Pathways to the Present

Research infrastructure

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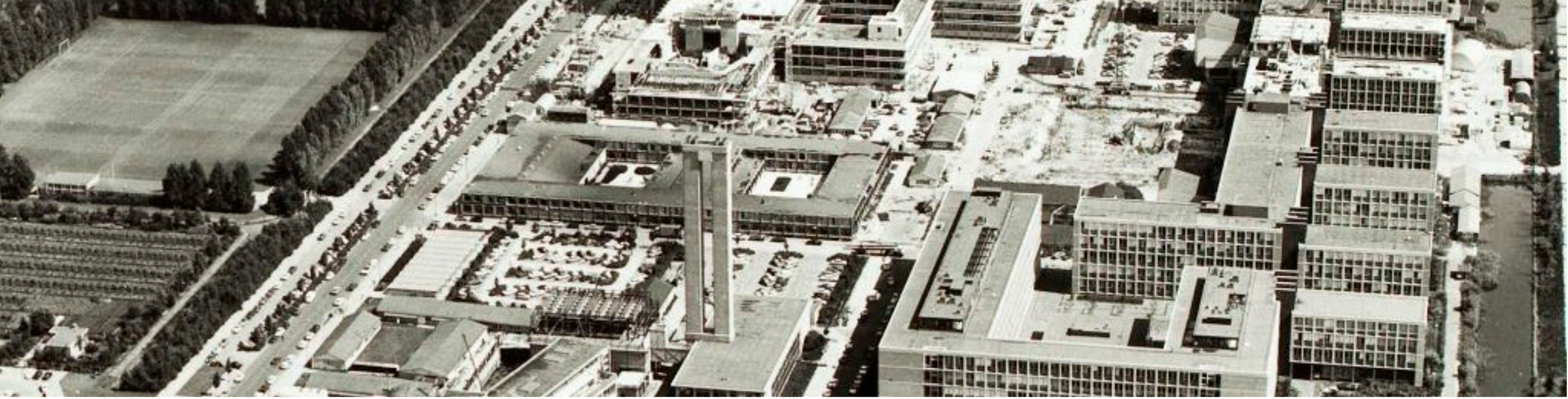
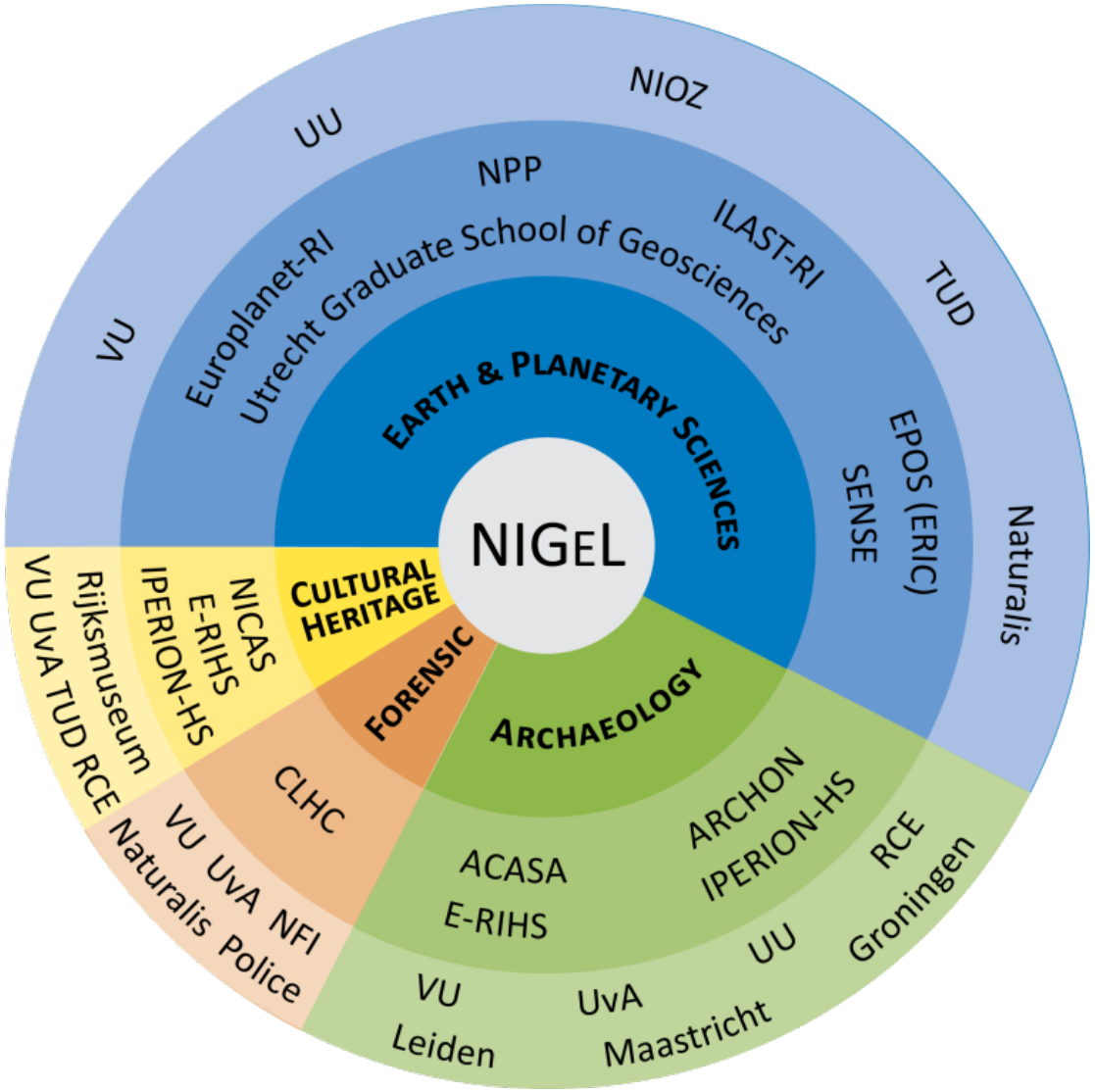
VU VRIJE UNIVERSITEIT AMSTERDAM

