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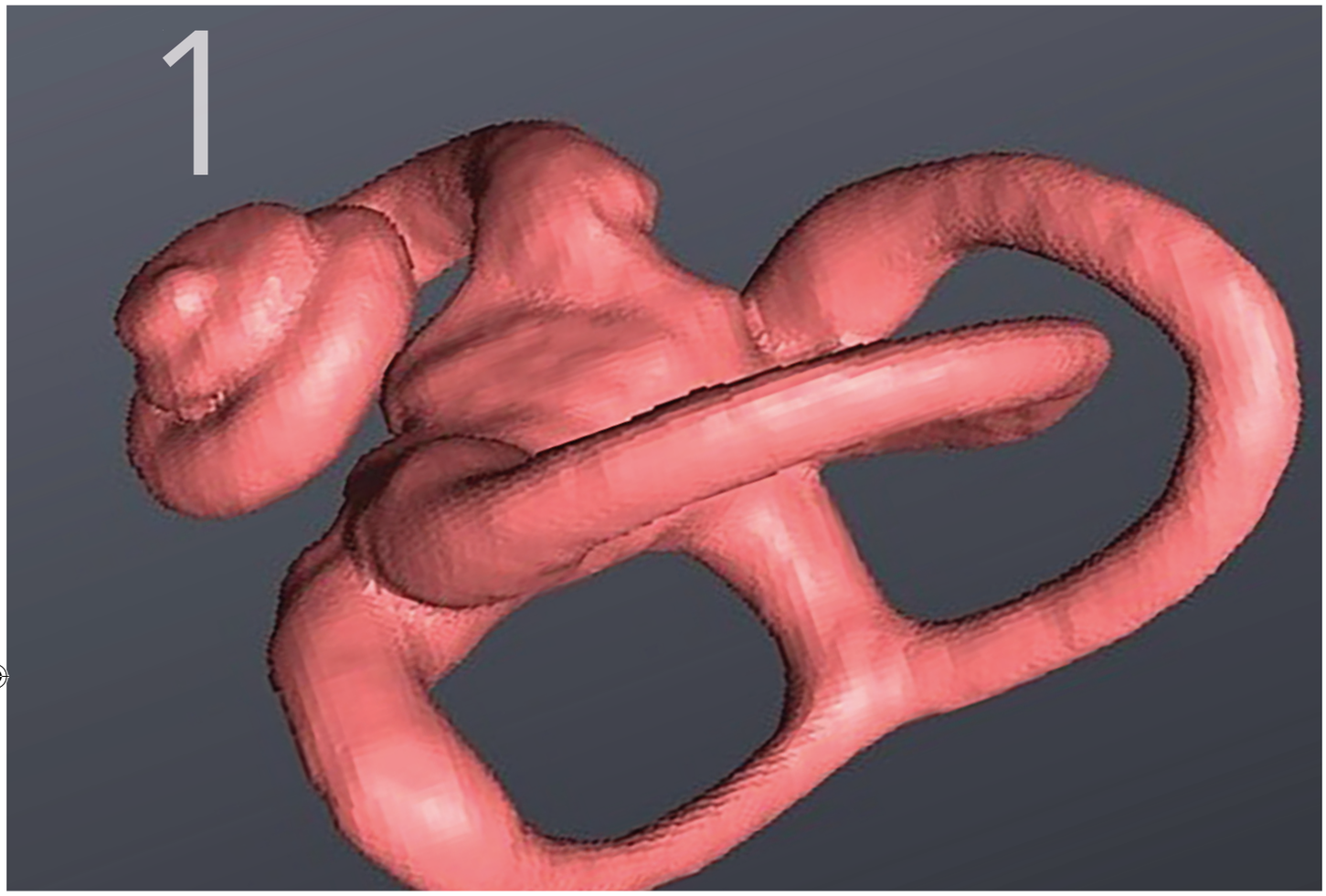
Review 2025 and Structure of the KLI



"The KLI combines integrative theoretical enterprises, interdisciplinary workshops, and international vision in an inspired setting, [...] adapted to become a veritable scholar´s paradise."

D. Kimbrough Oller
University of Memphis

1.1 The Year in Review

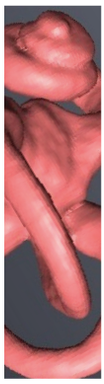
The year 2025 was a very prolific year for the KLI. With 14 writing-up (predoc) fellows, 12 postdoc fellows, 7 visiting fellows, and 3 fellows with external funding, this was an all-time record in the number of people at the KLI. We held two Altenberg Workshops, one on the legacy of Conrad Waddington in modern biology, and one on the measurement of development and evolution of organismal form. With more than 50 participants, the latter was one of the biggest ever held at the KLI. We also organized the symposium "What is Theoretical Biology?" to celebrate the 100th anniversary of Rupert Riedl, one of the founders of the KLI. Finally, we hosted the focus group on Urban EvoDevo, a truly interdisciplinary endeavor to apply evolutionary theory to urban growth.

Our journal, Evolutionary Theory, experienced a major transition. Kevin Lala, Professor of Behavioral and Evolutionary Biology at the University of St Andrews and External Fellow of the KLI, followed Stuart Newman as Editor-in-Chief. We look forward to welcoming Kevin more regularly at the KLI, and I deeply thank Stuart for his invaluable contributions to the journal. We were also able to hire the biologist and cognitive scientist Elisabeth Zimmerman as managing editor of the journal and communications officer of the KLI.

As our largest infrastructure project, we have begun the construction of two guest apartments at the KLI to accommodate even more visitors. The first guests will stay there in the summer of 2026.

I am very grateful to the KLI team, Barbara Fischer, Gerd Müller, Isabella Sarto-Jackson, Christina Villegas, Maria Yurdakul, and Elisabeth Zimmermann for running the KLI so smoothly and successfully. I am also much obliged to the members of the KLI Foundation, the Board of Directors, and the Scientific Advisory Board for their contributions to the continued success of the Institute.

Philipp Mitteroecker
President



1.2 The KLI

The KLI is an international center for theoretical studies in the life sciences. The institute commits itself to the formulation, analysis, and integration of biological theories as well as the investigation of their scientific and cultural consequences. The thematic focus is on evolutionary biology, developmental biology, and cognition. The KLI supports interdisciplinary research projects in these areas that aim at generating models of living systems or meta-theoretical constructions of historical, philosophical, or cultural aspects of biological theories. Research at the KLI is supported by fellowships in different categories; granting decisions are based on international peer review.

The KLI also pursues its objectives by organizing international workshops, summer schools, and colloquia, and by publishing a scientific journal and a book series.

1.3 Organization of the KLI

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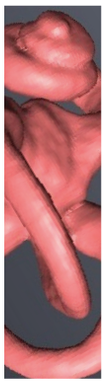

6 External Faculty

PROF. DR. EHAB ABOUHEIF
Zhejiang University, Hangzhou, Zhejiang

PROF. DR. MARTA BERTOLASO
University Campus Bio-Medico of Rome

PROF. DR. MARKUS BASTIR
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Yale University, New Haven, CT
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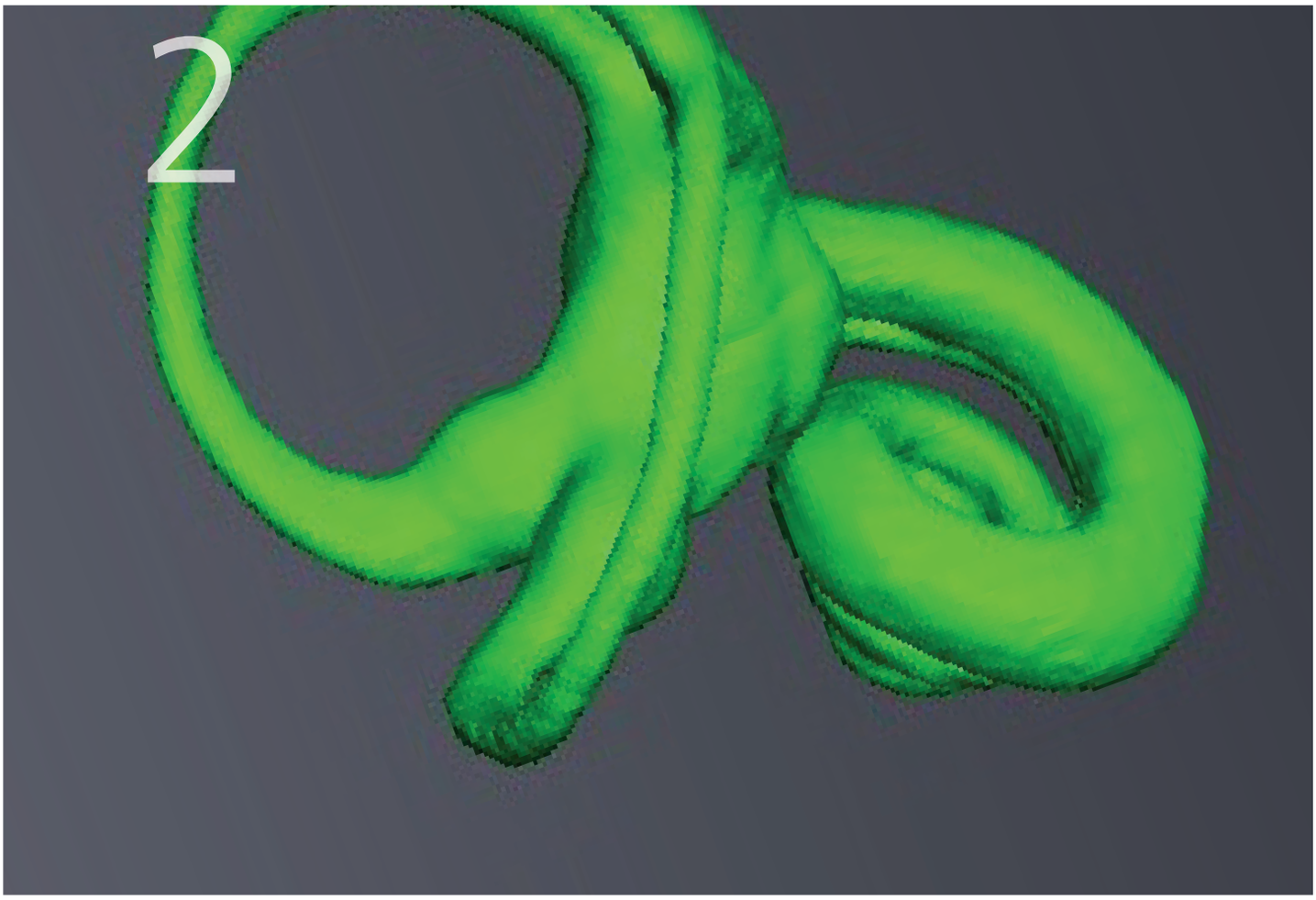
Medical University of Vienna

Scientific Projects



The KLI offers different types of fellowships for students, post-docs, and visiting scholars in the area of theoretical biology for a period of a few weeks up to two years. All project applications are subjected to an international review process.

2.1 Applications

In 2025, the KLI received a total of 49 applications for fellowships in residence, 5 of these were granted for 2025 or 2026.
In addition, 16 scholars applied for visiting fellowships in 2025 of which 9 were granted.

	applied	granted
Writing-Up Fellowships	15	3
Postdoctoral Fellowships & Senior Fellowships	34	2
Visiting Fellowships	16	9

2.2 Writing-Up Fellowships

Saudat ALISHAYEVA
(September 2025 – March 2026)

Saudat Alishayeva grew up in Atyrau, Kazakhstan, and later moved to Istanbul for her undergraduate studies in molecular biology and bioinformatics. During her time in Istanbul, she has fond memories of exploring the library at Barbaros Boulevard, where she was fortunate to discover The Serengeti Rules by Sean B. Carroll, a book recommended by her academic advisor. This book sparked her fascination with evolvability and adaptation, setting the stage for her future studies.
She went on to become a student in the MEME program (Erasmus Mundus Master's in Evolution), conducting research at LMU Munich, the University of Montpellier, and Harvard University. At LMU, she worked on coral regeneration using single-cell transcriptomics. Her first

master's thesis, completed in collaboration with the Lemaire and Robinson-Rechavi groups, focused on using machine learning to detect positive selection on developmental enhancers in ascidians. At Harvard, she explored the connections between behavioral variability and chromatin in fruit flies.
Since October 2022, she has been pursuing her PhD in the Pallares Lab, where she studies how environmental stresses influence the evolution of complex traits in Drosophila melanogaster. Her work integrates genomic and phenotypic data to deepen our understanding of robustness and evolvability.

Correlational Selection in Drosophila: Balancing Robustness and Plasticity Under Stress

Organisms must strike a delicate balance between robustness, which preserves advantageous traits, and plasticity, which allows adaptation to changing environments. This balance is crucial for survival and evolution, yet our understanding of how these forces interact across multiple traits during adaptation remains incomplete. Most studies have focused on the plasticity of individual traits, overlooking the broader patterns of co-evolution under new environmental pressures. To address this gap, my research centers on analyzing the patterns of correlational selection using genomic data and morphological measurements in experimentally evolved populations of *Drosophila melanogaster*.

To explore these dynamics, I reared populations of D. *melanogaster* under control and dietary stress conditions for 30 generations. This study examines how robustness and plasticity emerge and interact at various levels — developmental, functional (flight performance), and morphological (wing shape and size) — to shape the organism's adaptability in stressful environments. A key component of this study is the assessment of fluctuating asymmetry (FA), which refers to random differences between the left and right sides of bilaterally symmetrical traits. Since these differences occur despite both sides developing from the same genetic code, FA serves as a metric of developmental noise and a sensitive indicator of an organism's ability to

maintain phenotypic integrity under stress. By integrating FA with analyses of wing morphology and flight performance, this project offers a novel approach to understanding how traits co-evolve in response to environmental challenges.

My initial findings indicate that exposure to dietary stress leads to an increase in fluctuating asymmetry in flies, suggesting a deficiency in maintaining developmental stability. However, this instability also aligns with an adaptive strategy, as the evolved populations exhibit increased variability in wing morphology, suggesting that developmental instability may serve as a mechanism for exploring broader phenotypic space in a new environment.

The interdisciplinary nature of this study, bridging ecological, genetic, and biomechanical perspectives, provides novel insights into stress resilience across different phenotypic levels. At KLI, I will focus on integrating multivariate quantitative genetics with genomic data to explore the dynamic shifts in trait correlations during adaptation. This approach will not only deepen our understanding of how traits co-evolve but also shed light on the speed and nature of morphological evolution. The findings from this research have broad implications for evolutionary biology, offering new perspectives on how organisms balance stability and flexibility to thrive in changing environments. By elucidating these mechanisms, this study will contribute to a more comprehensive understanding of the adaptive strategies that organisms employ in response to environmental stressors.

Erica CALABRETTA
(October 2025 – April 2026)

Erica Calabretta is currently pursuing a PhD in Biology at the University of Veterinary Medicine in Vienna. Her research focuses on the migration ecology and physiology of long-distance migratory bird species at a key stopover site in the Central Mediterranean. She investigates how environmental conditions at

the pre-breeding grounds and during long sea crossings influence the timing, performance, and overlap of pre-breeding migration in several trans-Saharan migratory species (i.e., birds that spend the non-breeding season over the Sahara Desert).
She holds a Bachelor's degree in Natural Sciences and a Master's degree in Ecology and Biology from the University of Rome "La Sapienza." Through her diverse international training and research experiences in Spain, the Netherlands, Germany, Italy, and Austria, she has developed an interdisciplinary perspective, combining fieldwork, data analysis, and laboratory work with solid and versatile ecological expertise.

Birds in Two Worlds: Carry-Over Effects of Environmental and Winter Conditions on Spring Migration Ecology

Migratory birds face increasing environmental challenges across their annual cycles. Decades of research into migration ecology have shown that ecological conditions in non-breeding and stopover areas influence the time and performance of spring migration. Food quality and availability are critical for migratory birds to fuel their long journeys toward the breeding areas. Local weather conditions, particularly wind, are another essential cue for departure, especially during long water crossings. Thus, conditions at non-breeding grounds can have carry-over effects on pre-breeding migration success. Recent studies have revealed a growing temporal overlap of multiple species in arrival at key stopover sites during migration, suggesting that co-migration may enhance survival by enabling the sharing of navigation cues and reducing the predation risk. While temporal co-occurrence at stopovers may reflect similar ecological needs, how this synchrony arises as collective responses to changing environmental conditions, triggering the formation of migratory communities, remains poorly understood.

Along the Afro-European flyway, many landbirds cross the Mediterranean Sea in a single nocturnal flight of more than 500 km, without a chance to rest or refuel. Migrants may rely on high energy reserves and select meteorological conditions before departing. However, less is known about the effects of the weather experienced over the sea route.

Building on previous fellowship projects (DOC ÖAW and Marietta Blau OeAD), this research aims to integrate empirical work into a novel conceptual framework viewing spring migration as both an individual and a community ecological process. The main question is investigating how non-breeding ecology in sub-Saharan areas and weather conditions experienced while crossing the sea influence the timing, physiology and co-occurrence of several long-distance migratory bird species during pre-breeding migration. In the long run, this project will reveal how migratory birds adapt to environmental instability, providing essential insights for developing conservation strategies for declining species.

Henry CAMARILLO
(September 2025 – March 2026)

Henry Camarillo is a 6th-year PhD candidate in the Department of Ecology & Evolutionary Biology at Yale University. During his dissertation, he has been trained in phylogenetic comparative methods and has succesfully published manuscripts displaying this skillset. In the past few years, he has also been trained in how to obtain 3D morphological data from CT and diceCT scans and has used this skill set to collect the data from his dissertation. He will use the scans collected and implement his knowledge in phylogenetic comparative methods to look at changes to the evolutionary dynamics of morphological evolution.

Evolutionary Anatomy of Lungless Salamanders

Henry´s dissertation research focuses on discovering how shifts in life cycle strategy and feeding mode shape the tempo and mode of morphological evolution in the feeding apparatus of lungless salamanders. He uses CT scans to compare differences in cranial and jaw anatomy between salamander lineages that display different life cycle strategies and feeding modes. He uses diceCT

to investigate the soft-tissue anatomy in a clade of paedomorphic salamanders to see if repeated shifts to subterranean environments influenced the timing of development and changes to the shape of morphological structures. These data and the results from these studies will contribute to the theoretical understanding of how 3D geometric morphometrics and the analysis of soft-tissue anatomy through diceCT can increase our understanding of evolution and development.

Marta GÓMEZ RECIO
(April 2025 – September 2025)

Marta Gómez Recio is a paleobiologist interested in the relationship between shape and function of biological structures. She is a PhD candidate in Biology at the Universidad Autónoma de Madrid and in Biomedicine and Pharmacy at the Université Libre de Bruxelles. Her research integrates motion capture techniques and 3D geometric morphometrics to study the respiratory kinematics of the human torso. Specifically, she explores how exercise and respiratory pathologies influence breathing motion, and she aims to translate these findings into a deeper understanding of the functional adaptations of the human respiratory system and its role in shaping our evolutionary history.

From Shape to Function: Evolutionary Dynamics of Human Breathing through 4D Geometric Morphometrics

The relationship between shape and function is a cutting-edge research question in biology. While it is well accepted that anatomical structures are intricately linked to their functions, the precise nature of this relationship, particularly in the context of human evolution, remains insufficiently understood. In the context of the respiratory system, the influence of torso size and shape on modern human breathing kinematics, as well as the evolution of this relationship in the hominin lineage, remains poorly understood.

To address this issue, this project proposes a novel methodological approach that combines Optoelectronic Plethysmography (OEP) with 4D Geometric Morphometrics (4DGM). The use of OEP allows the non-invasive volumetric study of breathing patterns, and thus, the breathing motion of the subjects of study is not influenced by measuring devices (such as classical spirometers). This is of vital importance in clinics to measure spontaneous breathing, but also from an evolutionary approach, which tests for a relationship between shape (of the chest wall) and function (breathing kinematics). This work is pioneer in analysing OEP results with the mathematical analysis of shape through time, with the purpose of filling a gap of knowledge in evolutionary anthropology and providing further a methodological tool of importance in clinical research.

This research will provide new insights in the importance of translational studies such as this, which develops a new methodology that can help both unravel evolutionary questions about the functional anatomy of the respiratory system and understand the mechanical principles of breathing from a clinical context.

Merin JOJI
(February 2025 – September 2025)

Merin Joji is currently pursuing her PhD from the University of Copenhagen, Denmark on Indian freshwater turtles' shell shape effect by pollution and presence of invasive turtles. She holds a Biology and Zoology Master's degree from University of Copenhagen and PSG College of Arts and Science, India respectively. Her research is focused on understanding the intricate patterns of shell shape variation in turtles, and how these variations relate to both ecological and anthropogenic factors. She employs geometric morphometric techniques, which involves the detailed analysis of 3D models of turtle and tortoise shells. By quantifying the subtle differences in shell morphology, she aims to uncover how environmental pressures, such as habitat changes, climate variations, and human activities, impacts the evo-

lution and development of shell shapes. Furthermore, her work seeks to understand how these factors contribute to the phenotypic diversity and potential adaptive strategies of Testudines across different environments. She aspires to contribute to the broader field of evolutionary biology by bringing insights into the morphological adaptations of Testudines, through this research. Her findings have the potential to impact future conservation efforts significantly since understanding the relationship between shell morphology and environmental factors can inform strategies to protect these species in a rapidly changing world. Apart from this, she actively engages in disseminating science through publishing 3D models on Sketchfab, facilitating Citizen Science projects, conducting talks, and organizing PhD day..

3D Shell Asymmetry as a Monitoring Tool for Environmental Stress in India's Freshwater Turtles

Turtles (Order Testudines) are a unique group of vertebrate animals whose bodies are enclosed inside a bony shell covered in protective scales or scutes. Over the past 220 million years, turtles have diversified from a terrestrial ancestor into aquatic, semi-aquatic, and marine habitats, today occurring on most continents, oceans, and some islands. Despite their roles as indicators of environmental quality, over half of the ~360 living turtle and tortoise species are threatened with extinction by human activities, including habitat degradation, pollution, and overexploitation. My project aims to monitor turtle health based on fluctuating asymmetry (FA), defined as random deviations in the correspondence of left-right bilateral traits. FA is known to arise through developmental disturbance, offering a sensitive biomarker to environmental stress that can lead to shell deformation.

While environmental factors are difficult to detect in preserved specimens, the first chapter of my PhD thesis results suggest that minimum level of FA in total shape, carapace and plastron, indicating that museum collections may be biased towards "ideal" turtle specimens. This suggests the importance of understanding the effect of environmental on living turtle

populations shell shape. Also, highly significant directional asymmetry (DA) suggests that Testudines tend to walk faster using their preferred side. Lateralities have been previously documented in turtles living in aquatic, and terrestrial habitates. My study on museum specimens confirms that whole shell, carapace and plastron of 12 families in order Testudines shows highly significant DA and significance of FA.

In my second chapter I aim to have a descriptive study on the ontogenic allometry of Melanochelys trijuga, where we understand the changes in scute patterns in 128 individuals scanned live using Artec space spider. This study will examine the developmental trajectories of shell scute patterns across different age cohorts, employing advanced geometric morphometric techniques to quantify and characterize shape transformations during the species' developmental progression. By meticulously documenting morphological changes, I aim to establish a robust baseline understanding of natural developmental variations in Indian pond turtle shell shape. Furthermore, this study will explore potential environmental influences on turtle morphological plasticity, potentially elucidating the intricate relationships between developmental processes and ecological effects.

