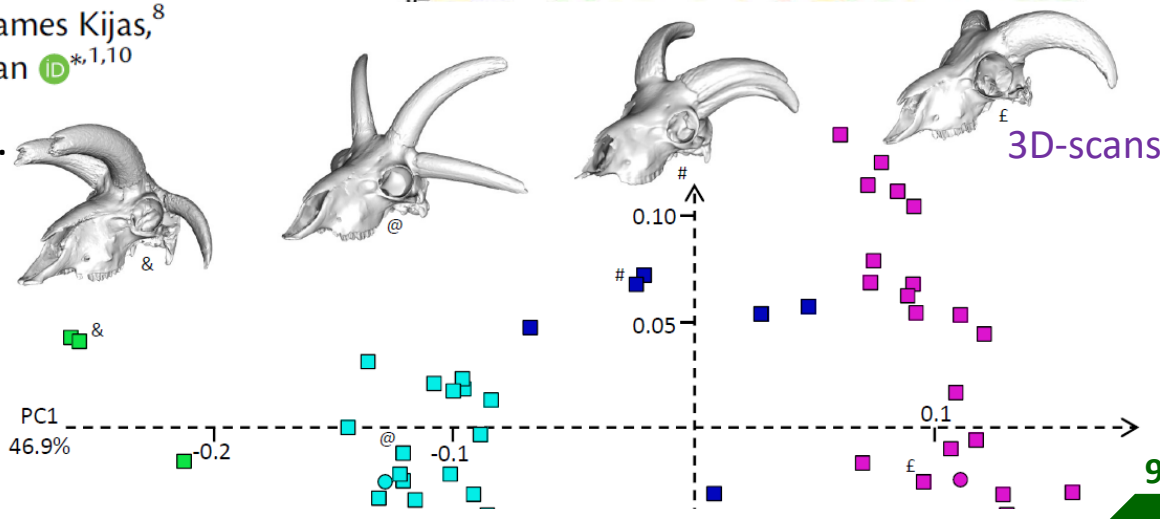
Analysis of Polycerate Mutants Reveals the Evolutionary Co-option of *HOXD1* for Horn Patterning in Bovidae

Aurélie Allais-Bonnet,[†,1,2,3] Aurélie Hintermann,[†,4] Marie-Christine Deloche,[1,2,3] Raphaël Cornette,[5] Philippe Bardou,[6,7] Marina Naval-Sanchez,[8] Alain Pinton,[6] Ashleigh Haruda,[9] Cécile Grohs,[10] Jozsef Zakany,[4] Daniele Bigi,[11] Ivica Medugorac,[12] Olivier Putelat,[13,14] Ockert Greyvenstein,[15] Tracy Hadfield,[16] Slim Ben Jemaa,[17] Gjoko Bunevski,[18] Fiona Menzi,[19] Nathalie Hirter,[19] Julia M. Paris,[19] John Hedges,[20] Isabelle Palhiere,[6] Rachel Rupp,[6] Johannes A. Lenstra,[21] Louisa Gidney,[22] Joséphine Lesur,[23] Renate Schafberg,[9] Michael Stache,[9] Marie-Dominique Wandhammer,[24] Rose-Marie Arbogast,[25] ndine Blin,[28] Abdelhak Boukadiri,[10] Julie Rivière,[10,29] Diane Esquerré,[30] e Danchin-Burge,[31] Coralie M. Reich,[32] David G. Riley,[15] oelle Cockett,[16] Benjamin J. Hayes,[34] Cord Drögemüller,[19] James Kijas,[8] osser-Klopp,[6] Denis Duboule,[*,4,35,36] and Aurélien Capitan[*,1,10]

Mol Biol Evol. 2021 May 19;38(6):2260-2272.