Research infrastructures are **facilities** that provide resources and services for the research communities to **conduct research and foster innovation** in their fields. These include: major equipment or sets of instruments, knowledge-related facilities such as collections, archives, or scientific data infrastructures.

Definition "research infrastructure" EU (Horizon)




DEMAND!

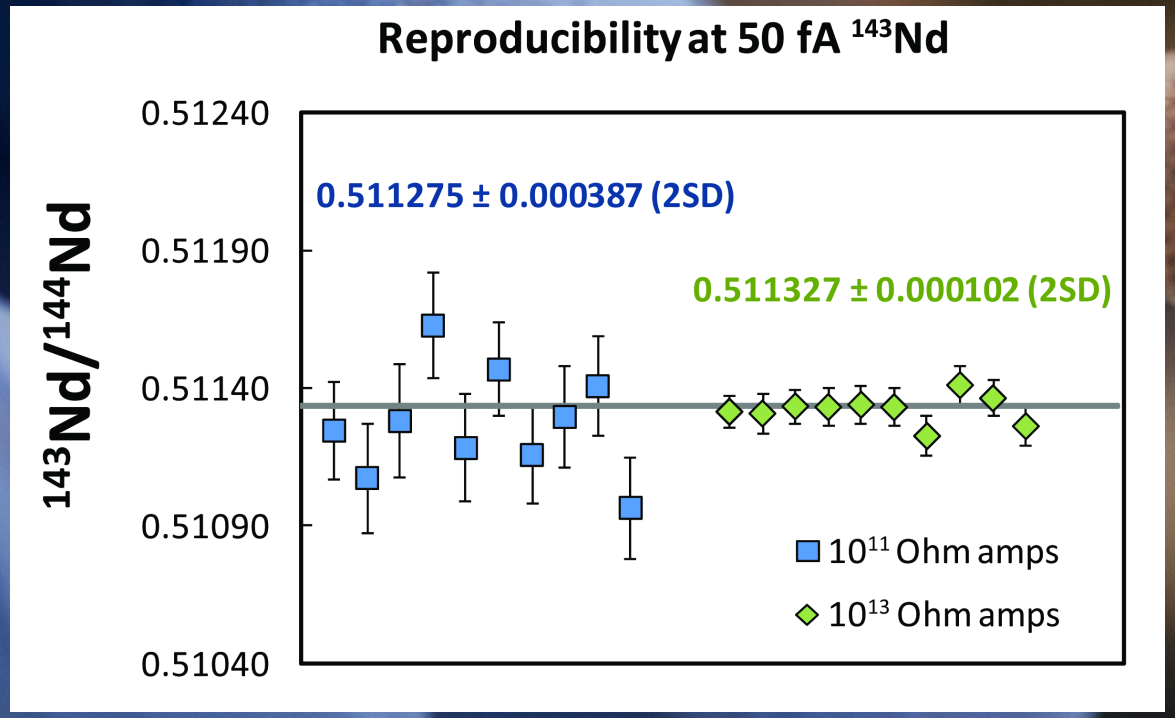

NIOZ
UU
NPP
ILAST-RI
Europlanet-RI
Utrecht Graduate School of Geosciences
TUD
VU
EARTH & PLANETARY SCIENCES
EPOS (ERIC)
SENSE
Naturalis
NIGeL
NICAS
E-RIHS
IPERION-HS
CULTURAL HERITAGE
Rijksmuseum
VU UvA TUD RCE
FORENSIC
ARCHAEOLOGY
CLHC
ARCHON
IPERION-HS
VU UvA NFI
Naturalis Police
ACASA
E-RIHS
RCE
Groningen
UU
VU
UvA
Leiden
Maastricht