The third chapter will be correlating different environmental and individual health factors with fluctuating asymmetry of ontogenic Melanochelys trijuga landmark data. I will explore between environmental stressors, individual physiological parameters, and fluctuating asymmetry (FA) in ontogenetic Melanochelys trijuga populations. This multifaceted approach of integrating biomechanical, ecological, and physiological perspectives to comprehensively evaluate how environmental conditions potentially modulate developmental symmetry, with particular emphasis on understanding the complex relationships between asymmetry patterns and organismal fitness.

The fourth chapter will be a citizen science project about measuring the presence and abundance of invasive and native Indian freshwater turtles by water eDNA method. Species-specific primers will help to identify 6 Indian freshwater turtles and if there is co-existence with red-eared slider and invasive turtle. This research will help a critical intervention in conservation biology, potentially informing evidence-based policy interventions regarding invasive species management, wildlife trade

regulations, and ecosystem preservation strategies. Moreover, the integrated citizen science methodology not only generates rigorous scientific data but simultaneously serves as an innovative environmental education platform, fostering public engagement, and ecological awareness. Together, these four chapters will contribute significantly to the knowledge of turtle biology and provide critical information for the conservation of these ecologically important species. By integrating morphological study and environmental DNA surveys, my dissertation aims to understand factors influencing freshwater turtle populations and inform conservation strategies aimed at preserving their populations, both in India and globally.

Ben KAWAM
(May 2025 – December 2024)

Ben Kawam is a PhD student in behavioural ecology at the German Primate Center, as a member of the research group of Julia Ostner & Oliver Schülke. He is also an external researcher in the Department of Human Behavior, Ecology and Culture, at the Max Planck Institute for Evolutionary Anthropology and a Writing-Up Fellow at the KLI.
Ben is broadly interested in building bridges between theory and data to explain variation in animal behaviour. In his PhD research, he is (trying to) build a causal framework for the drivers of animal social network structure, using probabilistic and causal modelling.

Causal Inference for Animal Social Networks

Many of the scientific and societal challenges of the 21st century involve the study of networks, whether ecological, biochemical, or social. Behavioural ecologists focus on social networks, and inquire about the causes and consequence of their structure. To do this, they formulate theoretical models — whether verbally or formally — proposing causal mechanisms that explain the observed network structure. These models can then be tested

empirically, by assessing the evidence for the causal mechanisms of interest using social network data collected in wild or captive populations of animals. This inferential task is, however, extremely challenging. Observed social interactions are often noisy, and the causal effects of interest can be confounded by biological factors, or by the sampling process. Recent research has highlighted that common methods in the field (e.g., network permutations, covariate selection based on predictive criteria) fail to effectively address these challenges, often leading to wrong conclusions. More broadly, these issues reflect a growing disconnect between theoretical and empirical research in the field. For my doctoral thesis, I propose an alternative inferential framework. My framework integrates tools from the field of formal causal inference (e.g., Directed Acyclic graphs) and probabilistic modelling (e.g., Bayesian multilevel models), while drawing on models from network science and behavioural ecology. I provide a workflow for empiricists to first translate their theoretical domain expertise into formal assumptions, and second, derive and evaluate statistical estimators from these assumptions. In doing so, I demonstrate how these methods address the challenges posed by the inherent noise and confounding factors in animal social network analysis, and explain why causal inference in such systems cannot be achieved without an explicit theoretical grounding. More generally, my framework lays the groundwork for a stronger, more transparent, and more rigorous bridge between theoretical and empirical research in behavioural ecology, as well as in the broader context of the social, ecological and evolutionary sciences.

Onerva KIIANLINNA
(October 2024 – March 2025)

Onerva Kiianlinna is a late-stage doctoral student at the Doctoral Programme in Philosophy, Arts and Society, University of Helsinki. Her PhD research project "Aesthetic Judging in Contemporary Evolutionary Aesthetics" has been funded by The Finnish Academy of

Science and Letters (a three-year grant in 2020–2022) and Alfred Kordelin Foundation (a one-year grant in 2023). Onerva's research interests lie in evolutionary aesthetics, and more generally, in the relationship between philosophical and empirical aesthetics. Recently, her research has expanded towards aesthetics of technology and everyday urban experience. Onerva is the vice president of The Finnnish Society for Aesthetics, secretary of The Nordic Society for Aesthetics, and co-author of the newsletter at The European Society for Aesthetics.

Aesthetic Judging in Contemporary Evolutionary Aesthetics

In my dissertation, I examine the human capability to form aesthetic judgments, such as "x is beautiful". I do it from the viewpoint of contemporary evolutionary aesthetics and propose a way to grasp the concept of aesthetic judging tailored for this field.

Aesthetic judgment is one of the core concepts in philosophical aesthetics. It is common for evolutionary aestheticians to employ it without positioning their research in relation to the philosophical accounts. The focus has been on different instances of perceiving aesthetic value, but the question of how aesthetic value is – and can be – perceived has remained under the radar. This is problematic since taking something as an instance of aesthetic judgment depends on the way aesthetic judging is conceptualized. Shedding light on what is meant with aesthetic judging clarifies what evolutionary aesthetics explains as well as gives tools to evaluate its research outcomes and formulate future research questions.

The objective of this dissertation is to provide perspectives on how the act of aesthetic judging could and should be understood in contemporary evolutionary aesthetics. Rather than providing a general definition as an answer to the question of what aesthetic judging is, I focus on how aesthetic judging functions in relation to the general functioning of the aesthetic agent (person forming aesthetic judgments). Doing so, I position myself within the proximate evolutionary level asking causal "how questions" about perceiving aesthetic value.

My results presented in five independent articles support the following claims:

The field of evolutionary aesthetics is moving towards proximate level explanations (article I).

From the third-person perspective, aesthetic judging functions as an interface – an indirect information provider – between aesthetic experience and an observer (article II).

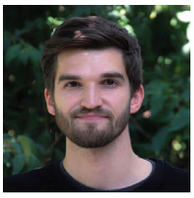
From the first-person perspective and looking at the behavior of aesthetic judging, aesthetic judging should be seen as metacognitive activity (at least second-order inference) rather than a non-interpretational reflex (article III).

Looking at the cognitive mechanisms at play, aesthetic judging does not necessarily rely on innate traits even if it was considered universally human (article IV).

An explanation of (a) how an aesthetic agent making aesthetic judgments actually functions and (b) how an aesthetic agent can potentially function that way constitute different levels of abstraction rather than competing same-level explanations (article V).

The results suggest that aesthetic judging should be seen as a plastically (or domain-generally) realized functional module or collection of modules. Modularity of aesthetic judging allows seeing aesthetic judging as an activity but keeping the concept open enough to accommodate different cultural ways in which it can be realized as well as different contexts within which an individual can employ it.

This dissertation is, to my knowledge, the first attempt to clarify the concept aesthetic judging in contemporary evolutionary aesthetics. Used here as a functional rather than an empirical concept, it calls for philosophical analysis tailored for evolutionary aesthetics specifically, where scholars operate back and forth philosophical and empirical explanations. I defend the usefulness of terminology of philosophical aesthetics for the field of evolutionary aesthetics, provide an up-to-date functionalist account of the concept aesthetic judging, and call for further exchange between traditional philosophical and more empirically informed aesthetics.



Paul KNABL
(February 2025 – September 2025)

Paul Knabl holds a Master's degree in Genetics and Developmental Biology of the University of Vienna. He is currently a PhD student in the Doctoral School of Ecology and Evolution (VDSEE) at the University of Vienna where he works at the Department of Neuroscience and Developmental Biology. He is also a Lecturer in Experimental Developmental Biology at the University of Vienna.

Developmental Roles of BMP Signaling in Cnidaria

Components of Bone Morphogenetic Protein (BMP) signaling are highly conserved in the early diverging phylum Cnidaria, the sister clade of Bilateria. Thus far, cnidarian BMP signaling has mostly been studied in Anthozoa (sea anemones and corals), where a gradient of BMP signaling patterns their secondary, "directive" body axis, similar to dorsal-ventral axis patterning in Bilateria. In contrast, all cnidarians within Medusozoa (jellyfish) lack the directive axis, yet the entire intracellular BMP signaling machinery remains present, both in Anthozoa and Medusozoa, suggesting that there are yet unknown functions of BMP signals that are unrelated to axial patterning but indispensable for the survival of these animals.

To unravel the roles of cnidarian BMP signaling unrelated to axis patterning, we generated a morphological atlas of the BMP signaling activity in the adult polyp of the sea anemone Nematostella using an antibody against its effector, pSMAD1/5. BMP signaling was most prominent in the neuro-muscular regions of the so-called mesenteries – the folds of the gut epithelium. Combining the pharmacological attenuation of BMP activity with tissue-specific RNA-Seq, we showed that BMP signaling mostly controls developmental regulators (transcription factors, signaling molecules etc.), including many neuronal genes. Utilizing transgenic reporter lines, we discovered that BMP signaling partially overlaps with neuronal populations of the mesentery, including soxB2(+) progenitors expressing and their differentiated elav(+)/nanos1(+) progenies. Strikingly, another

neuronal population expressing prdm14d never displayed active BMP signaling, suggesting BMP signaling marks only specific neuronal subpopulations. Similarly, we detected BMP signaling in parts of the nervous system of two Medusozoa representatives, the moon jellyfish Aurelia and box jellyfish Tripedalia.

Our findings provide new insights into pro-neural roles of BMP signaling in Anthozoa and Medusozoa. Moreover, the comparison to data from Bilateria indicates that pro-neural functions of BMP signaling might represent an ancient trait present already before the cnidarian-bilaterian split.

Nina KRAUS
(March 2025 – September 2025)

Nina Kraus is currently pursuing her PhD at the University of Vienna as part of the Vienna Doctoral School of Ecology and Evolution, under the supervision of Dr. Brian Metscher. Her research centers on how environmental factors, rather than just genetic mutations, contribute to the evolution and development of cardiac structures. Specifically, she is exploring the hypothesis that the same evolutionary mechanisms that allowed for key innovations in vertebrate heart evolution may also contribute to the susceptibility of human cardiogenesis to malformations. This builds on her Master's work, where she explored anuran heart development and contributed to publications in respected journals.
Apart from her research, she teaches courses on imaging and visualization in developmental biology, helping to train future scientists. She actively engages with the scientific community through organizing and participating in interdisciplinary journal clubs focused on computational evolutionary biology and by presenting her work at international conferences. Additionally, she is part of the doc:muv mentoring program, which supports female doctoral candidates in their career development and skill enhancement.

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Environmental Drivers of Cardiac Evolution and Development

This project investigates the evolutionary history of cardiogenesis and its implications for congenital heart diseases (CHD) in humans, applying principles from evolutionary medicine to deepen our understanding of the origins and mechanisms underlying these conditions. While some CHDs are linked to identifiable genetic defects, the majority arise from non-genetic factors, such as environmental influences, which disrupt the development of the outflow tract (OFT) of the heart. This project explores the hypothesis that the same evolutionary mechanisms that allowed for key innovations in vertebrate OFT evolution may also contribute to the susceptibility of human cardiogenesis to malformations.

I propose the Environmentally Dependent Developmental Induction model, which posits that environmental changes during key developmental stages can induce phenotypic changes without relying solely on genetic mutations. This model emphasizes the importance of extrinsic factors, such as oxygen levels, in shaping cardiac development. Experiments with chick embryos support the hypothesis that reduced oxygen availability during critical periods inhibits apoptosis in the OFT, leading to malformations similar to severe CHD in humans.

By bridging evolutionary biology and clinical research, this work aims to provide a deeper understanding of the evolutionary mechanisms underlying CHD, with potential applications in improving diagnostic tools, preventative measures, and treatment strategies. The interdisciplinary approach of this research makes it relevant to a broad audience, including evolutionary biologists, geneticists, developmental biologists, and medical professionals, particularly those specializing in cardiology.

Aleksa RATARAC
(February 2025 – August 2025)

Aleksa Ratarac is a PhD student in Isaac Salazar Ciudad's group at the Autonomous University of Barcelona and an

alumnus of University of Belgrade's Faculty of Biology. His research focuses on evolutionary developmental biology, phenotypic plasticity, and computational modeling of developmental processes. His current project integrates geometric morphometrics with a first-principles physics model of insect wing development, in attempt to explore the mechanical bases of morphological plasticity and developmental variation in general.

Fly Wing Development *in silico:* A Computational Investigation of Morphological Plasticity in Drosophila Wings

The plastic variation of insect wing shape across different environments has been thoroughly documented. However, it remains unclear which aspects of development – such as specific gene regulation, cell growth, and intercellular interactions – are influenced by the environment to produce this variation. The project aims to address this question by combining in-silico developmental modeling with empirical morphometric analysis of the Drosophila wing.

Our group previously constructed a two-dimensional apical vertex model simulating Drosophila wing development. The model is based on the assumption that all morphogenetic movements can be explained by a finite set of behaviors and properties of cells and extracellular structures. Early model versions successfully reproduced the broad developmental dynamics of wild-type wing formation, as well as some distinct mutant phenotypes, solely by tuning the parameters governing the mechanical properties of cells at the tissue or system-wide level.

As part of my PhD project, I have expanded and refined this model to capture finer-scale variation (such as population-level differences), and to simulate all experimentally observable phases of the pupal stage. To assess population-level variation, I conducted an experiment in which Drosophila lines from multiple homogeneous genetic backgrounds were raised at different temperatures and population densities. Wing morphology was characterized using landmark-based geometric morphometrics, resulting in a large dataset of imaged and digitized wings.
The project's primary objectives encompass 1) simulating the

pupal development of a representative wild-type morphology, 2) reproducing the direction and extent of experimentally observed variation through controlled parameter perturbations, and 3) interpreting these results in the context of environment-phenotype and environment-genotype-phenotype interactions. The results are expected to provide new insights into the broader principles governing environmental influences on morphogenesis, and to open the way for generating new hypotheses on how specific environmental changes drive morphological differences.n.

Wiktor ROROT
(October 2024 – March 2025)

Coming from a background in both cognitive science and philosophy, I'm primarily motivated by the (somewhat radical) perspective that cognition is a biological function that we can track across the phylogenetic history of the animals we ordinarily ascribe it to – building on the ecological and dynamic approaches to mind in philosophy and the emerging research field of basal cognition. My central research interests lie in understanding how cognition is studied across a variety of scientific disciplines, how theoretical concepts shape empirical studies, and what can we do to improve upon our current research practices. This includes also actively encouraging young empirical researchers within neuroscience to reflect upon the theoretical background and implications of their work – which is the goal of the School of Ideas in Neuroscience, a summer school I've been co-organizing annually since 2022 (https://nenckiopenlab.org/school-of-ideas/).
Practically speaking, in my work I employ the tools of digital philosophy of science to get a better sense of how researchers use central explanatory and descriptive concepts, and what these concepts actually mean in the scientific practice. In my doctoral thesis I focus on

the term "communication" which is routinely used to describe a plethora of biological processes, from signaling pathways within individual cells, all the way up to human linguistic exchanges.
I am a PhD student at the Interdisciplinary Doctoral School, University of Warsaw, where I'm supervised by Prof. Joanna Rączaszek-Leonardi (Faculty of Psychology, University of Warsaw) and Prof. Marcin Miłkowski (Institute of Philosophy and Sociology of the Polish Academy of Sciences). I have previously graduated with a Master's degree in Cognitive Science and a Bachelor's degree in Philosophy from the University of Warsaw.

Life Scale-Free Communication? An Investigation of the Use of the Concept "Communication" in Biology and Cognitive Sciences

A growing body of research within life science: molecular, developmental, and evolutionary biology, animal behavior, and cognitive sciences (represented by psychology, neuroscience, neurobiology, and cognitive science), employs the term "communication" in the descriptive and explanatory practices. Processes that are subsumed under this notion include—but are not limited to—interactions between single cells, cell ensembles, organisms of varying complexity, both unicellular and multicellular, and at times between animals and artifacts (such as computers). However, this complex role of the term "communication" in the scientific practice of biologists has hitherto received limited attention.

The current project seeks to answer the question whether the parallels that researchers draw between the linguistic and symbolic communication, and the signaling-based communication that happens in much simpler biological systems are justified, based on an empirical study of a large corpus of scientific papers from life and cognitive sciences. Overall, the project seeks to develop an empirically relevant understanding of "communication" in life science, one that allows for systematic and informative use of this term in the study of a broad variety of biological phenomena, and that can guide further research both in philosophy of science, as well as in life science itself.

Liberty SEVERS
(October 2025 – March 2026)

Liberty Severs is a philosopher and cognitive scientist, and currently finishing up her PhD at the University of Lisbon. Most recently, she carried out a fellowship at Ruhr University Bochum on agential thinking in biological and artificial agents. Her work lies at the intersection of philosophy, cognitive science, biology, and AI, with a focus on the concept of agency and how it can be studied across diverse systems, from unicellular organisms to humans and artificial agents. In particular, she is interested in the diversity of agenthood, and how various functions of agency can be organised and constrained in different ways to support adaptive behaviour. To address this question, she combines the paradigm of reinforcement learning (RL) with comparative methods, where she aims to clarify the role of modelling assumptions in the science of agency and to better understand phylogenetic variation in agential behaviour.
During her writing-up fellowship, she aims to critically assess the core assumptions of RL approaches to agency, and their compatibility with a constraint-sensitive account of agency. This allows her to critically assess the operational scope and ecological validity of RL-based accounts, and some of the strengths and limitations of RL as a model for thinking about agency more generally. Outside of her research, she is passionate about supporting grass-roots movements and more diverse research communities in academia. External to her PhD, she is a co-founder and associate researcher at Non-neural cognition research (NnCR), a member of the PPI group for Interoception and Mental Health (University of Surrey), and programme chair for the International Society of the Philosophy of the Sciences of the Mind (ISPSM).

Beyond Control: Reinforcement Learning and the Operational Foundations of Agency

Agency is a foundational yet contested concept across various subfields of philosophy, biology, cognitive science and psychology. Often, it is treated as a philosophical placeholder or intuition about whatever distinguishes purposeful behaviour from mere dynamics and passivity. However, it also operates with increasing proximity to computational approaches and methods that aim to model or approximate the continual, open-ended regulation of action that is characteristic of biological agency in dynamic environments. In my thesis, drawing on the framework of reinforcement learning (RL) and comparative methods, I attempt to test the boundaries of RL style accounts of agency, evaluating its use as a cross-species and cross-systems framework that is sensitive to different forms of control and constraint. I then turn to a more critical analysis of current RL-based approaches to agency, aiming to clarify when its models confer genuine explanations of biological behaviour, and when they function more as simplified explanatory strategies or otherwise convenient fictions.

At a high-level, RL refers to the process by which an agent learns to act through feedback, using reinforcers that signal whether outcomes are better or worse. Within the RL paradigm, there is often convergence around three core assumptions: (i) behaviour is organised around the maximisation of cumulative reward (i.e., a scalar quantity), (ii) objectives are explicit and well-defined, and (iii) control is mediated by environmental feedback (i.e., control as closed-loop adjustment). This template has helped to uncover a wide range of biological phenomena, from dopaminergic prediction errors to developmental shifts in exploration strategies, and appears to provide a blueprint for designing artificial agents capable of surpassing human performance in specific (well structured) tasks and environments. More recently, such accounts have been extended to the concept of agency, which is approximated as the ability of a system to regulate its interaction with the world so as to preserve and extend its future possibilities – a kind of "control by consequences", where behaviour is shaped by how well things go, and the shaping mechanism is explicit.

Yet, the same simplifying assumptions and parsimony that give RL its operational edge also prompt questions about its ecological validity as a framework for thinking about agency. Whilst RLs core assumptions are plausible in restricted settings, its models abstract away critical features of the messy realities of biological life, and the unique ways in which agents have evolved to be sensitive to their environmental niche. Living systems, from the seemingly "simple" to the cognitively "complex," do not simply optimise external payoffs, but can invent and revise goals and norms, and act under evolved constraints. Biological agents exhibit actions that are driven by intrinsic motivations and homeostatic needs, which, despite being approximated through various heuristics and biases, resist straightforward reduction to externally specified rewards or computations. A closer look at these asymmetries, particularly when dynamics are tied to evolutionary and developmental processes and the organisational roots of motivated behaviour in regulatory control, reveals the current scope of the RL paradigm. Its formalisms appear well suited to modelling some features of high-level human behaviour, yet unable to capture the fidelity (and generative complexity) of motivated behaviour in biological agents and their living ecologies.

A more naturalistic account requires bringing control and constraint into focus as an organising principle of agency. Here, agential behaviour is modulated by multiple, overlapping constraints, including metabolic budgets, developmental trajectories, ecological affordances, and evolutionary histories. These constraints are organised in ways that notonly determine how agents learn and decide, but also what they value and how those values change, what counts as a goal, how goals are revised, and how trade-offs are tolerated or managed. They are layered and interdependent, with physiology gating developmental plasticity, development conditioning ecological engagement, and ecology canalising evolutionary strategies. To the extent that agency can be contextually understood as the product of layered physiological, developmental, ecological, and evolutionary constraints, RL models can provide naturalistic explanations of agent-like behaviour only insofar as its abstractions align with, or approximate, a given constraint architecture. The aim of the project is thus to develop a

constraint-sensitive account of agency that clarifies the operational boundaries of RL. More generally, I aim to show how these forms of control and constraint organise the functions of agency across scales and substrates, and the utility of RL as both a computational paradigm and a lens that can be deconstructed and reassembled to better understand the comparative realities of agenthood in biological systems. The question is therefore not whether RL "gets agency right", but under what conditions the abstractions of RL can track the biological dynamics of agenthood, and when alternative frameworks are needed.

Oryan ZACKS
(August 2025 – June 2026)

Oryan Zacks completed a B.Sc. and an M.A at the Sagol School of Neuroscience at Tel Aviv University. Her M.A thesis was on the impact of imagery on human movement, which sparked her initial interest in the evolution of imagination. She has an extensive educational and speaking background, including teaching in the neuroscience program for excellent high-school students at the Davidson Institute (part of the Weizmann Institute of Science). She also taught at the EMIS international school for Israeli, Palestinian and international students, dedicated to promoting a dialogue of peace in the region. She was the initiator and teacher of a unique academic course within the Sagol School, in which students took part in shaping "the university of the future." As part of this course, the students developed an interactive study space within the university that they operated for several years (up until COVID). Before starting on her academic path, she studied in a circus school, and performed and taught dance, yoga and acrobatics for several years. During her PhD she has given several conference talks on her research, attended relevant summer schools, and has recently spent a term as a visiting student at the HPS department at Cambridge University.

The Evolution of Imagination in Mammals

Human imagination is a complex, rich and highly developed cognitive ability, constituting an important part of human experience. Nevertheless, imagination is critically understudied as such, with little systematic research addressing it directly. Approaching imagination from an evolutionary perspective, this research will address the following questions: how could such an ability evolve? Is imagination uniquely human, or is this ability more widespread across the animal kingdom? And finally, what would be the best way to approach such scientifically and philosophically difficult questions?

