activities of the KLI

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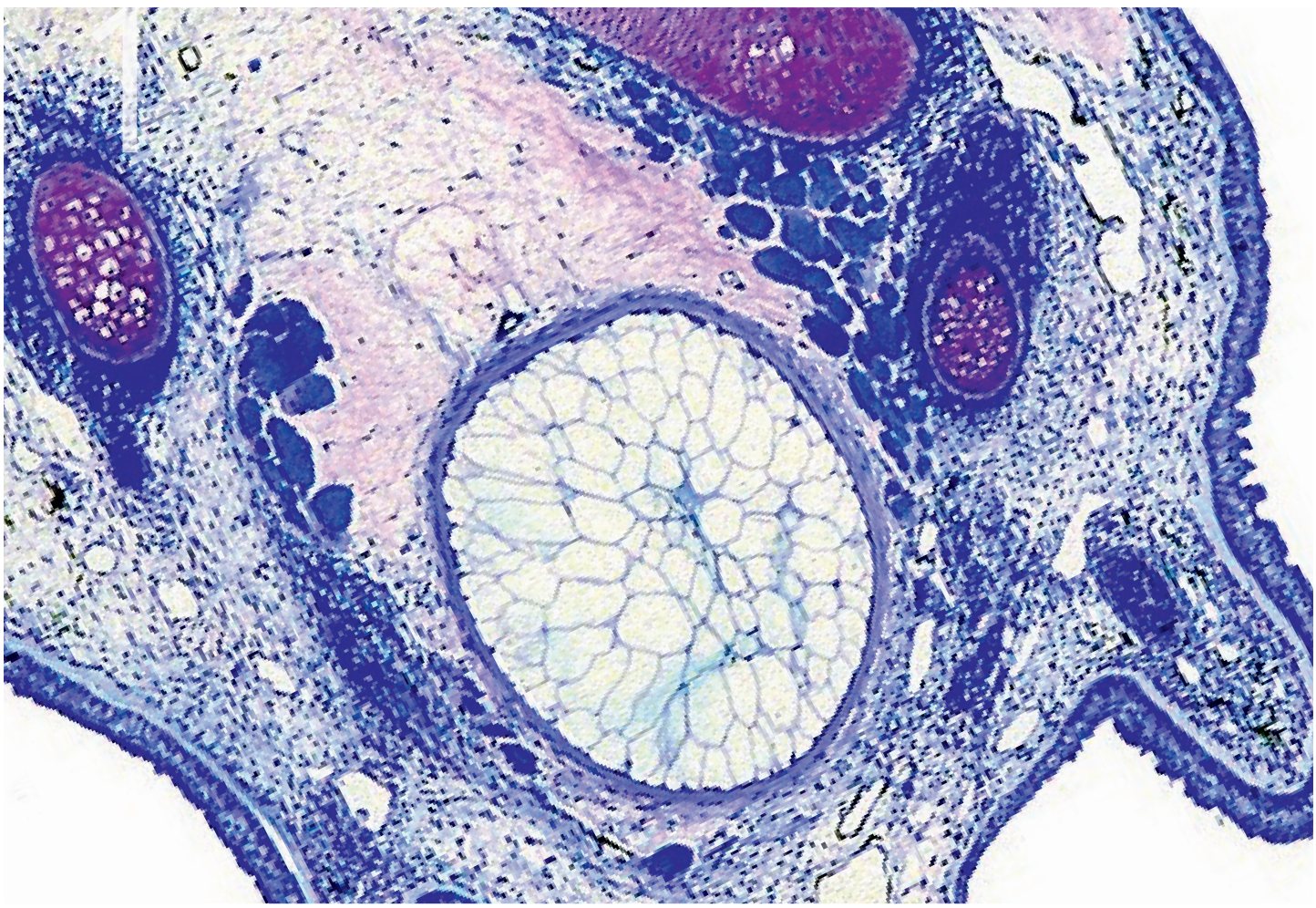
Review 2019 and Structure of the KLI



The KLI is not just an institute constituted in a formal way,

it is an "emergent phenomenon" in its own right.

Steve Lewis
(University of Chester)

1.1 The Year in Review

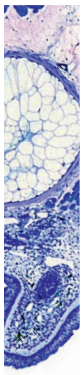
While writing these lines in April 2020, we experience the challenges of the Covid-19 pandemic. Like all other institutions, the KLI currently undergoes major restrictions to it's activities. However, due to the not-for-profit status of our organization and the largely intellectual nature of our work, we are very privileged to suffer less than many other institutions and businesses. The KLI fellows are working from home, and our meetings and lectures take place in virtual spaces. Only in the next year's report will we be able to assess the consequences of the significant changes in our daily routines for the institute and the world's societies at large. For now, I wish all members of the KLI community a safe journey through this period of uncertainty!

The year of 2019 was marked by numerous new administrative and scientific formats launched by the KLI's scientific director together with the executive manager and the secretary. Weekly check-in meetings, lab meetings, and other joint activities, as well as the increased use of social media have strengthened both the internal coherence of the KLI and its public outreach. A new and much more informative website has been launched, a new flyer was created, a YouTube channel records fellow projects, Twitter feeds advertise our activities, and Slack helps to organize internal communication. The categories of the KLI fellowships were reformed, as were the application procedures, and calls for applications were internationally announced. In addition to the traditional Altenberg Workshops in Theoretical Biology, new formats have been implemented, such as the Focus Groups, Working Groups, Cooperative Events, Public Events, and Professional Training Workshops. Due to this general increase in activities, for the first time since the establishment of the KLI's spacious office wing, all desks were occupied at once. At the same time, the theoretical and evolutionary focus of the KLI's scientific orientation has been extended to include the conceptual foundations of sustainability science and a strengthened cognitive science domain. Both areas are of major importance at a time of societal reorientation in a perturbed world.

I thank the KLI leadership team, Guido Caniglia, Isabella Sarto-Jackson, and Eva Lackner, for their immense dedication to the institute and their continued efforts in creating an enabling environment for innovative scientific thought. I am grateful to the Fellows of the KLI for honoring us with their presence and their projects. I am also much obliged to the members of the KLI Foundation, the Board of Directors, and the Scientific Advisory Board. And, as always, my special thanks go to Traudl Engelhorn for her generosity and her unwavering love for all things cultural.

Gerd B. Müller
President

1.2 The KLI



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The KLI is an international center for Theoretical Biology. 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, sustainability science, 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 five 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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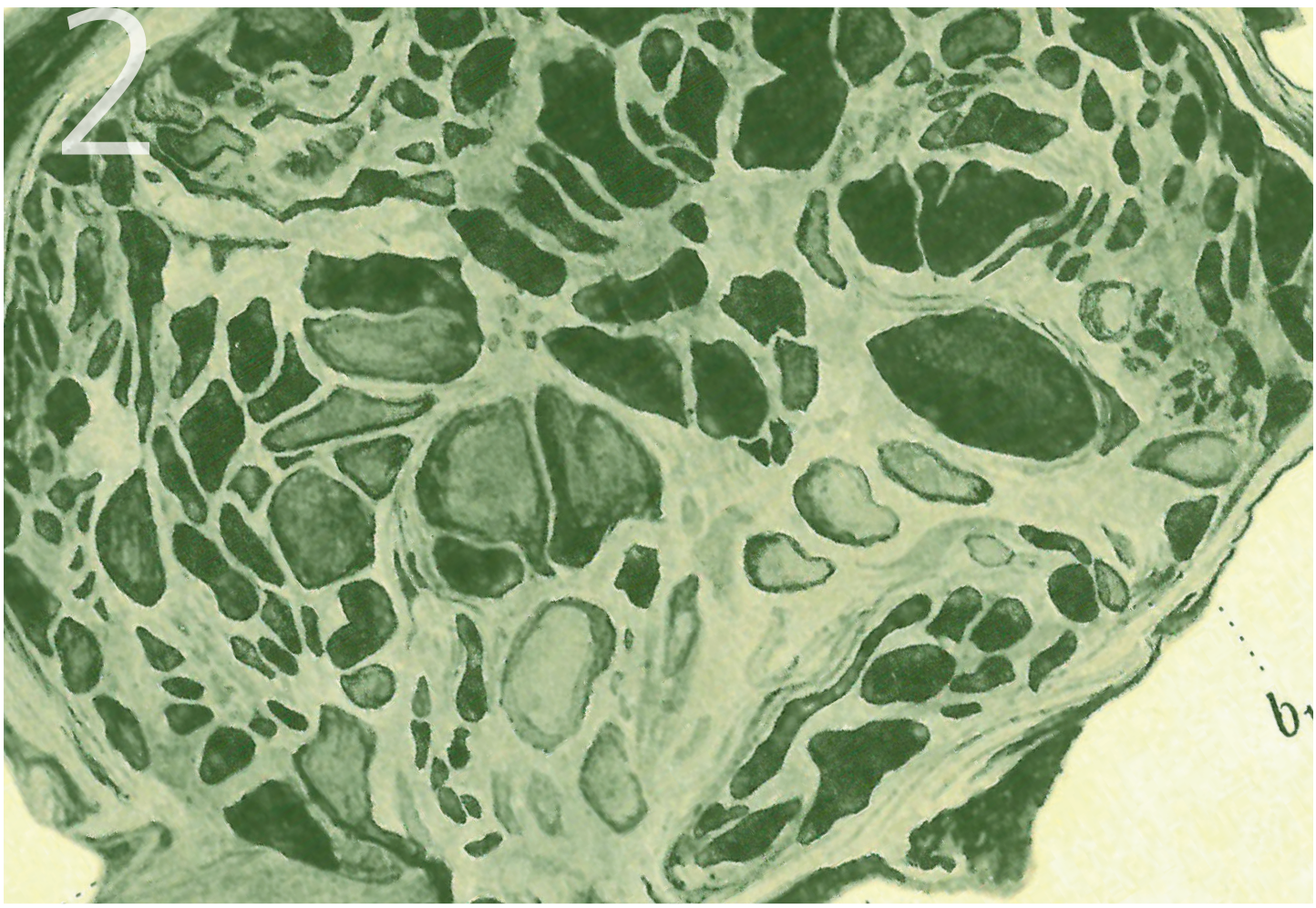
DR. STEFANIE WIDDER
Center of Molecular Medicine of the Austrian Academy of Sciences, Medical University of Vienna

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 2019, the KLI received a total of 70 applications for fellowships. 8 postdoctoral fellowships, 7 writing-up fellowships, and 23 visiting fellowships were granted for 2019 or 2020.

2.2 Writing-Up Fellowships

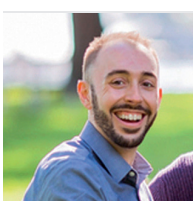
Christian DORNINGER
(April – September 2019)

Christian Dorninger is a Ph.D. candidate at the Leuphana University of Lüneburg and a writing-up fellow at the KLI in Klosterneuburg. He has a background in sociology, development studies, and social ecology. Since 2015, he has been involved as a project member in the inter- and transdisciplinary 'Leverage Points for Sustainability Transformation' project at Leuphana University. His research interests include the development and application of methods of human-nature interaction, the sustainability transformation, resource use and decoupling, a biophysical perspective on trade relations, teleconnections, and ecologically unequal exchange. Since April 2019 he is a fellow at the KLI and has started approaching these complex phenomena through a niche construction perspective.

Biophysical Human-Nature Disconnections as a Form of Sociocultural Niche Construction

This project investigates the sustainability of biophysical human-nature connections and disconnections from a sociocultural niche construction perspective. Many regions across the world have disconnected themselves from the productivity of their regional environment by (1) accessing biological products

from distant places through international trade, and (2) using non-renewable resources from outside the biosphere to boost the productivity of their natural environment. Both mechanisms allow for greater resource use then would be possible otherwise, but also lead to fundamentally different feedbacks between humans and the environment. For example, a social-ecological system that is biophysically disconnected from its regional environment does not get direct feedback from over-consumption or transgressing natural boundaries, because those are outsourced to distant regions or veiled by industrial technology respectively. Different countries in the world position themselves differently along the gradient of connectedness and disconnectedness, which should be grasped as niche construction. Cultural evolution undoubtedly plays a critical role in how humans interact with the biosphere and the scientific literature on cultural evolution and sociocultural niche construction is potentially able to shed light on the evolution of the institutions that play a vital role in mediating biophysical human-nature disconnections. However, cultural evolution and institutional path-dependency have largely been overlooked by the sustainability science literature. This project aims to create new insights and concrete knowledge about the evolution of biophysical human-nature disconnections and its sustainability implications. Thus, it contributes to the emerging field of integrating evolutionary theoretical thought and social-ecological systems research for sustainability.



Gregory RUPIK
(February – July 2019)

Gregory Rupik is a Ph.D. candidate studying the history and philosophy of biology at the Institute for the History and Philosophy of Science and Technology at the University of Toronto. His research encompasses both the history and philosophy of biology. On the one hand, he is explicating the understanding of organisms which

emerged from German Biology at the turn of the 19th century, specifically that which resulted from the relationship between Johann Wolfgang von Goethe and Friedrich Schelling. On the other hand, he is researching current shifts away from Modern Synthesis evolution theory, namely organism-centered 'Situated Darwinism' (Walsh 2015). His other research interests include imagination in science, scientific and aesthetic epistemology, feminist science, indigenous science, and theories of scientific change. He also has an M.A. in Catholic systematic theology, and research the relationship between science and Christianity and ecotheology.

Organismal Agency in Romantic Biology and Today

As organismal development has become increasingly relevant to evolutionary theory (as evinced by 'Evo-Devo' and groups working toward an 'Extended Evolutionary Synthesis'), biologists have had to theoretically re-engage with characteristics of organisms previously excised from the Modern Synthesis of evolution theory, such as their goal-orientedness and agency. Some have pointed to the similarities between this emerging focus on the organism and the "Romantic" organism-focused biology at the turn of the 19th century and drawn differing morals from this perceived similarity (Esposito 2013; Gambarotto 2017; Goldstein 2017; Zammito 2018). Despite growing interest in the biology of 19th century Germany, and a more favourable reading of thinkers engaged with Natur-philosophie, no dedicated study has focused on organisms' agency during this period. Additionally, while contemporary attempts to re-think biology have reached into biology's history for inspiration or conceptual resources, the philosophy of biology has not adequately considered the promise of Romantic biology. This dissertation seeks to redress both of these lacunae. In it, I will explore how Johann Wolfgang von Goethe and Friedrich Wilhelm Joseph Schelling conceived of organismal 'agency' & 'goal-

orientedness' with an interest in comparing these conceptions to contemporary theorizations of organismal 'agency' and 'goal-orientedness' (Fulda 2016; Walsh 2017). The goal is that a better understanding of organic vitality and teleology at the turn of the 19th century in Germany can cast light on those same concepts as they come to the fore again today.

Christine SYROWATKA (née MAYER)
(September 2018 – February 2019)

Christine Syrowatka completed her Master of Science in biological anthropology at the University of Vienna. Her master thesis was about the evolution of music in humans. After finishing her undergraduate studies, she worked on developing a Geometric Morphometric Image Analysis (GMIA) at the Department of Theoretical Biology at the University of Vienna. She is currently completing her Ph.D. thesis at the University of Oslo under the supervision of Thomas Hansen. For the final phase of her dissertation, she has been awarded a KLI writing-up fellowship.

Evolvability and Robustness

Evolvability is the ability of a system or population to respond to selection by producing heritable and selectable phenotypic variation. In contrast, robustness is the ability of a phenotype to persist against perturbations. By definition, a system cannot be evolvable and robust at the same time. However, evolvability and robustness are both important properties to evolve complex traits. This creates a paradox for the evolution of complex phenotypes. Evolvability depends on the way how genetic variation translates into phenotypic variation. This process is the key to understanding the relationship between evolvability and robustness in complex organisms and how they shape evolutionary change. I am using two different types of mathematical models of the genotype-phenotype map to explore the relationship between

evolvability and robustness. I am able to show that the relationship between evolvability and robustness depends on the topology of the genotype-phenotype map using a Boolean genotype-phenotype map. I am investigating more complex genotype-phenotype maps in a population-genetics context using reaction-diffusion models of pattern formation that are motivated by the development of butterfly eyespots. The reaction-diffusion model is used as genetic architecture in individual-based simulations of populations to study the influence of selection strength on evolvability and robustness. I am exploring the ability of the system to produce and maintain genetic variation over long-term evolutionary change and identify processes of pattern formation that facilitate evolvability and can give insight in the origination of novel patterns over time.