NIGeL

the Netherlands
state-of-the-art
Isotope GEochemistry
Laboratory

Palaeomobility studies

- Dedicated sample preparation laboratory
- MARS6 batch acid digestion microwave system
- USA class 100 (ISO 5) clean laboratory with USA class 10 laminar flow hoods (ISO 4)
- Thermal Ionisation Mass Spectrometer – TritonPlus & MAT262 (TIMS)
- Multicollector Inductively Coupled Plasma Mass Spectrometer – Neptune (MC-ICP-MS)
- Thermo Finnigan GasBench II preparation device interfaced with a Thermo Finnigan Delta mass spectrometer



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Palaeodietary studies

- Dedicated sample preparation laboratory
- Oven and lyophilizers
- Elemental analyser (NCA500; ThermoQuest) interfaced with a Thermo Finnigan Delta mass spectrometer

Questions in Cultural Heritage

Recycling and production processes

How artefacts are produced
Isotope heterogeneity

Trading

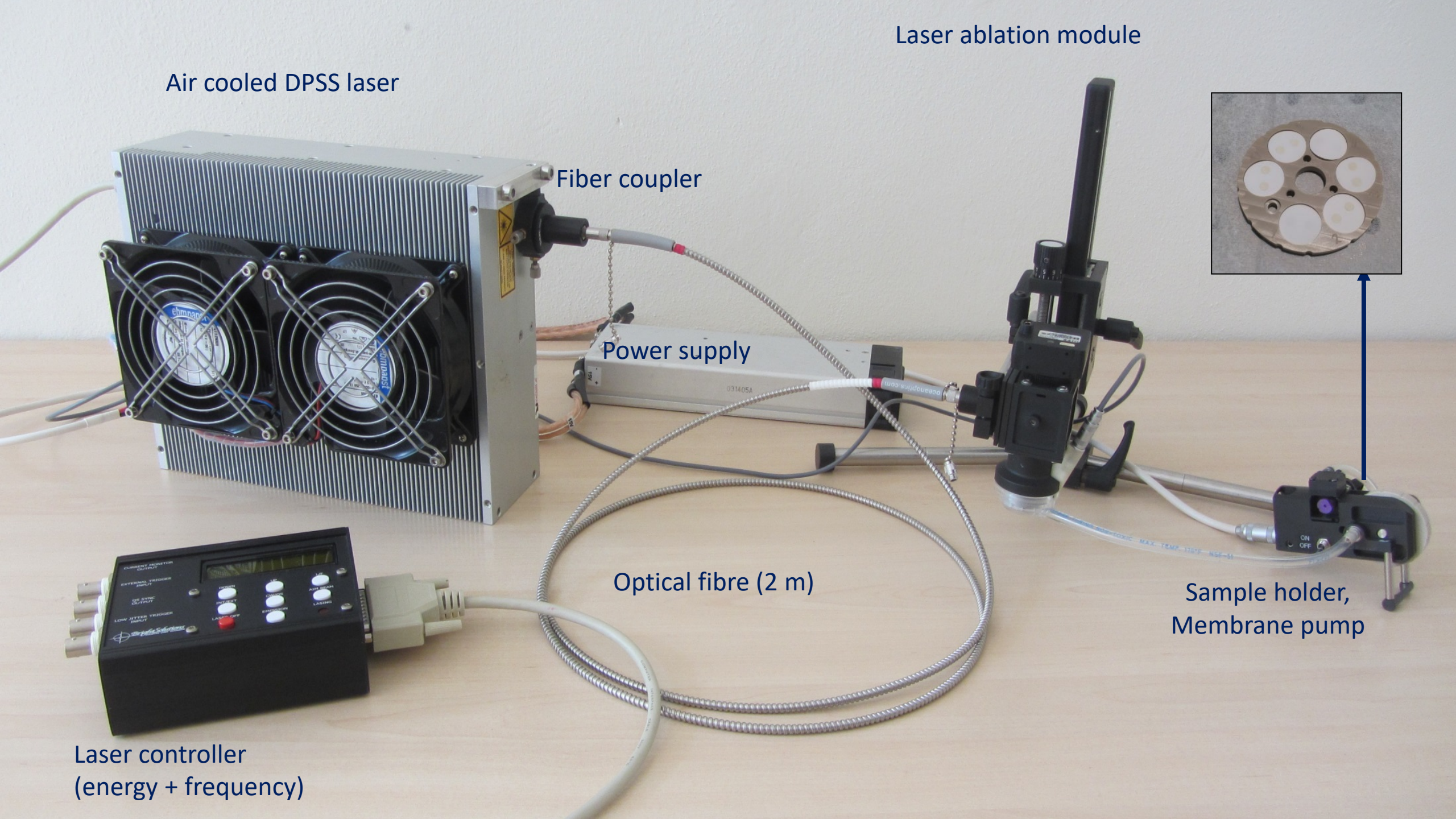
Manufacture & composition controlled by socio-political events?