The aim of this project is to develop a comprehensive and coherent framework of imagination that brings together findings from the fields of animal cognition, comparative neuroscience, and philosophy. The thesis as a whole will interrogate the neural structures that enable imagination and trace their development throughout vertebrate evolution. The project that will be the focus of the fellowship is comprised of an in-depth comparative study of reptilian and mammalian brains. A central hypothesis leading this study is that the specialization of the hippocampus and neocortex in the base of the mammalian lineage led to the evolution of imaginative consciousness, as they both underwent extensive expansion and reorganization in mammalian ancestors.

An important contribution of this project will be to organize findings across vertebrate species and present a coherent, multilevel comparison of their brains. An additional contribution will be to discuss the computational capabilities attributed to mammalian brains. These are central in describing the neural basis of imaginative abilities, and there is little consideration in the literature of how they developed and how they differ (qualitatively or quantitatively) from the computational abilities of other vertebrate lineages (such as reptiles). A better understanding can emerge from considerations of which features are indeed uniquely mammalian, including plausible accounts of how these features evolved through developmental modifications and in response to ecological shifts. I believe significant progress can be made in providing a scientifically based, and philosophically tractable, description of animal imagination and its evolution.

Eva ZAFFARINI
(February 2025 – September 2025)

Eva Zaffarini is a PhD candidate at the Cumming School of Medicine of the University of Calgary, where she works in the Hallgrímsson Lab. She completed her Bachelor's degree in Biological Sciences in 2016 and her Master's degree in Biology at the University of Milan-Bicocca in 2019. Her Master thesis, completed at the University of Vienna, focused on the societal transitions that cause high rates of c-sections worldwide, and on the sexual dimorphism of chimpanzee pelvises. Her current research focuses on the genetic factors and developmental processes underlying the covariation between skull shape and pelvic shape, particularly in relation to cephalopelvic disproportion (CPD) and the evolution of childbirth.

Genotype to Phenotype Mapping of Feto-Maternal Trait Covariation: A Multivariate Approach to Understanding Cephalo-Pelvic Disproportion

Obstructed labour, a major cause of maternal and fetal mortality and morbidity, is largely attributed to Cephalo-Pelvic Disproportion (CPD), where the fetal head is too large for the maternal pelvis. I propose that investigating the genetic and developmental factors influencing morphological covariation between fetal skull and maternal pelvis could significantly advance our understanding of CPD. Using imaging, geometric morphometrics and Multivariate Genotype-Phenotype mapping, I create a comprehensive genotype-phenotype map of skull-pelvis covariation in adult mice. Additionally, I evaluate the effects of prenatal estradiol and testosterone on the covariation between fetal head and maternal pelvis. This approach challenges the traditional view of CPD, which treats maternal pelvis and fetal head as separate traits under distinct evolutionary pressures, by offering a more integrated perspective on the factors contributing to obstructed labour.

2.3 Postdoctoral Fellowships

Silvia BASANTA
(April 2025 – March 2027)

Silvia Basanta has a PhD in evolutionary and reproductive biology. She completed her doctoral studies at the University of Vienna under the supervision of Mihaela Pavlicev. In the context of the FWF-funded project "The evolution of cell-cell communication networks at the fetal-maternal interface," her thesis approaches the evolution of the luteal phase of the ovarian cycle, gestation length, embryo implantation, and invasive placentation in placental mammals. She also has a background in philosophy and has collaborated with Laura Nuño de la Rosa on how the female body has been portrayed in contemporary evolutionary biology.
In the context of her KLI fellowship, she now focuses on the emerging field of endocrinology in fin de siècle Vienna and Austria in the interwar period.

Apollonian Eros: Revisiting Sexuality and Evolutionary Thought in Vienna

How did fin-de-siècle Vienna receive, reinterpret, and integrate evolutionary theories into its previous and ongoing intellectual milieu? During my fellowship, I aim to investigate the reception and nature of evolutionary thought at the Vienna turn of the century by using sexual science as a case study. Viennese thinkers brought about the separation of reproduction and sexual functions and developed concepts such as bisexuality, sexual drive, and sex determination during a period in which sexuality became the subject of extensive research.

However, a clear account of which theories on sexuality pre-dated evolutionary reasoning and which heavily depended on it is currently lacking. An account of this should encompass not only how emergent biological thinking first influenced sexological inquiry but also the application of biological models once biology became an objective, independent branch of

science, including from teleological interpretations of sexuality to comparative frameworks that explain endocrine processes or sex determination. The topic of sexuality has often been portrayed under an interpretive paradigm of fin-de-siècle that emphasizes the so-called „inward turn" towards the individual psyche, its aestheticism, or decadence. These paradigms, which have long informed research, can be reimagined by placing sexual research and evolutionary thought within the confines of a thriving modern science. My goal of analyzing the role of sexuality in interpreting evolutionary theory thus serves a double function. By exploring the intersection of these two lines of thought, I aim to contribute to a more comprehensive understanding of evolutionary theories' societal, cultural, and scientific implications of turn-of-the-century Vienna. More generally, I want to explore further the unique character of Austrian rationality, characterized by its anti-deterministic and anti-metaphysical bent, and its potential as a new analytical frame.

Olesya BONDARENKO
(April 2024 – March 2026)

Olesya Bondarenko is a philosopher of science, specialising in philosophy of biology and philosophy of the social sciences. She received her PhD in History and Philosophy of Science from the University of Cambridge in 2024. Her philosophical interests relate to integrative biosocial research, causal evidence and explanation, and the role of ethical and political values in science. She is particularly interested in behavioural genetics and genomics and their recent integration with the social sciences (sociogenomics). Olesya has developed and taught courses in philosophy of science at the University of Vienna and Kyiv School of Economics.

Behavioral Genetics and Cultural Evolutionary Theory: An Integrative Relationship?

This project examines the relationship between behavioral genetics and cultural evolutionary theory (CET). In particular, it focuses on the recent attempts to integrate the two fields, such as the "cultural evolution of heritability" integrative proposal by Uchiyama et al. (2022). This proposal argues that perspectives on sociocultural change – especially the diffusion of cultural practices – from CET can be fruitfully applied to explain fluctuating heritability estimates of behavioral and psychological phenotypes. I aim to provide a critical examination of this proposal, pointing out its limitations, such as 1) the tension between its mechanistic aims and the use of mechanistically opaque heritability coefficients; 2) its reliance on cases that contrast with the high polygenicity and causal complexity of behavioral traits; and 3) the secondary explanatory import of cultural diffusion compared to the role of specific cultural practices themselves and their ability to interact with genetic effects on behavioural characteristics. I argue that, while an integration along the lines of "cultural evolution of heritability" may be theoretically attractive, an empirical research programme informed by the proposal is unlikely to be very fruitful, at least in the short term. Nevertheless, it raises more fundamental questions about the possibility of integration between behavioral genetics and the social sciences, the limitations of behavioural genetic methodology, and the aims of explanation itself.

Pascal HAGOLANI
(November 2025 – October 2026)

Pascal Hagolani is an evolutionary biologist with a robust computational background, focused on advancing our understanding of complex biological systems. His research specializes in developing and applying algorithms to investigate morphogenesis and evolutionary dynamics. With expertise in simulation design, high-performance com-

puting, and interdisciplinary collaboration, he addresses fundamental questions about the mechanisms driving biological diversity and complexity.

Urban Evolution

The proposed research agenda for the project focuses on three interconnected areas:
1. Developing a comparative framework between urban and biological genotype-phenotype maps (GPMs) to identify universal properties and system-specific characteristics
2. Creating computational models to investigate how cultural evolution shapes urban morphological variation, with particular attention to the interaction between cultural and physical evolution
3. Implementing novel computational methods to analyze and model urban evolutionary dynamics, validated against real-world data

This research includes conducting morphometric analysis of urban form and exploring potential phylogenetic relationships between urban form taxa.

The development of computational models allows for making very specific hypotheses about how urban morphology and organization can change, gaining insight into their variational properties, and thus in how they might evolve within different selection pressures or cultural contexts. This systematic approach, combined with the detailed information available for different cities and urban contexts, provides an excellent framework for validating our models and their potential predictions on morphological changes.

Elis JONES
(May 2024 – April 2025)

Elis Jones is a philosopher and sociologist focused on scientific practice and values in marine contexts. He is interested in using qualitative and conceptual methods to understand how values (in a broad sense) shape scientific

activity, including the influence of personal, social and scientific ideals, but also the value attributed to specific entities, particularly living ones. His BA dissertation, a part of his degree in Politics, Philosophy and Economics, offered a non-anthropocentric definition of environmental damage (i.e. a way to define environmental damage which does not require the existence of humans). His MRes in Science and Technology Studies focused on human bioengineering of corals. His PhD, based at Exeter University's Egenis Centre, focused on the value attributed to coral reefs by scientists. This work was empirical and conceptual: he interviewed coral scientists and qualitatively analysed interview data alongside scientific literature. The result was a thesis looking at key issues in coral science related to reef value: how ecological baselines (depictions of 'normal' or 'healthy' reefs) are produced; how intrinsic, instrumental and non-human forms of value interact and are incorporated into scientific activities; and how coral science itself is increasingly evaluated according to the socio-ecological conditions it produces and perpetuates. After finishing his PhD, he undertook at short project embedded in a marine biogeochemistry lab (the Betrand Lab at Dalhousie University in Canada), where he explored the concepts underlying the rapidly developing field of marine biogeochemistry, which involves the study of microbes and how they move chemical elements around in the ocean. His postdoctoral work focuses on the ecological, scientific and economic value of marine ecosystems.
His work is interdisciplinary and engaged, borrowing from philosophy, sociology, science and technology studies (STS), economics, ecology, and biogeochemistry. He has worked closely with scientists and engaged with the public, by organising, attending and speaking at events with marine and social scientists, philosophers, arts and humanities scholars, the general public, and school children. More recently, he has co-organised an international workshop, research network, podcast (titled 'Values at Sea'), and an edited journal volume to foster closer dialogues between STS, philosophy, and marine science.

Theorising the Blue Economy: Connecting Economic, Ecological, and Epistemic Value in Coral Reef Research

Coral reefs sit at the intersection of ecological, economic, social, and scientific systems: they therefore provide a perfect system for a rigorous conceptual analysis of the 'blue acceleration' and 'blue economy', terms respectively denoting the rapid expansion of economic and scientific interest in the sea, and the aim to develop more sustainable marine economic systems in the process. Reefs support a vast range of organisms, impact substantially on human wellbeing, are of considerable scientific importance, so are at the forefront of expanding scientific and economic marine interests. Yet economic values often dominate decision making. This postdoctoral project connects the scientific and ecological value of reef systems within the emerging framework of 'blue economics' to provide tools for understanding and articulating the diverse values of living systems beyond solely economic considerations, something particularly important given growing economic and ecological pressures on marine systems (the 'blue acceleration').

This project builds on my PhD work (which focused on the roles of various forms of value in coral reef science), through analysis of previously unused empirical data already gathered from interviews with coral scientists. Throughout these, scientists expressed the value of reef ecosystems in nuanced ways, providing a rich resource for understanding the value of reefs and other marine systems more comprehensively. I am interested particularly in the different ways the value of reefs are intertwined. Reefs are scientifically very valuable, for example providing records of past climates (similar to tree rings), or sites for 'natural experiments'. But reefs are also often characterised as ecologically very valuable, something often related to their complex structure, biodiversity, and roles in larger ecological processes. Using these cases, as well as concepts from the marine sciences (such as ecological functions and ecological metabolism) I hope to contribute to better understanding of how a variety of forms of value are important in sustainable human-ocean interactions.

Marina KNICKEL
(October 2022 – May 2027)

Marina Knickel was a junior researcher at the Department of Agriculture, Food and Environment of the University of Pisa and a guest researcher at Wageningen University and Baltic Studies Centre (Latvia) working in two projects: Horizon 2020 project ROBUST on rural-urban relations and Interreg project Food Pro·tec·ts in the Dutch-German cross-border region Euregio Rhein-Waal. In ROBUST, she has led a task on monitoring and evaluation of joint learning processes in 11 Living Labs. Her research interests include co-learning processes in transdisciplinary research around agri-food and rural-urban issues, science-policy-practice collaboration, and functioning of the Living Lab approach in multi-actor research projects. Currently, she is a researcher in the EU-funded PLUS Change project, hosted by the KLI.

Knowledge Integration in the Theory and Practice of Interdisciplinary and Transdisciplinary Collaboration in the Agri-Food and Social-Ecological Research: From Challenges to Opportunities

The challenges societies are facing today (e.g., climate crisis, biodiversity decline, resources depletion, pandemics) and the solutions to be developed transcend disciplinary boundaries, are multi-sector and multi-actor, connect local and global, and they are intertwined with diverse and dynamic socio-cultural and political contexts. Pursuing sustainability requires fundamental and deliberate changes in knowledge systems. In fact, integrating different kinds of knowledge and different ways of knowing is increasingly seen as a precondition for achieving sustainability.

A key feature of interdisciplinary (ID) and transdisciplinary (TD) research approaches is their aim to bridge different knowledge systems. To use and generate knowledge for solving complex real-world problems, scientists need higher-order cognitive skills when applying theories, models, concepts or data in ID and TD research. However, contributions on how to theoretically and

practically integrate different knowledge systems remain scarce and scattered and multiple inconsistencies are identified between the theory and practice of ID and TD sustainability research.

My research aims to go beyond the state-of-the-art by providing both theoretical and empirical contributions on how to enhance the integration of different knowledge systems. In doing that, I will pay particular attention to underexplored epistemological and cognitive mechanisms. This will include exploring the 'lenses' of different actors in the knowledge system and their collaborative capacity as well as examining how joint learning processes and knowledge integration can be fostered across disciplinary, cultural, and sectoral boundaries.

My research will build on a two-step iterative research design whereby theoretical and empirical explorations will be mutually reinforcing. The qualitative and quantitative data available for the analysis comprise three online surveys providing longitudinal data over 4 years and multiple interviews with key actors.

By using different methods in this two-step iterative research design, a more differentiated analysis of knowledge integration and learning processes accounting for socio-cultural context will be possible. Thanks to the novel and encompassing theoretical framing achieved in the first step, the empirical analysis is expected to contribute to shaping theory and indicating new avenues for research.

Somya MANI
(April 2024 – April 2026)

Somya Mani is a theoretical biologist. In her work to date, she has studied evolutionary transitions in genetic, cellular and multicellular systems. She received her PhD from NCBS in India, where she studied the evolution of the eukaryotic cell through mathematical modeling. She moved to do a postdoc at the Institute for Basic Science in South Korea where she explored many subjects in evolutionary biology: This is where she began to build her research on developmental evolution, and also produced the first modeling

framework for the study of de novo gene birth. In general, her work involves building mathematical models to capture evolution of biological systems using tools from physics and mathematics, particularly statistics and graph theory.
Her research at KLI will be focused on developmental evolution: Her approach is to combine insights from single cell transcriptomics data analysis with theoretical modeling in order to understand selective forces that shape developmental programs, and at a local level, shape cellular decisions to migrate, die or differentiate into other cell types.

Investigating the Origins of Directionality in Multicellular Development

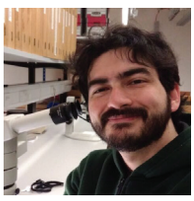
Multicellularity arose from unicellular ancestors multiple times independently in the history of life. During the evolution of multicellular lineages, multicellular and unicellular life-cycles have diverged significantly from each other: some differences are lineage specific, for example, in contrast with plant and fungal cells, animal cells are motile, and animal development involves massive cellular rearrangement. While other differences between multicellular and unicellular organisms are shared across the different multicellular lineages, and form core features of multicellularity.

This research proposal deals with a core multicellular feature: directional development. Multicellular life-cycles invariably involve developmental stages, where starting from a single celled zygote, cells divide and differentiate into distinct cell-types and give rise to a multicelled adult body. Multicellular development is directional: cell-types that arise early in development (such as embryonic cells) are not seen again in later stages (such as the adult). There are many molecular mechanisms which maintain developmental directionality, for example epigenetic mechanisms, and mechanisms based on cellular signaling. The directionality of multicellular development is in sharp contrast with unicellular cell-type switching programs which are cyclic and contain bidirectional differentiations: This contrast leads us to ask why directional development repea-

tedly arose in multicellular lineages that evolved independently from unicellular ancestors?

Our understanding of directionality of development comes piecemeal from experimental observations, and we lack a measure of the extent to which multicellular development is directional. We also do not understand how and why multicellular development has evolved to be directional. The main objectives of this research project are: (a) using the recent explosion in single cell RNA sequencing data to empirically quantify the extent to which multicellular developmental programs are directional across different multicellular lineages, and (b) theoretical modeling of developmental evolution in order to understand evolutionary pressures that drove multicellular development to become directional. Overall, this project aims to deliver a new perspective for developmental evolution, and forges a connection between research on cell fate restriction during development with questions around the origins and evolution of multicellularity.

Marcelo DOMINGOS DE SANTIS
(May 2025 – May 2027)



My fascination with natural history and biodiversity has been a driving force throughout my academic journey. This passion led me to pursue a bachelor's degree in Biology, where I developed a keen interest in Zoology and systematics. Early in my career, I focused on the taxonomy and systematics of a unique group of flies (Insecta, Diptera, Tachinidae) that are parasitoids of other insects. During my Master's and PhD, I conducted projects on the morphological phylogenetics of this group; and in my current postdoc, a molecular one.
While my background is rooted in biology, my interest in theoretical and philosophical aspects of evolutionary biology began to grow during my PhD. As cladistics is embedded with philosophical discussion, e.g., Popper and Hull being one of the acting figures, I began having a deep

interest in these matters. This new perspective led me to question the explanatory frameworks within evolutionary biology, inadvertently expanding my research interests. My theoretical background equipped me with tools to identify and propose new paths for addressing systematic problems, such as using Evo-Devo research in phylogenetics. Additionally, it allowed me to provide insights into overlooked issues in the epistemology of biology, e.g., the distinctions between historical and experimental sciences.

Explanation in Phylogenetic Systematics: When Pattern and Process Meet in the Light of Evo-Devo

Phylogenetic Systematics is the primary framework for organizing biological knowledge, focusing on the evolutionary history of organisms. Phylogenetic analysis involves both constructing an evolutionary tree (evolutionary pattern) and studying the processes that shaped this history (evolutionary processes). Currently, the field is biased towards studying patterns rather than processes, leading to logical and epistemological issues. One issue is the perception of phylogenetics as minimizing ad hoc hypotheses of homoplasy, being seen just as an error. To address these issues, I will incorporate findings from Evolutionary Developmental Biology (Evo-Devo), which explores the mechanisms linking genotype to phenotype through developmental processes. Evo-Devo's insights are crucial for phylogenetics and will be explored in this project. This research aims to answer fundamental questions in systematics: Is homoplasy more than just non-homology? Should it be considered both a pattern and a process? By exploring these questions, I will apply theoretical arguments to analyze an empirical issue: Dollo's Law, which states that a complex trait lost during evolution cannot return to its exact ancestral form, once lost. Recent phylogenetic studies have seemingly refuted this law. Therefore, I will investigate further questions such as: Are distinctions between convergence and parallelism significant for discussing Dollo's ideas? How does convergence impact phylogenetics empirically? Is there an epistemic gap in mapping morphological traits onto DNA-based phylogenetic trees? Overall, this project seeks to provide a new perspective on phylogenetics, emphasizing its explanatory frame-

work and reworking its goals. Innovatively, it will use Evo-Devo research to reshape our understanding of form and classification. Ultimately, the project aims to translate theoretical concepts about explanations and evolution into practical phylogenetic methods.

Ludo SCHOENMAKERS
(October 2023 – September 2025)

Ludo Schoenmakers is a philosopher and scientist who works at the interface of biology, chemistry, and philosophy. His interests include synthetic biology, origins of life, evolutionary theory, metaphilosophy, and the history of analytic philosophy. After completing a BA in philosophy and a BSc in medical biology, he obtained a MA in analytic philosophy and a MSc in molecular biology, in each case at Vrije Universiteit Amsterdam, the Netherlands. He completed his PhD in synthetic biology under supervision of Prof. Dr. Wilhelm Huck at the Department of Physical-Organic Chemistry at Radboud University, the Netherlands. His research at the KLI is focused on the applicability of evolutionary theory outside classical, organismal biology, specifically to the origin and early development of life.

The Origins of Evolution

The theory of evolution has a tremendous explanatory power when it comes to understanding the biological world, yet its basic conceptual structure appears to be fairly simple. In this light, attempts to apply evolutionary theory outside the context of classical, organismal biology – to topics such as economics, epistemology, literary theory, and many others – are hardly surprising. Yet these attempts rely on an important assumption, namely that evolutionary theory is sufficiently ontologically and epistemically domain independent to be applied to domains other than biology. That is, it relies on the assumption that even though evolutionary theory is based

entirely on biological phenomena (ontology), synthesizing fields such as population genetics, paleontology, geology, ecology, molecular biology, and the like (epistemology), this nevertheless does not restrict its application to other domains.

If we want to understand whether and how evolutionary theory can be applied outside biology, one strategy is to look at its application to an ontologically and epistemically closely neighboring domain. One such domain is the emergence and early development of life as studied within Origins of Life (OoL) and synthetic biology research. In both of these fields, complex molecular systems ranging from autocatalytic reaction networks to minimal protocells are routinely described in terms of evolution, selection, heredity, and others. This raises the question whether this use of language is merely metaphorical, or if it is indicative of the use of actual evolutionary concepts in explaining and understanding the early, chemical emergence and development of life on Earth. More generally, it raises the question what constitutes the lower limit of evolutionary theory in terms of the scale and complexity of living (or life-like) entities.

Thus, in this project, the following question takes center stage: How can evolutionary theory be applied to the prebiological emergence and development of life? Answering this questions requires answering three further questions, namely: (i) What constitutes the proverbial hard core of contemporary evolutionary theory? (ii) How should we conceptualize the prebiological emergence and development of early life? (iii) In what way, if at all, can contemporary evolutionary theory be applied to this development?

Due to its strongly interdisciplinary character, the relevance of this project is threefold. First, it allows us to get clearer on the nature of evolutionary theory at the early stages of life, as there must have been some point during the transition from prebiotic chemistry to cellular life at which evolutionary theory began to apply. Second, it allows us to understand how contemporary scientists working on early life use evolutionary language to describe their work – metaphorically or otherwise. Third, an analysis of the application of evolutionary theory to early life research potentially allows valuable crosspollination, where evolutionary theory is modified by insights from early life research and vice versa.

2.4 Senior Fellowships

Mauricio GONZALEZ-FORERO
(June 2025 – May 2027)

Mauricio Gonzalez-Forero is interested in developing mathematical theory to address major biological questions. Some of the questions he has addressed include why did the human brain size evolve, how does development affect evolution, what caused major evolutionary transitions, and what is a species? In these pursuits, he has obtained mathematical tools to integrate development and evolution, to model human brain size evolution, and to predict how dynamical systems respond to intervention. His work has found that the human brain size can evolve because of ecology and culture rather than sociality, that brain size may be mechanistically related to cognitive ability by a simple equation, that development plays major evolutionary roles, that eusociality can evolve from ancestral conflict that becomes a kin mutualism, and that species may be overlapping.
He finished his undergraduate degree in Biology in 2006 at the University of Antioquia, in Medellín, Colombia, where he is originally from. He finished his PhD in Ecology and Evolutionary Biology in 2013 at the University of Tennessee, Knoxville, in the USA, with Sergey Gavrilets as supervisor. He then did a postdoc until 2016 at the University of Lausanne, Switzerland, with Laurent Lehmann as supervisor. He subsequently obtained a Marie Skłodowska-Curie Fellowship, held until 2018 at the University of St Andrews, UK, with Andy Gardner as supervisor. He remained in St Andrews as a postdoc until 2024, with Andy Gardner as supervisor.