Sophie Juliane VEIGL
(November 2019 – April 2020)

Sophie Veigl is a fellow at the DK 'The Sciences in Historical, Philosophical and Cultural Contexts.' She studied microbiology and genetics, immunology, history and philosophy of science as well as comparative literature at the University of Vienna. She worked as a guest researcher at Tel Aviv University and the University of Cambridge as well as at the Gurdon Institute. One central question that motivates her research is how and to which ends should philosophers of science be normative about their fields of study? In her current research project, she investigates whether certain species of RNA can act as alternative trajectories of inheritance, and whether that constitutes a case for theoretical pluralism. In addition, she works closely together with leading researchers in RNA inheritance to test how resonant her claims are with the notions of the relevant actors. She has been awarded a writing-up fellowship by the KLI to complete her Ph.D. thesis.

Testing Scientific Pluralism

Scientific Pluralism has become a popular position in the philosophy of science and the philosophy of biology in particular. In recent years, debates centering around the extended evolutionary synthesis have also received a pluralist interpretation. While pluralism seems appealing to many philosophers of science, it also has a significant impact on the conduct of research, and thus concerns scientists. However, the question whether scientific pluralism is resonant with researchers' aims and goals remains unanswered. I therefore attempt a first case study, that combines philosophical and sociological methods in order to "test" scientific pluralism in the sciences. The subject of my case study are alternative trajectories of inheritance, and there bearing on theoretical pluralism in the extended evolutionary synthesis. Through this case-study, I aim at contributing a first interdisciplinary approach towards scientific pluralism.

2.3 Postdoctoral Fellowships

Sidney CARLS-DIAMANTE
(May 2018 – May 2020)

Sidney Carls-Diamante has recently received a Ph.D. in philosophy from the University of Auckland. Her doctoral thesis explored how the octopus nervous system challenges a number of received views on the nature of cognition and consciousness. She has been awarded a KLI postdoctoral fellowship to work on a project entitled 'The Free Energy Principle: From Promises to Premises.' The aforesaid project explores how the theoretical framework of the free energy principle theory of cognitive brain function can be refined.

The Free Energy Principle: From Promises to Premises

This project explores the free energy principle (FEP), a highly controversial neuroscientific theory that claims that all forms of brain function can be reduced to a single type of process. The proponents of the FEP claim that if their theory is correct, it has the potential to 1) unify explanation in neuroscience, and 2) identify a fundamental ontological feature definitive of biological organisms. These unificatory and evolutionary claims are highly attractive, as they address two major issues surrounding the nature of theory in cognitive neuroscience. However, the extreme reductionism of the FEP has raised concerns about its explanatory validity, in particular that it comes across as an unfalsifiable 'theory of everything.' In order to secure its place as a plausible theory of brain function and ultimately cognition, the FEP must first pass empirical and theoretical muster. This calls for two things: first, that its claims be verified by empirical testing, and second, that its claims be whittled down into more manageable premises detailing how it can bear out its unificatory and evolutionary promises.

Flavia FABRIS
(January 2019 – January 2021)

Flavia Fabris (Ph.D. La Sapienza University of Rome) is a philosopher of biology who worked at Egenis, the Centre for the Study of Life Sciences, at the University of Exeter. Her background is in philosophy of science and evolutionary developmental biology. From 2011 until 2014 she worked at the La Sapienza, Department of Genetics and Molecular Biology "Charles Darwin," focusing mainly on epigenetic inheritance and the canalization of development. Since 2013 she has been associated with the Centre for Applied Philosophy of Science (CAPS) at the Norwegian University of Life Sciences (NMBU), Ås. Her research examines a variety of conceptual issues in evolu-

tionary and developmental biology, with an emphasis on causation and on methodological and ontological aspects of scientific practice. At present, she is particularly interested in re-examining the philosophy of cybernetics, its primary forms of reasoning, and its implications for theoretical biology, with particular regard to Evo-Devo and the Extended Evolutionary Synthesis.

Rethinking Cybernetics in Contemporary Theoretical Biology

In recent years, the contributions of cybernetics to the development of evolutionary developmental (Evo-Devo) biology have increasingly been recognized. The particular theories and models developed during the flourishing of cybernetics in the early 20th century laid the foundation for the systems approach, which is nowadays widely and fruitfully employed in molecular biology, genetics, genomics, immnology, developmental biology, and ecology. Nevertheless, in some quarters, scholars argue that cybernetics should be treated with suspicion because many evolutionary phenomena cannot be explained reductively in terms of mechanisms, their parts, and their production. This debate, almost a decade long, has produced a considerable amount of literature, mostly centred on the long-protracted dispute between mechanistic philosophers of biology on one side, and those who argue for the superiority of a process view of life on the other. My project aims to re-examine the philosophy and epistemology of cybernetics, its history and its implications for contemporary theoretical biology. The philosophical analysis will focus on clarifying the epistemologies of both cybernetics and Evo-Devo biology, and determining how and to what extent they overlap. I aim to provide positive arguments for the conclusion that, in contrast to the predominant view, cybernetic explanations within biology, when properly understood, are a form of non-reductionist explanation. My work will also help to evaluate the general assumption that cybernetics has, at its ground, a metaphysical commitment to the mechanistic nature of life. I will put this assumption in question, and therefore suggest that the suspicion mentioned above is misplaced.

Richard GAWNE
(September 2017 – February 2019)

Richard Gawne is a developmental and evolutionary biologist, currently working as a postdoctoral fellow at the KLI. He holds a Ph.D. in biology from Duke University. Richard completed his dissertation on the development and evolution of wing patterning in the bella moth Utetheisa ornatrix *in 2017, under the supervision of Fred Nijhout. Before coming to the KLI, he was a visiting researcher at the Smithsonian National Museum of Natural History, and a Fulbright fellow at the University of Copenhagen's Center for Social Evolution.*

Agriculture as a Co-Evolutionary Process

It can be easy to forget that agriculture isn't a uniquely human accomplishment. Various species of ants, bees, beetles, and termites maintain fungus gardens that are used as a primary food source. This means that in order to develop a truly general hypothesis about the origins or consequences of agriculture, we need to take human and insect systems into account. A review of the published literature from both of these fields reveals that research on the evolution of agricultural arrangements has been conducted almost exclusively from the perspective of the farmers, who are simply assumed to be 'in charge' of things. Accordingly, many have asked how the process of domestication affects the organisms being tended, but few have attempted to determine how partnering with a plant, animal, or fungus affects the evolutionary trajectory of the farmers. The driving rationale of my project is that agriculture should be studied as a co-evolutionary process that elicits significant changes in both farmers and cultivars. It is well known that the brain sizes of human-domesticated animals tend to be reduced, compared to their wild ancestors. Over the course of this project, I will use micro-CT scans to measure the ways in which entering into an agricultural relationship with fungi has impacted the brains of insect farmers. Normalizing for factors such as colony

and body size, the prediction is that fungus-farming attine ants will show overall or region-specific reductions in brain size, compared to closely related hunter-gatherer species.

Ivan Dario GONZALEZ CABRERA
(March 2018 – February 2020)

Ivan D. Gonzalez Cabrera recently completed his Ph.D. in philosophy at the Australian National University supervised by Professor Kim Sterelny. He has been research student in Professor Yoshiyuki Hirono's lab at the University of Tokyo and research fellow at the Max Planck Institute for Evolutionary Anthropology under Professor Michael Tomasello's supervision. He was a writing-up fellow at the KLI in 2016. His research focuses on the intersection between biology and psychology, and their philosophical implications. Most of his previous work has been concerned with issues about normative cognition, with a secondary interest in causal and physical cognition. As a KLI postdoctoral fellow, he is currently working on normative disagreement and its role in the emergence of large-scale cooperation and cultural complexity in humans.

The Role of Normative Disagreement in the Emergence of Large-Scale Cooperation and Cultural Complexity in Humans

The proposed research focuses on the evolution and development of normative disagreement and its relation to the emergence of large-scale cooperation and cultural complexity. Normative disagreement is an understudied cause of cultural complexity via norm diversification. It leads to both opposing norms that govern the same aspects of our lives as well as norms that govern different aspects of it such as moral, religious, political, and epistemic norms. Human norm-psychology is often seen as a key driver of large-scale cooperation in our lineage. But large-scale cooperation is

constantly threatened by normative disagreement, whether moral, religious, political, or epistemic. In this project, I aim to understand the evolutionary and developmental roots of these kinds of disagreement, the proximal mechanisms responsible for handling them, and the consequences that the underlying psychology of moral disagreement had for the expansion of cooperation in large, culturally complex societies.

Nicole Dieneke Sybille GRUNSTRA
(September 2019 – August 2020)

Nicole D.S. Grunstra is a biological anthropologist, interested in the interaction between evolutionary processes (both adaptive and neutral), evolutionary constraints, and variational properties in giving rise to macroevolutionary patterns of trait evolution. Nicole first used such a 'holistic' approach in her doctoral dissertation on phenotypic diversification in macaques (Primates: Macaca) at the University of Cambridge. To this end, she studied phenotype-environment associations using traditional morphometrics, multivariate statistics, and phylogenetic comparative methods. She has since added the use of geometric morphometrics and other digitization techniques to her repertoire. Her main theoretical interest concerns the definition, usage and detection of phylogenetic 'constraints', phylogenetic 'effects', and phylogenetic signal.
Nicole's current projects include the decomposition of primate cranial shape into components that differentially preserve phylogenetic history, adaptation, and ontogenetic trajectories, as well as a comparative study of pelvic morphology in relation to neonatal size in bats (Chiroptera). Her proposed research at the KLI is devoted to the study of the human and non-human mammalian pelvis in pursuit of resolving the 'obstetric conundrum' of why the human birth canal evolved to be narrow relative to the size of our neonates, with a special focus on the pelvic floor hypothesis.

Towards Resolving the Human Obstetric Conundrum: Theoretical, Computational, and Comparative Mammalian Approaches

Childbirth in humans is difficult compared to most other mammals. There is a high risk of mortality and morbidity to both, mother and baby, associated with childbirth arising from the tight fit or mismatch between the size of the baby and the maternal birth canal. So why has the human birth canal not evolved to be wider? This 'obstetric conundrum' has long been debated and several explanations have been advanced. However, explanatory factors are manifold, interact, vary among human populations, and often pertain to different levels of explanation, impeding our understanding of this conundrum and attempts to resolve it. To help overcome this challenge, a theoretical framework is required, grounded in evolutionary theory and integrating principles from developmental and evolutionary biology, which helps to reconcile different levels of explanation and identify methodological challenges and outstanding questions pertaining to the obstetric conundrum.

Furthermore, few evolutionary hypotheses exist of why the human pelvis evolved to be relatively narrow, and the ones that do have received little empirical attention. One in particular, the pelvic floor hypothesis, will be the focus of applied research. Using numerical finite element simulations, the pelvic floor will be modeled as an idealized membrane and subjected to sensitivity analysis to establish the relationship between membrane geometry and its level of deformation. Lastly, not only pelvic size and shape are relevant for childbirth; the degree of mobility at the pelvic joints can also facilitate or hinder easy passage of the fetus through the birth canal. Mammals document a range of pubic symphysis morphologies, reflecting a combination of adaptations and constraints related to positional behavior, birth, and phylogeny, the study of which can yield valuable insight into the human condition.

Alice LACINY
(February 2019 – June 2020)

Alice Laciny is a former Ph.D. student at the Department of Theoretical Biology at the University of Vienna and recently completed her thesis in the course of the WWTF project "Voluntary self-sacrifice in exploding ants: a mechanism to defend coevolved microbiomes?" at the Natural History Museum Vienna. She has been fascinated by insects from an early age and recently became president of the Austrian Entomologists' Association. Her scientific interests include myrmecology, parasitology, evolutionary developmental biology, and caste-characterization of social insects via morphological, statistical, and behavioral methods. Her postdoc work focusses on the influence of parasites on the morphology of ant hosts. Her current project at the KLI aims to review the body of current literature on this topic and highlight the overlapping aspects of ecology, evolution, and ontogenetic development therein.

Eco-Evo-Devo in Action: Parasite-Induced Morphologies in Ants

Ant colonies can harbor a large number of diverse parasites and pathogens, many of which are known to induce phenotypic changes in their hosts. Although hitherto largely overlooked in the context of ecological evolutionary developmental biology, the study of parasitogenic morphologies can shed light on mechanisms and pathways relevant to the ontogenetic development of the host, their plasticity or robustness under environmental perturbations, as well as evolutionary and ecological consequences for the host. Within a one-year postdoctoral fellowship at the KLI, I plan to assess the current body of scientific literature regarding parasite-induced morphological changes in ants. I aim to compile and publish a review article on parasite-induced morphological aberrations in the family Formicidae, within which I will compare previously described host-parasite systems and assess commonalities and differences of different parasitogenic phenotypes and their

underlying developmental mechanisms. I will interpret my findings in light of current theories, especially from the field of (Eco)-Evo-Devo, and identify systems suitable for further study. This will lay the groundwork for an international, interdisciplinary project researching host-parasite interactions and parasitogenic phenotypes in ants.

Lumila MENENDÉZ
(September 2018 – August 2020)

Lumila Menéndez is a bioanthropologist, with a B.A. in anthropology, and a Ph.D. in natural science, both from the University of La Plata. During her Ph.D. she contributed to discuss the strong impact that nutritional components have on the cranial shape of South American populations. She was a postdoctoral fellow at University of Tübingen, where she studied the skeletal pattern of the earliest Andean populations living at highlands. She currently holds a KLI postdoctoral fellowship. Her main research interest is human evolution, specifically the peopling and concomitant morphological diversification of South America. She investigates this with a particular focus on the impact of non-random factors on the skeleton.

Influence of Diet on Human Face and Mandibular Variation

The face and mandible have been described as the two cranio-mandibular modules with the strongest environmental influence. Moreover, due to the prominent functional role that they have during chewing, it was suggested that diet mostly contribute to shape them. Most previous studies describe these modules independently, using either a local or a worldwide approach, and evaluating diet qualitatively. As a result, it is not clear the differential role that diet might have played on shaping the facial and mandibular variation during

human evolution, while diet diversity is reduced and simplified, thus avoiding its multifactorial complexity. In contrast, in the present project, I propose to analyse diet as a continuous quantitative variable, and also to evaluate the degree of association between diet diversity, facial, and mandibular variation, in order to address the differential influence that diet might have had on shaping craniofacial variation in humans. For this, I will use two morphometric databases, a worldwide sample, and a local one from the Argentinean Pampas that spans through the Holocene (9,000-500 years BP). In addition, I will estimate bite force, collect δ13C, δ15N, archaeological and ethnographic data, which will be used to quantitatively characterize diet, thus incorporating quantitative independent variables into the statistical model. It is expected to build a more suitable method for studying the influence of ecology on the skeleton. Therefore, this project would contribute to the ongoing debate on the influence of ecological factors on humans' skeleton, whose interpretations could be extended to the fossil record.

2.4 Senior Fellowships

Willem HORDIJK
(May – September 2019)

Wim Hordijk is a computer scientist working in the areas of computational biology and bioinformatics. He was a graduate fellow at the Santa Fe Institute for several years, after which he worked on many short-term research and computing projects all over the world. As an independent researcher and consultant he provides computational support to other scientists, while his own research focuses primarily on autocatalytic sets and the origin and organization of life.