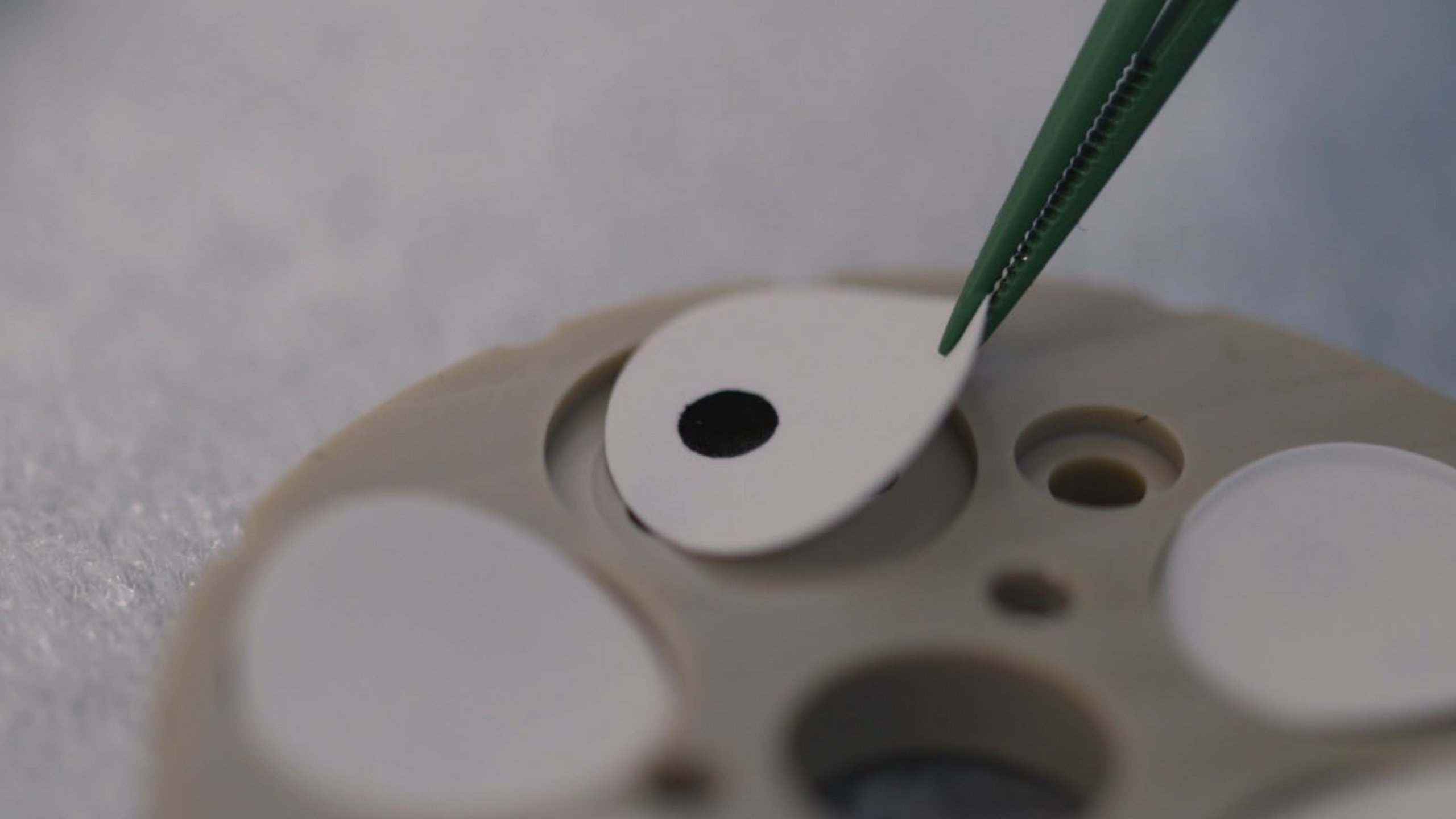
Provenance of the raw material

Authentication and attribution of artworks

Slide: Dr. Paolo d'Imporzano (VU)

