

Sarah Pederzani

AMBI Research Lab, Instituto Universitario de Bio-Orgánica Antonio González, University of La Laguna
Avenida Astrofísico Francisco Sánchez, 2, 38206, La Laguna, Tenerife, Spain | scpederz@ull.edu.es

Current Employment

2022 – present German National Academy of Sciences Leopoldina Postdoctoral Fellow
Archaeological Micromorphology and Biomarker (AMBI) Research Lab
University of La Laguna, Tenerife, Spain
“Developing a multi-proxy stable isotope approach to demonstrating the climatic preferences of site-use of Late Pleistocene humans”

Academic Education and Employment

2020 – 2021 Postdoctoral researcher, Department of Human Evolution, Max-Planck-Institute for Evolutionary Anthropology Leipzig, Germany
“Reconstructing site specific palaeoclimate and –environment at Pleistocene archaeological sites using isotope geochemistry proxies”

2016 – 2021 PhD in Archaeology
Department of Human Evolution, MPI for Evolutionary Anthropology, Leipzig
Department of Archaeology, School of Geoscience, University of Aberdeen, UK
“Exploring Late Pleistocene intra- and inter-site climate variability and seasonality using isotope zooarchaeology”
Supervisors: Kate Britton (University of Aberdeen), Jean-Jacques Hublin (MPI EVA)

2014 – 2016 MA in Prehistoric and Historic Archaeology
Christian-Albrechts-University Kiel
“Effects of Heating and Fat Separation on $\delta^{13}\text{C}$ of Single Fatty Acids in Milk: Potential Uses for the Detection of Pasteurization in Prehistoric Pottery”. Final Grade 1.1
Supervisors: Cheryl Makarewicz, Cynthia Spiteri (University of Tübingen)

2015 Graduate Research Assistant
Institute for Pre- and Protohistoric Archaeology, CAU Kiel
Sample preparation of bioapatite and collagen for C, N, O isotope analysis

2014 Undergraduate Research Assistant
Institute for Pre- and Protohistoric Archaeology, CAU Kiel
Sample preparation of bioapatite for C & O isotope analysis

2010 – 2014 BSc in Prehistoric and Historic Archaeology and Chemistry (minor)
Christian-Albrechts-University, Kiel
“Herd Mobility in Xiongnu Funerary Contexts Assessed by Stable Isotope Analysis of Sheep Tooth Enamel from Baga Gazaryn Chuluu, Mongolia”. Final Grade 1.5
Supervisor: Cheryl Makarewicz

Grants and Funding

2022 – 2024 German National Academy of Sciences Leopoldina Postdoctoral Fellowship
“Developing a multi-proxy stable isotope approach to demonstrating the climatic preferences of site-use of Late Pleistocene humans” (69,500 €)

2011 – 2016 German National Academic Foundation (Studienstiftung des Deutschen Volkes)
scholarship (18,000 €)