Autocatalytic Sets – The Origin and Organization of Life

Life is a self-sustaining and self-regulating chemical reaction network. In other words, a living system continuously regenerates its own components, in such a way that these components maintain and regulate the underlying reaction network that produced them. Autocatalytic sets are a formalization of this notion of life. An autocatalytic set is a reaction network in which each reaction is catalyzed by at least one of the molecules from the set itself, and each molecule can be produced from a suitable food source by using only reactions from the set itself. Autocatalytic sets are believed to have played an important role in the origin and early evolution of life. My colleague, Prof. Mike Steel, and I have developed a formal framework known as RAF theory to detect and analyze autocatalytic sets in general reaction networks. We have shown that autocatalytic sets are highly likely to exist under a wide variety of realistic assumptions in simple computational models of chemical reaction networks, and that these sets usually have a rich hierarchical structure of smaller and smaller autocatalytic subsets, which is an important requirement for their possible evolution. Furthermore, we have shown that the formal framework can be successfully applied to real chemical and biological networks as well, and that autocatalytic sets exist in such real networks. However, there is still somewhat of a gap between theory and experiments on the emergence and further evolution of autocatalytic sets. In this project, I will continue and expand my research on autocatalytic sets, in particular in collaboration with experimental chemists, in an effort to close this gap.

Daniel J. NICHOLSON
(September 2018 – September 2020)

Daniel J. Nicholson holds Masters degrees in molecular and cellular biology (University of Bath) and in history and philosophy of science (University of Leeds). In 2010, he obtained his Ph.D. in philosophy (University of Exeter). His doctoral thesis presented a critical examination of

mechanistic thinking in biology. At present, he is particularly interested in the role of machine models in biological explanations, in the task of providing a naturalistic account of organismic purposiveness, and in philosophical arguments for the autonomy of biology. He also has a longstanding interest in the history of theoretical biology. Dan was a postdoctoral fellow at the KLI, a research fellow at the Cohn Institute for History and Philosophy of Science and Ideas of Tel Aviv University, and a research fellow at the Centre for the Study of Life Sciences (Egenis) of the University of Exeter.

The Organism Reconsidered

This project aims to provide a new theoretical understanding of the nature of the organism. Taking the machine conception of the organism as its critical target, the project will elaborate an ontological conception of life that highlights its intrinsically purposive self-maintaining organization. It will also consider the implications that such non-mechanical – yet scientifically-grounded – understanding has for how living systems should be studied and explained, and more generally for how the epistemic relation between biology and the physical sciences should be construed. This novel philosophical outlook on organisms will be developed by drawing on a virtually forgotten school of biological thought known as 'organicism,' which came to prominence between the First and Second World Wars, but which subsequently became marginalized following the rise of molecular biology. By revisiting the organicist tradition and updating its core ideas, the project will not only reshape current theoretical views regarding the nature of life, but also restore organisms to their rightful place in the edifice of biological theory. In the process of doing so, the organism-centred perspective developed in the project will be used to address a number of highly topical issues in the philosophy of biology. Overall, the project will demonstrate that, despite all efforts to consign it to the dustbin of history, organicism has never been more relevant than it is today. The main output of the project will be an extended monograph with MIT Press, which will eventually appear as part of the Vienna Series in Theoretical Biology.

Harold de VLADAR

(October 2017 – February 2019)

Harold de Vladar is a cell biologist, statistical physicist, and artist with a main focus on evolutionary biology. He purposely escapes any disciplinary categorisation and researches on a wide range of subjects spanning genetics, evolution, structural biology, ecology, cancer, synthetic biology, art & science, neuroscience, language, culture and others. Harold has a creative pulse for inter-disciplinary methods and is successful in identifying analogies across subjects that give new ways to under-stand and study evolving systems, such as a statistical-mechanical view of population genetics, an evolutionary description of language and culture, sonification of protein structures, etc. Harold intellectually roots himself with haunting foundational questions of science. He is a researcher in the Hungarian Academy of Sciences and in Parmenides Foundation, near Munich.

Cognitive Cultural Evolution

I propose studying parallels and connection between cultural change and organic evolution using computational and mathe-matical models. My proposal considers cognitive accounts of concept formation by applying notions of neuroscience and of evolutionary biology to language games. These can be coupled to population dynamics, including spatial mobility and also generational change to study genetic-cultural co-evolution.

2.5 Visiting Scientists

Nina ATANASOVA
(May – August 2019)

Nina Atanasova holds a Ph.D. in philosophy from the University of Cincinnati. Since 2014 she is a lecturer at the University of Toledo. In fall 2018, she was a visiting fellow at the Center for Philosophy of Science at the University of Pittsburgh. She was awarded a KLI visiting fellowship in summer 2019, supplemented by a Kohler International Grant from The University of Toledo.

Animal Models of Pain and the Puzzle of Similarity

The 'Puzzle of Similarity' is a problem for animal experimentation in general but it is especially troublesome for models of pain. It can be stated as follows: If animal models (of pain) are valid, they are morally impermissible and if they are morally permissible, they are useless. Either way, experiments involving animal models (of pain) should be abolished. The puzzle arises from the clash of two normative prescriptions imposed on animal experimentation by epistemology and ethics. Epistemology prescribes increasing similarity between humans and animal models. However, too much similarity may entitle animals to protection against harmful experimentation. The purpose of this paper is to solve the puzzle by reconciling the two normative prescriptions, at least for some animal species. The position defended is that at least some animal models of pain could be validated as representations of human experience of pain without featuring animals that experience pain.

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John BICKLE
(December 2019)

Bickle works primarily in the areas of philosophy of neuroscience, philosophy of science (especially the nature and scope of scientific reductionism), and cellular and molecular mechanisms of cognition and consciousness. He has also written on the impact of logical positivism, especially the pragmatism of Rudolph Carnap. Recently, he has been working specifically on strategies of long-range experiment planning in the brain sciences, and research tool development in neurobiology with an eye toward its lessons for our general understanding of scientific practice.
He is the author of four books, the editor of the Oxford Handbook of Philosophy and Neuroscience, and has published more than 85 articles, book chapters, encyclopedia entries, and book reviews in professional philosophy and neuroscience journals and volumes. He has given over 280 professional talks, including invited addresses in Germany, France, England, Spain, Portugal, Greece, Norway, Sweden, Holland, Mexico, Peru, the Czech Republic, Hungary, Poland, Slovenia, Romania, Italy, and Israel. He has been an invited keynote lecturer at numerous national and international conferences, has given the annual Dunbar Lecture at Millsaps College in Jackson, MS, has been an invited speaker at two international meetings at the Banbury Center at Cold Spring Harbor National Laboratories, Long Island, NY, the Inaugural Donald Gustafson Memorial Lecture at the University of Cincinnati, and the Bar Hillel Lectures in Tel Aviv and Jerusalem, Israel.

Tool Development in Neuroscience … and in Neighboring Sciences

Anglo-American philosophy of science has been theory-centric since at least the dominance of scientific realism in the late 20th century. While more recent work has tended away from "general" philosophy of science and towards

"foundational" questions specific to particular sciences, and has focused more on experimentation and actual scientific practices, the attitude that everything in science begins and ends with theory, and its confirmation and progress, remains stubbornly recalcitrant (although now is more surreptitiously expressed).

A recent focus on experiment tools and their patterns of development in laboratory-driven sciences like neurobiology challenges this theory-centrism. Tools that revolutionized neuroscience, at least in the eyes of neuroscientists, developed by way of a theoretical tinkering in the laboratory—by solving engineering and applied science problems, by trial-and-error, and even by sheer serendipity—and not by the systematic application of theory. A common general pattern runs through these cases: laboratory tinkering -> new experiment tools and designs -> theory progress. I'll argue for this pattern by way of some historical facts about the development of a number of neurobiology's most influential experiment tools.

Maria CEREZO
(July – September 2019)

María Cerezo is Professor of logic and philosophy of science at the Department of Philosophy of the University of Murcia. Her initial interests centred on the philosophy of language, in particular, the Tractatus logico-philosophicus of Ludwig Wittgenstein. From 2008 on, she has started working on issues of philosophy of biology, and in particular on metaphysical issues that arise in biological concepts and problems. She is the coordinator of the research project metaphysics of biology: framing the interactions between molecular, developmental and evolutionary biology. Her interests in philosophy of biology center in issues such as: metaphysical theories of persistence applied to species evolution; causation; individuation and teleology in developmental biology; and dispositional theories of genes.

Interactions between Metaphysics and Biology: Some Study-Cases in Molecular, Developmental and Evolutionary Biology

Recent work on philosophy of biology has focused on issues that can be considered to be at the intersection between metaphysics and biology: issues such as individuation of biological entities, the consideration of biological entities as things or as processes, recourse to 3D and 4D theories of persistence to account for the persistence and dynamical nature of biological systems (organisms, tissues, species, ecosystems and so on) are some examples. But there is little reflection on the nature of such interactions between metaphysics and biology. The aim of the project is to offer a categorization of the interactions between metaphysics and biology, paying attention, in particular, to some philosophical issues that have arisen recently in molecular, developmental and evolutionary biology. Our hypothesis is that there are three forms of interaction, to be characterised by three propositions: "with", "for" and "from", depending on the particular way in which the crossfertilization of disciplines takes place.

The relevance of the project derives from two factors: a) the strong interdisciplinarity presupposed to develop it: the interaction between the two disciplines requires real attention to both biological empirical advances and to contemporary philosophical theories; b) in the last decades there have been several individual and group research projects playing such interaction (among others, three paradigmatic examples are the following: project on biological processes at Exeter developed by J. Dupré and D. Nicholson; work on inmuno-individuation at Bordeaux developed by T. Pradeu and his group; and the project "From biological practice to scientific metaphysics" developed by A. Love, K. Waters and M. Weber).

Lorenzo DEL SAVIO

(March – April 2019)

Lorenzo Del Savio obtained his Ph.D. from the University of Milan / European Institute of Oncology. His thesis was entitled "Life Sciences: Foundations and Ethics." Lorenzo´s research focus is at the interface of political philosophy, bioethics, and philosophy of the life sciences.

Are Humans Self-domesticated Animals?

It has been hypothesised that, in the evolution of *Homo sapiens*, there has been selection for docility and social tolerance, leading to a self-domestication of the human species. If so, political, cultural and institutional mechanisms may have affected the nature of human sociality. This project explores the consequences of such hypothesis for moral and political philosophy.

Arantza ETXEBERRIA AGIRIANO

(January 2019)

Arantza Etxeberria Agiriano is Associate Professor at the University of the Basque Country UPV / EHU. She graduated in philosophy at the Complutense University of Madrid, obtained a Ph.D. in philosophy at the University of the Basque Country UPV / EHU, and was a postdoctoral researcher at the University of Sussex. Since then, she has been a visiting scholar at the University of Iceland, the University of Exeter, and Bristol University.

The Pregnant Female as a Reproducing Individual: Evolutionary and Developmental Reflections on Individuality and Reproduction

While reproduction is generally agreed to be a crucial feature of life on Earth, many of its roles in evolution are disregarded in discussions of biological individuality, by reducing reproduction to replication and copy making. The great diversity of reproductive modes explored by organisms during evolution are thereby treated as alternative strategies with a single purpose: to maximize fitness. This leaves many aspects of reproduction unconsidered, such as the effects of the diverse reproductive modes on the characterization of the entities relevant for biology. Recent reflections on the nature of the reproducing relation call for reconsidering the material processes involved in reproduction (Griesemer 2014, 2016, 2018), and Evo-Devo seems to be the natural disciplinary candidate for integration of reproduction and development into the structure of evolutionary theory. However, the theoretical implications of an "Evo-Devo of reproduction" have remained largely unexplored so far, also due to its focus on the evolution of body parts and their interactions.

In this contribution, we will reflect on the biological status of the pregnant female within this framework. We will argue that recent research in eutherian pregnancy and its evolution may have philosophical implications for our understanding of reproduction and individuality. The question whether the pregnant female is a carrier of independent developing individuals, or a single individual by itself, is becoming a focus of debate in the philosophical literature (Kingma 2018). The "fetal container model" has prevailed in the scarce philosophical thoughts dedicated to the question (Smith & Brogaard 2003), and is also the implicit choice in the biological and medical literature. In contrast, Kingma has recently argued in favor of understanding the pregnant female according to a part-whole model and her claim states that the fetus is part of the gestating organism. Our aim here is reissue/retake this discussion from a biological standpoint rather than the meta-physical one favoured by Kingma´s work.

This is a joint project of Arantza Etxeberria, Laura Nuño de la Rosa García, and Mihaela Pavlicev.

Andrej EVTEEV
(November – December 2019)

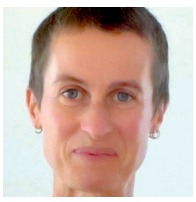
Andrej Evteev graduated from the biological faculty of the Lomonosov Moscow State University (MSU) with a specialist degree in physical anthropology, in 2004. From 2004 to 2007 he was a Ph.D. student at the Institute of Ethnology and Anthropology of the Russian Academy of Science. In 2008, Andrej defended his Ph.D. dissertation entitled "The problem of sexual dimorphism in craniology." From 2005 until now, he has been working at the Anuchin Research Institute and Museum of Anthropology of the MSU at different position, the last several years as a senior researcher.
Main field of Andrej's interest is the study of the interplay of factors shaping the human skull: genetic, ontogenetic, climatic, functional, and stochastic. Specifically, during the last several years he has been primarily dealing with ecogeographic variation of the facial skeleton in North Eurasia paying a special attention to employing population genetic data as a "control for phylogeny." Andrej is also studying growth of the human skull using medical CT data with a distant aim of detailing the ontogenetic origin of intergroup morphological differences. He also uses a variety of methods, including GMM and Finite-Element Analysis, and spends a lot of time working with CT images of both living and skeletal individuals. Finally, Andrej has quite an experience as a field bioarcheologist specialized on the macroscopic descriptive study of human remains.

Craniofacial Adaptation to High Latitudes in Eurasia and the Americas: An Integrated Approach

The correlation between shape of the nose and climate is one of the most spectacular and convincing examples of natural selection in man. It has been the focus of research for more than 100 years and dozens of studies were done for all parts of the world. But the number of controversies was growing together with the number of studies on mid-facial climatic

adaptation. For instance, it is still not quite clear if the face in cold-adapted groups is wide or narrow? tall or short? flat or protruding? These controversies project on the discussion of potentially adaptive features in the face of glacial hominins, mostly Neanderthals.

As early as in 1930s it was shown that the association between climate and facial morphology is stronger at the continental rather than global level which was later confirmed by a number of studies from different parts of the world. Thus, studying this association is expected to be more productive at the continental rather than the global level, and a control for phylogenetic relatedness of studied groups is necessary. In this study, three large datasets were combined in order to explore ecogeographic patterns in four continental regions – Asia, Europe, the Americas - including areas of cold or extreme cold climate and inhabited by populations of different origin.



Rebecca FREETH
(September – October 2019)

Rebecca Freeth is a dialogue facilitator, researcher, and writer. The joys and challenges of meaningful collaboration have been a source of interest and practice for many years. She has initiated and supported long-term multi-sector dialogue and action projects and also specializes in working collaborating towards uncertain futures. Much of her work has been located in post-apartheid South Africa, which is her primary home. She teaches on numerous university courses for under- and postgraduate students, as well as a 'systems thinking for social change' summer school. Her recently completed doctoral research, in which she tracked an interdisciplinary collaboration in the field of sustainability science for three years, has deepened her understanding of dynamics of collaboration in research teams. Rebecca is currently a senior fellow at the Institute for Advanced Sustainability Science (IASS) in Potsdam, Germany.

Building Collaborative Capacity for Meaningful Interdisciplinary Team Research

Interdisciplinary collaboration requires researchers to navigate multiple challenges of teamwork. Such challenges have both epistemic and interpersonal qualities. While researchers may enter collaborations with considerable expertise in their own field, they may find themselves under-prepared to address the collaborative challenges they encounter.

During my recent doctoral research, I developed a methodology called formative accompanying research (FAR). Using FAR, I tracked an interdisciplinary collaboration in the field of sustainability science. This has deepened my understanding of dynamics of collaboration in research teams. It has also provided considerable insight into navigating positionality and relationality as a boundary-crossing researcher.

I will introduce the FAR methodology for studying collaboration, identify common challenges in collaboration and propose capacities that can be cultivated to address these challenges. How can difficult experiences of collaborating deliberately be used as opportunities to learn to collaborate? The role of discomfort in collaboration will be introduced as a prompt for learning to collaborate while collaborating.