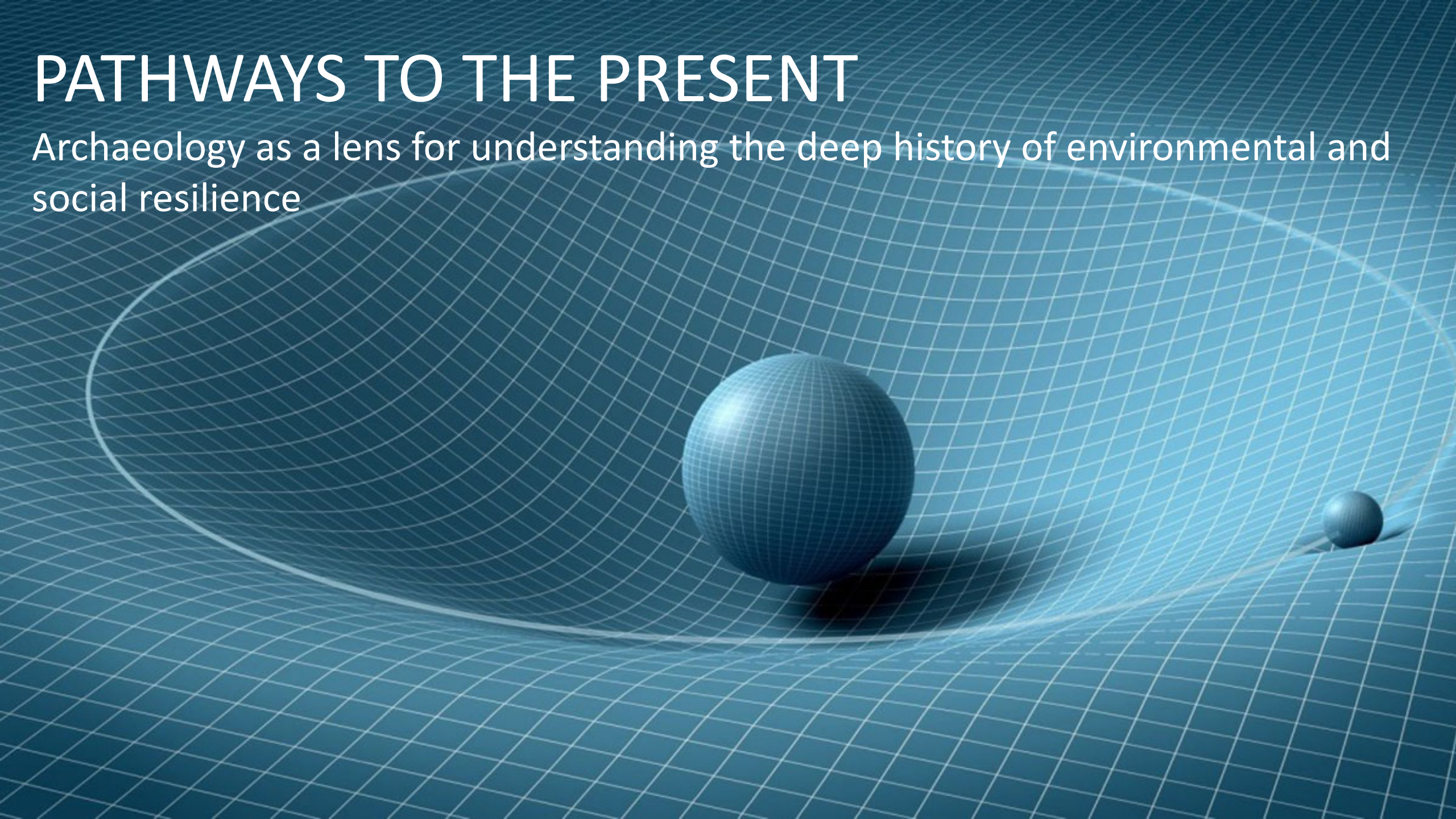

GEOCTROYEERDE
CAMMER VANDE


Laser ablation module
Air cooled DPSS laser
Fiber coupler
Power supply
Optical fibre (2 m)
Sample holder,
Membrane pump
Laser controller
(energy + frequency)



PATHWAYS TO THE PRESENT

Archaeology as a lens for understanding the deep history of environmental and social resilience



PATHWAYS TO THE PRESENT

Archaeology as a lens for understanding the deep history of environmental and social resilience

- How did the human niche evolve?
  How did successive developments of the human niche interactively change human microbiomes (the human body), strategies of food production and provisioning (subsistence economy) and -eventually- entire ecosystems?

- What can we learn from the deep history of human migration?
  Is migration – or even mass migration- of all times? Under which conditions do people start to become mobile and at what scale? When did migration give rise to conflicts? How can we use both science-based archaeological research (aDNA, isotopes) and material culture studies to reconstruct the movements of people in the past and what can we learn from these studies?

- How did human diseases and pandemics evolve and spread over time?
  Using cutting-edge palae-anthropological, palaeo-biological and medical insights, archaeologists are now able to reconstruct the evolutionary and geographical pathways that human diseases have followed throughout human history – even around the planet.