Publications

1. **Pederzani, S.**, Britton, K., Jones, J. R., Agudo Pérez, L., Geiling, J. M., Marín-Arroyo, A. B., **submitted**. Pleistocene Neanderthal exploitation of stable ecosystems in northern Iberia shown by multi-isotope evidence. *Quaternary Research*.
2. **Pederzani, S.**, **accepted**. Stable Isotope Analyses of Organic Remains. In: Rehren, T., Nikita, E. (Eds.), *Encyclopedia of Archaeology*, Second Edition. Elsevier.
3. Britton, K., Jimenez, E.-L., Le Corre, M., **Pederzani, S.**, Daujeard, C., Jaouen, K., Vettese, D., Tütken, T., Hublin, J.-J., Moncel, M.-H., **in press**. Multi-isotope zooarchaeological investigations at Abri du Maras: the palaeoecological and palaeoenvironmental context of Neanderthal subsistence strategies in the Rhône Valley during MIS3. *Journal of Human Evolution*.
4. McCormack, J., Griffiths, M.L., Shimada, K., Kim, S., Karnes, M., Maisch, H., **Pederzani, S.**, Bourgon, N., Jaouen, K., Becker, M.A., Jöns, N., Sisma-Ventura, G., Straube, N., Pollerspöck, J., Hublin, J.-J., Eagle, R.A., and Tütken, T., **2022**. Competition between Neogene *Otodus megalodon* and great white sharks revealed by zinc isotopes. *Nature Communications* 13, 2980.
5. Smith, G.M., Spasov, R., Martisius, N.L., Rezek, Z., Aldeias, V., Ruebens, K., **Pederzani, S.**, McPherron, S.P., Sirakova, S., Sirakov, N., Tsanova, T., Hublin, J.J., **2021**. Subsistence behaviour during the Initial Upper Palaeolithic in Europe: Site use, dietary practice, and carnivore exploitation at Bacho Kiro Cave (Bulgaria). *Journal of Human Evolution* 161, 103074.
6. **Pederzani, S.**, Britton, K., Aldeias, V., Bourgon, N., Fewlass, H., Lauer, T., McPherron, S. P., Rezek, Z., Sirakov, N., Smith, G. M., Spasov, R., Tran, N.-H., Tsanova, T., Hublin, J.-J., **2021**. Subarctic climate for the earliest *Homo sapiens* in Europe. *Science Advances* 7, eabi4642 (2021). <https://doi.org/10.1126/sciadv.abi4642> Data and code available at: <https://osf.io/tk9dc/>
7. **Pederzani, S.**, Aldeias, V., Dibble, H.L., Goldberg, P., Hublin, J.J., Madelaine, S., McPherron, S.P., Sandgathe, D., Steele, T.E., Turq, A., Britton, K., **2021**. Reconstructing Late Pleistocene paleoclimate at the scale of human behavior: an example from the Neandertal occupation of La Ferrassie (France). *Scientific Reports* 11, 1419. <https://doi.org/10.1038/s41598-020-80777-1> Data and code available at: <https://osf.io/sfnb8/>
8. **Pederzani, S.**, Snoeck, C., Wacker, U., Britton, K., **2020**. Anion exchange resin and slow precipitation preclude the need for pretreatments in silver phosphate preparation for oxygen isotope analysis of bioapatites. *Chemical Geology* 534, 119455. <https://doi.org/10.1016/j.chemgeo.2019.119455> Data and code available at: <https://osf.io/ug5k4/>
9. Britton, K., **Pederzani, S.**, Kindler, L., Roebroeks, W., Gaudzinski-Windheuser, S., Richards, M.P., Tütken, T., **2019**. Oxygen isotope analyses of Equus teeth evidences early Eemian and early Weichselian palaeotemperatures at the Middle Palaeolithic site of Neumark-Nord 2, Saxony-Anhalt, Germany. *Quaternary Science Reviews*. 226, 106029. <https://doi.org/10.1016/j.quascirev.2019.106029>
10. **Pederzani, S.**, Britton, K., **2019**. Oxygen isotopes in bioarchaeology: Principles and applications, challenges and opportunities. *Earth-Science Reviews*. 188, 77–107. <https://doi.org/10.1016/j.earscirev.2018.11.005>

11. Makarewicz, C.A., **Pederzani, S.**, 2017. Oxygen ($\delta^{18}\text{O}$) and carbon ($\delta^{13}\text{C}$) isotopic distinction in sequentially sampled tooth enamel of co-localized wild and domesticated caprines: Complications to establishing seasonality and mobility in herbivores. *Palaeogeography, Palaeoclimatology, Palaeoecology*. 485, 1–15. <https://doi.org/10.1016/j.palaeo.2017.01.010>
12. Hermes, T., **Pederzani, S.**, Makarewicz, C.A., 2017. Ahead of the curve? Implications for isolating vertical transhumance in seasonal montane environments using sequential oxygen isotope analyses of tooth enamel, in: Ventresca-Miller, A.R., Makarewicz, C.A. (Eds.), *Isotopic Investigations of Pastoralism in Prehistory*. Routledge. <https://doi.org/10.4324/9781315143026>

All recent publications (2019 onwards) are open access or made available online as post-prints within 3 months of acceptance.