I will illustrate the conceptual input with illustrations from recent experiences in the interdisciplinary project 'Leverage Points for Sustainability Transformation.' A brief exploration of this case will give rise to key insights that may be recognisable in other cases with which participants are familiar.

Chia-Hua LIN
(July – September 2019)

Chia-Hua Lin recently obtained a Ph.D degree from the Department of Philosophy at the University of South Carolina. Her dissertation, entitled "Tool Migration: A Framework to Study the Cross-disciplinary Use of Mathematical Constructs in Science," is a philosophical analysis of both the development and use of the

formal language-based research tools across disciplines, such as linguistics, computer science, and cognitive biology. Currently a visiting fellow at the KLI, Chia-Hua had received a KLI writing-up fellowship in 2018. In June 2019, the National Science Foundation awarded a two-year postdoctoral fellowship to support Chia-Hua's next research project titled "A Case Study of the Cross-disciplinary Use of Mathematical Constructs in Computational Biology as Tool Migration." Starting in September 2019, she will be working as the co-PI to the project and as postdoc in the Department of Philosophy at the University of Virginia under the direction of Paul Humphreys.

The Migrations of Game Theory and Formal Language Theory: Understanding the Crossdisciplinary Use of Mathematical Constructs, Its Epistemic Opportunities and Risks

Mathematical constructs developed to advance knowledge in one discipline are sometimes applied to study new phenomena and answer different questions in other disciplines. Using game theory and formal language theory as examples, this project will develop a conceptual framework to analyze the epistemic impacts of the cross-disciplinary use of mathematical constructs in science. Game theory was developed to model strategic interaction between rational agents, but it has been borrowed to study biological evolution. Similarly, formal language theory was developed to study natural languages, yet it has become the theoretical backbone of computer science and recently applied to study the cognitive capacity of animals. Concerning these theories and their novel applications, my research questions are:

(1) To researchers from different—and not directly related—scientific contexts, what epistemic opportunities may make these mathematical constructs attractive?

(2) What are the epistemic risks involved in producing knowledge associated with the aid of borrowed mathematical constructs in particular?

In this project, I confine my philosophical analysis to focus

on these two theories' features and their applications in multiple disciplinary contexts. I will begin by investigating the kind of questions these theories were conceived to answer in their initial disciplinary contexts, such as economics and linguistics respectively. I will then compare and contrast these with their various novel applications in evolutionary biology, computer science, the social sciences, and most recently cognitive biology. The primary goal of this project is two-fold: it aims to understand both the positive and negative impacts of the cross-disciplinary use of formal constructs in the sciences, and to disseminate the research results among scholars of science.

Laura NUNO DE LA ROSA GARCIA
(January 2019)

Laura Nuño de la Rosa is a philosopher of biology working on the history and philosophy of developmental biology and evolutionary developmental biology (Evo-Devo). She graduated in humanities, and in 2010, she obtained a Masters Degree in biophysics at the Autonomous University of Madrid. In 2012, she obtained a Ph.D. in philosophy with a thesis on the problem of organismal form in contemporary biology, jointly from Complutense University of Madrid and the Paris 1-Sorbonne University. She joined the KLI as a postdoctoral fellow, and subsequently held a Juan de la Cierva fellowship at the IAS-Research group, University of the Basque Country. Since October 2015, Laura is a member of the MSR research group at UCM, and in 2018, she became a postdoctoral fellow at Complutense University. She also works as a scientific editor of a major reference guide on Evo-Devo in collaboration with Springer. Her current philosophical interests lie on the philosophical nature of dispositional concepts (fitness and evolvability) in evolutionary biology, the role of representative modelling strategies in developmental biology and Evo-Devo, and the theoretical assumptions of synthetic biology.

The Pregnant Female as a Reproducing Individual: Evolutionary and Developmental Reflections on Individuality and Reproduction

While reproduction is generally agreed to be a crucial feature of life on Earth, many of its roles in evolution are disregarded in discussions of biological individuality, by reducing reproduction to replication and copy making. The great diversity of reproductive modes explored by organisms during evolution are thereby treated as alternative strategies with a single purpose: to maximize fitness. This leaves many aspects of reproduction unconsidered, such as the effects of the diverse reproductive modes on the characterization of the entities relevant for biology. Recent reflections on the nature of the reproducing relation call for reconsidering the material processes involved in reproduction (Griesemer 2014, 2016, 2018), and Evo-Devo seems to be the natural disciplinary candidate for integration of reproduction and development into the structure of evolutionary theory. However, the theoretical implications of an "Evo-Devo of reproduction" have remained largely unexplored so far, also due to its focus on the evolution of body parts and their interactions.

In this contribution, we will reflect on the biological status of the pregnant female within this framework. We will argue that recent research in eutherian pregnancy and its evolution may have philosophical implications for our understanding of reproduction and individuality. The question whether the pregnant female is a carrier of independent developing individuals, or a single individual by itself, is becoming a focus of debate in the philosophical literature (Kingma 2018). The "fetal container model" has prevailed in the scarce philosophical thoughts dedicated to the question (Smith & Brogaard 2003), and is also the implicit choice in the biological and medical literature. In contrast, Kingma has recently argued in favor of understanding the pregnant female according to a part-whole model and her claim states that the fetus is part of the gestating organism. Our aim here is reissue/retake this discussion from a biological standpoint rather than the meta-physical one favoured by Kingma´s work.

This is a joint project of Arantza Etxeberria, Laura Nuño de la Rosa García, and Mihaela Pavlicev.

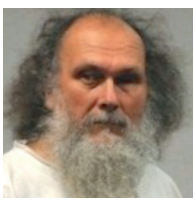
Isabell SCHRICKEL
(April – May 2019)

Isabell Schrickel is a Ph.D. candidate at the Center for Global Sustainability and Cultural Transformation (Leuphana University & Arizona State University). She studied media theory, history, and journalism at Humboldt and Freie Universität Berlin and the University of Basel. In 2017, Isabell was a visiting fellow at the Harvard Department of the History of Science. Her research interests include the history of the environmental sciences, the history of modeling and simulation, and the evolution of sustainability thinking.

IIASA and the Making of Sustainability Science

The International Institute for Applied Systems Analysis (IIASA) has been established in 1973 as an East-West Think Tank in the baroque castle of Laxenburg / Vienna in order to foster scientific collaboration on "common problems of advanced societies" such as pollution control, urban growth, public health, energy supply, and environmental problems. The initiative dates back to the mid 1960s, when President Johnson launched the policies of "bridge-building" towards the Soviet Union and Eastern Europe, designed to resolve international tensions, to deal with emerging complexities in the international system, and to develop transnational relations throughout the industrialized world. It was an attempt to create an interdisciplinary policy science that would allow to address the universal problems, that all advanced societies had in common and the emerging global issues of the 1970s – such as the energy crisis, climate change, world population, and sustainable development. The castle became an environment of multilateral rapprochement, new formats of scientific collaboration and policy advice, of sounding common interests and problems, of data exchange and computer connections through the Iron Curtain. Scientists, engineers, systems analysts, and policy experts from initially twelve nations worked together in international and interdisciplinary teams.

My project seeks to embed the history of IIASA within the broader intellectual, institutional and scientific developments of the years around 1970 and to provide a historiographical context for the establishment of the field of sustainability science at IIASA. The institute is the result precisely of the growing sense of urgency to engage with the problems that modern industrialized societies already faced in a globalizing environment. Knowledge about the future became more widely available and an emerging planetary consciousness and the availability of the means to cooperate globally intensified the sense of obligation to act. In light of the perceived challenges of peacekeeping at the time, the global population boom, sustenance, energy demand, overexploitation, automation or the biological revolution numerous authors began to theorize the temporality of historical dynamics, the governability of societal developments and the question of how to bring about desired change. In this context new forms of expertise have been developed – and IIASA was an important node in this emerging epistemic community. In the project, I provide examples of how some of these challenges have been discussed at IIASA in different research groups. I conextualize the development of new conceptual frameworks, modeling techniques and policy approaches still relevant today, in particular global modeling, integrated assessment, resilience thinking, and risk assessment. The project is situated at the intersections of history of science and STS, contemporary history and environmental humanities.



Kim STERELNY
(October 2019)

After studying philosophy at Sydney University, Kim Sterelny taught philosophy in Australia at Sydney, La Trobe University, and Australian National University (ANU – where he was research fellow, and then senior research fellow in philosophy at RSSS), before taking up a position at Victoria University in Wellington. Between

1999 and 2008 he spent half a year at Victoria and the other half at ANU. After 2009, he transitioned to full time at ANU. His research interests have always been in the border areas between philosophy and the sciences; most of his research and graduate supervision has been in philosophy of biology and the philosophy of the cognitive sciences. In the last decade and a half, he has been particularly interested in human evolution, and in understanding the the evolution of the distinctive features of human social life, and of the cognitive capacities that make that life possible.
*Sterelny has been a Visiting Professor at Simon Fraser University in Canada, and at Cal Tech and the University of Maryland, College Park, in the USA. He is the author of "*The Representational Theory of Mind*"; the co-author of "*Language and Reality*" (with Michael Devitt); "*Sex and Death: An Introduction to Philosophy of Biology*" (with Paul Griffiths); "*Thought in a Hostile World*" (which won the 2003 Lakatos Prize); "*What is Biodiversity*" (with James MacLaurin); "*Dawkins vs Gould*"; and "*The Evolved Apprentice*" (the book of the 2009 Nicod Prize Lectures). He is fellow of the Australian Academy of the Humanities, and the Royal Society of New Zealand.*

Demography and Cultural Complexity

Until recently, signs of an increase in technical and social complexity over deep time have taken to be signs of, and caused by, increases in individual cognitive capacity. Likewise, long period of no-change have been seen as the result of constraints on individual cognitive capacity. This picture has recently been challenged both empirically and theoretically. The empirical challenge derives from an apparent mismatch between morphological evolution in our lineage, including the expansion of our brain and neocortex, and changes in material culture. The theoretical challenge derives from a set of ideas that link cultural complexity to social scale. These models suggest that material culture is sensitive to the social and demographic environment, not just the native cognitive

capacities of individual agents. Innovation and its uptake is more reliable in larger social worlds. This paper takes up these ideas, and distinguishes three different versions of the view that increases in social scale support increases in the complexity of material culture. Those are: (i) cultural selection is more efficient in larger social worlds; (ii) larger social worlds support more specialisation, which in turn supports a more complex material culture; (iii) cultural learning is more efficient in larger social worlds. The paper argues that the first two of these pathways are probably more important than the third in explaining otherwise puzzling features of the archaeological and ethnographic record.

Timothy WARING
(April 2019)

Tim Waring studies how cooperation determines social and environmental outcomes at any scale. He has developed an evolutionary theory to explain the role of cooperation in environmental dilemmas, and tests it with simulation studies and behavioral experiments. Tim has led two national working groups to refine this theory and apply it to case studies around the world. He was awarded a National Science Foundation CAREER grant to study how cooperation also determines organizational outcomes, with application to the local food economy.

Expanding Evolutionary Approaches to Sustainability

The quest to find and implement paths of societal change toward sustainable human use of the environment has proven intransigent, while environmental destruction mounts higher (Ripple et al. 2017). The scientific community has not provided a solution to the sustainability problem in part because scientists are struggling to define the problem and its solutions. In general, sustainability science lacks generalizability and predictive capacity (Levin and Clark 2010). One way to

improve sustainability research is to develop general, discipline-agnostic theory in clear, non-disciplinary language.

I propose that evolution provides one of the most general crosscutting theories uniting the social sciences, environmental sciences and biology, and that an evolutionary theory of sustainability (Waring et al. 2015) may help to overcome these issues and accelerate our collective efforts to achieve a stable human-natural system.

Adam WILKINS
(November 2019)

*Adam Wilkins is a geneticist and evolutionary biologist and is currently a senior fellow at Humboldt University in Berlin. Wilkins obtained a B.A. from Reed College in Portland, Oregon, and a Ph.D. in genetics from the University of Washington in Seattle. He completed postdoctoral fellowships at Massachusetts Institute of Technology and the University of Wisconsin. His books include "*Genetic Analysis of Animal Development*" and "*The Evolution of Developmental Pathways.*" From 1990 to 2008, Adam Wilkins was editor of BioEssays and he is currently editor of the "Perspectives" section of GENETICS.*

Evolution of the Human Face & Genetics of Animal Domestication

One thing that comes out of these two research questions is how they relate, through the question of whether humans are a "self-domesticated" species. The two topics raise fundamental questions in the history and philosophy of science, concerning human nature and the biological roots of human ethical systems.

Andrew YANG
(October 2019)

Andrew S. Yang is a transdisciplinary artist working across the flux of the naturalcultural. His projects have been exhibited from Oklahoma to Yokohama, including the 14th Istanbul Biennial (2015), a solo exhibition at the MCA Chicago (2016), the Spencer Museum of Art (2019), and the Smithsonian Museum of Natural History (2020). His writings appear in Leonardo, Biological Theory, Art Journal, Evolution & Development and the forthcoming Routledge Handbook of Art, Science, and Technology Studies. He will be the inaugural artist-in-residence at Yale-NUS College in Singapore in the spring of 2020. He holds a Ph.D. in evolutionary biology from Duke University and MFA in visual arts from Lesley University School of Art and Design, and is Associate Professor at the School of the Art Institute of Chicago.

Aesthetics and Ecologies of the Evolving Anthropocene

It is no exaggeration to say that global warming – and a number of concomitant changes in biodiversity, nutrient cycling, and landscape – are emerging crisis rivalling any other in human history in both scale and scope. Indeed, the fact that the implications of these shifts (1) extend far beyond only humans (and to the totality of the planetary biosphere), and (2) exceed the ken of human history (and into the deep time of geological timescales) is why the International Commission on Stratigraphy is now poised to recognize a new geological period called "the Anthropocene."

While post-modern theory has claimed a "crisis of representation" in epistemology and politics, the Anthropocene condition (and the complex systems of entanglement and feedback that define it) present a new representational challenge: How to sense and "make sense" of the immanent and pervasive nature of planetary change that is, at the same time, somehow elusive – that we might understand intellectually, but not viscerally. What about the systems that we are a part of – the niches that we've constructed – obfuscates the

ecologies at work and the trajectories through which they are evolving? At its most foundational, these are question of evolutionary aesthetics, of perceptibility's dynamics and limits of possibilities to change the world in appropriate directions.

Trained as an evolutionary ecologist and having studied developmental systems of social insects and other "superorganisms," over the past ten years I have expanded my work to the topics of transdisciplinary research in evolutionary ecology and sustainability research in the Anthropocene context, especially through the lens of system aesthetics. In addition to my own writing on these subjects, I have also worked in collaboration with both the HKW (Haus der Kulturen der Welt) and the Max Planck for the History of Science (MPIWG) in Berlin over the past five years.

My interest in developing this line of research at KLI specifically is the opportunity to explore the concept (and application) of system aesthetics as eco-cognitive system in a fuller sense, extending beyond more traditional humanistic framings. While the transdisciplinary work of researchers like C.H. Waddington provide a precedent for the application of evolutionary and developmental perspectives on both aesthetics and macro-ecology, relatively little contemporary work is being done in this conceptual vein, resulting in both a gap and opportunity for renewed engagement.

2.6 Researchers with Own Funding

Mihaela PAVLICEV
(January 2019)

Mihaela Pavlicev is evolutionary biologist with a wide range of interests. After finishing her Ph.D. in ecology in Vienna, 2003, she joined Natural History Museum in Vienna to work on molecular phylogenetics of reptiles. This was followed by two consecutive postdoctoral

appointments in evolutionary quantitative genetics, in St. Louis and in Oslo. Mihaela subsequently returned to Vienna as a postdoctoral fellow at KLI and lecturer at the University of Vienna, before taking a faculty position at the University of Cincinnati Medical School & Cincinnati Children`s Hospital in Ohio in 2013.
Mihaela`s work has been focused around the influence of the structure of genotype-phenotype map on evolutionary response to selection, as well as the evolution of this map. Two aspects of the genotype-phenotype map, which is essentially an abstraction of developmental / physiological genetic structure, have been of particular interest: the evolution of gene effects and the impact of pleiotropic genes affecting multiple traits.
More recently, Mihaela started exploring how evolutionary approaches to studying variation of traits, both short- and long term, can be used to understand specific trait states, namely disease. Recent work includes theoretical and experimental work focusing on the evolution of mammalian pregnancy and its relevance for human medicine.