Advancing a Mathematical Theory Integrating Development and Evolution

Development and evolution are two fundamental biological processes. While development is the process of construction of the phenotype over life, evolution is the process of change in the genetic and phenotypic composition of the population over generations. However, a longstanding challenge is to

mathematically describe simultaneously development and evolution. For instance, quantitative genetics is a prevalent mathematical theory used to describe evolution but considers development as the regression of phenotype on genotype without characterizing how such regression evolves. Consequently, quantitative genetics is said to apply only for short evolutionary timescales, over which such regression coefficients describing development would remain relatively unchanged. Quantitative genetics becomes less suitable in long evolutionary timescales as these regression coefficients evolve. Therefore, to describe long-term evolution, it is necessary to develop mathematical theories that integrate development and evolution, in the sense that they describe how the coefficients describing development evolve.

I have formulated a mathematical integration of development and evolution, which I call evo-devo dynamics. Previous quantitative genetics theory implied that development affects evolution by generating genetic covariation between traits, which diverts evolution on the fitness landscape from the direction of steepest fitness increase. At most, this effect can only shift evolution from one fitness peak to another, but the ultimate evolutionary outcome is a local fitness peak that is solely defined by selection, that is, the fitness landscape. In this sense, this classical theory entails that development plays a minor evolutionary role as the outcome is defined only by selection. My evo-devo dynamics formulation finds that the situation is different when the evolution of development is considered. Evo-devo dynamics finds that the long-term evolution of the phenotype requires tracking the evolution of the underlying genotype, which is not done in quantitative genetics. Doing so entails that evolution can only proceed along a path on the fitness landscape where the relationship between the genotype and phenotype holds. Consequently, evolution converges to path peaks rather than landscape peaks as traditionally assumed. Since path peaks are defined both by selection and development, evo-devo dynamics finds that development plays a major evolutionary role in the sense that development and evolution co-define the evolutionary outcomes.

However, evo-devo dynamics remains of limited scope as it assumes simplified genetics (particularly, continuous rather

than discrete genotypic traits), deterministic development, and a single sex.

In this fellowship, I will develop further the mathematical theory of evo-devo dynamics. I will extend the theory to allow for more realistic genetics (discrete genotypic traits), stochastic development (due to both developmental and environmental noise), and two sexes. These extensions aim to answer how development affects evolution under discrete genotypes and stochastic and sex-specific development. These extensions have applications to understand extra-genetic-genetic co-evolution, to bring the theory to genetic data, and to model sex-specific complex phenotype evolution.

Anne LE MAÎTRE
(February 2024 – March 2026)

Trained in natural sciences, I completed a Master's in Paleontology at the Universities of Poitiers and Montpellier, as well as a Master's in Education in Biology and Geology at the École Normale Supérieure of Lyon, France. I did my doctoral degree on the adaptation and phylogeny of the inner ear in extant and fossil primates at the Université de Poitiers, where I also taught Geology and Plant Biology for three years. In relation to these activities, I have participated to paleontological excavations in Myanmar, Greece and France. Since 2017, I joined the department of theoretical biology at the University of Vienna, Austria, to work on the evolutionary mechanisms underlying morphological variation from an empirical perspective, always rooted in a theoretical framework. My research at the KLI is focussed on the evolvability of the inner and middle ear from a macroevolutionary point of view, and its role in the adaptive radiation of mammals.
My work is at the crossroads of evolutionary biology, palaeontology and biological anthropology. I am also interested in the history of these disciplines and the relationships between science and society. In parallel to my research activities, I am active in diverse initiatives to promote equity, justice and democracy in research institutions and in the

society. I am a board member of the Société d'Anthropologie de Paris, as well as a member of the editorial committee of its journal, the BMSAP.

Evolvability of the Mammalian Ear: A Macroevolutionary Approach

The vertebrate ear is a remarkable structure. Tightly encapsulated within the densest bone of the skeleton, it comprises the smallest elements of the vertebrate skeleton (auditory ossicles) and gives rise to several different senses: balance, posture control, gaze stabilization, and hearing. Nowhere else in the skeleton are different bones and functional units packed so close together jointly embedded in their anatomical environment, which hampers the independent evolution of the ear components. Furthermore, the inner and middle ears have already achieved their final size around birth in mammals, creating further challenges for evolutionary change.

All this makes it puzzling how mammals, a predominantly nocturnal group reliant on hearing, were able to occupy such a vast diversity of environments in the aquatic, terrestrial, subterranean, and aerial realms that require an amazing variety in hearing abilities, locomotion and posture. How could the different, tightly connected parts of the ear adapt independently to these diverse functional and environmental regimes?

Despite its similar function, the ear is composed of different bones in mammals, birds, and reptiles. In birds and reptiles, the lower jaw and its joint are composed of multiple bones, and they have a single auditory ossicle that transmits the sound. Modern mammals, by contrast, have three ossicles (malleus, incus, stapes), all of which are separate from the jaw. This evolutionary transformation of the primary jaw joint into the mammalian ear ossicles is one of the most iconic transitions in vertebrate evolution, but it is not clear why this complex transition has happened.

Recently, my colleagues and I suggested a new hypothesis: This substantial evolutionary change increased the "evolvability" (capacity for adaptive evolution) of the ear and its asso-

ciated sensory functions in mammals, in addition to any direct enhancements of mastication or hearing. The incorporation of several jaw bones into the mammalian ear has considerably increased its genetic, regulatory, and developmental complexity which, in turn, has increased the evolutionary degrees of freedom for an independent adaptation of the different functional units of the ear. Despite the tight spatial entanglement of functional ear components, the increased evolvability of the ear in mammals may have contributed to their evolutionary success and adaptive radiation in the vast diversity of ecological and behavioural niches observable today.

For my project at the KLI, I will test this hypothesis by comparing the variational properties, the macroevolutionary adaptation and the evolutionary rates of inner and middle ear shape across birds and mammals by high-resolution 3D imaging and cutting-edge multivariate biometric methods.

Enrico PETRACCA
(September 2023 – September 2025)

Enrico Petracca has been a senior fellow at KLI since September 2023. His work at the intersection of economics, "embodied" cognitive science, and the philosophy of mind aims to introduce a novel notion of rationality called "embodied rationality." In the last ten years, he has published more than 20 articles variously related to this subject in peer-reviewed journals and collective volumes, privileging strongly interdisciplinary outlets. Since 2014 he has also held an appointment as a research associate at the University of Bologna (Italy) and did research, either as a post-doc or a lecturer, at the University of Pisa (Italy), Neuchâtel (Switzerland), and the Swiss Institute in Rome. He is a devotee of the (underappreciated) art of writing academic book reviews.

Embodied Rationality: Normative and Evolutionary Foundations

This project introduces a new naturalistic view of rationality called "embodied rationality," which combines the traditional idea of bounded / ecological rationality with embodied cognition in cognitive science. Given the plurality of views within embodied cognition, I introduce four concepts of embodied rationality following an increasing order of embodied radicalism (i.e., increasing degree of rejection of information-processing assumptions): "embodied bounded rationality," "body rationality," "extended rationality," and "radical embodied rationality." The project focuses on the normative and evolutionary foundations of these concepts, showing that the more radical the view of embodied cognition gets, the more the idea of rationality it informs needs to depart from adaptationism (and embrace non-adaptationism). The project also challenges the view that evolutionary theory would be *per se* incompatible with radical embodied cognition. I show that far from being incompatible, non-adaptationism can provide new foundations for radical embodiment.

2.5 Hans Przibram Fellowships

Enrico PETRACCA
(October 2025 – September 2026)

Enrico Petracca has been a senior fellow at KLI since September 2023. His work at the intersection of economics, "embodied" cognitive science, and the philosophy of mind aims to introduce a novel notion of rationality called "embodied rationality." In the last ten years, he has published more than 20 articles variously related to this subject in peer-reviewed journals and collective volumes, privileging strongly interdisciplinary outlets.

Since 2014 he has also held an appointment as a research associate at the University of Bologna (Italy) and did research, either as a post-doc or a lecturer, at the University of Pisa (Italy), Neuchâtel (Switzerland), and the Swiss Institute in Rome. He is a devotee of the (underappreciated) art of writing academic book reviews.

Opposable Thumbs and Rules of Thumb: An Evo-Devo Perspective on Decision-Making

Opposable thumbs marked a turning point in primate, especially human evolutionary history for their disruptive improvement of manipulation abilities. This project uses the lens of "socio-cultural evo-devo" to shed light on the opposable thumb's evolutionary and developmental role beyond prehensility, focusing on its understudied contribution to human decision-making. The phrase "rule of thumb" is used in decision making to indicate any fast-and-frugal decision rule (heuristic) that individuals use beneficially in specific environments. The thumb itself can be used, out of metaphor, to make accurate spatial estimations in the wild. Here, I plan to study how opposable thumbs have morphed into rules of thumb as a process of resource reuse (exaptation). The argument is that thumbs have represented "plastic" resources in the evolution of judgment and decision-making abilities. A parallel will be drawn with the cognitive science concept of "affordance": the thumb's morphology specifies a set of potentialities/affordances for organisms engaging in decision-making tasks. At the same time, using the thumb in these tasks may affect its anatomy, behavior and use, and hence modify the affordance space. Such reciprocal form of causation will give me the chance to explore the connection between affordances and evolvability.

Ludo SCHOENMAKERS
(October 2025 – September 2026)

Ludo Schoenmakers is a philosopher and scientist who works at the interface of biology, chemistry, and philosophy. His interests include synthetic biology, origins of life, evolutionary theory, metaphilosophy, and the history of analytic philosophy. After completing a BA in philosophy and a BSc in medical biology, he obtained a MA in analytic philosophy and a MSc in molecular biology, in each case at Vrije Universiteit Amsterdam, the Netherlands. He completed his PhD in synthetic biology under supervision of Prof. Dr. Wilhelm Huck at the Department of Physical-Organic Chemistry at Radboud University, the Netherlands. His research at the KLI is focused on the applicability of evolutionary theory outside classical, organismal biology, specifically to the origin and early development of life.

Extending the Synthesis: e pluribus unum?

For the past five decades, evolutionary biology has been the stage for a persistent and ongoing scientific controversy. This controversy is about the question whether the dominant version of evolutionary theory – the modern synthesis – needs to be reformed and expanded. It has been characterized by the opposition between two broad camps: the reformists and the conventionalists. The reformists have argued that the modern synthesis has outlived its usefulness, in some important sense, and needs major reform. The conventionalists have opposed these claims, generally arguing that all empirically adequate reformist proposals can be incorporated into the modern synthesis without fundamentally changing that synthesis or our view of evolutionary theory. The result has been a continuous and complex scientific controversy about the structure and content of evolutionary theory – here called the extension controversy.

In this project, I focus on reformist thought, particularly as it was developed in palaeontology, evolutionary deve-

lopmental biology (EvoDevo), and the 'Extended Evolutionary Synthesis' (EES). My aim is to lay an important part of the foundation of an understanding-based account of the extension controversy by (i) determining the leading epistemic considerations that have motivated reformist critiques of the modern synthesis and (ii) to determine the extent to which these critiques constitute, and came to constitute, a coherent reformist position. Thus, this project consists in a comparative analysis of various phases of reformist critique of the modern synthesis, starting in the 1970s with palaeontology, followed by EvoDevo, and leading up to the EES. This comparative analysis of reformist thought relies on recent advances in integrated history and philosophy of science (&HPS) and the epistemology of scientific understanding. As such, this project should be interest to historians and philosophers of science, as well as historically minded evolutionary biologists, and the current generation of reformists.

Hari SRIDHAR
(December 2024 – March 2026)

Hari Sridhar is a senior fellow at KLI and oversees the oral history programme of the Archives at NCBS (National Centre for Biological Sciences). Hari is currently involved in two Oral History projects examining the contemporary history of conservation in India, especially in relation to the intersection of ecological knowledge and conservation practice. Over the last eight years, Hari has also led another interview project with authors of classic papers in Ecology and Evolution (https://reflectionsonpaperspast.com/). Hari's other major research interest lies in understanding the causes and consequences of heterospecific sociality, a topic he researched during his PhD and post-doctoral years at the Indian Institute of Science, Bangalore, and which he continues to stay in touch with through collaborative projects. In addition to doing research, Hari is a visiting lecturer at Azim Premji University and National Centre for Biological Sciences in Bengaluru, and has been an editor of the magazine Current Conservation.

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Scientific Practice and Conceptual Change in Evo-Devo: A View from Oral Histories around the Discipline's Foundational Papers

Although only about four decades old, Evolutionary Developmental Biology ("evo-devo" for short) has already made fundamental contributions to a wide variety of areas in biology, and today has all the markings of an established discipline. At the same time, evo-devo's highly interdisciplinary nature and its community of practitioners drawn from diverse disciplinary backgrounds means that the question "What is evo-devo?" doesn't have a singular answer. It contains a variety of research programmes, each with its own style of functioning, paradigms, model systems and culture of scientific practice.

This project is intended as a contribution to the contemporary history of evo-devo, guided by the broad question, "From its beginning, roughly 40 years ago, how did evo-devo get to where it is today, in terms of its concepts, questions, approaches, study systems and empirical and theoretical understanding?" Given the contrasting nature of evo-devo - being a recognized scientific discipline, but consisting of a diversity of independent research agendas – I believe that such a history will be valuable in itself as well as for practicing evo-devo biologists to better understand how the discipline got to where it is today, in terms of its priorities, approaches and understandings gained.

Historical research on evo-devo, till date, has mainly focused on understanding the intellectual antecedents of evo-devo and, to a lesser extent, examining the history of ideas in the discipline based primarily on published scientific papers. To my knowledge, there has been little attention paid to the history of contemporary scientific practice, along with its ideas, in evo-devo. In this project, I hope to address this gap by conducting a series of oral histories around foundational papers in evo-devo, using an approach I've developed and used extensively in an earlier oral history project in Ecology and Evolution (https://reflectionsonpaperspast.com/).

2.6 Research Assistant

Nora HEIN
(June 2024 – May 2027)

I am a student in the master's programme Organic Agricultural Systems and Agroecology at BOKU University in Vienna where I have previously obtained a master's degree in Environment and Bio-Resources Management. In the course of my training, I have come to appreciate what I believe are vital contributions that inter- and transdisciplinary perspectives can offer to better understand and shape the role of food and farming systems in sustainability transitions.
For my master thesis research, I studied elements of Positive Peace in recurring resource conflicts between agricultural communities in rural Kenya.
My current research collaboration brings together justifications for vegan food choices and structures that support or impede transitioning to veganism in DACH geographical region, with empirical data suggesting substantial demand for the recognition of more-than-human perspectives in analysing non-animal-based food systems.
At KLI, I work as a research assistant in the EU project PLUS Change, which uses a transdisciplinary perspective to investigate land use strategies and decision-making processes to address social, climate and biodiversity objectives.

PLUS Change

PLUS Change is an EU-funded Horizon project that aims to create strategies and decision-making processes for land use, addressing issues related to climate change, biodiversity, and human well-being.

The overarching goal is to generate knowledge and drive transformative change towards a sustainable world. This is

done through the production of a range of tools and interventions to shape how land use decisions are made by citizens, planners and policy makers (https://pluschange.eu/about/).

2.7 Visiting Scientists

Dean FALK
(May – June 2025)

Dean Falk is the Hale G. Smith Professor of Anthropology and a Distinguished Research Professor at Florida State University in Tallahassee, where she teaches and does research. Having trained as a physical anthropologist, Falk is interested in the evolution of the brain and the emergence of human cognitive abilities that led to language, music, analytical thinking, and warfare. She has directed collaborative research on the brains (or traces of them imprinted in fossilized skulls) of nonhuman primates, prehistoric human relatives, and recent humans including Homo floresiensis (aka "Hobbit") and Albert Einstein. In addition to numerous scientific and popular articles, Falk has written books including Braindance: Revised and Expanded Edition (2004), Finding Our Tongues: Mothers, Infants, and the Origins of Language (2009), The Fossil Chronicles: How Two Controversial Discoveries Changed Our View of Human Evolution (2011), and Geeks, Genes, and the Evolution of Asperger Syndrome (2018), which is coauthored with her "Aspie" granddaughter, Eve Penelope Schofield. Falk is currently writing a book titled The Botanic Age (University of Toronto Press, forthcoming).

Publication and Annotation of Private Letters to Hans Asperger from 1933-1949

The proposed project is to publish a volume titled Letters from the Round Table (Tafelrunde): Private Letters to Hans Asperger Before, During, and After World War II, which will provide previously unpublished correspondence of communications written to Asperger between 1933 and 1949 by members of his inner circle, his boss (Franz Hamburger), and Erwin Jekelius, a physician who later became infamous for facilitating the murders of hundreds of disabled children. The items were obtained from Asperger's private estate, which is curated by his daughter Dr. Maria Asperger Felder who is a practicing psychiatrist and one of the seven coeditors of the volume. The original correspondence, which is in German, will be provided along with English translations and annotations. Other materials will be included that illuminate the historical background.

Richard GAWNE
(September 2025)

Richard Gawne is an evolutionary developmental biologist, currently working as Curator of Natural History at the Nevada State Museum, Las Vegas. He previously held postdoctoral positions at Tufts University, and the KLI.

Wing Size and Shape as Mechanisms of Evolvability in Lepidopteran Color Patterns

The homology systems that make-up the color patterns of butterflies and moths have been extensively studied in developmental and evolutionary contexts. Yet, a case can be made that the field has been slow to advance in recent years, due to an over-emphasis on techniques borrowed from model-systems biology, and a coincident decline in the formulation of synthetic hypotheses. This project aims to demonstrate the

continued relevance of theoretical and comparative methods for color pattern research, and evolutionary developmental biology more generally. The overarching objective is to show that the growth dynamics that give rise to wing size and shape play an important role in determining the overall topology of color patterns. A key prediction is that the secretory sources that are responsible for pigmenting pattern homologs have a regular spatial positioning that is correlated with the locations of vein junctions and termini. When the arrangement of these morphological landmarks varies, pattern homologs can fuse or discretize, with no up- or down-regulation of the associated pigment synthesis pathways. The proposed 'dynamic canvas model' has the potential to advance our understanding of wing patterns by clarifying the role that physiological processes such as allometry, scaling, and growth play in their development and evolution. The study of these mechanisms will provide insight into the evolvability of insect color patterns, which in turn, could help to elucidate the conceptual and empirical basis of character evolvability in other taxa.

Kevin N. LALA
(June & October 2025)

Kevin Laland is Professor of Behavioural and Evolutionary Biology at the University of St Andrews, and prior to that held positions at UCL, UC Berkeley and Cambridge Universities. He studies animal behaviour and evolution, with a specific focus on niche construction, the extended evolutionary synthesis, and the evolution of cognition. He has published over 200 scientific articles on these topics, and been the recipient of more than £15m in grant income. He is an Elected Fellow of the Royal Society of Edinburgh and a Fellow of the Royal Society of Biology. His books include "Niche Construction: The Neglected Process in Evolution," "Sense and Nonsense: Evolutionary Perspectives on Human Behaviour" and "Social Learning: an Introduction to Mechanisms, Methods and Models."

Editorship of *Biological Theory*

To allow for the effective planning of a smooth succession of the editorship of *Biological Theory*, Kevin will be at the KLI as a visiting fellow. The fellowship will allow him both the time and an extended opportunity for detailed discussions with the KLI staff and the newly recruited managing editor of *Biological Theory*. This will not only facilitate a smooth succession of the journal editorship but also allow for protracted discussions over journal structure, article categories, composition of the editorial board, and potential innovations.

Adam LINSON

(June – August 2025)

Adam Linson is a Lecturer (Assistant Professor) in Computing & Communications at the Open University (UK). He is also Co-Director of the Innogen Institute (connecting life science innovation and policymaking), based jointly at the Open University and the University of Edinburgh. He develops neurobehavioural models of how perceptual uncertainty is resolved under stress and time pressure, in relation to impaired or enhanced cognitive flexibility. His research focus is Post-traumatic Stress Disorder (PTSD), which he studies using multiple methods that connect theoretical neurobiology, psychiatry, evolutionary ecology, and the history and philosophy of science. His work also links to other fields including cognitive science and music psychology. He was previously an Anniversary Fellow in Computing and Philosophy at the University of Stirling, a Postdoctoral Fellow at the University of Edinburgh, and a Visiting Fellow at the University of Oxford, the UCL Wellcome Centre for Human Neuroimaging, and the Konrad Lorenz Institute for Evolution and Cognition Research.

Maladaptive Threat Inference and Niche Construction: Neurobehavioral Factors in Life History

An array of co-existing mechanisms contribute to the range of reciprocal causal processes described by the Extended Evolutionary Synthesis (EES) (Laland et al., 2015). One area that is relatively well-studied is the intergenerational sharing of knowledge, part of 'cultural transmission' (Laland et al., 2000). Such cultural transmission can be mapped to neuro-cognitive and behavioural mechanisms that relate to (e.g.) communication and skill acquisition. For example, neural specialisations for learning lead to strengthened neuronal connections and enlarged cortical representations. These changes in the brain confer faster behavioural performance and lower metabolic costs on oft-repeated ('over-learned') actions. Responsive, coordinated actions are integrated in skillful individual and group activities that influence niche construction. Neurobehavioural research thus confirms the intuition that skill learning supports niche construction and is therefore an adaptive, evolutionarily stable strategy.

In addition to skill learning, there are also evolutionarily stable strategies of risk-balancing (e.g., forgone foraging vs. predation) that similarly relate to neural specialisations with behavioural consequences. A neural specialisation for rapid threat inference from (e.g.) acoustic cues such as a loud noise is also typically adaptive: a predator may growl or a tree may fall, mandating immediate flight (Linson & Friston, 2019). When loud noises subside, organisms that perceived a threat should feel safe to return, for example, for foraging or reproductive opportunities.

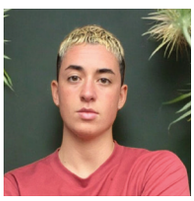
Given these specialised neural mechanisms that relate to adaptive behaviour, it is notable that there can also be contingent life history factors that can produce maladaptive interactions between these mechanisms (Linson et al., 2020). Specifically, when over-learning is combined with threat inference, it is possible for an organism to become overly risk averse and thereby abandon a suitable habitat. Even for nutrient-rich habitats where predation risk is low, life histories marked by extensive confrontations with perceived threat – for example, where there is anthropogenic noise pollution

– could lead to maladaptively risk-averse populations. These neurobehavioural effects could lead to abandonment of a suitable habitat, and thereby produce large-scale knock-on effects associated with dispersal and distribution, such as behaviourally mediated trophic cascades (Fortin et al., 2005; Kauffman et al., 2010). Further downstream effects could influence niche construction and related selection factors.

In light of inherited abilities to activate motoric threat-defence mechanisms (e.g., rapid flight or defensive limb postures related to 'fight'), how does over-learned defensive behaviour become a maladaptive habit? Pursuing this question draws together theoretical neurobiology and life history research in ecology. Moreover, this interdisciplinary approach has potential implications for adding to our understanding of factors driving niche construction within an EES framework.