Invited Talks

- 2022 “Exploring climatic patterns in site-occupation and movement of Palaeolithic humans using biomolecular methods”. AMGC Research Group Seminar, Vrije Universiteit Brussel, Belgium.
- 2022 “Palaeoclimatology on the scale of human behaviour - stable isotope approaches to site-specific climatic reconstruction”. One Health Archaeology Seminar, School of History, Classics & Archaeology, University of Edinburgh, UK.
- 2021 “Molekulares Ausgraben - Isotopenwerkzeuge zur Rekonstruktion von Klima und Umwelt im Pleistozän” (in German; Eng.: “Molecular digging – stable isotope tools for reconstructing Pleistocene climate and environment”). Archaeological Colloquium, Institute for Prehistoric and Protohistoric Archaeology, Friedrich-Alexander-University Erlangen, Germany.
- 2020 “Cold climatic conditions during an early occurrence of Upper Palaeolithic *Homo sapiens* in Europe - stable isotope evidence from Bacho Kiro Cave, Bulgaria”. Seminar Series, London Geochemistry and Isotope Centre, University College London, UK.
- 2017 “Reconstructing Pleistocene Palaeoclimate and Palaeoseasonality using Oxygen Isotope Zooarchaeology”. Northern Archaeological Seminar Series, University of Aberdeen, UK.
- 2017 “Reconstructing palaeoclimate and palaeoseasonality using oxygen isotope analyses of faunal remains – possibilities, problems, and method development”. AHRC funded network project “Coping with climate: the legacy of *Homo heidelbergensis*”, University of Brighton, UK.

Selected Conference Presentations

1. **Pederzani, S.**, Britton, K., Jones, J. R., Agudo Pérez, L., Geiling, J. M., Marín-Arroyo, A. B., 2022. A multi-isotope study of palaeoenvironment and herbivore palaeoecology during the late Neanderthal occupation of Axló Cave, Spain. Oral presentation of the 2022 UK Archaeological Science conference (UKAS), Aberdeen, UK.
2. **Pederzani, S.**, Herrera-Herrera, A. V., Kleijne, J.P., Simões, C. D., Lenting, R., Elvira, A., Mallol, C., 2022. Climate under the microscope – retrieving n-alkane biomarkers from micromorphology blocks. Poster presentation at the 12th Annual ESHE meeting, Tübingen, Germany.

3. **Pederzani, S.**, Britton, K., Aldeias, V., Bourgon, N., Fewlass, H., Lauer, T., McPherron, S. P., Rezek, Z., Sirakov, N., Smith, G. M., Spasov, R., Tran, N.-H., Tsanova, T., Hublin, J.-J., **2021**. Cold climatic conditions for *Homo sapiens* in the Initial Upper Palaeolithic – direct evidence from Bacho Kiro Cave, Bulgaria. Oral presentation at the Hugo Obermaier Society 62 Annual meeting (virtual).
4. **Pederzani, S.**, Britton, K., Aldeias, V., Lauer, T., McPherron, S. P., Rezek, Z., Sirakov, N., Smith, G. M., Spasov, R., Tsanova, T., Hublin, J.-J., **2020**. Direct evidence for climatic conditions experienced by Initial Upper Palaeolithic *Homo sapiens* at Bacho Kiro Cave, Bulgaria. Oral presentation at the 26th EAA Annual Meeting (virtual).
5. **Pederzani, S.**, Aldeias, V., Goldberg, P., Hublin, J.-J., Madelaine, S., McPherron, S., Sandgathe, D., Steele, T. E., Turq, A., Britton, K., **2019**. Contextualising Neanderthal behaviour during MIS 3 and 4 at La Ferrassie, France: Seasonal palaeotemperature reconstructions from oxygen stable isotopes. Pecha Kucha presentation at the 9th Annual ESHE meeting, Liège, Belgium.
6. **Pederzani, S.**, Aldeias, V., Goldberg, P., Hublin, J.-J., Madelaine, S., McPherron, S., Sandgathe, D., Steele, T. E., Turq, A., Britton, K., **2019**. Reconstructing patterns of palaeoseasonality during the Weichselian: Sub-annual palaeotemperatures from the La Ferrassie rock shelter. Oral presentation at the 20th INQUA Congress, Dublin, Ireland.
7. **Pederzani, S.**, Aldeias, V., Goldberg, P., Hublin, J.-J., Madelaine, S., McPherron, S., Sandgathe, D., Steele, T. E., Turq, A., Britton, K., **2019**. Using isotope zooarchaeology to reconstruct late Pleistocene climate and seasonality: new evidence from La Ferrassie, France. Oral presentation at the 2019 UK Archaeological Science conference (UKAS), Manchester, UK.
8. **Pederzani, S.**, Hublin, J.-J., Britton, K., **2018**. Reconstruction of local palaeoseasonality and palaeoclimate at Middle Palaeolithic sites in Western Europe: Sampling, data handling, and temperature conversion in oxygen isotope seasonality models. Poster presentation at the 8th International Symposium on Biomolecular Archaeology (ISBA), Jena, Germany.
9. **Pederzani, S.**, Wacker, U., Hublin, J.-J., Britton, K., **2017**. Method development in palaeoclimate and palaeoseasonality reconstruction using oxygen isotopic analyses of bioapatite phosphate of faunal remains. Poster presentation for the 2017 UK Archaeological Science conference (UKAS), London, UK.
10. **Pederzani, S.**, Wacker, U., Hublin, J.-J., Britton, K., **2017**. Reconstructing palaeoclimate and palaeoseasonality using oxygen isotope analyses of faunal remains – possibilities, problems, and method development. Oral presentation for „Coping with climate: the legacy of Homo heidelbergensis“ workshop, Brighton, UK.
11. **Pederzani, S.**, Makarewicz, C.A., **2016**. Pasteurization, Processing, Palaeoenvironment – Applicability of modern dairy reference fats in archaeological lipid residue analysis using $\delta^{13}\text{C}$ of single fatty acids. Oral Presentation for 7th International Symposium on Biomolecular Archaeology (ISBA7), Oxford, UK.