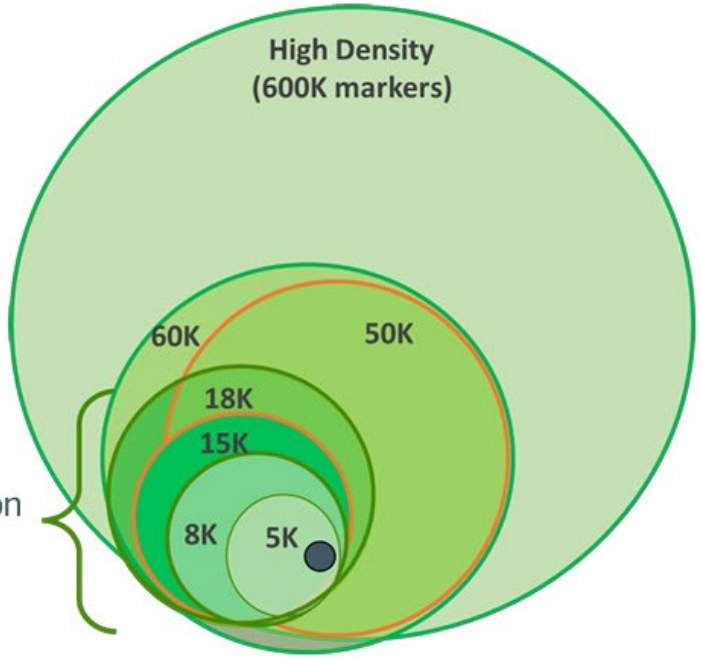


Genomics (Integration Period ?)

agresearch
āta mātai, mātai whetū

Sheep SNP chip development at AgResearch

New Zealand



High density arrays
- genome wide association
- imputation to sequence
- reference population
- improving BVs
- generation of new chips

Low density arrays
- low-cost industry implementation
- imputation to HD
- single gene traits
- pedigree assignment

ISGC International Sheep Genomics Consortium

illumina

1000 genomes project
June 2023: 3522 genomes

Can we use SNP-Chip-Technology for analysing historical objects?

New INsights

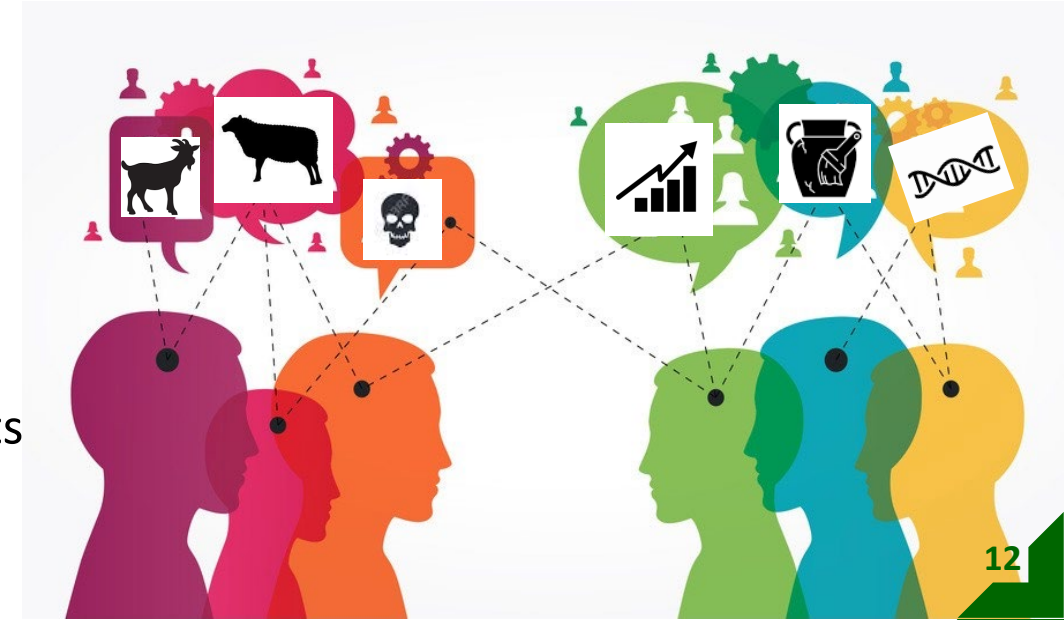
Thuringian Forest Goat
Credo: 08.03.2012 to 17.08.2022

Archaeozoology - Zooarchaeology

- Integration Period
  the pool of methods and also the integration into archaeology is still growing
    in terms of amount and quality of data

– Own Science Period
  today Archaeozoology has become an own Science with specific questions and stand-alone topics
    f.e. evolution, domestication and breeding history

- Multidisciplinary Period (Key challenge)
    Research in a team
    multidisciplinary teams are able to deliver unique results



ChatGPT to my prompt: What is our collection useful for?

In the treasures of the university collections,
we not only find the knowledge of the past,
but also the key to shaping our future

Thank you for your attention

Collaborations are always welcome!