The guiding hypothesis is that organisms can become stuck in a vicious circle (approximated by a dynamical attractor basin) in which over-learning of defensive action in the motor system can bias sensory disambiguation towards threat inference. This will be explored with a synthesising literature review, formal Bayesian modelling, and computational simulation.

Jules MACOME
(March 2025)



Jules Macome is a PhD student at the Department of History and Philosophy of Science at the University of Cambridge. He holds a B.A. in Philosophy from University College London and a B.Phil. in Philosophy from the University of Oxford. His research focuses on the origins of life, particularly the application of evolutionary theory as a framework for explaining abiogenesis and its potential limitations. One of his central aims is to examine how debates in evolutionary biology impact the use of evolutionary concepts in origins research, while exploring how insights from origins research can inform and clarify controversies within evolutionary biology. He recently

carried out a 6-month long research visit at the IAS-Research Centre at the University of the Basque Country. Jules is interested in the potential for unifying the processes foregrounded by the Extended Evolutionary Synthesis, and its prospects of integration with (or re-formation of) the Modern Evolutionary Synthesis. Aside from philosophy of biology, Jules is interested in genealogy, the history of evolutionary theory, its overlap with the history of eugenics, and trans/queer histories.

'Selection' Before and After the Origins of Life

The continuity thesis is a methodological heuristic which underlies research into the origins of life. It posits that (i) there is no unbridgeable gap between inorganic matter and life; and (ii) the emergence of life is a highly probable process (Fry 1995). The path from non-living matter to the first living organisms is usually construed as an evolutionary process, and the conceptual machinery of Darwinian evolution (e.g., natural selection, fitness) is often used to explain prebiotic evolution in complexity. However, it is not clear whether these concepts are used in a metaphorical way, or whether they mean something different than their meaning in the context of biology. In short, it is not clear what kind of evolutionary process characterizes abiogenesis. If it is a Darwinian evolutionary process, there is a strong continuity between life and non-life: life is just an instance of a broader Darwinian process which characterizes any self-replicating and self-maintaining system. One may then question whether Darwinian evolution can 'pick out' life, like some definitions postulate (Joyce 1994) if it also describes non-living prebiotic processes. If the driving force of abiogenesis is a different form of evolutionary process (continuity weakly construed), then what kind, how did it get started, and how did it become ‚Darwinian'?

Fry argues that the continuity thesis is required because the alternatives, creationism and the almost-miracle view (which states that life is an extremely improbable event), trump the possibility of scientifically inquiring into life's origins. However, endorsing the continuity thesis also involves limitations and contradictions. On one hand, committing to strong continuity

may take away the enigma of life's origins, instead incentivizing focus on all complexity which results from Darwinian processes. On the other hand, committing to weak continuity still involves spotting relevant discontinuities between various kinds of evolutionary processes throughout abiogenesis in order to understand the relations between them. A challenge for the continuity thesis is: how could abiogenesis have been driven by a process of evolution by natural selection, if the conditions for natural selection to increase adaptive complexity (which include not just multiplication, variation, and heredity (Maynard Smith 1986), but also low drift and high continuity (Godfrey Smith 2009)) could have hardly been realized? If not natural selection, then what kind of evolutionary dynamics drove life's emergence?

Thinking about the ontology of the continuity thesis is a segue to understanding fundamental questions in the field of origins of life. A comprehensive explanation of life's origins requires understanding the type of phenomena life is and the kind of evolutionary dynamics which could have led to its initial origins and subsequent evolution.

Ronald PLANER
(October – December 2025)

I obtained my PhD in Philosophy and Cognitive Science from Rutgers University, New Brunswick, in 2015. After that, I carried out post-doctoral research on the evolution of language at the Australian National University and the University of Melbourne. Currently, I am a Lecturer in the School of Liberal Arts at the University of Wollongong, where I also serve as Head of Post-Graduate Studies.
I research a wide variety of topics relating to behavioral, social, and cognitive evolution, especially as regards humans, hominins, and other great apes. Though I am trained as a philosopher and cognitive scientist, I have developed broad competences across a range of fields and methodologies. These include evolutionary and developmental biology, archeology, anthropology, and linguistics.

I have published 30+ journal articles and an MIT Press book on the evolution of language (with Kim Sterelny). I was recently a Research Fellow at the Words, Bones, Genes, and Tools Center at the University of Tübingen. I maintain a rich global network of research connections with world-leading experts in human evolution, culture, and language.

Cooperation, Common Knowledge, and Social Scale

Common knowledge is often integral to our ability to successfully cooperate. This includes our ability to coordinate our behaviors and effectively communicate. It is not enough for common knowledge that two or more agents know the same thing; rather, each must know that each knows this thing, etc. To see the difference, compare two individuals each seeing that their train is departing (shared individual knowledge), versus seeing that each is seeing this (common knowledge). Assuming they intend to travel together, each may remain behind in the first case (each is unsure whether the other sees the train is departing), whereas we expect both to quickly board the train the latter case. Common knowledge, or its lack, makes all the difference here.

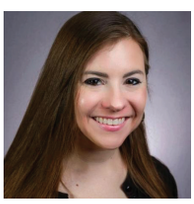
The overarching aim of this project is to flesh out our theoretical and empirical understanding of the diverse mechanisms that function to produce and sustain common knowledge under the full range of socio-ecological conditions in which humans live and have lived historically. For it is obvious that mechanisms that work in one social setting may not translate to others. This is easiest to see in the case of increasing social scale. In very small groups, common knowledge often results simply from sharing a perceptual environment. Not so in the case of larger, and hence, more spatially and temporally distributed groups. What strategies have humans devised - either intentionally or unintentionally (i.e., via "hidden hand" forces) – to work around the challenges to common knowledge introduced by increased social scale? How have we managed to maintain the requisite levels of common knowledge for effective cooperation with groupmates, even as we have gone from living in intimate, hunter- gatherer bands, to tribes,

chiefdoms, states, and countries?

This project will begin its analysis with the appearance of material symbols in the archeological record. Prototypical examples of such symbols include the use of various pigments to paint the body, personal jewelry, such as shell necklaces, and abstract engravings. The working hypothesis of this stage of the project is that the origins of symbolic behavior reflect a flexible response to the erosion of common knowledge production via old mechanisms due to the increasing size and complexity of human social groups at around 100 kya. Symbolic technologies in part earned their keep through generating common knowledge under these more distributed social conditions.

It is this first stage of the project that I propose to carry out during my visit at the KLI, with later stages to be completed over the following 2 or so years. The project will draw on work from a wide range of disciplines: biology, archeology, anthropology, psychology, and philosophy, among others. Its outcomes will be both theoretical, including an improved analysis of the cognitive scientific demands of common knowledge itself, and empirical, including a cross-cultural and cross-temporal inventory of the diverse mechanisms of common knowledge production in human societies past and present.

Emilie RAYMER
(June – July 2025)



I teach first-year seminars through the Harvard College Writing Program, and my research interests include the development of the life and human sciences, the philosophy of science, epistemology, evolutionary theory, and environmental history. I have lectured on these subjects, and I also have taught classes focused on bioethics and relationships among science, art, and literature. I additionally have taught both writing and "Introduction to Graduate Studies in Biology" in the Harvard Summer School and have worked as an editor and workshop

facilitator in Harvard Medical School's Postgraduate Medical Education Program. I hold a doctorate in the history of science and technology from Johns Hopkins University, and my research has appeared in The History and Philosophy of the Life Sciences, The Journal of the History of Biology, and other venues. I worked on the editorial staff of the National Academy of Sciences before I started my doctorate.

The Web of Life: Ecology, Culture, and Reciprocal Evolution

This project examines the development and influence of human ecology, an interdisciplinary area of study that incorporated research from the life and human sciences and laid the intellectual foundations for environmental history, cultural geography, and cultural ecology, as well as for a deeper understanding of anthropogenic environmental change within the life sciences. I trace its roots beyond the well-known conservation movements and activist events of the 19th and 20th centuries and highlight the importance of Jean-Baptiste Lamarck and Charles Darwin, who in underscoring the continuity between humans and other life forms, influenced views on the natural world and humanity's place within it. I emphasize that their work also contributed to the development of ecology, which emerged as a cohesive area of science in the late 19th century and focused on the relationships among individual organisms, groups of organisms, and their environments, as well as on processes like adaptation and niche construction.

This study further explores how sociologists, historians, and anthropologists embraced ecological ideas in the 1920s and addressed what they perceived to be the artificial division between natural and human history erected by Western intellectual traditions. They used evolutionary theory and ecological ideas to reconceptualize the dynamic and reciprocal interactions between humans and their environments and to establish that humans were a part of the "web of life." Additionally, by examining the contributions of key figures like Julian Steward and Carl Sauer, the project illu-

strates how human ecologists collaborated with biological scientists to craft novel research and insights. This interdisciplinary approach was exemplified in events like the 1955 conference „Man's Role in Changing the Face of the Earth," which brought together ecologists, zoologists, and anthropologists to address critical environmental issues. I also examine how Steward, Sauer, and others were inspired by the French Annales school, Paul Vidal de la Blache, Radhakamal Mukerjee, Alexander von Humboldt, and Goethe, and I explore how human ecologists applied and refashioned some of the contributions of these earlier scholars. This research project also aims to highlight that the relationship between biological and social thought has not always been unidirectional, and it suggests that some of the origins of persistent debates within environmentally oriented human and biological sciences can be seen within research on human ecology. These include discussions about the threshold for environmental change, debates about the promises and perils of interdisciplinary research, and questions about the extent to which environmental fields should be anthropo- or ecocentric.

2.8 Researchers with Own Funding

Joyshree CHANAM
(November 2022 – April 2026)

Joyshree Chanam is trained in the ecology and evolution of plant-insect interactions. She holds a Master´s degree from the University of Delhi and a PhD from the Indian Institute of Science, Bangalore, India. During her PhD, she investigated dynamics of mutualistic interactions between an ant-plant (myrmecophyte) and its ant and insect associates. As a postdoctoral researcher she worked at the National Centre for Biological Sciences Bangalore and investigated the effects of climate warming on floral volatiles and plant-pollinator interactions.

Effects of Climate Change on Food Plants

The project I pursue at the KLI stems from my experience with climate change effects on plants during my post-doc. Plants produce chemical defense compounds in response to biotic (herbivores) and abiotic stresses (heat and drought). In edible plants, these 'defense chemicals' are what we call 'flavors'. I plan to investigate how climate change affects food plants in terms of flavors, growth and yield. During my stay at the KLI, I plan to conduct a literature survey of published work on this topic and write up a summary paper on how plant-based food will be affected by a future warmer climate. With that as the base, I will then work on more nuanced questions within this broad framework, and how to collect data for future work. I also plan to explore the impact of climate warming on possible eco-evolutionary dynamics of food plants, and what that implies for future wild edible plants, and communities that use them.

Daniel J. NICHOLSON
(July 2025)

Daniel J. Nicholson is Assistant Professor of Philosophy at George Mason University. He holds a Ph.D. in Philosophy from the University of Exeter, an M.A. in History and Philosophy of Science from the University of Leeds, and an M.Biol. in Molecular and Cellular Biology from the University of Bath. Before coming to Mason, he held appointments at the Konrad Lorenz Institute for Evolution and Cognition Research near Vienna, the Centre for the Study of Life Sciences in Exeter, and the Cohn Institute for History and Philosophy of Science and Ideas in Tel Aviv. In recent years, he has been a visiting fellow at the University of Sydney, a Mercator Fellow at Ruhr-Universität Bochum, a Sydney Brenner Research Fellow at the Cold Spring Harbor Laboratory Center for Humanities and History of Modern Biology, and a visiting

research fellow at the Center for Philosophy of Science in the University of Pittsburgh.
Dr. Nicholson's research is characterized by a strongly interdisciplinary engagement with the conceptual foundations of the life sciences—an engagement that combines and integrates historical, philosophical, and theoretical approaches. A central organizing theme of his research is the ontology of living systems, particularly the ways in which organisms differ from other complex organized systems like machines, and on the epistemic implications of these differences. His work can be regarded as a concerted attempt to revive an organism-centred philosophy of biology capable of overcoming the mechanicist and reductionist limitations of late 20th C. biology. Dr. Nicholson also has longstanding interests in general debates in the philosophy of science as well as in the historical interplay between philosophical and scientific conceptions of nature.

Population Thinking and the Uniqueness of Biological Entities

The concept of 'population thinking' was introduced by Ernst Mayr in the mid-twentieth century and it has since become one of the most pervasive notions in the philosophy of biology. Despite its influence, however, the term has been widely misunderstood, even by those who have done the most to champion it. Population thinking today is often confused with population-level thinking (i.e., the idea of treating populations as units of analysis), which, ironically, is the opposite of what Mayr intended to convey when he coined the term. For Mayr, population thinking was a way of emphasizing the variation among individuals in a population, as well as the importance of recognizing their differences and uniqueness. In this paper, I recover the original meaning of 'population thinking' and elucidate its central role in evolutionary theory. I also demonstrate its surprising relevance to many other areas of contemporary biology. In particular, I show how the recent introduction of novel methodologies in molecular biology has led to a number of unexpected discoveries that are best understood

through the lens of population thinking. Finally, I examine the historical origins and philosophical foundations of population thinking, and I show how it lies at the heart of what makes biology different from physics.

Martin Andreas SCHMID
(September 2024 – February 2025)

Martin Schmid is an environmental historian trained in history and archaeology. He studies societies' biophysical and symbolic relationships with nature since c. 1500. His research covers rivers, agriculture, cities and wars, and has a spatial focus on Austria and Europe.

What Is Socio-Ecological Industrialization in Co-Evolutionary Terms?

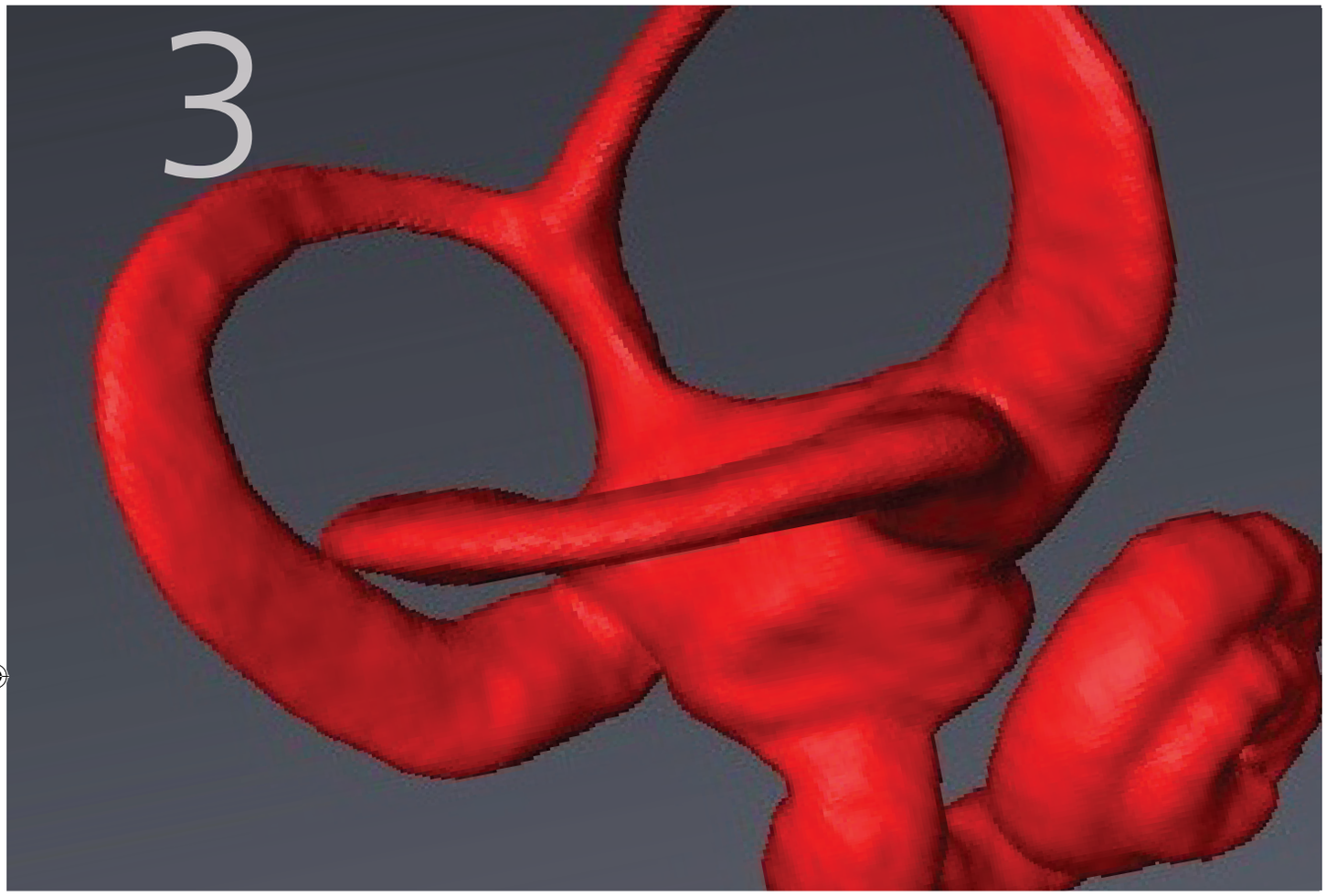
With its theoretical concepts and empirical studies, Social Ecology has established an understanding of industrialization that has become influential in various academic communities. The idea of a socio-metabolic regime transition based on fossil fuels forms the core of this socio-ecological understanding of industrialization. In my research at the KLI, I want to reconcile this socio-ecological approach with concepts and terms from the evolutionary sciences and reformulate it on a co-evolutionary basis. My starting point is to conceive of social-metabolic industrial regime shifts as a new mode of structural coupling of natural and social systems and thus as a genuinely co-evolutionary process and to analyze it systematically. This project aims to argue for a historically informed, long-term and co-evolutionary perspective in the current debate on socio-ecological transformation. Its originality stems from this novel combination.

My project for KLI has a clear focus on theory development. As an environmental historian, I can also draw on previous debates in my field, e.g., on "evolutionary history". As an environmental historian, it is important to me to bring such

theoretical considerations down to earth by reconstructing very specific processes of historical change. Therefore, I see my work at the KLI embedded in two of my current, FWF funded research projects on the industrialization of Austrian forests and rivers from the late 18th century onwards. My work at the KLI aims to update and strengthen the theoretical basis of this ongoing research, including that of the doctoral students I supervise.

During my stay at KLI, I plan to mainly work on two journal articles. A conceptual paper arguing for a co-evolutionary understanding of socio-ecological "industrialization," which shall become the core outcome of my stay at KLI, hopefully to be developed in collaboration and co-authorship with other people at the institute. Secondly, an environmental history paper analyzing how rivers and forests from the late 18th c. onwards changed their role in social metabolism during industrialization in terms of society-nature co-evolution.

Meetings and Lectures



The KLI supports international workshops, symposia, and individual talks that are organized by the KLI or in cooperation with other institutions.

3.1 Altenberg Workshops in Theoretical Biology

The 'Altenberg Workshops' address key questions of biological theories. Each workshop is organized by leading experts of a certain field who invite a group of international specialists to the KLI. The Altenberg Workshops aim to make conceptual progress and to generate initiatives of a distinctly interdisciplinary nature. Further information concerning the participants and their presentations can be found on the KLI website. Workshops hosted at the new institute building in Klosterneuburg are continued as 'Altenberg Workshops.'

43rd Altenberg Workshop in Theoretical Biology 17 – 20 June 2025

The Waddingtonian Landscape: Rediscovering Conrad Hal Waddington's Legacies in Biology and Beyond

KLI, Klosterneuburg

Organizers: Alejandro Fabregas Tejeda (KU Leuven) & Francisco Vergara-Silva (Universidad Nacional Autónoma de México)

Topic and Aims

The British embryologist and geneticist Conrad Hal Waddington is celebrated in biological historiography and contemporary scientific practice for his theoretical and conceptual contributions to fields like systems biology, epigenetics, and evolutionary developmental biology. Recent years have borne witness to a burgeoning meta-scientific interest in Waddington, as historians and philosophers have begun to scrutinize diverse facets of his oeuvre. These important investigations notwithstanding, the expansive scope of Waddington's body of work remains underexplored. His extensive repertoire of research undertakings spans a wide spectrum, addressing topics such as the interplay between science and ethics, the intersections of visual arts and scientific inquiry, the nature and evolution of cognition and agency, theoretical tools for systemic thinking and societal problem-solving, the environmental consequences of human activities, and the "science of human settlements" (Ekistics). As we approach the 50th anniversary of Waddington's passing in 2025, the occasion becomes ripe for embarking on a systematic exploration of his manifold legacies, his influences

and shortcomings, his socio-cultural and institutional arenas, his interdisciplinary network of interlocutors across the natural and social sciences, the arts and the humanities, and the enduring resonance of his ideas within and outside the life sciences. This workshop aims to gather a group of 15 philosophers and historians hailing from diverse backgrounds to offer the first interdisciplinary re-appraisal of Waddington's life-long contributions over two and a half days of activities.

Speakers

JAN BAEDKE
Ruhr University Bochum

ALEJANDRO FÁBREGAS-TEJEDA
KU Leuven

SCOTT GILBERT
Swarthmore College

SHANI INBAR
The Open University of Israel

KEVIN LALA
University of St. Andrews

LAURENT LOISON
French National Centre for Scientific Research (CNRS), Paris

MAURIZIO MELONI
Deakin University, Victoria

LAURA NUÑO DE LA ROSA
Complutense University of Madrid

M. ALEJANDRA PETINO ZAPPALA
University of Heidelberg

GUIDO I. PRIETO
Bielefeld University

PANAYIOTA I. PYLA
University of Cyprus, Nicosia

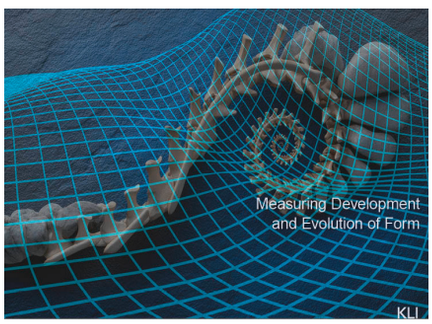
SAHOTRA SARKAR
University of Texas at Austin

ADAM SCARFE
University of Winnipeg

MATTHEW SIMS
University of Cambridge

FRANCISCO VERGARA-SILVA
National Autonomous University of Mexico

CASSANDRA ZIE YANG
University of Cambridge



44th Altenberg Workshop in Theoretical Biology 16 – 19 September 2025

Measuring Development and Evolution of Form Conservation
KLI, Klosterneuburg

Organizers: Katrin Schäfer (University of Vienna), Philipp Gunz (MPI Leipzig), Philipp Mitteroecker (KLI & University of Vienna)

Topic and Aims

The workshop will foster an engaging, collaborative dialogue between experts in morphometric theory and researchers facing complex challenges requiring innovative approaches. By bringing together method and software developers alongside users from various disciplines and experience levels, we aim to create a practical and solution-oriented environment.