Teaching and Supervision Experience

Lectures and Tutorials

- 2019 MSc module “Palaeoenvironmental Research”, University of Leipzig
Designing, preparing and delivering original lecture on environmental reconstruction with stable isotopes
- 2019 International Max Planck Research School, MPI-EVA, Leipzig
Designing, preparing and delivering original lecture on stable isotopes and mobility lecture, and preparation of exam questions
- 2015 BSc module “Introduction to Archaeological Science”, University of Kiel
Design and delivery of zooarchaeology lecture
- 2014 BSc module “Introduction to Zooarchaeology”, University of Kiel
Teaching Assistant for Introductory Zooarchaeology modules, including assisting students during practical sessions, providing practice materials, designing and implementing formative assessment exercises

Programming and Reproducible Science

- 2022 Scientific Analysis using R
3-day introductory level R programming course for undergraduate and graduate students and postdocs of the University of La Laguna
Complete course design, preparation of materials, and instruction
- 2021 Reproducible Workflows for Scientific Computing
5-day introductory level Software Carpentry programming course
Instructor for data visualisation and RMarkdown portions (2 days)
Contribution to course design, lecture design for 2 course days
- 2021 Writing Research Articles using R and RMarkdown
Half-day programming course for graduate students and researchers, MPI-EVA, Leipzig
Complete course design, preparation of materials, instruction over Zoom
- 2020 Reproducible Workflows for Scientific Computing
5-day introductory level Software Carpentry programming course
Instructor for data visualisation and RMarkdown portions (2 days)
Lecture design based on existing materials, participation in overall course design

Laboratory Instruction and Supervision

Instruction of visiting students, researchers and technicians in principles of IRMS, TC/EA-IRMS use, quality control and trouble shooting. Instruction of visiting students, researchers and technicians in sample preparation of bioapatites, collagen extraction. Teaching wet chemistry techniques and laboratory safety to visiting students without prior laboratory experience. Introduction to laboratory health and safety regulations and safe working practices.