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Archaeology as a lens for understanding the deep history of environmental and social resilience

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FOOD
FOR
THOUGHT

“New and fundamental research. Not just applied”

Jan Kolen, earlier today

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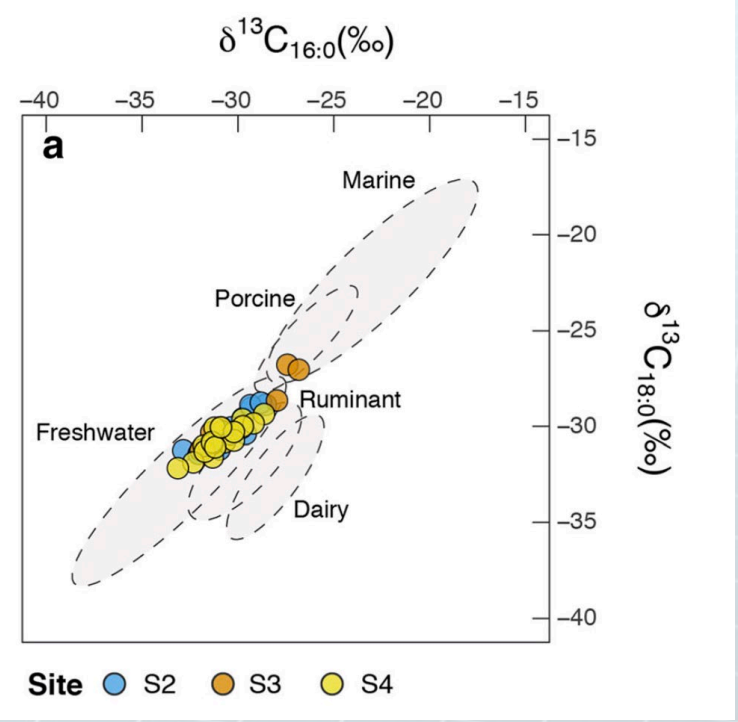
- Compound-specific amino acid isotope research
  - Conventional bulk CN: the ability to detect small amounts of marine protein consumption is highly problematic. $\Delta^{13}C_{Phenylalanine\text{-}Glycine}$ or $\delta^{13}C_{Phe}$ effectively discriminates between diets dominated by aquatic (marine and freshwater) and terrestrial (C3 and C4 plant-derived) protein
  - (Historical changes in) Trophic level

- Lipid residue analysis
  - Swifterbant (Demirci et al., 2020): "[Lipid residue analysis] to understand the role of pottery in terms of its relation to hunter-fisher-gatherer lifestyle, and the change in available food resources brought about by the arrival of domesticated animal and plant products."



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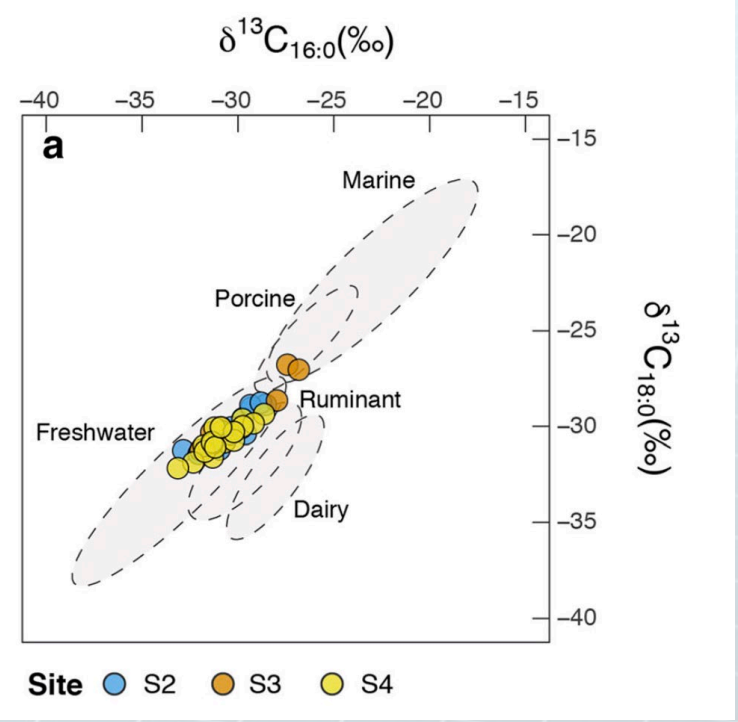
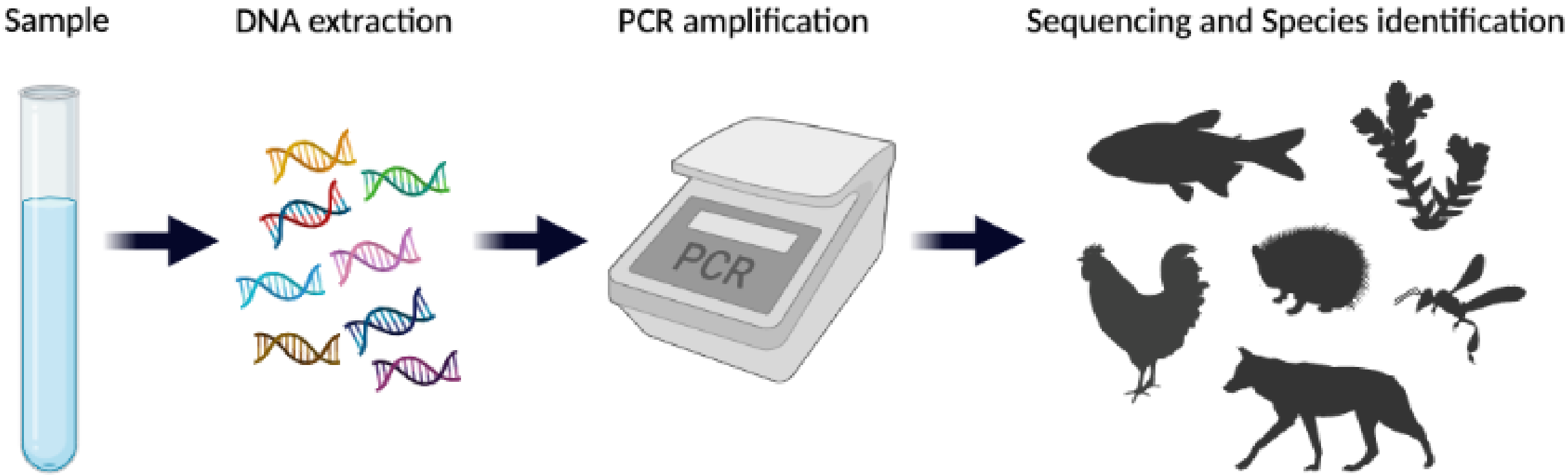
- Non-traditional isotope systems
  - Zn, S…