The Pregnant Female as a Reproducing Individual: Evolutionary and Developmental Reflections on Individuality and Reproduction

While reproduction is generally agreed to be a crucial feature of life on Earth, many of its roles in evolution are disregarded in discussions of biological individuality, by reducing reproduction to replication and copy making. The great diversity of reproductive modes explored by organisms during evolution are thereby treated as alternative strategies with a single purpose: to maximize fitness. This leaves many aspects of reproduction unconsidered, such as the effects of the diverse reproductive modes on the characterization of the entities relevant for biology. Recent reflections on the nature of the reproducing relation call for reconsidering the material processes involved in reproduction (Griesemer 2014, 2016, 2018), and Evo-Devo seems to be the natural disciplinary candidate for integration of reproduction and development

into the structure of evolutionary theory. However, the theoretical implications of an "Evo-Devo of reproduction" have remained largely unexplored so far, also due to its focus on the evolution of body parts and their interactions.

In this contribution, we will reflect on the biological status of the pregnant female within this framework. We will argue that recent research in eutherian pregnancy and its evolution may have philosophical implications for our understanding of reproduction and individuality. The question whether the pregnant female is a carrier of independent developing individuals, or a single individual by itself, is becoming a focus of debate in the philosophical literature (Kingma 2018). The "fetal container model" has prevailed in the scarce philosophical thoughts dedicated to the question (Smith & Brogaard 2003), and is also the implicit choice in the biological and medical literature. In contrast, Kingma has recently argued in favor of understanding the pregnant female according to a part-whole model and her claim states that the fetus is part of the gestating organism. Our aim here is reissue/retake this discussion from a biological standpoint rather than the meta-physical one favoured by Kingma´s work.

This is a joint project of Arantza Etxeberria, Laura Nuño de la Rosa García, and Mihaela Pavlicev.

Luis Alejandro HERNANDEZ VILLANUEVA
(August 2018 – April 2020)

Luis Alejandro Villanueva Hernández completed his B.A. in philosophy at the Benemérita University of Puebla BUAP, followed by a M.A. in ethnomusicology at the National Autonomous University of Mexico (UNAM). Currently, he is a Ph.D. candidate in philosophy of science in the Institute for Philosophical Research at the National Autonomous University of Mexico. From January to June 2016 he did a Ph.D. stay research under the supervision of Professor Ian Cross in the Centre for Music and Science at the Faculty of Music of the University of Cambridge.

In his Ph.D. dissertation, supervised by Professor Sergio F. Martínez, he explores models of niche construction, material culture evolution, social interaction, cognitive ethnomusicology, cognitive archaeology and embodied music cognition, to develop a framework that would allow the integration of different scientific findings going on different disciplines that may be relevant to explain the origins of musical cognitive capacities. He has previously received a KLI writing-up fellowship to complete his Ph.D. thesis.
He is also an active musician and plays a wide range of traditional musical instruments from Mexico and South America. He has been, for many years, a member of a Mexican musical band called Tsasná (moonlight in Totonac language) with which he has recorded several albums and performed in many international music festivals in Mexico, Europe, South America, and Asia.

The Origins of Musical Behavior as Co-Evolution of Cognitive Capacities of Social Interaction

According to niche construction perspective, the aim of this project is to develop a theoretical model to explain the origins of cognitive musical capacities not committed to the task of identifying one crucial cause (natural selection, sexual selection, genetic inheritance, brain architecture, pleasure production, or any other) that occurred in a specific period of time to solve a particular survival issue. Instead, it will be argued that cognitive musical capacities may have evolved as part of interdependent and intertwined bio-cultural processes that enhanced the evolution of our cognitive capacities for basic social interaction over the development of our hominin lineage.

Stephanie SCHNORR
(September 2018 – August 2020)

Stephanie is a biological anthropologist interested in understanding the dietary landscape accessed by human ancestors that enabled the evolution of large brains and complex cognition. During her Ph.D. she worked with the Hadza of Tanzania to investigate food acquisition and processing behaviors in how these alter the digestibility of plant food resources, mainly underground storage organs, or tubers. Through her research on digestion, Stephanie became interested in understanding the role of the gut microbiota in human nutritional acquisition, particularly in consideration of human foragers who often rely on refractory plant resources that are high in fiber. Her research ranges from work on reconstructing ancient microbiomes from human tissue to ethnographic modeling of food processing in understanding the dietary flexibility of present day humans. Stephanie Schnorr was a postdoctoral associate at the Oklahoma University and a KLI postdoctoral fellow. In September 2018, she was awared a fellowship of the US National Science Foundation (NSF) and now works as an NSF fellow at the KLI on her project 'Relevance of Positive Selection on Human Salivary Amylase Gene.'

Physiological Relevance of Salivary Amylase

Human salivary alpha amylase (sAA) is the most abundant protein found in saliva. The expression of sAA is regulated by copy number variation (CNV) of the AMY1 gene, and the enzyme is responsible for the breakdown of starch into simple sugars. We lack specific knowledge as to how changes in sAA concentration impacts starch digestion during mastication or through downstream regulatory effects. Importantly, no empirical research exists that explores rate variation in the hydrolysis of raw versus cooked starch. Using a controlled in-vitro and histological approach along with human subject validation trials, I intend to address questions about the starch

degrading activity of sAA in the mouth, and the potential nutritional advantages brought about by a selective increase in AMY1 CNV in human evolutionary history. These questions address diet related selective events that occurred along human evolutionary history. Understanding the resulting nutritional benefits and potential susceptibilities to metabolic and inflammatory disease promises not only resolution of our distinctly human traits but also advances towards evolutionarily-informed models of targeted therapies. This project uses a multidisciplinary approach to tackle relevant questions in the field of anthropology and human evolutionary research.

Javier SUAREZ
(March – June 2019)

Javier Suarez obtained his B.A. in philosophy at the University of Oviedo (BA Extraordinary Prize) and his M.A. in analytic philosophy at the University of Barcelona (MA Extraordinary Prize). After two years working in the Centre for the Study of Life Sciences (Egenis) of the University of Exeter, on a project on the individuation of biological entities, he joined Logos in October 2017 funded by the Spanish Ministry of Education (FPU) to work with José Díez in his project "Laws, explanation and realism in physical and biomedical sciences." At the same time, since April 2017 he started to collaborate with Sabina Leonelli (University of Exeter) on her ERC-funded project on Data Studies, and since September 2017 he has served as student representative in the EPSA Steering Committee.
Javier´s main interests include general topics in philosophy of science (causation, modelling, explanation, scientific classification) and, particularly, in philosophy of biology, with special emphasis on the biological and philosophical implications of the pervasiveness of symbiosis in nature and the hologenome concept of evolution.

Stability of Traits as the Kind of Stability that Matters: Holobionts as Units of Selection

The project I aim to develop at the KLI is just one of the parts of my general doctoral project, which I started in Exeter in 2015 and it is still going on. The project has already produced some outcomes, in the form of different presentations in philosophy and biology meetings, three publications in specialized journals, and transference to the society – in the form of talks for a general audience, including non-philosophers, and non-biologists. The project is supposed to be extended for a few more months after my stay at the KLI, probably until December 2019, or maybe March 2020, which are the dates when I plan to defend my dissertation. In that context, the stay at the KLI is aimed at a double role: first, I aim to frame my whole doctoral project in a better way, while in there; second, I aim to test some of the key points of my model, particularly trying to address if my model makes sense to conceive the holobiont as a unit of selection. These two roles are structural for the success of my project.

Francisco VERGARA-SILVA
(April 2019)

Francisco Vergara-Silva holds a Ph.D. in biology form the Universidad Nacional Autónoma de México (UNAM). He was a postdoc at University of Uppsala, at the Natural History Museum & Royal Botanic Gardens in Kew, London, and at the Institute of Ecology in Veracruz. He currently is a full researcher at the Universidad Nacional Autónoma de México.
His main research topics deal with the history, philosophy and sociology of evolutionism, both in biology as well as in the human sciences – especially anthropology. He also collaborates in biological systematics-oriented projects in select taxonomic families and genera of the Mexican and Latin American flora.

Archaeology and Niche Construction Theory: Epistemology and Historiography of Anthropology and Biology beyond the Nature/Culture Divide

Niche construction theory (NCT) is a strand of evolutionary theory that stresses the influence that organismal activities have on natural selection, ecological processes, and biological causality (Laland, Odling-Smee and Endler 2017; Odling-Smee, Laland and Feldman 2003). In the context of recent debates on evolutionary thinking across disciplinary fields, NCT has played an important role within the framework currently known as 'extended evolutionary synthesis' (EES; Laland et al. 2015; Müller 2017): its models of (the complexity of) biological evolutionary processes have been widely endorsed to differentiate the global EES proposal from the Modern Synthesis-based 'standard evolutionary theory' (SET). Depicted as abstractions of the reciprocal interactions between organisms (O) and environments (E) – in which niche construction (NC) and ecological inheritance (EI) appear as primary conceptual innovations – these models are currently undergoing further elaboration to accommodate the 'biosocial becomings' (sensu Ingold and Pálsson 2013) of human groups. Initially adopting the classical anthropological notion of 'culture', prominent NCT authors started this work by (re)interpreting well-known cases of niche construction in human populations (e.g. cattle domestication / dairy farming plus lactase persistence in Eurasia) under the label of 'cultural niche construction theory', notably in co-authorship with archaeologists (e.g. Laland and O'Brien 2011). At present, other well-known evolutionary archaeologists continue to foster collaborations with EES-oriented evolutionary biologists to refine (c)NCT, at the same time addressing longstanding questions in archaeological theory / practice (e.g. domestication and agricultural origins). NCT's positive reception in other recent archaeological works, not necessarily linked directly to ongoing conversations around NCT and the EES (e.g. Hodder 2012), suggests that earlier conceptual frameworks throughout the history of archaeological theory might have contained proposals whose resemblances to NCT postulates go beyond simple appearance. Historiographically, the 'origins of NCT' have been legitimately

traced back to the work of Richard Lewontin and Conrad Waddington. In the context of an increasing interest in the EES from scholars in the human / social sciences, would it be possible to establish that past archaeological discourse, in and of itself, has entailed conceptual stipulations that fit NCT to a larger, deeper degree than currently recognized? Which implications could these correspondences have on future refinements of NCT/cNCT, and forthcoming debates around the EES?

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 Workshop 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.'

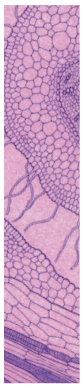
38th Altenberg Workshop in Theoretical Biology
13 – 16 June 2019

The Convergent Evolution of Agriculture in Humans and Insects
KLI Klosterneuburg

Organization: Peter Peregrine, Ted Schultz, and Richard Gawne

Topic and Aims

Agriculture, defined here as the dietary reliance on domesticated organisms cultivated in engineered microenvironments, has evolved at least thirteen times among Attini (leaf-cutting fungus-farming ants), Macrotermitinae (termites), and Xyleborini (ambrosia beetles), and seven times among humans (Hominini). This seems a remarkable case of convergent evolution, and one that deserves to be carefully examined. How can we understand agriculture as a product of convergent evolution? Two working groups were convened at the Santa Fe Institute to examine this question. The groups found that the convergent evolution of agriculture may derive from energetic benefits that include reduction in time spent foraging, reduced overall mobility, and a reduced reliance on wild protein sources that are often under intense competition from other species. There is also greater reliability or predictability in food supplies with agriculture (although catastrophic crop failures can, obviously, occur). Agriculture is a highly successful evolutionary strategy in both humans and insects; indeed, it has been estimated that fully half of the biomass of the insect world and a large percentage of the earth's total biomass is constituted by the agricultural insects. Among humans, agriculture dominates all other food production systems, and has had a profound impact on the earth's ecosystems. Why is such a potent adaptation so relatively rare? The working groups also



examined this question, and found that developmental constraints appear not to limit the evolution of agriculture; rather, it is functional constraints that seem uniquely limiting. The groups identified a set of specific preconditions that must be present for agriculture to evolve, including (1) generalized foragers that create central places for food storage, distribution, and consumption; (2) some reliance on a plant or animal species that is genetically or behaviorally pre-adapted for domestication; (3) relatively intense group sociability and communication, particularly sociability and communication that crosses generations and allows for social learning or conditioning; (4) rapid replication of mutations or innovations; and (5) a relatively stable climate. The preconditions may be quite rare, thus making agriculture a rare adaptation. The aims of this Altenberg Workshop are both to share and evaluate findings from the Santa Fe Institute working group meetings and, perhaps more importantly, elaborate on them by developing a better understanding of the preconditions, sequential evolution, and social, biological, and environmental impacts of agriculture in a comparative framework. We hope our discussions and papers will provide new insights to help to further develop evolutionary theory.

Program

DUUR K. AANEN
Wageningen University & Research
The Sociobiology of Domestication

PETER H.W. BIEDERMANN
University of Wuerzburg
Did Insects Invent Agriculture?

JACOBUS J. BOOMSMA
University of Copenhagen
How Leucocoprineaceous Fungi Domesticated the Attine Ants

R. FORD DENISON
University of Minnesota
Domestication versus Taming of Crop Plants and Their Symbionts

DORIAN Q. FULLER
University College London
Coevolution in the Arable Battlefield: Crop Morphology, Cultural Practice, and Parasitic Domesticoids

RICHARD GAWNE
Tufts University, Medford & KLI, Klosterneuburg
Distributional Constraints in the Development of Domesticated Forms

NICOLE GERARDO
Emory University, Atlanta
The Evolution of Microbial Interactions within Ancient Ant Agriculture

JIRI HULCR
University of Florida, Gainesville
Ambrosia Symbiosis

ANA JEŠOVNIK
Croatian Myrmecological Society, Zagreb
Fungus-Farming Ants

HANNA KOKKO
University of Zurich
How to Deal with Unpredictability in Life

JUDITH KORB
University Freiburg
Fungus-Growing Termites: An Ecological Perspective

GEORGE R. McGHEE
Rutgers University, Piscataway
Convergent Evolution of Agriculture in Bilaterian Animals: An Adaptive Landscape Perspective

SUSAN MILIUS
Science News, Washington
The Other Kind of Insect Farming

PETER N. PEREGRINE
Lawrence University, Appleton
The Impact of Agriculture on Social Organization: A Comparative Analysis

DOLORES R. PIPERNO
Smithsonian Institution Tropical Research Institute, Balboa Ancón
Developmental Plasticity, Gene Expression, and Crop Plant Evolution

TED R. SCHULTZ
Smithsonian Institution National Museum of Natural History, Washington
Evolutionary Convergence of Ant and Human Agriculture

3.2 KLI Focus Group

The KLI Focus Group gathers leading experts of an interdisciplinary field with the aim to develop ideas on a particular subject and generate suggestions for action. The invitees come from different scientific backgrounds and strive to develop specific, practical goals within the designated period of time.

3rd Focus Group
3 – 6 July 2019

Evolution of Language: Human and Non-Human Primate Comparative Research as Evidence
KLI Klosterneuburg

Organization: D. Kimbrough Oller, Ulrike Griebel

Topic and Aims

The evolution of language is an active area of research, but one of the key sources of relevant evidence is essentially blocked by a major split between two critical areas of research, human infant communicative development and primate communication. The two areas pursue different assumptions and empirical methods and generally publish in disjunct venues. Thus, primatologists investigating communicative development (especially vocal communication) have little in common with developmental psychologists investigating human communication development. The two fields seem to talk past each other, and as a result, there is no published research quantitatively comparing human and non-human primate communication, not even regarding such seemingly simple matters as amount of vocalization usage or degree of flexibility in the functions of vocalizations. It seems likely that a focus group of important players from primatology and human communicative development could, over a period of a few days, conceivably hash out an agenda for research, by developing a new consensus on a few design features for communication systems. The prior standard that has been used in primatology, based on a model of language features by Hockett, will, we suggest, have to be substantially improved. With agreement on at least a few improved (and more carefully defined) design features that can be compared across species, the focus

group could move forward to suggesting an empirical agenda for how to quantify the command of consensus design features in various species.