- 2017 Laboratory instruction and supervision of 3-month placement PhD student Jeanne Marie Geiling (University of Cantabria); Instruction in laboratory protocols, TC/EA-IRMS measurements, stable isotope data processing and quality control. Assisting with interpretation of stable isotope results and giving feedback on dissertation chapters

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Academic and Institute Service

2018 PhD representative of the Department of Human Evolution, Max-Planck-Institute for Evolutionary Anthropology, Leipzig

Peer Reviewer

Journal Articles: Rapid Communications in Mass Spectrometry, Journal of Archaeological Science, Journal of Archaeological Science: Reports, Scientific Reports, Quaternary International, PlosOne, Archaeological and Anthropological Sciences, International Journal of Osteoarchaeology, Environmental Archaeology, Journal of Asian Earth Sciences, Ecology and Evolution, Humanities and Social Sciences Communications

Grants: The Leakey Foundation

Symposia Organised

2018 Co-organiser 'Gender Equality Symposium', Max-Planck-Institute for Evolutionary Anthropology, Leipzig. 2-day programme of invited lectures and workshops
Designing symposium programme, acquiring internal funding, inviting speakers, practical organisation

Excavations and Prospection Fieldwork

08/2022	El Salt, Middle Palaeolithic rock shelter (1 week) Site direction: Carolina Mallol (University of La Laguna), Cristo Manuel Hernández Gómez (University of La Laguna)
07/2022	Pech de L'Aze IV, micoreexcavation of sediment blocks, Middle Palaeolithic (3 weeks) Site direction: Vera Aldeias (ICArEHB), Paul Goldberg (University of Tübingen), Shannon McPherron (MPI EVA), Deborah Olzewski (University of Pennsylvania), Dennis Sandgathe (SFU) and the late Harold Dibble
08/2021	Pech de L'Aze IV, micoreexcavation of sediment blocks, Middle Palaeolithic (2 weeks) Site direction: Vera Aldeias (ICArEHB), Paul Goldberg (University of Tübingen), Shannon McPherron (MPI EVA), Deborah Olzewski (University of Pennsylvania), Dennis Sandgathe (SFU) and the late Harold Dibble
10/2019	'Ain Difla, Jordan, Initial Upper Palaeolithic rock shelter (10 days) Site direction: Zejlko Rezek (MPI-EVA)
03/2019	Lichtenberg, Germany, Middle Palaeolithic open air site (1 week) Site direction: Marcel Weiß (FAU Erlangen), Michael Hein (MPI-EVA)
07/2017	Ranis Ilsehöhle, Germany, Middle to Upper Palaeolithic cave site (2 weeks) Site direction: Marcel Weiß (FAU Erlangen), Shannon McPherron (MP-EVA)
03/2016	Sharara, Jordan, Prepottery Neolithic A settlement site (3 weeks) Site direction: Cheryl Makarewicz (CAU Kiel), Bill Finlayson (Oxford Brookes University)

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04/2014	Beidha, Jordan, Prepottery Neolithic B settlement site (2 weeks) Site direction: Cheryl Makarewicz (CAU Kiel), Bill Finlayson (Oxford Brookes University)
02/2014	El-Hemmeh, Jordan, Prepottery Neolithic A settlement site (5 weeks) Site direction: Cheryl Makarewicz (CAU Kiel)
09/2013	Borchen-Gellinghausen, Germany, Iron Age fortification (2.5 weeks) Site direction: Alexandra Stiehl (Johannes-Gutenberg-University Mainz)
07/2013	Geomagnetikprospektion Steinförde, Germany (1 week) Site direction: Christoph Rinne (CAU Kiel)
08/2012	Wangels LA 69, Germany, Early Neolithic long barrow (4 weeks) Site direction: Jan-Piet Brozio (CAU Kiel)
02/2012	Feldbegehung Lüdelsen, Salzwedel und Haldensleben, Germany (2 weeks) Site direction: Carsten Mischka (FAU Erlangen), Johannes Müller (CAU Kiel)
09/2011	Ankum, Lkr. Osnabrück, Early Medieval fortress church (2 weeks) Site direction: Daniel Lau (Stadt und Kreisarchäologie Osnabrück)
07/2008	La Salle, Frankreich, Gallo-roman quarry „Les Fossottes“ (2 weeks) Site direction: Virginie Farget (Université de Paris 1)

Professional Society Membership

European Society for the Study of Human Evolution (ESHE)

European Association of Archaeologists (EAA)

German Chemical Society (Gesellschaft Deutscher Chemiker, GdCh)