Environmental DNA (eDNA)


Sample
DNA extraction
PCR amplification
Sequencing and Species identification
PCR

Sample

Sequencing and Species identification

CONSTRUCTING THE LIMES

- What can we learn from the deep history of human migration?
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- Isotopes and aDNA
  - Continue to collect human, faunal and reference (baseline) data: the larger the database, the more accurate the interpretation of the data will become
  - Sequential sampling of faunal dental elements: palaeomobility and seasonality
  - Combine with faunal aDNA research
  - Invest in mapping Pb?

  - Sr-Nd-Pb isotope analysis of artefacts

  - ZooMS: zooarchaeology by Mass Spectrometry. Method to allow to distinwuish between taxa. This enables a greater insight into choices made by farmers/pastoralists with regard to mixed-herd management (see **Subsistence**), as well as herd management strategies (e.g., mobility patterns)

- How did human diseases and pandemics evolve and spread over time?
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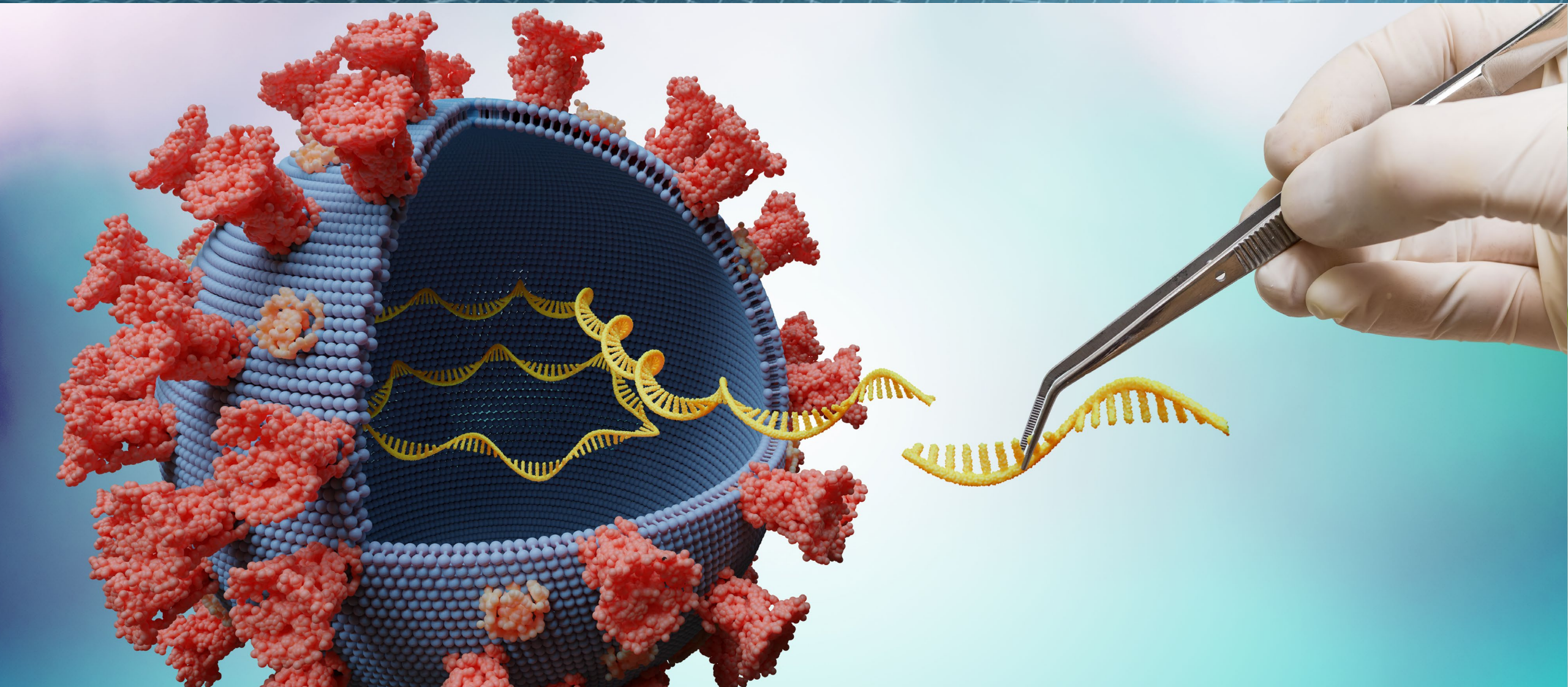