Speakers

DEAN ADAMS
Iowa State University

MICHAEL COLLYER
Chatham University

AIDA GOMEZ-ROBLES
University College London

MARTA GOMEZ RECIO
Museo Nacional de Ciencias Naturales, Madrid

BENEDIKT HALLGRIMSSON
University of Calgary

NEUS MARTINEZ-ABADIAS
University of Barcelona

PHILIPP MITTEROECKER
KLI & University of Vienna

F. JAMES ROHLF
Stony Brook University

Participants

SAUDAT ALISHAYEVA
KLI & Max Planck Institute for Biology, Tübingen

ATHI BALISO
University of Cape Town

MARKUS BASTIR
Museo Nacional de Ciencias Naturales, Madrid

GUILLERMO BRAVO MORANTE
University of Zurich

HENRY CAMARILLO
KLI & Yale University

ANDREA CARDINI
Università di Modena e Reggio Emilia

MARION CHARTIER
University of Vienna

THOMAS DAVIES
University of Vienna

PAULINE FÄNDERS
Max Planck Institute for Evolutionary Anthropology, Leipzig

BARBARA FISCHER
KLI & University of Vienna

RICHARD GAWNE
Nevada State Museum

PHILIPP GUNZ
Max Planck Institute for Evolutionary Anthropology, Leipzig

MARTIN HÄUSLER
University of Zurich

MERIN JOJI
KLI & University of Kopenhagen

ANNE LE MAITRE
KLI

GERD MÜLLER
KLI

SELIM NATAHI
Max Planck Institute for Evolutionary Anthropology, Leipzig

PAUL O´HIGGINS
University of York

MIHAELA PAVLICEV
University of Vienna

CATHRIN PFAFF
University of Vienna

PAOLO PIRAS
CPIA 1 Roma

EVA PLETZENAUER
University of Vienna

ANNA PYTLIK
University of Vienna

ALEKSA RATARAC
KLI & University of Barcelona

KATRIN SCHÄFER
University of Vienna

STEFAN SCHLAGER
University of Freiburg

ALEXANDRA SCHUH
Max Planck Institute for Evolutionary Anthropology, Leipzig

PETRA SIMKOVA
University of Vienna

EKATERINA STANSFIELD
University of Vienna

KIM STROBEN
University of Vienna

ALESSANDRO URCIUOLI
University of Zurich

JANA VOGLMAYR
University of Vienna

GÜNTER WAGNER
Yale University & University of Vienna

JUNYA WATANABE
University of Barcelona

SONJA WINDHAGER
University of Vienna

EVA ZAFFARINI
KLI & University of Calgary

3.2 KLI Focus Group

Glossary Event
1 – 3 October 2025

Urban Evo-Devo:
Starting the Glossary
KLI, Klosterneuburg

Organizers: Sergio Porta (University of Strathclyde, Glasgow) & Philipp Mitteroecker (KLI & University of Vienna)

Topic and Aims

The workshop, "Urban Evo-Devo: Starting the Glossary" (1-3 October 2025) marked the beginning of a dialogue on transferring knowledge between evolutionary developmental biology and urban morphology. It was organized by Sergio Porta (University of Strathclyde, Glasgow) & Philipp Mitteroecker (KLI & University of Vienna).

The first half of the workshop featured a series of introductory presentations that set the foundation for interdisciplinary discussion, and establishing conceptual parallels between biological systems and cities. Sergio Porta, Monika Kuffer, Martin Fleischmann, Vítor Oliveira, and Stephen Marshall presented on various aspects of cities, while Gerd Müller provided an overview of the principles of evolutionary and developmental biology.

The second half centered on collaborative discussions aimed at developing a shared glossary to unify definitions and concepts from both disciplines. This glossary seeks to promote a common understanding and facilitate future research at the intersection of urban morphology and evolutionary developmental biology.

Participants also outlined concrete steps to advance the project, agreeing on two primary focus areas: first, to build computational models of urban form development in order to understand the variational properties of urban systems; and second, to continue working on phylogeny from phenetics in urban form.

Participants

OLESYA BONDARENKO
KLI

BARBARA FISCHER
KLI & University of Vienna

MARTIN FLEISCHMANN
Charles University, Prague

PASCAL HAGOLANI
KLI

MONIKA KUFFER
University of Twente

STEPHEN MARSHALL
University College London

PHILIPP MITTEROECKER
KLI & University of Vienna

GERD MÜLLER
KLI

VITOR OLIVEIRA
University of Porto

SERGIO PORTA
University of Strathclyde, Glasgow

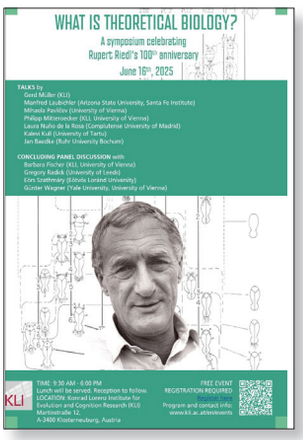
OMBRETTA ROMICE
University of Strathclyde, Glasgow

ISABELLA SARTO-JACKSON
KLI

MARTIN SCHMID
University of Natural Resources and Life Sciences, Vienna

WOLFGANG SONNE
Technical University of Dortmund

3.3 KLI Special Event



Symposium
16 June 2025

What Is Theoretical Biology?

A symposium celebrating Rupert Riedl's 100th anniversary
KLI, Klosterneuburg

Organizer: Gerd Müller (KLI)

Program

GERD MÜLLER
KLI
Rupert Riedl and the Austrian School of Theoretical Biology

MANFRED LAUBICHLER
Arizona State University, Tempe
The International Context of Theoretical Biology

MIHAELA PAVLICEV
University of Vienna
The Role of Riedl's Systems Theory for Today's Evolutionary Biology

PHILIPP MITTEROECKER
KLI & University of Vienna
Theoretical Biology and Morphometrics: On the Generation and Canalization of Morphological Variation During Development

LAURA NUÑO DE LA ROSA
Complutense University of Madrid
The Evolvability of Riedl's Ideas

84 KALEVI KULL
University of Tartu
Towards Semiotics in Theoretical Biology

JAN BAEDKE
Ruhr University, Bochum
O Theory Where Art Thou? The Changing Role of Theory in Theoretical Biology in the 20th Century and Beyond

PANEL DISCUSSION
The Future of Theoretical Biology
BARBARA FISCHER (KLI & University of Vienna),
GREGORY RADICK (University of Leeds)
EÖRS SZATHMARY (Parmenides Foundation, Pöcking & Eötvös Loránd University, Budapest)
GÜNTER WAGNER (Yale University & University of Vienna)

3.4 KLI Colloquia

KLI Colloquia are informal, public talks that take place at the KLI in Klosterneuburg. Since the pandemic, KLI colloquia are carried out in a hybrid format, with speakers and fellows participating in-person at the KLI, while international guests joining virtually. Abstracts of the presentations and information about the lecturers can be found on the website of the institute.

SERGIO PORTA
University of Strathclyde, Glasgow
Urban Morphometrics: A Tale of Space, Cities and Cultural Evolution

MARTIN SCHMID
University of Natural Resources and Life Sciences Vienna (BOKU)
The Danube's Industrialization. A Co-Evolutionary Environmental History

GENTARO TAGA
University of Tokyo
Development and Evolution of Human Bipedalism

TUDOR POPESCU
University of Padova & University of Vienna
Bridging Cognition and Evolution in the Study of Music and Language

DETLEV ARENDT
European Molecular Biology Laboratory & University of Heidelberg
The Origin and Evolution of the Central Nervous System: A Cell Type Perspective

ELIS JONES
KLI, Klosterneuburg
The Epistemic Red Queen Hypothesis: Are We Making the World Harder to Understand?

LUISA PALLARES
Friedrich Miescher Laboratory, Tübingen
Phenotypic Robustness Across the Genotype-Phenotype Map, from Genes to Environment and Back

SONIA KLEINDORFER
Konrad Lorenz Research Center, University of Vienna
Rapid Coevolutionary Dynamics in Darwin's Finches and the Avian Vampire Fly

DEAN FALK
Florida State University, Tallahassee
When Hominins Were Babies: Evolution of the Brain and Cognition from 6.5 to 3.5 Million Years ago

GREGORY RADICK
University of Leeds
Genetic Determinism Is an Accident of History

ADAM LINSON
The Open University UK
Evolutionary Pressure on the Capacity for Context-Relevant Behavior: Implications for Translational Psychiatry

RICHARD GAWNE
Nevada State Museum
A Dynamic Canvas Model of Butterfly and Moth Color Patterns

RICHARD COCKETT
The Economist
Vienna, the Laboratory of Modernity

LUDO SCHOENMAKERS
KLI, Klosterneuburg
How Darwinian is Darwinian Enough? The Case of Evolution and the Origins of Life

RONALD PLANER
University of Wollongong
Common Knowledge Considered as Cause and Effect of Behavioral Modernity

THOMAS HANSEN
University of Oslo
Rates of Evolution, Time Scaling, and the Decoupling of Micro- and Macroevolution

CRISTINA VILLEGAS
KLI, Klosterneuburg
Chance, Necessity, and the Evolution of Evolvability

3.5 Cooperative Events

Reading Group
28 November 2025
Vienna Science Studies Laboratory

KLI, Klosterneuburg

Organizer: Olesya Bondarenko (KLI)

The Vienna Science Studies Laboratory is a Vienna-based group of multi-disciplinary researchers interested in the diverse topics and issues of science, technology, and medicine studies. The Lab hosts a reading group currently focused on feminist STS, giving participants the possibility to share ideas on crucial topics of philosophy of science, philosophy of mind and STS.

In their third meeting, participants focused on M Kronfeldner´s manuscript "The parity and plurality of explanatory roles of nature, culture and environment." Within the philosophy of life sciences literature on human nature, it has been claimed that, for any explanatory endeavor regarding human life, one needs nature, culture and environment. They are explanatorily on a par. This paper will, first, introduce the reader to this so-called parity thesis of the interactionist consensus, which stands behind "one-needs-all-of-them" claims. The paper will, second, point at limits of this consensus, with respect to matters of facts explainable thereby. The aim is to show that we do not only have to acknowledge interactionism, and with that parity of explanatory roles of nature, culture and environment. We also need to acknowledge three aspects of a pragmatics of explanation: (1) different notions of causation (and thus of explanatory role), (2) the plurality of explanatory interests and (3) the plurality of explananda (phenomena to be explained) resulting from (2). We need to recognize both the parity and plurality of different explanatory roles of human nature, culture and environment.

Fachtagung
28 March 2025

Bindung & Beziehung: Schnittstelle Neurobiologie und Soziale Arbeit

Vienna City Hall

Organizers: Isabella Sarto-Jackson (KLI) & Arbeitsgruppe: Interdisziplinäre Bindungsforschung im Dialog mit psychosozialer Praxis (AGB)

Topic

Frühe Bindungserfahrungen zu Bezugspersonen spielen eine zentrale Rolle in der emotionalen, sozialen und kognitiven Entwicklung. Sie sind nicht nur prägend für die Gehirnentwicklung in Kindheit und Adoleszenz, sondern haben auch einen wesentlichen Einfluss auf die psychische und soziale Entwicklung im späteren Leben.

Die Bindungstheorie, ursprünglich entwickelt von John Bowlby und Mary Ainsworth, vereint human- und sozialwissenschaftliche Ansätze. Ihre Bedeutung wird durch aktuelle Erkenntnisse aus der Hirnforschung weiter gestützt. Die Bindungstheorie bietet großes Potenzial für den Austausch zwischen Wissenschaft und Praxis im Sinne eines translationalen Ansatzes. Das bedeutet, es werden wissenschaftliche Modelle in der Praxis getestet und bei Anwendungsgrenzen zur Weiterentwicklung an die Forschung zurückgespielt. So kann die Bindungsforschung nicht nur die Betreuung junger Menschen verbessern, sondern auch den Fachkräften als Reflexionsmodell dienen.

Program

CLAUS LAMM
University of Vienna
Empathie und (Ver)Bindung - eine neurowissenschaftliche Entdeckungsreise

FRIEDRICH-HUMAN UNTERRAINER
Sigmund Freud Private University Vienna
Sucht als Bindungsstörung – eine neuro-evolutionäre Perspektive

GERTRUDE BOGYI
Traumazentrum „Die Boje“
Trauma und Bindung – Was können wir für Kinder mit Bindungsstörungen tun?

RONALD SLADKY
University of Vienna
Die Amygdala - nicht nur Angst und Schrecken

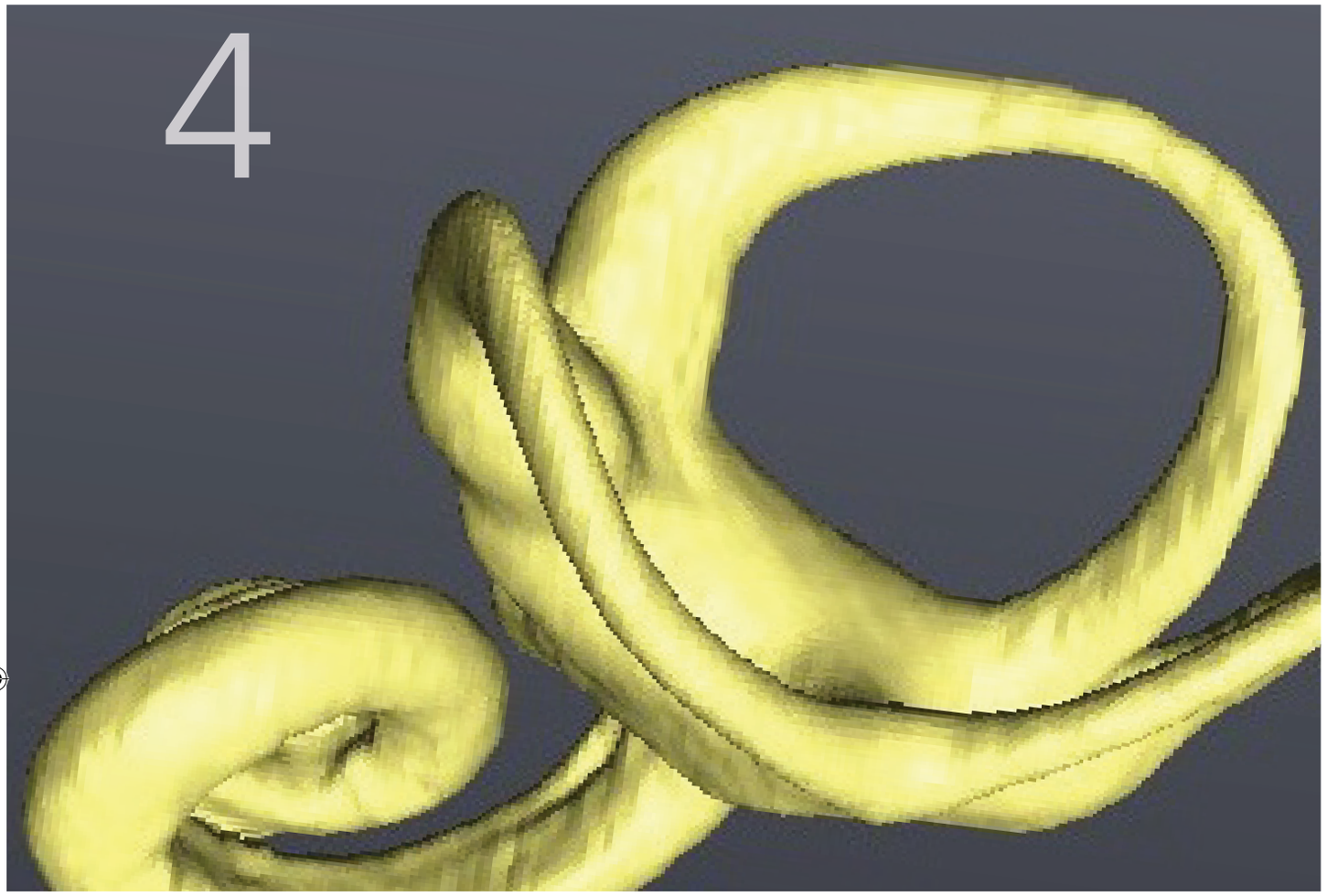
NATASCHA TASLIMI
Pädagogische Hochschule Wien & Netzwerk elementare Bildung Österreich
JOHANNES PRINZ
Krisenintervention in Familien, Kompetenzzentrum für Kinder- und Jugendpsychiatrie Amstetten
Gemeinsam wachsen. Wie Beziehung Entwicklung beeinflusst

MANUELA GANDER
University of Innsbruck
Neurobiologie und Bindung im Jugendalter: Neuste Forschungsergebnisse aus dem psychiatrischen Kontext

PETER SARTO
Kinder- und Jugendanwaltschaft Wien
Trauma-sensitive Begleitung: Wege zur Heilung

PODIUMSDISKUSSION
MATHIAS BERG (Kath. Hochschule Nordrhein-Westfalen), YONCA IZAT (Oberberg Fachklinik Villa Drachenfels, Bad Honnef bei Bonn), THOMAS KÖHLER-SARETZKI (Psychologische Beratungsstelle Herbstmühle Wipperfürth), KATJA NOWACKI (Fachhochschule Dortmund), INGRID PÖSCHMANN (MA 11), ISABELLA SARTO-JACKSON (KLI), MARTIN SCHRÖDER (Univ. Psychiatrische Kliniken Basel)
Moderation: Hannes Kolar (MA 11)

Publications



Scientific publications and presentations of KLI fellows and staff in 2025.

4.1 Professional Papers and Books

BERILLON G, DUVEAU J, COSNEFROY Q, AERTS P, AGOSTINI V, ..., FISCHER B, ..., MARCHAL F.
An International Research Network on Bipedalism
In: 15th annual European Society for the Study of Human Evolution Meeting (ESHE 2025), pp. 435–436
Paleoanthropology: Paris

CASTEX D, CHAMEL B, LE MAITRE A, MUNOZ O, PRUVOST M, RÉVAILLAS H, RIVOLLAT M, ROTTIER S. (eds)
Mortuary Practices and Social Inferences
Bulletins et Mémoires de la Société d'Anthropologie de Paris (BMSAP) 37. https://doi.org/10.4000/14ohi

CHAMEL B, LE MAITRE A. (eds)
Varia
Bulletins et Mémoires de la Société d'Anthropologie de Paris (BMSAP) 37. https://doi.org/10.4000/13pt6

FOLTS L, MARTINEZ AS, WILLIAMS JA, BUNCE C, CAPEL B, MCKEY J.
OoCount: A Machine-Learning Based Approach to Mouse Ovarian Follicle Counting and Classification
Biology of Reproduction 113: 1083–1101

GONZÁLEZ-FORERO M, GÓMEZ-ROBLES A.
Why Did the Human Brain Size Evolve? A Way Forward
Philosophical Transactions of the Royal Society B 380: 20240114

HAIDVOGL G, HOHENSINNER S, SCHMID MA.
Disturbance on the Upper Danube: A Long-Term Socio-Ecological Perspective on Floods
In: Flowing Progress: Transforming the Danube Through Infrastructure (Dorondel S, Gatejel L, eds), pp. 267–302
Purdue University Press: West Lafayette

JOJI M.
Morphometric and Genetic Indicators of Threat and Adaptability in Testudines
PhD Thesis, University of Copenhagen

92 JONES E, CUYPERS V.
Marine Constraints as Philosophical Opportunities: The Krogh Principle and the Benefits of Philosophical Engagement with the Sea
History and Philosophy of the Life Sciences 47: 43

KAWAM B.
The Causal Analysis of Animal Social Networks
PhD Thesis, University of Göttingen

KNABL P, ORDOÑEZ JF, MONTENEGRO CABRERA JD, WOLLESEN T, GENIKHOVICH G.
The Anti-Neural Role of BMP Signaling Is a Side Effect of Its Global Function in Dorsoventral Patterning
bioRxiv 2025.06.08.658475

LINSON A, SCHULKIN J, CLARK A.
The Fast and the Curious: Improvisation as Action-Oriented Abduction
Imagination, Cognition and Personality
https://journals.sagepub.com/doi/10.1177/02762366251365906

MENÉNDEz LP, LUISI P, LÓPEZ-SOSA MC, DA SILVA SM, BUCK LT,... LE MAITRE A,...., RASCOVAN N.
µCT Scanning Effects on DNA and a Multi-Step Workflow for Archaeological Petrous Bones
bioRxiv 2025.10.02.680114

MITTEROECKER P, COLLYER ML, ADAMS DC.
Exploring Phylogenetic Signal in Multivariate Phenotypes by Maximizing Blomberg's *K*
Systematic Biology 74: 215–229

PÉLABON C, AGUDELO G, ARAYA AJOY Y, BOLSTAD GH,...VILLEGAS C, VOJE KL, WALLING C, WRIGHT J.
Evolvability: Progress and Key Questions
BioScience 75: 1042–1057

PETRACCA E.
Evolution at a Tipping Point. A review essay on 'Evolution Evolving', by K. Lala, T. Uller, N. Feiner, M. Feldman and S. F. Gilbert
Biological Theory 20: 222–232

PETRACCA E, GALLAGHER S.
Norms are Relational: Cognitive Institutions, Practices, and the 'Where' Question
Journal of Institutional Economics 21: e39

PETRACCA E, GRAYOT J.
Mindshaping and the Embodiment of Rationality
In: The Routledge Handbook of Mindshaping (Zawidzki TW, Tison R, eds), pp. 212–224
Routlegde: Abingdon

SANTIS MD, MENGUAL X.
A New Species of *Ptilodexia* (Diptera: Tachinidae: Dexiinae) from Ecuador, with a Key to the South American Species
Integrative Systematics: Stuttgart Contributions to Natural History 8: 127–131

SANTIS MD, CAMARGO A.
Lost between Types: A New Species of *Chaetotheresia* Townsend, 1931 (Diptera: Tachinidae: Dexiinae) Discovered 200 Years after Collecting
Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen 77: 115–122

SARTO-JACKSON I.
What's in a Trait? Reconceptualizing Neurodevelopmental Timing by Seizing Insights From Philosophy
European Journal of Neuroscience 62: e70171

SARTO-JACKSON I.
Kreativität braucht Neugier, Lernen, Visionen und ganz schön viel Mut
In: Fantastische Hypothesen (Abendstein M, Weber N, eds)
Bilding: Innsbruck

SCHMID MA.
The Kreisky Era in Environmental Terms: On the Social Ecology of the Austrian 1970s
In: Bruno Kreisky: A Reassessment (Burri M, Bischof G, eds), pp. 220–248
Berghan: New York City

SEVERS L, WANG Q.
Continual Decision-Making Dynamics across Biological Organisms
Biological Reviews https://doi.org/10.1002/brv.70115

STADTMAUER DJ.
Mechanistic and Phylogenetic Perspectives on Pregnancy Sickness
EcoEvoRxiv 10.32942/x2fh16

STADTMAUER DJ, BASANTA MARTINEZ S, MAZIARZ JD, COLE AG, DADGAS G, RAE SMITH G, VAN BREUKELEN F, PAVLICEV M, WAGNER GP.
Cell Type and Cell Signaling Innovations at the Fetal-Maternal Interface
Nature Ecology & Evolution 9: 1469–1486

STANSFIELD E, PHAN K, FISCHER B, DELANCEY J, UMEK W.
Pelvis Shape Predisposes for Pelvic Organ Prolapse: A Geometric Morphometric Study
Ultrasound Obstetrics & Gynecology 66: 659–666