Participants

MARINA DEVILA-ROSS, University of Portsmouth
JULIA FISCHER, University of Göttingen
ULRIKE GRIEBEL, University of Memphis
STEFFEN R. HAGEN, University of Tübingen
JOHN L. LOCKE, City University of New York
BOB McMURRAY, University of Iowa
D. KIMBROUGH OLLER, University of Memphis
DREW RENDALL, University of New Brunswick
DANIEL Y. TAKAHASHI, Princeton University

3.3 Cooperative Events

Symposium
9 May 2019

Evo-Devo in Evolutionary Theory: The Challenges Ahead
Istituto Veneto di Scienze, Lettere ed Arti
Palazzo Loredan

Organizers: Gerd B. Müller, Alessandro Minelli, Giuseppe Fusco

Topic and Aims

The symposium explores current trends in Evo-Devo research and their conceptual implications. Particular attention is given to the challenges that arise from combining developmental concepts with evolutionary ones. Lectures and discussions will explore avenues of future progress in the theoretical integration of Evo-Devo with evolutionary theory, a theme of ongoing collaboration between the Istituto Veneto and the KLI.

 Program

EHAB ABOUHEIF
McGill University, Montreal
A Theory for the Role of Rudiments and Vestiges in Development and Evolution

PAUL BRAKEFIELD
University of Cambridge
Patterning of Butterfly Eyespots and Exploring Developmental Bias

YOAV SOEN
Weizmann Institute of Science, Rehovot
The Missing Link of Darwinian Evolution:
How Every INDIVIDUAL Adapts to Its INTERNAL Perturbations?

SONIA SULTAN
Wesleyan University, Middletown
Eco-Devo Insights to Evolution: A Case Study in 3 Big Questions

Workshop
10–13 September 2019

Sustainability as a Problem of Complexity: Past, Present and Future of Sustainability Science in the Anthropocene

KLI Klosterneuburg

Organizers: Guido Caniglia, Manfred Laubichler

Topic and Aims

Popular ideas about sustainability are still largely guided by a techno-scientific ideal of control, even though limits and difficulties of this ideal have been obvious for some time. Often fueled by alarmist scenarios of destruction, the remnants of a techno-scientific ideal of control threaten to undermine the very notion of sustainability as well as our attempts to initiate and foster transformations towards more desirable and just futures. Alternatives to a techno-scientific illusion, such as co-evolutionary processes within complex adaptive systems or par-

ticipatory transdisciplinary conceptions of sustainability have emerged, but have yet to gain wider acceptance outside of specific academic discourses.

This workshop places current ideas about sustainability and related transformations in the context of interlinked histories of techno-science, cybernetics, complex systems theory, and sustainability science. Participants will focus on detailed historical analyses of case studies, assessment of current trends and discourses, and envisioning of future ones. A main focus will be on the shifting conceptual frameworks and on the role of modeling strategies (especially complex systems models) for sustainability transformations.

The goal of the workshop is to jointly develop a more adequate methodology and epistemology for a sustainability science that moves beyond a techno-scientific ideal of control and that is rooted in complex adaptive systems, co-evolutionary perspectives, and transdisciplinary methodologies. We will develop a vision for a complexity-inspired sustainability science that is grounded in a thorough understanding of the historical roots and epistemological conditions of sustainability which shall enable participatory and collaborative approaches to sustainability transformations.

Participants

DAVE ABSON, Leuphana University, Lüneburg
SOPHIA BECKER, Institute for Advanced Sustainability Studies (IASS), Potsdam
EMILY BOYD, Lund University
GUIDO CANIGLIA, KLI Klosterneuburg
ROGER CREMADES, Helmholtz-Zentrum Geesthacht
CHRISTIAN DORNINGER, KLI Klosterneuburg
SIMONE GINGRICH, University of Natural Resources and Life Sciences, Vienna
JEREMIAS HERBERG, Institute for Advanced Sustainability Studies (IASS), Potsdam
CARLO C. JAEGER, Global Climate Forum, Berlin
DANIEL LANG, Leuphana University, Lüneburg
STEVE LANSING, Santa Fe Institute
MANFRED LAUBICHLER, Arizona State University, Tempe
CARLOS ALVAREZ PEREIRA, Club of Rome
RIKA PREISER, Center for Complex Systems in Transitions, Stellenbosch University
MAJA SCHLUETER, Stockholm Resilience Center
GREGOR SCHMIEG, Leuphana University, Lüneburg
ISABELL SCHRICKEL, Leuphana University, Lüneburg
PIA SCHWEIZER, Institute for Advanced Sustainability Studies (IASS), Potsdam
JOHANNES SORGER, Complexity Science Hub, Vienna
SANDER VAN DER LEEUW, Arizona State University, Tempe
DOMINIK WIEDENHOFER, University of Natural Resources and Life Sciences, Vienna
VERENA WINIWARTER, University of Natural Resources and Life Sciences, Vienna

3.4 Public Event

CSH Colloquium
11 September 2019

Sustainability —
A Complex Challenge

Complexity Science Hub, Vienna

Organizers: Stefan Thurner, Manfred Laubichler, Guido Caniglia

Topic and aims

The Public Event to kick-off the KLI / Complexity Hub Workshop „Sustainability as a Problem of Complexity: Past, Present and Future of Sustainability Science in the Anthropocene" (12 –13 September 2019).

Popular ideas about sustainability are still largely guided by a techno-scientific ideal of control. Hence, limits and difficulties of this ideal have become obvious. Is there a more adequate methodology for a sustainability science? The answer is yes: alternatives have emerged, but have yet to gain wider acceptance in the scientific community. The CSH Colloquium highlighted approaches to sustainability that move beyond the control paradigm and deal with the systems of the world as what they are: complex.

MANFRED LAUBICHLER (Arizona State University, Tempe)
Can We Design Sustainable Pathways? Why Sustainability is a Complex Problem

CARLO JÄGER (Global Climate Forum, Berlin & Complexity Science Hub, Vienna)
Beyond the Wrong Kind of Complexity: Why Sustainability Requires a Major Transition in the Evolution of Global Institutions

MAJA SCHLÜTER (Stockholm Resilience Centre)
Navigating the Emergence of Collapses and Transformations

J. STEPHEN LANSING (Santa Fe Institute & Complexity Science Hub, Vienna)
Lessons from the Ice Age — Why the Tropics Matter

3.5 KLI Colloquia

KLI Colloquia are informal, public talks taking place at the KLI in Klosterneuburg. Abstracts of the presentations and information about the lecturers can be found on the website of the institute.

PHILIPP MITTEROECKER
University of Vienna
How Human Bodies Are Evolving in Modern Societies: Do We Want to Know This?

VERENA WINIWARTER
University of Natural Resources and Life Sciences, Vienna
Eternity Costs and Wicked Legacies: Unacknowledged Constraints to a Sustainability Transformation?

TARJA KNUUTTILA
University of Vienna
Representations, Fictions and Artefacts: Modeling Genetic Circuits

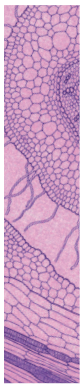
TIMOTHY WARING
University of Maine
The Evolution of Social-Ecological Systems

MANFRED LAUBICHLER
Arizona State University, Tempe
Major Transitions in Biology, Technology, and Finance: The Role of Platforms

DENIS WALSH
University of Toronto
Evolutionary Foundationalism and the Myth of the Chemical Given

RON PINHASI
University of Vienna
What Can Paleogenomics Tell Us about Prehistoric Agricultural Dispersals?

EVA HORN
University of Vienna
"Geological Agents?" Thinking about the Human in the Anthropocene



SABINE TEBBICH
University of Vienna
Behavioral Innovations in Animals and Humans

NINA ATANASOVA
University of Toledo
Animal Models of Pain and the Puzzle of Similarity

ROBERTO CAZZOLLA GATTI
Tomsk State University
New Ideas on the Emergence and Evolution of Life

CHRISTIAN DORNINGER
Leuphana University, Lüneburg & KLI, Klosterneuburg
Biophysical Human-Nature Connectedness

REBECCA FREETH
Institute for Advanced Sustainability Studies (IASS), Potsdam
Interdisciplinary Collaboration: Challenges and Capacities

DANIEL J. NICHOLSON
KLI, Klosterneuburg
Schrödinger's What is Life? 75 Years On

KIM STERELNY
Australian National University, Canberra
Demography and Cultural Complexity

ANDREW YANG
Chicago Art Institute
Evolution, Umwelten, and the Possibility of Planetary Aesthetics

RAGHAVENDRA GADAGKAR
Indian Institute of Science, Bangalore
Can We Understand an Insect Society, and Why Should We Care?

ANDREJ EVTEEV
Lomonosov Moscow State University
Craniofacial Adaptation to High Latitudes in Modern and Paleolithic Hominins

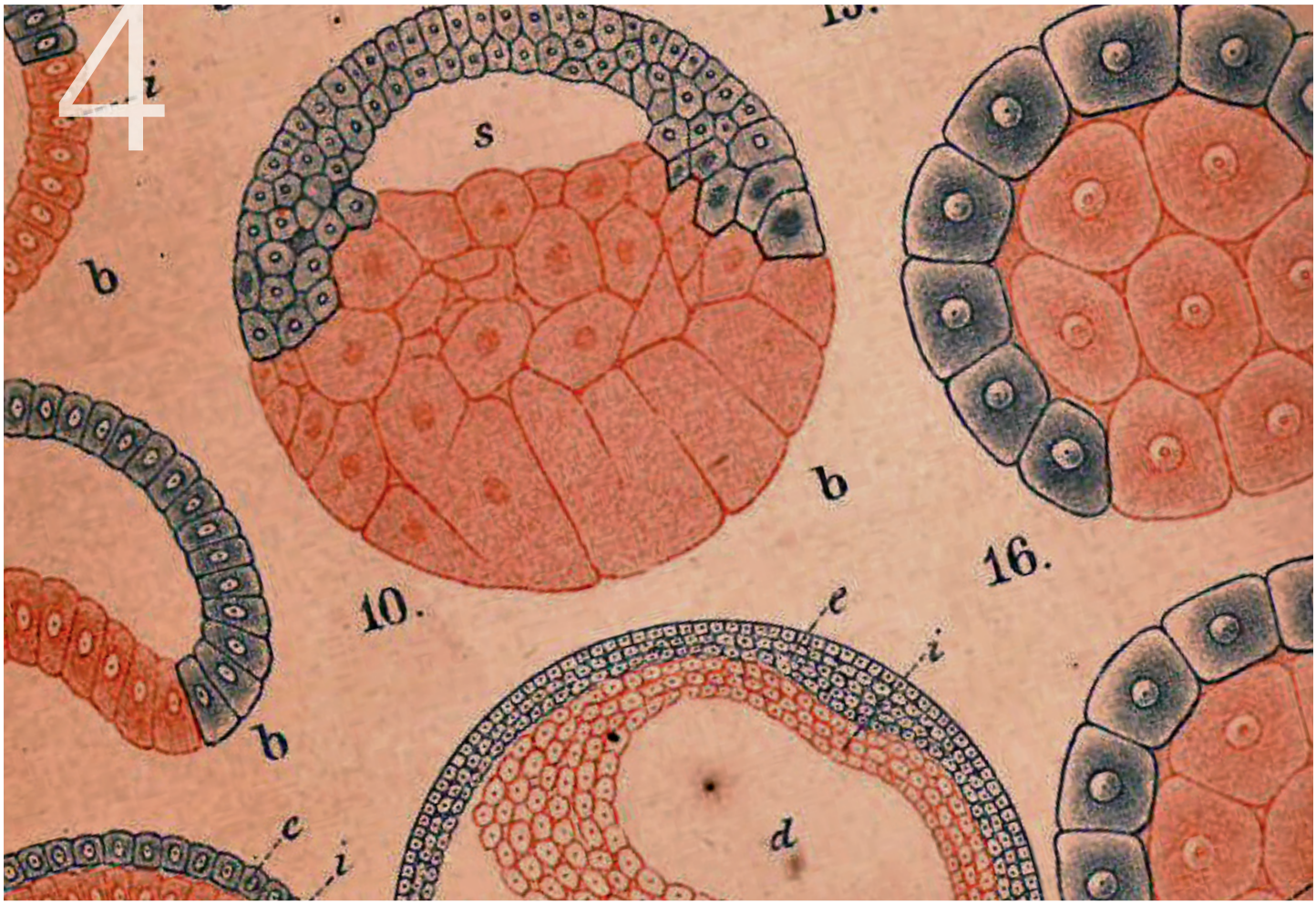
ADAM WILKINS
Humboldt University, Berlin
The Genetic Basis of Animal Domestication: An Old Question, a New Approach

KATE MACCORD
Marine Biology Laboratories, Woods Hole
&
LUCIE LAPLANE
Université Sorbonne, Paris 1
From Stemness Identity in Cancers to Germline Identity in Metazoans

JOHN BICKLE
Mississippi State University & University of Mississippi Medical Center
Tinkering in the Lab

Publications

4



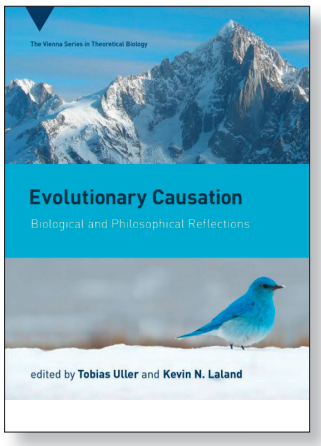
Scientific publications

and presentations of fellows

and staff of the KLI in 2019.

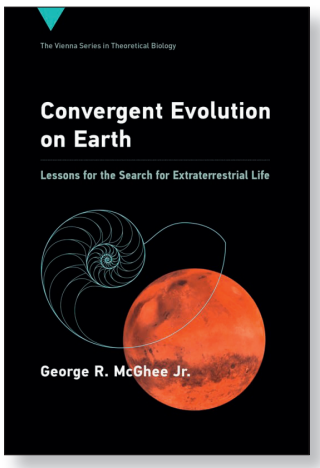
4.1 Vienna Series in Theoretical Biology

The 'Vienna Series' is published by The MIT Press as a book series. Books are mainly based on the Altenberg Workshops and the resulting contributions and new syntheses. The book projects are subjected to a reviewing process by The MIT Press.