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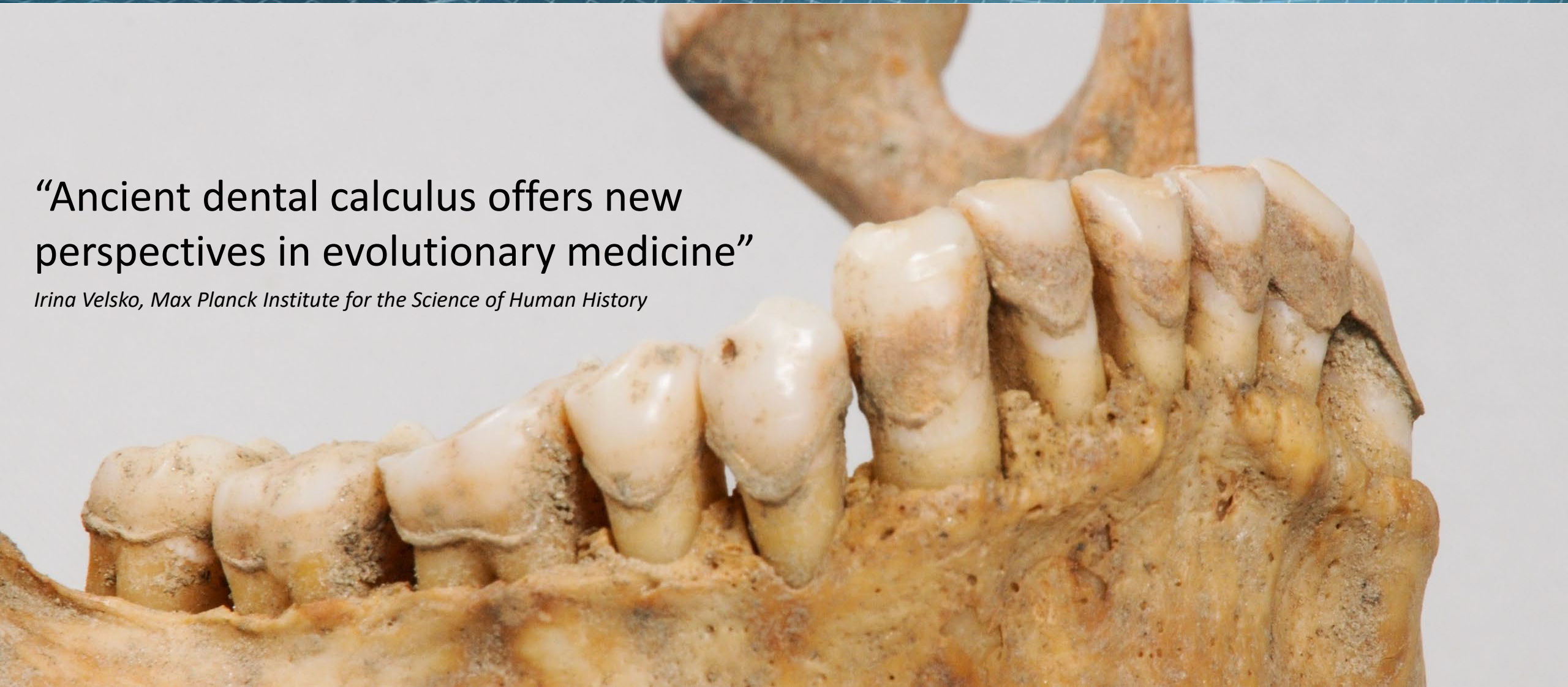

"Ancient dental calculus offers new perspectives in evolutionary medicine"

Irina Velsko, Max Planck Institute for the Science of Human History

Collaboration – interdisciplinary research – Çanan: interpretations as good as our connections with other disciplines – new machines – new techniques – new applications of existing techniques and machines – continue present research – Jan: new fundamental research – high risk, high gain? – NWO XS application(s) prior to Zwaartekracht? – Jason: Bigger ambitions – European networks – Sjoerd's Terra Nova: Training new generation of ESRs → sustainable research – avoid brain drain

Thank you

www.vu.nl

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