STANSFIELD E, PHAN K, FISCHER B, DELANCEY J, UMEK W.
Pelvis Shape Predisposes for Pelvic Organ Prolapse: A Preliminary Result
American Journal of Biological Anthropology 186

4.2 Forthcoming Publications

ALONZO MM, VILLANUEVA LA.
Overcoming Medical Scholasticism in New Spain: Experience and Indigenous Knowledge in Arias de Benavides' Treatment of Syphilis
History and Philosophy of the Life Sciences 48: 20

BONDARENKO O.
Credibility and Trustworthiness: The Promises of Sociogenomic Integration and Research on Gene-Environment Interaction
European Journal for Philosophy of Science

BONDARENKO O.
Can Philosophy of Science Meet the Challenge of Interdisciplinarity? The Case of Integrative Biosocial Research
In: Philosophy of Science: Past, Present and Future (Love A, Verhaegh S, eds)
Minnesota Studies in the Philosophy of Science Monograph Series: Minneapolis

BRUNE M, CHELI S.
The Evolution of Psychotherapy. Applying Evolutionary Theory to Mental Health Care
Springer: Cham

CATIC A, WALTENBERGER L, PINK KE, PANY-KUCERA D, FISCHER B, HUMMEL JIMENEZ J, MAIER A, BALTZER P, HANZAL E, BODNER-ADLER B, HEINZL F, UMEK W.
Exploring Pelvic Changes: Do Pregnancy and Birth Leave Scars?
American Journal of Biological Anthropology 189: e70248

DIOS RVP, SANTIS MD.
Taxonomic Update on Cordyligasterini (Diptera: Tachinidae: Dexiinae), New Generic Synonyms and New Species of *Neosophia* Guimarães
Entomological Science 29, e70003

DUNKLEY K, CANTOR M, AFAN AI,.... SRIDHAR H, ...VAN DER WAL JEM.
Cues and Signals in Animal Interspecies Cooperation
Animal Behaviour

FABREGAS-TEJEDA A.
The Organism-Environment Pairing: A Historical and Philosophical Re-Appraisal
MIT Press: Cambridge

FALK D.
Locomotor and Cognitive Evolution in Early Hominins: An Evo-Devo Perspective
Brain, Behavior and Evolution

FALK D.
Reconsidering whether Knuckle-Walking Gave Rise to Bipedalism in Light of the Extended Evolutionary Synthesis
American Journal of Biological Anthropology

FALK D, ZOLLIKOFER CPE, PONCE DE LEÓN MS.
De-Opercularization of the Lunate Sulcus in Early *Homo*
The Anatomical Record 309: 314–332

96 GONZÁLEZ-FORERO M.
A Mathematical Synthesis of Genetics, Development, and Evolution
bioRxiv

GONZÁLEZ-FORERO M.
From Nerve Cells to Consciousness
In: Humans: The Evolution of a Species (Roberts A, ed)
Dorling Kindersley (DK): London

GONZÁLEZ-FORERO M.
Growing Brains
In: Humans: The Evolution of a Species (Roberts A, ed)
Dorling Kindersley (DK): London

JOJI M, HIPSLEY CA, DZIOMBER I.
3D Shell Asymmetry of Testudines as a Potential Biomarker for Environmental Stress
bioRxiv

JONES E, CANADA J, LEONELLI S.
Values at Sea: Science Studies Meets Marine Science
History and Philosophy of the Life Sciences

KNICKEL K, KNICKEL M, REED M.
Business Models that Valorise ESS and Advance a More Socially and Ecologically Grounded Economy
In: Role of Ecosystem Services in Enabling Rural-Urban Synergies (Partidario MR, Keech D, Loupa-Ramos I, eds.) pp. 211–237
Springer: Cham

KRAUS N.
Environmentally Dependent Developmental Induction as a Potential Driver of Heart Evolution
Journal of Experimental Biology 229: jeb250920

KRAUS N.
Environmental Regulation of Cardiac Development and Evolution
PhD Thesis, University of Vienna

KUNZE M, BRUN C, BADAUT J, DARNAUDÉRY M, GROSS F, PELTIER L, PRADEU T, SARTO-JACKSON I, KONSMAN P.
How to Foster Challenging Interdisciplinary Collaborations: Can Philosophy Support Neuroscientists?
European Journal of Neuroscience

LARSON DO, SARTO-JACKSON I, FISCHER B.
Integrative Neurobiology and Cultural Context Theory: The Role of Cultural Neurobiological Inheritance Systems
Biological Theory

LINSON A, BEAUCHAMP G, BARVE S.
Alerting and Orienting Attention in Anti-Predator Vigilance: Neurocognitive Modelling and Behavioural Evidence
Journal of the Royal Society Interface 23: 20250687

MANI S, TLUSTY T.
Linking Tissue Morphology and Tissue Healing in a Cell Fate Model
Frontiers of Cell and Developmental Biology

MÉNDEZ ALONZO M, VILLANUEVA LA.
Overcoming Medical Scholasticism in New Spain: Experience and Indigenous Knowledge in Arias de Benavides' Treatment of Syphilis
History and Philosophy of the Life Sciences

MITTEROECKER P.
There Is no Measurement Error in Biology
Biological Theory

MITTEROECKER P.
Genetic Variance in Reproductive Timing Contributes to Trait Evolvability
Journal of Evolutionary Biology

ÑUNO DE LA ROSA L, VILLEGAS C.
Perspectives on Evolvability: An Autobiography of Contemporary Evolutionary Theory
Springer: History, Philosophy and Theory of the Life Sciences
Springer: Cham

98 PETRACCA E.
Review of "Toward a Wider Vision of Behavioral Economics," by Peter E. Earl
Œconomia – History / Methodology / Philosophy

SANTIS MD.
The importance of Natural History Collections and Taxonomy: A Tachinid Species Collected by Johann Natterer during the Austrian Scientific Expedition to Brazil (1817–1835)
The Tachinid Times

SANTIS MD.
On "Hennig's Dilemma" and the Post-Systematics Wars
Journal of the History of Biology

SANTIS MD.
Revision of Neotropical Genus *Echinodexia* Brauer & Bergenstamm, 1893 (Diptera: Tachinidae), with new Synonymies
Zootaxa

SARTO-JACKSON I.
Can Evolutionary Epistemology Shed Light on the Role of Essentialism in Group-Thinking?
In: Culture, Identity, and Essentialism: Anthropological and Psychological Perspectives (Wagner W, Moya C, eds)
Springer: Heidelberg

SARTO-JACKSON I.
Trauma und Gehirn
Klett Cotta: Stuttgart

SRIDHAR H, CHANAM J, HARIHARAN P.
Spark, Scaffold, Substrate: The Multiple Roles of Natural History in the Making of Ecology and Evolution
The American Naturalist

STANSFIELD E, EGNER C, MITTEROECKER P, KAINZ H.
Did Energy Costs of Walking Limit the Evolution of a Larger Human Birth Canal?
Proceedings of the Royal Society B

STANSFIELD E, KOLLER W, GONCALVES B, KAINZ H.
Do We Need Medical Imaging-Informed Musculoskeletal Models for Simulations in Healthy Adults? A New Workflow Based on Magnetic Resonance Imaging Highlights the Importance of Personalized Geometry
PLOS Computational Biology 22: e1014073

VILLANUEVA LA, VILLEGAS C.
Procesos de transmisión musical: el son jarocho y el enfoque evo-devo de reproducción cultural
In: El son mexicano en perspectiva (Cruz Zuleta M, Martínez de la Rosa A, eds.)
Ediciones del Lirio: Mexico City

VILLEGAS C.
Variation and Variability
In: Elsevier Comprehensive Philosophy of Science, vol. Philosophy of Biology (Merlin F, ed.)
Elsevier: Amsterdam

WALDHAUSER F, FALK D, DLUZAK S, SCHWARZ P, TATZER E, MALECZEK W, ASPERGER FELDER M.
Letters from the Round Table ("Tafelrunde"): Private Letters to Hans Asperger Before, During, and After World War II
Oxford University Press: Oxford

WATSON LM, FRÉMONDIÈRE P, STAUB K, MITTEROECKER P, FISCHER B, HAEUSLER M, WEBB NM.
Over the Edge: Empirical Evidence for the Cliff-Edge Model of Obstetric Selection
Anatomical Record 1–15

4.3 Journal *Biological Theory*

Volume 20, Issue 1:

KUTSCHERA U, NIKLAS KJ.
Evolution of Sexuality in Animals and Plants: From Julius Sachs 1874 to HMG-box Genes

BARAVALLE L, ROFFÉ AJ, LUQUE VJ, GINNOBILI S.
The Value of Price

KHAN S.
The Limits of Our Explanation: A Case Study in *Myxococcus xanthus* Cooperation

MÜLLER J, KOSTER P.
August Pütter (1879–1929) and the Mechanistic Origins of the Temperature–Size Rule

WILMSEN S, KOST C.
Defining Organismality

Volume 20, Issue 2:

LOVE AC, SARKAR S.
D'Arcy Thompson's Conceptual Legacy

JARRON M.
"A Single and Indivisible Principle of Unity": On Growth and Form in Context

DAVIES JA.
D'Arcy Thompson and Synthetic Biology—Then and Now

PALMQUIST KH, KO CS, SHYER AE, RODRIGUES AR.
Biological Theories of Morphogenesis Based on Holistic Biophysical Thinking

ARTHUR W.
D'Arcy Thompson's Morphological Transformations: Issues of Causality and Dimensionality

NUÑO DE LA ROSA L, LENNOX JG.
From the Method of Division to the Theory of Transformations: Thompson After Aristotle, and Aristotle After Thompson

Volume 20, Issue 3:

SLOAN PR.
A Return to Niels Bohr's "Light and Life" (1932)

GARAFFA L.
Plasticity-Led (Not First) Evolution: A Matter of Causal Relevance

O´BRIEN MJ, VIDIELLA B, DURAN-NEBREDA S, BENTLEY RA, VALVERDE S.
Archaeology and the Construction of Artifact Lineages: From Culture History to Phylogenetics

VEIT W, GASCOIGNE SJL, SLAGUERO-GÓMEZ R.
Evolution, Complexity, and Life History Theory

PETRACCA E.
Evolution at a Tipping Point

102 **Volume 20, Issue 4:**

NEWMAN SA.
So Long, and Thanks for All the Submissions

SUÁREZ J, HABER M.
Complicating the Concept of Lineage: A Topical Collection

SUÁREZ J, VEIGL S.
Vindicating Lineage Eliminativism

LAPLANE L.
Cancer Clones Revised

PAPALE F.
The Unit of Selection and the Theory of Evolution by Natural Selection Without Lineage Formation

MACCORD K.
Let's Talk About Sex…Cell Lineages

HABER M.
Biology's Einstein Moment: Specifying Lineal Frames of Reference and Rejecting Absolute Biological History

Referees for Volume 20

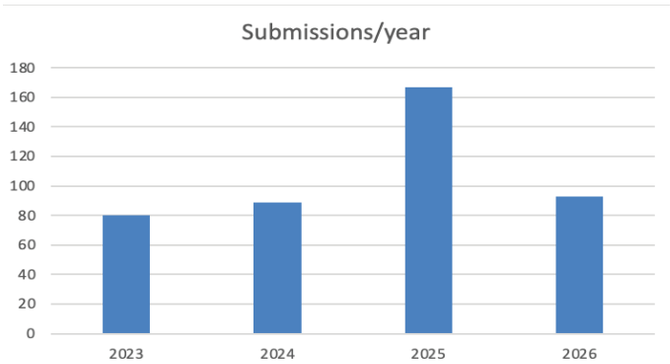
YUICHI AMITANI
GUNNAR BABCOCK
DAVID BARRACK
NATHANIEL BARRETT
NICHOLAS BAUMARD
WILLIAM BECHTEL
MARIANA BENITEZ
RAMRAY BHAT
LEONARDO BICH
AGNES BOLINSKA
ANDREW BOLLHAGEN
PIERRICK BOURRAT
CULUM BROWN
SEAN BROWN
CARL BRUSSE
GORDON BURGHARDT
DANIEL BURNSTON
ANDREW BUSKELL
RITA CASADIO
FRANCESCA CIRULLI
ELLEN CLARKE
JAMES DIFRISCO
ALEXANDER DOUGLAS
MAX DRESOW
IGOR FARKAS
FERMIN FULDA
PETER GÄRDENFORS
SARA GREEN
JEAN-BABPTISTE GRODWOHL
MATTHEW H. HABER
DAVID HAIG
MARTA HALINA
MADS HANSEN
JOHN HARTE
PHILIPP HAUEIS
BEN HAYDEN
FRANCIS HEYLIGHEN
WIM HORDIJK
DAVID HOULE
FABIAN HUNDERTMARK
SHAWN HURST
ANTON KILLIN
KALEVI KULL
JAMES LADYMAN
INSA LAWLER
MICHAEL LEVIN
ARNON LEVY
PAMELA LYON
KATE MACCORD
SHRIPAD MAHULIKAR
JOSEPH MCCAFFREY
ANDRA MENEGANZIN
LISANDRO MILOCCO
KEVIN MITCHELL
GERD B. MÜLLER
STUART NEWMAN
SAMIR OKASHA
STEVEN ORZACK
ROSS PAIN
YI-HSUAN PAN
LUIZ PESSOA
RONALD PLANER
ANNEMIE PLOEGER
ANYA PLUTYNSKI
ANGELA POTOCHNIK
ROBERT PRENTNER
MAXIM RAGINSKY
D. VINCENT RIORDAN
BERND ROSSLENBROICH
IÑANKI RUIZ-TRILLO
SAHOTRA SARKAR
ISABELLA SARTO-JACKSON
JAMES SHAPIRO
MAURO SILVA JÚNIOR
MATTHEW SIMS
ANDREJ SPIRIDONOV
KIM STERELNY
DUNCAN STIBBARD-HAWKES
MARY C. STINER
JAVIER SUÁREZ
ROD SWENSON
MARTIN TAKAC
KOHEI TAMURA
INGE LOES TEN KATE
TOBIAS ULLER
FEDERICO VEGA
HUGH WILSON
JASON WINNING
VICTOR WRAY
ORYAN ZACKS

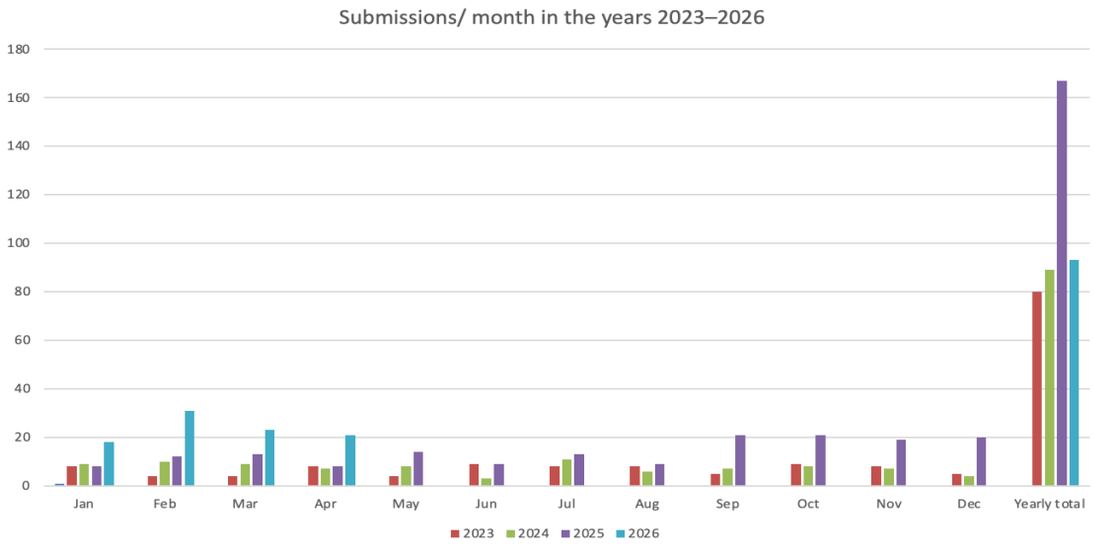
104 New Development Concerning *Biological Theory*

We express our heartfelt gratitude to Stuart Newman and Deborah Klosky for their invaluable contributions to *Biological Theory* over the years, as they both step down from their roles in 2025. Stuart has served on the Editorial Board since the journal's founding in 2006 and as Editor-in-Chief since 2015. Deborah has been Managing Editor since 2010. We are pleased that Kevin Lala took over the role as Editor-in-Chief in January 2026. Elisabeth Zimmermann joined the team in July 2025 as Managing Editor of the journal and Communications Officer of the KLI.

The previous incumbent, Stuart Newman, joined the editorial board in 2026, and at the same time Barbara Fischer, Laurel Fogarty, Luiz Pessoa, Ronald Planer, Tobias Uller, and Cristina Villegas all joined the team of Associate Editors, with Linda Corporael and Gerd Müller stepping down from that role.

In 2024, *Biological Theory* has officially received an Impact Factor of 1.9 in the category "History and Philosophy of Science" by Clarivate Analytics as part of their Journal Citation Reports. Largely, but not exclusively due to the Impact Factor, the number of submitted manuscripts to *Biological Theory* has increased drastically. The graphics below display a count of all papers submitted to *Biological Theory* in the last 3 1/2 years (as of April 24, 2026), sorted according to month and year.





The increase in submissions is also reflected in a modest increase of accepted manuscripts and in a significant increase of rejections.

Number of Final Decisions by Decision Term and Year (as of April 24, 2026)

4.4 Scientific Presentations

BASANTA S.
Unlikely Allies: The Effects of Shifting Public Sentiment on Endocrine Research in Vienna Interwar Period
Annual Meeting of the History of Science Society (HSS), New Orleans

BONDARENKO O.
Quasi-Experimental Methods and the Status of the Social Sciences
Philosophy of Science Association Off-Year Conference, online

BONDARENKO O.
Values Beyond (Mis)uses: Updating the Discussion About Values in Behavioural Genetics and Genomics
Meeting of the International Society for the History, Philosophy, and Social Studies of Biology (ISHPSSB), University of Porto

BONDARENKO O.
Behavioural Genetics and Cultural Evolutionary Theory: An Integrative Relationship?
British Society for the Philosophy of Science Annual Conference, University of Glasgow

BONDARENKO O.
Behavioural Genetics and Cultural Evolutionary Theory: An Integrative Relationship?
Workshop "Perspectives on Human Variation," KU Leuven

CALABRETTA E, BELLISARIO B, CARERE C, CARDINALE M, YOHANNES E, FUSANI L, MAGGINI I.
Wind Conditions Drive Co-Migration Fidelity in Trans-Saharan Migrants at a Mediterranean Stopover Site
Workshop on "Behavioural and Cognitive Biology," University of Vienna

CALABRETTA E, FUSANI L, LEMAIRE J, CARDINALE M, YOHANNES E, MAGGINI I, CANOINE V.
Passerine Stopover Physiology: Weather Variability Does not Alter Corticosterone Dynamics at a Mediterranean Stopover Site
Italian Ringing Conference, Grosseto

FISCHER B.
Testing the Pelvic Floor Hypothesis Using Clinical Data. Do Certain Pelvic Morphologies Carry a Higher Risk for Developing Pelvic Floor Disorders?
Pelvis & Evolution Seminar, KLI Klosterneuburg

FISCHER B.
Die Evolution der menschlichen Geburt
Public Lectures of the Natural History Museum Vienna

GONZÁLEZ-FORERO M, VAN DOOREN T.
Advances in Theoretical Evo-Devo
European Society for Evolutionary Developmental Biology Meeting, Glasgow

GONZÁLEZ-FORERO M.
Why Did the Human Brain Size Evolve? A Way Forward
Congress of the European Society for Evolutionary Biology, Barcelona

GONZÁLEZ-FORERO M.
Why Did the Human Brain Size Evolve? A Way Forward Using Simulation-Based Inference
Nick Barton's Lab Meeting, ISTA, Klosterneuburg

GONZÁLEZ-FORERO M.
Why Did the Human Brain Size Evolve? A Way Forward
Departmental Seminar at the Department of Anthropology of the University College London

GONZÁLEZ-FORERO M.
Advancing a Mathematical Theory Integrating Development and Evolution
EvolVienna Conference, Vienna

GONZÁLEZ-FORERO M.
Advancing a Mathematical Theory Integrating Development and Evolution
Modeller's Seminar at the Francis Crick Institute, London

GONZÁLEZ-FORERO M.
Evo-Devo Dynamics under Arbitrary Genetics
Blue Saloon, KLI Klosterneuburg

GONZÁLEZ-FORERO M.
Expanding the Mathematical Foundations of Evolutionary Biology to Incorporate Development
Departmental Seminar at the Department of Zoology of the University of Stockholm

GONZÁLEZ-FORERO M.
Expanding the Mathematical Foundations of Evolutionary Biology to Incorporate Development
Departmental Seminar at the Department of Biology of the University of Lund

HAWRANEK A-S, LE MAITRE A, VON BALTHAZAR M, TRAUN G, SCHÖNENBERGER L, PAMPERL S, SCHÖNENBERGER J, CHARTIER M.
3-D floral syndromes in *Aquilegia* (Ranunculaceae)
39th Annual Meeting of the Scandinavian Association for Pollination Ecology (SCAPE), Priego de Córdoba

JONES E.
What is Normal? Shifting Baselines in Biology
Interaction and Evolution of Organisms Seminar Series, University of Vienna

KAWAM B, MCELREATH R, OSTNER J, REDHEAD D, SCHÜLKE O.
Inferring the Causes of Animal Social Network Structure from Time-Series Data
Department of Sociology, University of Groningen

KNABL P.
Jacques Monod Conference "Origins of Metazoans," Roscoff

KNABL P.
From Conservation to Innovation – Adaptation Insights from Basal Metazoans
Evangelische Akademie, Tutzing

KNICKEL M.
Building Capacities for a More Just Transdisciplinary Research Practice
Seminar at the Pisa Agricultural Economics Group, University of Pisa

KNICKEL M.
Embedding Justice in European Land Use Planning: Exploring Understandings of (In)justice to Transform Land Use Decision-Making
Conference TCX York "Organising for Transformation," York

KNICKEL M, CANIGLIA G.
Facing the Justice Challenge with Care in Transdisciplinary Research
Seminar at the Faculty of Social Sciences, University of Helsinki

KNICKEL M, CANIGLIA G.
Embedding Justice in Transdisciplinary Methodologies: Towards More Equitable Land Use Research in Europe
30th European Society for Rural Sociology Congress, Riga

KNICKEL M, HEIN N.
Embedding Justice in Transdisciplinary Land Use Research in Europe: Towards Creating Spaces and Building Capacities
International Conference "Re-/Searching to Transgress Collaborative Formats and Practices of Social-ecological Transformation," Graz

LE MAITRE A.
Decomposing Morphological Variation with the Package prWarp: Which Applications for the Study of Human and Non-Human Primates?
1850th meeting of the Société d'Anthropologie de Paris (SAP), Paris

LE MAITRE A.
Biologie évolutive: Évolvabilité de l'oreille chez les primates
Symposium inter-thématique. Rencontre du réseau des chercheurs français en Autriche, Vienna

LE MAITRE A.
Annual meeting 2025 of the Société d'Anthropologie de Paris
Musée de l'Homme, Paris

LE MAITRE A.
Ear Variation and Evolvability in Mammals
Séminaire de l'ISEM, University of Montpellier