Volume 23:

TOBIAS ULLER, KEVIN N. LALAND, eds
Evolutionary Causation.
Biological and Philosophical Reflections



Volume 24:

GEORGE R. McGHEE Jr.
Convergent Evolution on Earth.
Lessons for the Search for Extraterrestrial Life

4.2 Professional Papers and Books

BETZLER R.
Finding Empathy: How Neuroscientific Measures, Evidence, and Conceptualizations Interact
International Journal of Philosophical Studies 27: 224-243

BONS P, BAUER C, BOCHERENS H, DE RIESE T, DRUCKER D, FRANCKEN M, MENÉNDZ LP, UHL A, WISSING C.
Out of Africa by Spontaneous Migration Waves
PLoS One 14: e0201998

BURROWS L, JARMULOWICZ L, OLLER DK.
Allophony in English Language Learners: The Case of Tap in English and Spanish
Language Speech and Hearing in the Schools 50: 138-149

CARRUTHERS G, CARLS-DIAMANTE S, HUANG L, ROSEN M, SCHIER E.
How to Operationalize Consciousness
Australian Journal of Psychology 71: 390-410

CARLS-DIAMANTE S.
The Octopus Mind: Implications for Cognitive Science.
[Invited peer commentary on "What is in an Octopus's Mind?" by J. Mather]
Animal Sentience 26: https://animalstudiesrepository.org/animsent/vol4/iss26/17/

CARLS-DIAMANTE S.
Armed With Information: Chemical Self-Recognition in the Octopus
In: Approaching Minimal Cognition (Segundo-Ortin M, McGivern P, Brancazio N, eds)
Adaptive Behavior. DOI: https://doi.org/10.1177/1059712319862253

CARLS-DIAMANTE S.
Make Up Your Mind: Octopus Cognition and Hybrid Explanations
In: Explanations in Cognitive Science: Unification versus Pluralism (Hohol M, Miłkowski M, eds)
Synthese. DOI: https://doi.org/10.1007/s11229-019-02102-2

CARLS-DIAMANTE S.
Out on a Limb?: On Multiple Cognitive Systems Within the Octopus Nervous System
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4.3 Forthcoming Publications

APETREI C, CANIGLIA G, VON WEHRDEN H, LANG D.
Knowledge for Sustainability: Just Another Buzzword?
Global Environmental Change

BICKEL M, CANIGLIA G, WEIZER A, LANG D, SCHOMEROS T.
Knowledge Systems for Sustainability: Municipal Climate Action Managers and the German Energy Transition
Journal of Cleaner Production

CAZZOLLA GATTI R, AMOROSO N, MONACO A.
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Ecological Modelling

CHAPUNGU L, NHAMO L, CAZZOLLA GATTI R, CHITAKIRA M.
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Sustainability

DiFRISCO J, MOSSIO M.
Diachronic Identity in Complex Life Cycles: An Organizational Perspective
In: Biological Identity. Perspectives from Metaphysics and the Philosophy of Biology (Meincke AS, Dupré J, eds)
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DORNINGER C, ABSON DJ, APETREI CI, DERWORT P, IVES CD, KLANIECKI K, LAM DPM, LANGSENLEHNER M, RIECHERS M, SPITTLER N, VON WEHRDEN H.
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Ecological Economics

FABRIS F.
The Philosophical Impact of Cybernetics on Waddington's Epigenetics
In: Epigenesis between Philosophy and Life Sciences (Continenza B, Ceccarelli D, eds)
Paradigmi

GONZALEZ-CABRERA I.
Review of "Cognitive Gadgets: The Cultural Evolution of Thinking" by Cecilia Heyes
History and Philosophy of the Life Sciences

GONZALEZ-CABRERA I.
Review of "Becoming Human" by Michael Tomasello
History and Philosophy of the Life Sciences

GONZALEZ-CABRERA I.
Review of "The Ape that Understood the Universe: How the Mind and Culture Evolve" by Steve Stewart-Williams
The Quarterly Review of Biology

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PLOS ONE

HORDIJK W, ALTENBERG L.
Developmental Structuring of Phenotypic Variation: A Case Study with a Cellular Automaton Model of Ontogeny
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LACINY A.
Review of "First in Fly. Drosophila Research and Biological Discovery" by Stephanie Elizabeth Mohr
History and Philosophy of the Life Sciences

LUEDERITZ C, CANIGLIA G.
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MENÉNDEZ LP.
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MENÉNDEZ LP, RADEMAKER K.
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PaleoAmerica

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NICHOLSON DJ.
On Being the Right Size, Revisited: The Problem with Engineering Metaphors in Molecular Biology
In: Philosophical Perspectives on the Engineering Approach in Biology: Living Machines? (Holm S, Serban M, eds)
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Journal for General Philosophy of Science

SARTO-JACKSON I.
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PhD Thesis, University of Vienna

VEIGL SJ, HARMAN O, LAMM E.
Friedrich Miescher: The First and Forgotten Genome Scientist
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VILLANUEVA HERNÁNDEZ LA.
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4.4 Journal *Biological Theory*

Volume 14, Issue 1:

ZERILLI I.
Neural Reuse and the Modularity of Mind: Where to Next for Modularity?

BARBIEREI M.
Code Biology, Peircean Biosemiotics, and Rosen's Relational Biology

DURAND PM, RAMSEY G.
The Nature of Programmed Cell Death

FRANCESCOLI G, SCHLEICH C.
Agonism Management Through Agonistic Vocal Signaling in Subterranean Rodents: A Neglected Factor Facilitating Sociality?

KETCHAM R.
Task Allocation and the Logic of Research Questions: How Ants Challenge Human Sociobiology

NEWMAN SA.
A Natural Philosopher

Volume 14, Issue 2:

ALBUQUERQUE UP, MUNIZ DE MEDEIROS P, SOARES FERRIERA Jr. W, DA SILVA TC, VASCONCELOS DA SILVA RR, GONÇALVES-SOUZA T.
Social-Ecological Theory of Maximization: Basic Concepts and Two Initial Models

ANDERSSON C, TÖRNBERG P.
Toward a Macroevolutionary Theory of Human Evolution: The Social Protocell

BLUTE M.
Mating Markets: A Naturally Selected Sex Allocation Theory of Sexual Selection

CASTRO L, CASTRO-NOGUEIRA MA, VILLARROEL M, TORO MA.
The Role of Assessor Teaching in Human Culture

STIEFEL KM, BROOKS DS.
Why is There No Successful Whole Brain Simulation (Yet)?

VENTURA R.
Multicellular Individuality: The Case of Bacteria

Volume 14, Issue 3:

PENA RODRIGUES PJF, FONSECA LIRA C.
The Bio-Evolutionary Anthropocene Hypothesis: Rethinking the Role of Human-Induced Novel Organisms in Evolution

LLOYD EA, WADE MJ.
Criteria for Holobionts from Community Genetics

FRANCESCOLI G.
Are Verbal-Narrative Models More Suitable than Mathematical Models as Information Processing Devices for Some Behavioral (Biosemiotic) Problems?

BOOKSTEIN FL.
Reflections on a Biometrics of Organismal Form

78 **Volume 14, Issue 4:**

NEWMAN SA.
Introducing "Classics in Biological Theory"

HUNG T-W.
How Did Language Evolve? Some Reflections on the Language Parasite Debate

HORDIJK W.
A History of Autocatalytic Sets

ELDREDGE N.
Revisiting Clarence King's "Catastrophism and Evolution" (1877)

BOURRAT P.
Evolution is About Populations, But Its Causes are About Individuals

BUSKELL A.
Reciprocal Causation and the Extended Evolutionary Synthesis

BLUTE M.
A *New*, New Definition of Evolution by Natural Selection

4.5 Scientific Presentations

CANIGLIA G.
What Knowledge Can Help Humanity Overcome the Climate Crisis? Humble Answers to a Pretentious Question
Bluesky Conference, Budapest

CANIGLIA G.
Experiments and Evidence in Sustainability Science: A Typology
Bosch Academy for Transformational Leadership, Berlin

CANIGLIA G.
Timewalk in the Anthropocene
(with R. Freeth)
Globart Academy, ESSL Museum, Klosterneuburg

CANIGLIA G.
Education in Times of Climate Change: The GLOCAL Curriculum
(with B. John)
Globart Academy, ESSL Museum, Klosterneuburg

CANIGLIA G.
Using Discomfort to Prompt Learning in Interdisciplinary Research Teams
(with R. Freeth)
Association for Interdisciplinary Studies, Amsterdam

CANIGLIA G.
What Is Evidence for Sustainability? Engaging Theories and Shaping Practices in Sustainability Science
International Society for History, Philosophy, and Social Studies of Biology (ISHPSSB) Conference, Oslo

CANIGLIA G.
Practical Wisdom for Sustainability. Mobilizing Old Concepts for New Challenges
Leverage Point for Sustainability Transformations Conference, Leuphana University Lüneburg

CANIGLIA G.
What is Action-Oriented Knowledge for Sustainability?
Leverage Point for Sustainability Transformations Conference, Leuphana University Lüneburg

CARLS-DIAMANTE S.
The Octopus: Implications for Cognitive Science and Philosophy
Messerli Research Institute, University of Veterinary Medicine, Vienna

CARLS-DIAMANTE S.
Single Arm Use in Octopuses and Motor Control by Prediction Error
Research Colloquium on Consciousness and Cognition, Ruhr-Universität Bochum, Bochum

CEREZO M.
Issues at the Intersection Between Metaphysics and Biology
16th International Congress on Logic, Methodology and Philosophy of Science and Technology, (CLMPST2019), Prague

CEREZO M.
The Impact of CRISPR-Cas Editing in Biology and Society
CNIO Workshop on Philosophy and Biomedical Sciences: Debates on Conceptual and Social Issues, CNIO, Madrid

FABRIS F.
Rethinking Cybernetics in Philosophy of Biology
Evolution Evolving Conference, University of Cambridge

FABRIS F.
The Legacy of Cybernetics on Quantitative and Qualitative Issues in the Post-Genomic Era
International Society for History, Philosophy, and Social Studies of Biology (ISHPSSB) Conference, Oslo

FABRIS F.
Rethinking Cybernetics in Philosophy of Biology
16th International Congress on Logic, Methodology and Philosophy of Science and Technology (CLMPST2019), Prague

FABRIS F.
The Philosophical Impact of Cybernetics on Waddington's Epigenetics
IHPST Pantheon-Sorbonne, Paris

FISCHER B.
Evolutionäre und epidemiologische Gründe hoher Sectioraten
Geburtshilflicher Dialog, Kongresszentrum Estrel, Berlin

GONZALEZ CABRERA ID.
Metaethical Judgments, Moral Realism, and Evolution
Workshop on Metaethics, Moral Realism, and Evolution, University of Munich

GONZALEZ CABRERA ID.
High-Fidelity Transmission of Social Norms
International Society for History, Philosophy, and Social Studies of Biology (ISHPSSB) Conference, Oslo

GONZALEZ CABRERA ID.
Sharing Our Normative Worlds: An Evolutionary Theory of Human Norm-Psychology
Book Manuscript Workshop, University of Munich

GONZALEZ CABRERA ID.
Investigating Human Normative Cognition: A Research Agenda
Ethics Conversations: Munich Center for Ethics, University of Munich

GONZALEZ CABRERA ID.
Metaethical Judgments, Moral Realism, and Evolution
Workshop on Cultural Evolution and The Evolution of Moral Behavior, Malaga

GONZALEZ CABRERA ID.
A Study of Folk Metaethical Beliefs and Political Orientation: Some Preliminary Results
Workshop on Folk Metaethics: Empirical and Philosophical Perspective, University of Graz

GONZALEZ CABRERA ID.
See No Evil: Moral Perception in the Realm of Reason
Harvard University, Cambridge, MA

GONZALEZ CABRERA ID.
Metaethical Judgments, Moral Realism, and Evolution
Duke University, Durham, NC

GRUNSTRA NDS, ZAFFARINI E, FISCHER B, MITTEROECKER P.
Sexual Dimorphism in the Chimpanzee Pelvis: Implications for Understanding the Human Childbirth Dilemma
9th Annual Meeting of the European Society for the Study of Human Evolution (ESHE), Liège

LACINY A.
Ants and Their Parasites
Meeting of the Austrian Entomologists' Association, Vienna

LACINY A, ZETTEL H.
Auf den Spuren der explodierenden Ameisen Borneos
Natural History Museum Vienna

LACINY A, ZETTEL H,
Die „explodierenden" Ameisen der Gattung Colobopsis in Südostasien, ihre Parasiten und Inquilinen
86. Entomologentagung, Schlossmuseum Linz

LIN C-H.
Competing Scientific Traditions Integrated Through Interdisciplinary Development of Mathematical Constructs as Epistemic Templates
7th Biennial Meeting of the European Philosophy of Science Association Conference, Geneva

LIN C-H.
The Increasing Power of Chomsky Hierarchy: A Case Study of Formal Language Theory Used in Cognitive Biology
16th International Congress on Logic, Methodology and Philosophy of Science and Technology, (CLMPST2019), Prague

MENÉNDEZ LP.
Estudio Comparativo sobre el rol diferencial de la historia poblacional y plasticidad fenotípica durante la diversificación humana en Sudamerica
XX Coloquio Internacional de Antropología Física Juan Comas, Aguascalientes

MENÉNDEZ LP.
Vida y Muerte en la gran montaña: Analisis morfometrico comparativo de un craneo del Holoceno temprano de Peru reconstruido virtualmente
Facultad de Medicina de la Universidad Nacional Autónoma de México, Mexico City

MENÉNDEZ LP.
How Have South American Populations Evolved and Diversified? A Morphological View on the Last 10,000 years BP
University of Bonn

MENÉNDEZ LP.
Living on the Edge: Morphometric Analysis of a Peruvian Skull and Its Implications for the Peopling of South America
Dipartimento di Biologia Ambientale, Sapienza Universitá di Roma

MENÉNDEZ LP, PROFICO A, RADEMAKER K, HARVATI K.
Retrodeformation Techniques Applied for Modeling Post-Depositional Changes in an Early Holocene South American Skull
IX ESHE Meeting, Liége

MENÉNDEZ LP, SARDI ML, SCHEIFLE NA, GONZALEZ ME, MESSINEO P, POLITIS GG.
10,000 Years of Mandibular Evolution in Southern South America: Implications for Morphological Diversification
88th Annual AAPA Meeting, Cleveland

MÜLLER GB.
Do We Need an Extended Evolutionary Synthesis?
Institute for Philosophy in Biology and Medicine, University of Bordeaux

MÜLLER GB.
The Extended Evolutionary Synthesis: Structure and Predictions
The Extended Evolutionary Synthesis Workshop: Philosophical and Historical Dimensions, 7th RUB Workshop on the History and Philosophy of the Life Sciences, Bochum

MÜLLER GB.
Evo-Devo and the Extended Evolutionary Synthesis
Molecular Seminar Series, McGill University, Montreal

MÜLLER GB.
Evo-Devo and the Extended Evolutionary Synthesis: An Overview
Symposium New Perspectives on Evolution, Washington and Lee University, Lexington

NICHOLSON DJ.
On Being the Right Size, Revisited
Philosophy of Biology Workshop: Size, Development, and Evolution, Complutense University of Madrid

NICHOLSON DJ.
The Processual Organism
Metaphysics in Biology Workshop, University of Murcia

NICHOLSON DJ.
On Being the Right Size, Revisited
Theoretical Underpinnings of Molecular Biology Workshop, University of Rijeka

NICHOLSON DJ.
'What is Life?' at 75: A Retrospective Evaluation
Theoretical Underpinnings of Molecular Biology Workshop, University of Rijeka

NICHOLSON DJ.
Rethinking the Legacy of Schrödinger's 'What is Life?'
Logic, History, and Philosophy of Science Seminar, National University of Distance Education, Madrid

NICHOLSON DJ.
Organisms ≠ Machines: The Argument from Teleology
Instituto de Investigaciones Filosóficas, Universidad Nacional Autónoma de Mexico, Mexico City

NICHOLSON DJ.
Organisms ≠ Machines: The Argument from Thermodynamics
Instituto de Investigaciones Filosóficas, Universidad Nacional Autónoma de Mexico

NICHOLSON DJ.
Organisms ≠ Machines: The Argument from Scale
Instituto de Investigaciones Filosóficas, Universidad Nacional Autónoma de Mexico

NICHOLSON DJ.
Unearthing the Forgotten Roots of Theoretical Biology
Carlos Graef Fernández Auditorium, Universidad Nacional Autónoma de Mexico

NICHOLSON DJ.
'What is Life?' at 75: A Retrospective Evaluation
Alfredo Barrera Amphitheatre Universidad Nacional Autónoma de Mexico

NICHOLSON DJ.
The Processual Organism
Séminaire Cavaillès, École Normale Supérieure, Paris

NICHOLSON DJ, BAEDKE J.
What the History of Biology Tells Us About the Extended Evolutionary Synthesis
Evolution Evolving: Process, Mechanism, and Theory, University of Cambridge

NICHOLSON DJ.
Is It Appropriate to Conceptualize Biological Macromolecules as Machines?
Bridging the Philosophies of Biology and Chemistry, University of Paris-Diderot

NICHOLSON DJ.
Schrödinger's 'What Is Life?' 75 Years On
International Society for History, Philosophy, and Social Studies of Biology (ISHPSSB) Conference, Oslo

NICHOLSON DJ.
Non-Formal Approaches to Theoretical Biology in the Post-War Period
History of Science Society, Utrecht University