LE MAITRE A, COSTEUR L, GERAADS D, GUY F, MAZURIER A, SPASSOV N, MERCERON G.
Une nouvelle perspective sur le colobiné fossile Mesopithecus: l'apport du labyrinthe osseux
37e Colloque de la Société Francophone de Primatologie (SFDP), Poitiers

MANI S.
Origins of Directionality in Multicellular Development
Seminar at the Max Planck Institute, Ploen

MANI S.
Jacques Monod Conference "Origins of Metazoans," Roscoff

MANI S.
EMBO Meeting "Evolution and Origins of Multicellularity Across the Tree of Life," Barcelona

MANI S.
French Society for Developmental Biology "Shaping life," Marseille

MITTEROECKER P.
What Is Measurement Error in Biology?
Workshop "Measuring Development and Evolution of Form," KLI Klosterneuburg

MITTEROECKER P.
Modeling the Evolution of Schizophrenia
Giessen International Schizophrenia Symposium, Ebsdorfergrund

PETRACCA E.
Workshop '4E Economics', 'Roma Tre' University

PETRACCA E.
Normative Alternatives to Adaptation for an Embodied Rationality
Meeting of the International Society for the History, Philosophy, and Social Studies of Biology (ISHPSSB), University of Porto

PFAFF C, RUF I, LE MAITRE A.
Back to the Past: The Middle and Inner Ear of Selected Extinct and Extant Rodents and Its Morphofunctional Implications
85th Annual Meeting of the Society of Vertebrate Palaeontology (SVP), Birmingham

PYTTLIK A, BRAVO MORANTE G, PFAFF C, MENENDEZ L, LE MAITRE A, MITTEROECKER P.
Inner Ear Asymmetry in Birds and Mammals: Clues to Developmental Instability and Evolvability
Congress of the European Society for Evolutionary Biology (ESEB), Barcelona

SANTIS MD.
Tachinids in Action: On the Biology and Diversity of Bristle Flies
Arbeitsgemeinschaft Österreichischer Entomologen, Vienna

SANTIS MD.
Ivan Schmalhausen as a Dialectical Biologist: His Influence on the Dialectical Thought of Levins and Lewontin
University of São Paulo, São Paulo

SANTIS MD.
Sobre a natureza das explicações evolutivas
Seminars of the Laboratory for Teaching, Philosophy and History of Biology, online

SARTO-JACKSON I.
History of Neuroscience through the Nobel Prizes
Guest Lecture, Medical University of Vienna

SARTO-JACKSON I.
Rethinking EvoDevo through the Lens of Process Ontology
Meeting of the International Society for the History, Philosophy, and Social Studies of Biology (ISHPSSB), University of Porto

SARTO-JACKSON I.
Reconceptualizing Neurodevelopmental Timing by Seizing Insights from EvoDevo
German Society for Philosophy of Science (GWP), Friedrich Alexander University Erlangen-Nürnberg

SARTO-JACKSON I.
From Quantitative to Qualitative Perspectives in Personalized Psychiatry
27th International Congress of History of Science and Technology (ICHST) 2025, online

SARTO-JACKSON I.
Rupert Riedls interdisziplinäres Erbe – Gründung und internationale Positionierung des Konrad Lorenz Institut für Evolutions- und Kognitionsforschung
Symposium des Club of Vienna "Die Bedeutung Rupert-Riedls Werk für die heutige Wissenschaft," Naturhistorisches Museum Wien

SARTO-JACKSON I.
Can Reciprocal Causation Inform Evolutionary Concepts?
International Winter Neuroscience Conference, Sölden

SARTO-JACKSON I.
The Making and Breaking of Minds – Das soziale Gehirn
Freunde des Naturhistorischen Museums und Naturhistorisches Museum Wien

SARTO-JACKSON I.
Biocognition: Knowledge Accumulation in Biological Systems
MeiCogSci Lecture Series, University of Vienna

SARTO-JACKSON I.
Cognitive Biology
MeiCogSci Course, Comenius University of Bratislava

SARTO-JACKSON I.
Warum ich weiß, was du fühlst
Brain Awareness Week 2025, Medical University of Vienna

SARTO-JACKSON I.
Das soziale Gehirn
Brain Awareness Week 2025, Medical University of Vienna

SARTO-JACKSON I.
Entwicklung von Gehirn und Sprache
Vorlesungsreihe, Pädagogische Hochschule Wien, online

SARTO-JACKSON I, KUNZE M.
Explanations in Neuroscience – An Introduction
Meeting of the Austrian Neuroscience Association 2025,
Institute of Science and Technology Austria (ISTA), Klosterneuburg

SCHMID M.
What Is Industrialization in Co-Evolutionary Terms?
13th European Society for Environmental History (ESEH) Conference
"Climate Histories," Uppsala

SCHOENMAKERS LLJ.
Minimal Evolutionary Theory and the Origins of Life
Meeting of the International Society for the History, Philosophy, and
Social Studies of Biology (ISHPSSB), University of Porto

SCHOENMAKERS LLJ.
Lessons from Contemporary Philosophy of Science
Konrad Lorenz Forschungsstelle, Grünau im Almtal

SCHOENMAKERS LLJ.
Philosophy of Origins of Life Research
ImmunoConcEpT, University of Bordeaux

SCHOENMAKERS LLJ.
Minimal Evolutionary Theory and the Origins of Life
IAS-Research Centre for Life, Mind, and Society, University of Basque Country

SCHOENMAKERS LLJ.
The Evolutionary Origins of Life
Guest Lecture in the MeiCogSci Course "Cognitive Biology," Comenius
University Bratislava

SEVERS L.
'Organisation before Representation: How Control Structures Support Adaptive Strategies in Learning and Decision-Making'
3rd Annual Web Conference of the International Society for the Philosophy of the Sciences of the Mind, online

SRIDHAR H.
The Imprint of Scientists' Non-Epistemic Values on Conservation Outcomes: A View from Conservation Biology in India
Meeting of the International Society for the History, Philosophy, and Social Studies of Biology (ISHPSSB), University of Porto

SRIDHAR H.
Naeem Revisits Naeem et al. 1994: Reading between the Lines of a Scientific Paper
10th Norwegian History of Science Conference, Bergen

SRIDHAR H.
Naeem Revisits Naeem et al. 1994: Reading between the Lines of a Scientific Paper
University of Copenhage

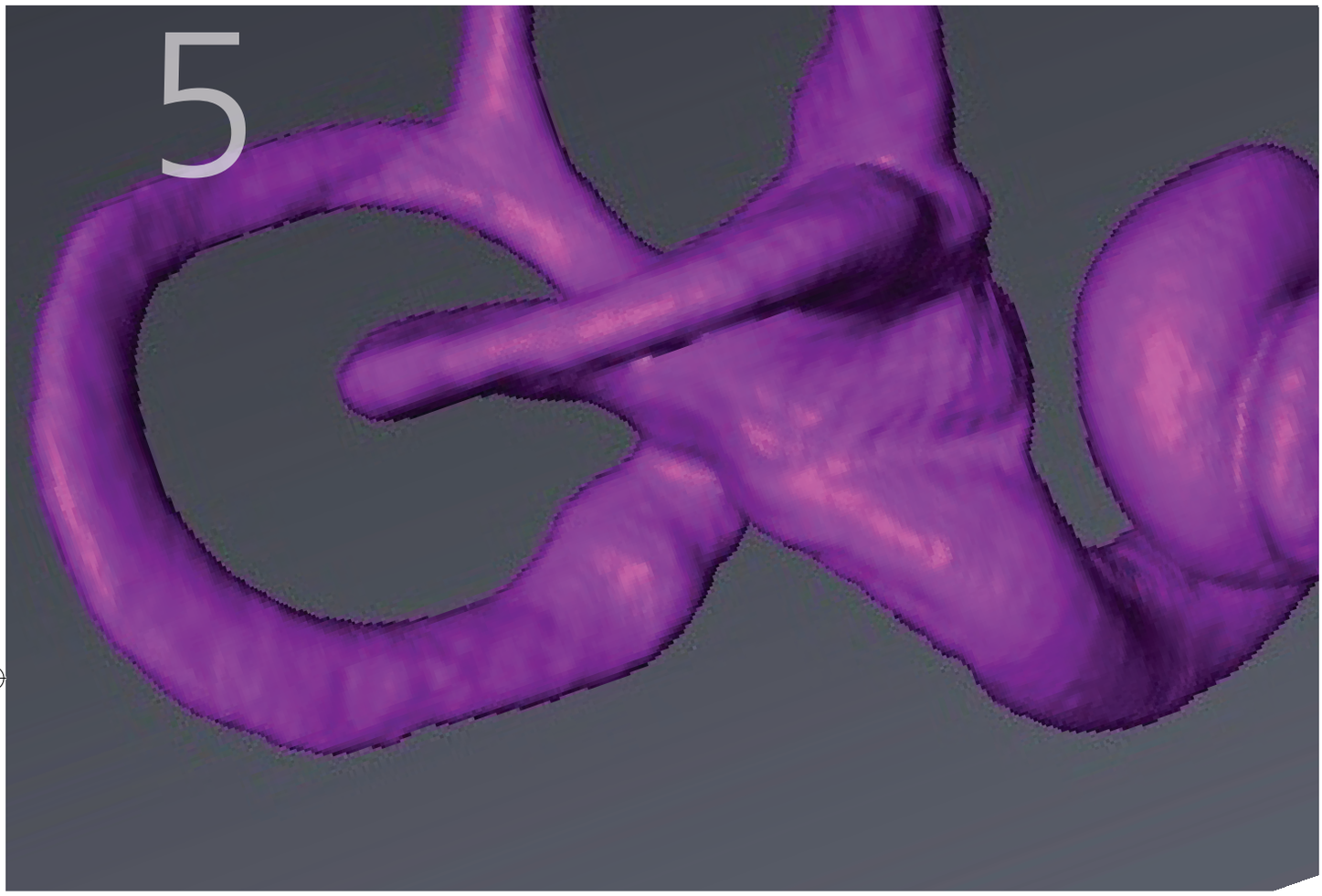
SRIDHAR H.
Making Historical Knowledge that Matters
Max Planck Institute for the History of Science, Berlin

VILLEGAS C.
Chance, Necessity, and the Evolution of Evolvability
Meeting of the International Society for the History, Philosophy, and Social Studies of Biology (ISHPSSB), University of Porto

VILLEGAS C.
Biological Variation: Theory and Practice
Session Commentary at the Meeting of the International Society for the History, Philosophy, and Social Studies of Biology (ISHPSSB), University of Porto

VILLEGAS C, TRIVIÑO V.
Making Sense of Natural Kinds in Evolution: Dynamism and Causal Powers
XI Congress of the Spanish Society for Analytic Philosophy (SEFA), Seville

Further Activities



Many activities of the KLI support its mission and vision. Some representative activities are listed here.

5.1 Grants

Projekt der Stadt Wien in Kollaboration mit dem Club of Vienna

to Joyshree CHANAM (KLI)
Supervisors: Isabella SARTO-JACKSON (KLI), Sigrid KROISMAYER & Hermann KNOFLACHER (Club of Vienna)

Ökologische Empathie (2024 – 2025)

Wie geht unsere Gesellschaft mit bevorstehenden, tiefgreifenden Veränderungen, unvorhergesehenen Risiken und einer unsicheren Zukunft um? Psychologische und kognitionswissenschaftliche Studien legen offen, dass kritische Reflexion und die Bereitschaft zu einem konstruktiven Diskurs durch Vorurteile und kognitive Verzerrungen („Bias") beeinträchtigt sind, insbesondere wenn es um Themen wie Umweltverschmutzung, Klimawandel und deren Folgen geht (Zaval und Cornwell, 2016). Die kognitiven Barrieren interferieren mit Denkansätzen, mögliche Gegenmaßnahmen zu entwickeln und implementieren, um Auswirkungen des Klimawandels zu reduzieren.

Um die kognitiven Prozesse besser zu verstehen, die sich in einer Gesellschaft angesichts drohender Umweltrisiken und Klimakatastrophe entfalten, ist es wesentlich, kulturelle, emotionale und prosoziale Dimensionen als zentrale Faktoren miteinzubeziehen. Insbesondere ein Verständnis für die Wechselwirkung zwischen „ökologischer Empathie" und Nachhaltigkeit scheint ausschlaggebend zu sein, um die Mensch-Umwelt-Beziehungen in seiner Vielseitigkeit zu erfassen. Brown et al. (2019) zeigen, dass mangelnde ökologische (und soziale) Empathie, die Motivation verringert, die Umwelt zu schützen und nachhaltig zu leben. Im Gegensatz dazu scheint eine verstärkte Empathiefähigkeit zu einer stärkeren Bindung zwischen Menschen und Natur zu führen, was wiederum die Grundlage für umweltfreundliches Verhalten und Handeln zu bildet (Weik von Mossner, 2017).

Im vorliegenden Projekt wird ein bibliografischer Ansatz verwendet, um das Thema „ökologische Empathie" anhand von primären und sekundären Literaturquellen und Datenbanken zu untersuchen. Im Wesentlichen geht es um die Fragestellung welche Faktoren die „ökologische Empathie" maßgeblich beeinflussen.

Max Planck-India Mobility Grant

to Hari SRIDHAR (KLI)

The Max Planck-India Mobility Grant (MPIMG) are a distinction awarded to highly qualified Indian scientists who should be in their final year of doctorate or have obtained their doctorate no longer than ten years ago. MPIMG are awarded for three years enabling the candidates to initiate and pursue research links to a Max Planck Institute of their choice. Candidates have the right to visit a Max Planck Institute (MPI) for a minimum of one month per year. In order not to forfeit the MPIMG these visits to the Max Planck Institute must take place regularly every year.

Hari Sridhar will spend a month every year (from 2025 to 2027) in the "Knowledge Systems and Collective Life" department of the Max Planck Institute for the History of Science (MPIWG) in Berlin, working on shared research interests and developing ideas for collaboration between MPIWG and the Archives at the National Centre for Biological Sciences, Bengaluru. In particular, Hari will work closely with MPIWG's newly launched Laboratory for Oral History and Experimental Media, to participate in efforts to develop new approaches to oral histories of knowledge.

European Union's Seal of Excellence

to Somya MANI (KLI)

Exploring the Role of Novel Genes in Cell-Type Invention

The Seal of Excellence is awarded to project proposals submitted under a Horizon Europe call for proposals and ranked above a predefined quality thresholds but were not funded by Horizon Europe due to budgetary constraints. With this label the Commission recognise the value of project proposals and encourage other funding organisations to take advantage of the high-quality Horizon Europe evaluation process.

EMBO Scientific Exchange Grant

to Somya MANI (KLI)

Exploring the Role of Novel Genes in Cell-Type Individuation in the Cnidarian *Hydra vulgaris*

With this grant, Somya will be spending three months (Sep – Nov, 2025) in Athens, Greece, where she will be working in collaboration with Dr. Nikolaos Vakirlis, Group Leader at the Hellenic Pasteur Institute. Dr. Varkilis is a leading expert in the study of novel genes, and has extensive experience in devising and implementing innovative *in silico* methodologies to identify and analyze novel genes in diverse organisms.

Novel genes are borne either by duplication of pre-existing genes, or *de novo* origin of genes from non-genic sequences. Novel genes from both origins are known to perform essential biological functions, especially in biological development. They also play a role in regulation of cell-type identity and the invention of novel cell-types. However, there is currently not enough evidence and knowledge of candidate novel genes, especially *de novo* genes, to experimentally test their role in determining cell-type identities.

This project aims to understand the role of novel genes in regulating and determining the identities of cell-types. Somya and Dr. Varkilis will make use of publicly available genomic and single cell transcriptomic datasets and use bioinformatic methods to identify novel genes in H. vulgaris and computationally characterize their cell-type specific expression profiles as well as novel gene functionality potentially related to determining cell-type identities.

Completion Grant of the Vienna Doctoral School of Ecology and Evolution

to Nina KRAUS (KLI & University of Vienna)

Investigation of Hemodynamic Influences on Heart Morphogenesis

Nina Kraus received a completion grant to finish her PhD thesis at the University of Vienna under the supervision of Dr. Brian Metscher.

Young Researchers´ Prize 2024/2025

to Olesya BONDARENKO (KLI)

Credibility and Trustworthiness: The Promises of Sociogenomic Integration and Research on Gene-Environment Interaction

For the past ten years, the French Society for Philosophy of Science (SPS) has organized the Young Researchers Prize (JCJC). Initially awarded annually, this prize is now awarded every two years and is presented at the SPS's biennial conference.

The JCJC Prize recognizes a doctoral candidate or a recent PhD graduate (defended within the last seven years) for a contribution in the field of philosophy of science. Each article is evaluated double-blind by experts in the subject matter. Based on these evaluations, a jury composed of members of the SPS board of directors ranks the submissions and awards the prize.

KLI fellow Olesya Bondarenko´s paper "Credibility and Trustworthiness: The Promises of Sociogenomic Integration and Research on Gene-Environment Interaction" ranked 3rd in the Young Researchers´ Prize 2024/2025 competition, Francophone Society for Philosophy of Science.

Humboldt Postdoctoral Fellowship

to Oryan ZACKS (KLI)

Oryan Zacks (2022–2023 Graduate Studies Fellow) was awarded an Alexander von Humboldt Postdoctoral Fellowship and will pursue a postdoctoral position at the Max Planck Institute for Evolutionary Anthropology in Leipzig. Her research will examine the brains and cognitive abilities of birds and their comparison with mammals.

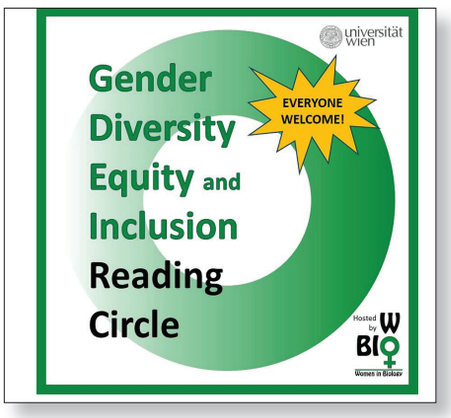
Werner Callebaut Prize

sponsored by the KLI

Elis Jones (KLI) and Richard Vagnino were awarded the 2025 Werner Callebaut Prize for Interdisciplinary Research at the ISHPSSB 2025 meeting in Porto. The prize, supported by the Konrad Lorenz Institute (KLI), recognizes early-career scholars for exceptional interdisciplinary research, with Jones winning for his paper, „Exploring the socio-ecology of science: the case of coral reefs“ which was presented at the ISHPSSB Toronto 2023 meeting.

The prize honors the memory of former scientific director of the KLI Werner Callebaut by supporting early-career scholars who cross traditional boundaries in philosophy, biology, and social studies.

5.2 Outreach Activities



Sexgender Diversity in Biology Reading Circle

Organizer: Anne LE MAITRE (KLI)

"Biological facts" are often central to current public debates about sex and gender in humans. But is biology enough to understand the complexity and variation of human sex, gender, and sexuality? And why and how should biologists contribute to this debate? The DEI Reading Circle, organized by Women in Biology, wants to explore these topics this summer semester.

We are convinced that biologists should deeply care about this topic because it has real consequences for people's lives as science is being weaponized to discriminate against marginalized groups. We will take a look at how we historically conceptualize and operationalize biological sex in animals and humans, and learn which biases these categories carry with them. We will also scrutinize these influences on how we do and talk about our science, and look at new concepts and frameworks beyond simplistic binary models of sex and gender to do better. Finally, we will consider how can we make teaching more inclusive with regard to sex and gender diversity content.

Der Ursprung der Menschheit
November 2025

Podcast des FWF

Barbara FISCHER (KLI & University of Vienna)

Podcast "Was wir wissen" des österr. Wissenschaftsfonds FWF.

In der ersten Episode des Podcasts geht es um nichts weniger als um die Frage des Ursprungs der Menschheit. Wie ist der Mensch entstanden? Wie sind Menschen durch die Einflüsse der Umwelt und ihrer Kultur zu so komplexen Lebewesen geworden? Wie geht die Evolution auch heute noch weiter? Und wieso hat die Evolution zugelassen, dass die Geburt beim Menschen so schwierig ist?

Dazu haben die Hosts Francesca GRANDOLFO und Thomas ZAUNER mit Christa SCHLEPER von der Universität Wien, Barbara FISCHER vom Konrad Lorenz Institut für Evolutions- und Kognitionsforschung und Barbara HOREJS von der Österreichischen Akademie der Wissenschaften gesprochen.
https://scilog.fwf.ac.at/magazin/der-ursprung-der-menschheit

Podiusmdiskussion zum Jubliäumsfest 10 Jahre bilding

September 2025

Bilding, Innsbruck

Wieviel Mut haben wir?

Was macht einen kreativen Freiraum aus? Welche Bedeutung hat er für die Entwicklung von Kindern und Jugendlichen, die die Gesellschaft der Zukunft gestalten? Zehn Jahre bilding bieten Anlass, um über einen außergewöhnlichen Ort, die Lust am Experiment, methodische Ansätze, Versäumnisse in der

Bildungspolitik und über die Frage „Wieviel Mut haben wir?“ nachzudenken. Zum Auftakt des Jubiläumsfests lud bilding im September 2026 zur Podiumsdiskussion ein mit:
INGEBORG ERHART, Vizerektorin für Kunst und Lehre an der Akademie der bildenden Künste Wien
MARTIN RAUCH, Keramiker, Künstler und führender Experte des modernen Lehmbaus, Schlins/Vorarlberg
ISABELLA SARTO-JACKSON, Neurowissenschafterin und Geschäftsführerin des Konrad Lorenz Institut für Evolutions- und Kognitionforschung
ANDREAS WURZRAINER, Erziehungswissenschafter und Leiter des Zentrums für Leadership und Schulentwicklung an der Pädagogischen Hochschule Tirol
Moderation: IVONA JELCIC, freie Journalistin und Autorin

5.3 Interviews

SARTO-JACKSON I.
Der „Traumkindergarten“ einer Hirnforscherin
Interview by M. Schwarz for the Austrian newspaper “Die Furche”
https://www.furche.at/gesellschaft/der-traumkindergarten-einer-hirnforscherin-16876016

SRIDHAR H.
Revisiting Sommer & Sternberg 1994
https://reflectionsonpaperspast.com/2025/02/26/revisiting-sommer-sternberg-1994/

SRIDHAR H.
Revisiting Kirschner & Gerhart 1998
https://reflectionsonpaperspast.com/2025/03/11/revisiting-kirschner-gerhart-1998/

SRIDHAR H.
Revisiting Newman & Frisch 1979
https://reflectionsonpaperspast.com/2025/07/03/revisiting-newman-frisch-1979/

SRIDHAR H.
Revisiting Love 2003
https://reflectionsonpaperspast.com/2025/07/24/revisiting-love-2003/

SRIDHAR H.
Revisiting Revisiting Duboule & Dollé 1989
https://reflectionsonpaperspast.com/2026/01/01/revisiting-duboule-dolle-1989/

SRIDHAR H.
Revisiting Badyaev 2005
https://reflectionsonpaperspast.com/2026/01/02/revisiting-badyaev-2005/

5.4 Acknowledgment

The KLI is grateful to the Office of the State Government of Lower Austria, Department of Science and Research for additional financial support that contributed to the pursuit of the KLI's scientific endeavors.