NICHOLSON DJ.
On Being the Right Size, Revisited
2nd Meeting of the PhilinBioMed International Network, University of Bordeaux

NICHOLSON DJ, BAEDKE J.
The Extended Evolutionary Synthesis: Old Wine in New Bottles?
The Extended Evolutionary Synthesis Workshop: Philosophical and Historical Dimensions, 7th RUB Workshop on the History and Philosophy of the Life Sciences, Bochum

SARTO-JACKSON I.
Reassessing the Role of Narratives in Psychiatry
International Society for History, Philosophy, and Social Studies of Biology (ISHPSSB) Conference, Oslo

SARTO-JACKSON I.
Roundtable on Historical, Philosophical, and Interdisciplinary Writing and Publishing
International Society for History, Philosophy, and Social Studies of Biology (ISHPSSB) Conference, Oslo

SARTO-JACKSON I.
Lecture Series in 'Cognitive Biology'
Interdisciplinary Curriculum of the Comenius University, Bratislava

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

SARTO-JACKSON I.
Warum ich weiß, was Du fühlst
Brain Awareness Week 2019, Medical University of Vienna

SARTO-JACKSON I.
Das soziale Gehirn
Brain Awareness Week 2019, Medical University of Vienna

SARTO-JACKSON I.
Unser Gehirn unter Stress. Geschlechtsspezifische Unterschiede von kognitiven Leistungen unter Stress
VHS Wiener Urania

SARTO-JACKSON I.
Sozialisierungsprozesse und Gehirnentwicklung
VHS Wiener Urania

SARTO-JACKSON I.
Das soziale Gehirn
Austrian Academy for Social Work Education, Vienna

SARTO-JACKSON I.
Neurobiologische Aspekte von Bindung
Deutsches Zentralinstitut für soziale Fragen, Berlin

SARTO-JACKSON I., TOMASKA L.
Simple Minds—Yeast as a Model Neuron
Kognícia a umelý život XIX, Conference of Cognition and Artificial Life, Bratislava

SCHNORR SL.
Ancient Foods, Fiber, and Bugs: Microbiomes and Functional Genetics to Discover Past Human Behaviors
University of Sao Paulo

SCHNORR SL.
Ancient Foods, Fiber, and Bugs: Microbiomes and Functional Genetics to Discover Past Human Behaviors
Proseminar Series, Department of Anthropology, University of Nevada, Las Vegas

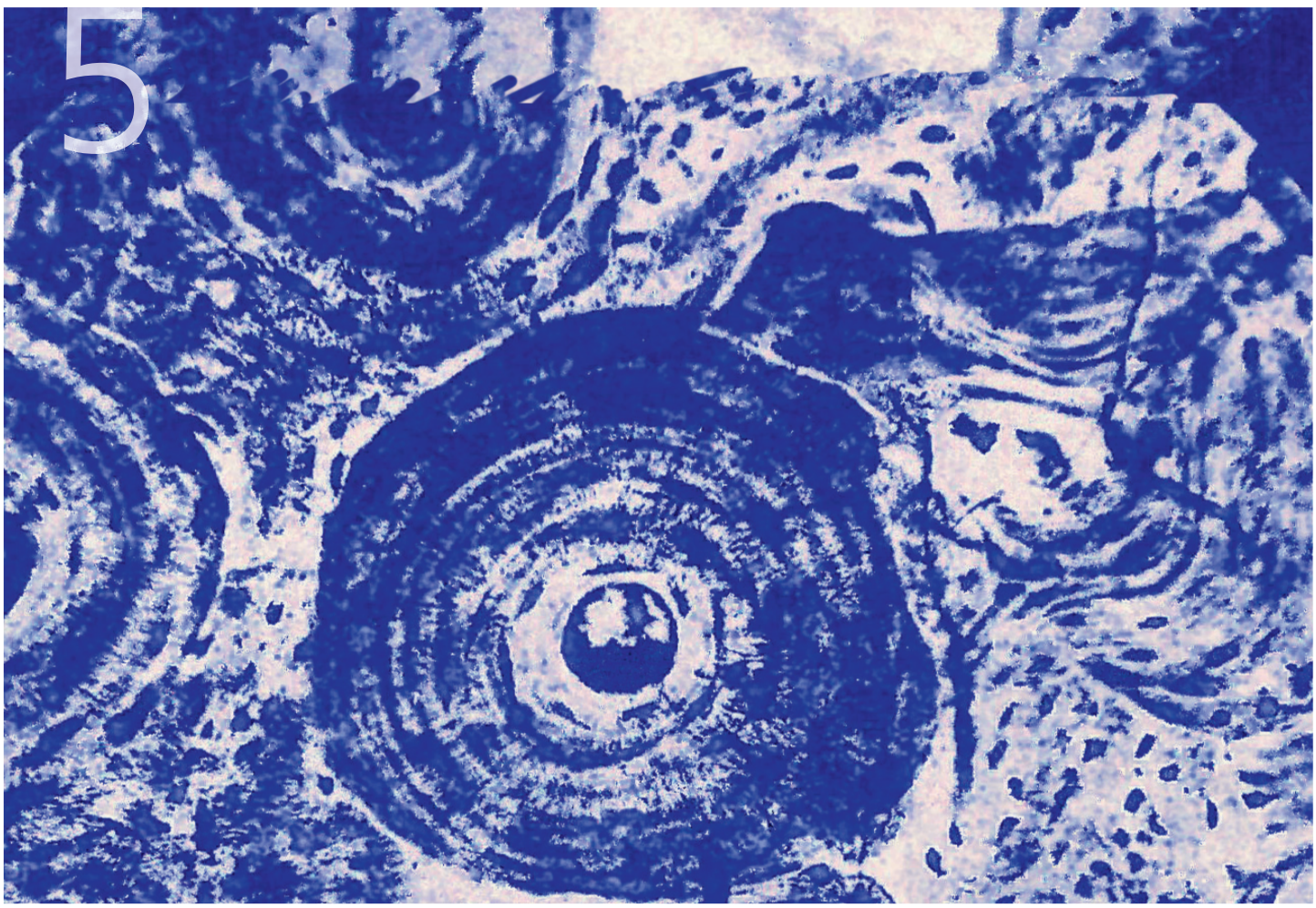
SCHNORR SL.
Ancient Foods, Fiber, and Bugs: Microbiomes and Functional Genetics to Discover Past Human Behaviors
University of Copenhagen

VEIGL SJ.
An Empirical Challenge for Scientific Pluralism
Forum fuer Analytische Philosophie, Vienna

VEIGL SJ.
The Role of Theory in small RNA Inheritance Research
Munich Center for Technology in Society, TU Munich

VILLANUEVA HERNÁNDEZ LA.
Mechanisms of Propensity Fidelity Embodied in Musical Practices
International Society for History, Philosophy, and Social Studies of Biology (ISHPSSB) Conference, Oslo

Further Activities



Many activities of the KLI exceed the scientific core agenda. Some representative activities are listed here.

5.1 Arts & Science Events

Timewalk in the Anthropocene

4 October 2019

Globart Academy & KLI Klosterneuburg

Moderators: Guido Caniglia, Rebecca Freeth

Topic

Time matters. The way we think about our evolutionary past, our impact on earth's complex climate, and the future of humanity depend on our perception of time. In our project, we will will walk together and experience different timescapes that surround us in the Anthropocene: the time of a river, the time of nature in an industrial area, the time of human conquest of the environment, the time of evolution and conservation, and the time of our desires about the future of life on earth. We will reflect together on the implications of these different timescapes for the future of humanity. We will walk from the ESSL museum to the Konrad Lorenz Institute in Klosterneuburg. We will take breaks and chat. We will encounter animated and inanimate companions. We will learn together for a better Anthropocene.

Exhibition & Performance "Federzeichnungen"

8 November 2019
KLI Klosterneuburg

Artist: Gerhard Papp

Program

Isabella Sarto-Jackson	Welcome Address
Wolfgang Straub	Book Presentation of Gehard Papp's "Federzeichnungen"
Willlibald Eigner	Exhibition Opening

5.2 Grants & Prizes

ATTRACT Project
EU Horizon 2020

21 – 22 May 2019
Meyrin Campus of CERN, Geneva

The ATTRACT project, coordinated by KLI senior fellow Wim Hordijk in collaboration with Eors Szathmary, Stuart Kauffman, and other international scientists was funded by the EU within the Horizon 2020 program. The project is an outcome of the proposal drafted at the 1st KLI Focus Group entitled "Synthesizing (a kind of) Life" in September 2017.

Werner Callebaut Prize
Sidney Diamante

11 July 2019

International Society for the History, Philosophy and Social Studies of Biology (ISHPSSB)

KLI Postdoctoral Fellow Sidney Carls-Diamante received the WERNER CALLEBAUT PRIZE 2019 awarded by ISHPSSB for her publication "Make Up Your Mind: Octopus Cognition and Hybrid Explanation" that was published in *Synthese*.

In order to argue that cognitive science should be more accepting of explanatory plurality, this paper presents the control of fetching movements in the octopus as an exemplar of a cognitive process that comprises distinct and non-redundant representation-using and non-representational elements. Fetching is a type of movement that representational analyses can normally account for completely — but not in the case of the octopus. Instead, a comprehensive account of octopus fetching requires the non-overlapping use of both representational and non-representational explanatory frameworks. What this need for a pluralistic or hybrid explanation implies is that cognitive science should be more open to using both representational and non-representational accounts of cognition, depending on their respective appropriateness to the type of cognition in question.

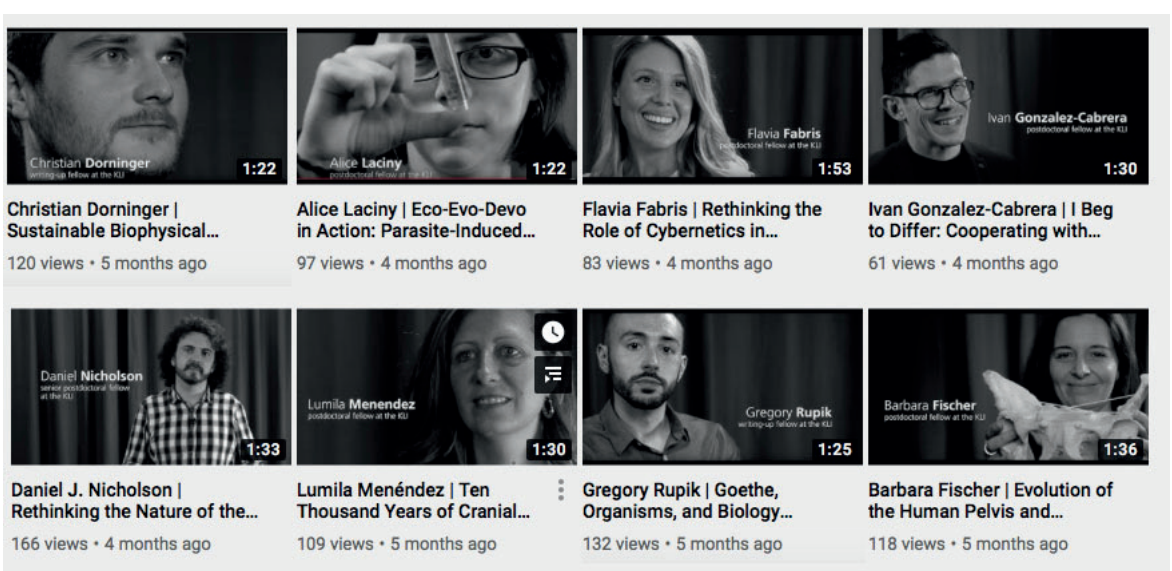
5.3 Professional Development

Minisymposium & Communication Training with Biofaction

25 April 2019
KLI Klosterneuburg

Producer Markus Schmid and videographer Camillo Meinhard of Biofaction, an interdisciplinary research and science communication company that works with emerging sciences, technologies, and art, introduced KLI fellows to methods on how to communicate research to researchers outside one's own field of research.

KLI fellows had the opportunity to create "video business-cards" that were published on the KLI and the Biofaction YouTube channels.



Professional Training & Fellows' Coaching
Liselotte Zvacek

25 April 2019
KLI Klosterneuburg

The workshop aimed at developing skills for the fellows' professional career and help in finding clarity about the next steps in one's career. The training provided a theoretical input about the systemic view of social systems and of organizations, the triangle between strategy, structure, and culture, and the concept of role. It offered the opportunity to examine the role of the researcher, clarify expectations, and understand role-taking, role-making, and role-shaping.

5.4 Festive Honoring

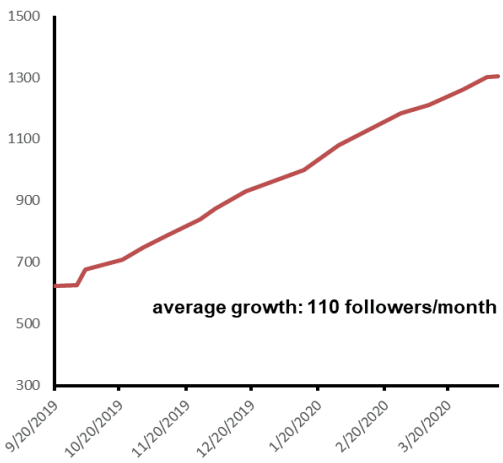
65th Birthday Celebration
of Günter Wagner
(Yale School of Medicine)

17 October 2019
KLI Klosterneuburg

On the occasion of his 65th birthday, the KLI celebrated Günter Wagner's lifetime achievements with a number of renowned scientists. Wagner, who was trained at the University of Vienna and is now full professor at Yale, served on the KLI Advisory Board for many years. He is also a corresponding member of the Austrian Academy of Sciences, fellow of the American Association for the Advancement of Science, and elected member of the American Academy of Arts and Sciences. The event was organized by Mihaela Pavlicev (University of Vienna) and hosted by the KLI.

5.5 Science Communication at the KLI

In 2019, the KLI has developed a strong communication strategy, through social media and other channels. The main purpose is to proactively strengthen our bonds with the multiple scientific communities connected to the KLI. As an example of the impact of our communication strategy, the graph in the image shows a steep increase in the number of individuals and organizations that follow and engage with the KLI on Twitter.

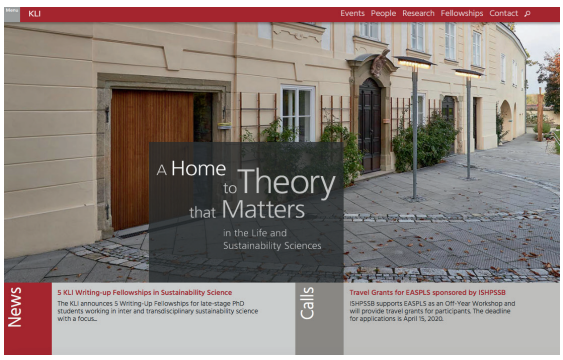


5.6 Sustainability Research at the KLI

To promote the new research focus on sustainability science and address scholars in this field, a new flyer was designed and widely distributed at different events.

KLI Flyer

In addition, to increase visibility of the new research focus, the starting page of the KLI website was revamped.



New Starting Page of the KLI Website

5.7 Making the KLI a More Sustainable Place

During the last year, the KLI team has worked hard to make the institute facilities and operations more sustainable and environmental friendly. Especially, we have implemented a recycling system in all the rooms, eliminated the use of plastic bottles, and used local caterers providing vegetarian foods for events.

5.8 Fostering Interdisciplinary Communication and Exchanges

Weekly activities are organised in collaboration with the fellows to foster interdisciplinary and interpersonal communication and exchanges at the institute. The Monday Check-in Meetings allow all fellows to update each other and exchange ideas on progress and challenges of their own research. The Thursday KLI Lab aims to support exchanges on topics of scientific and societal relevance among the fellows and with visiting researchers.

5.9 Embodying and Discussing Diversity at the KLI

Diversity is one of the main values of the KLI. The KLI has devoted three weeks around International Women's Day to open up conversations and discussion on forms of diversity in biology and society, from the evolution of cultural diversity to gender and biodiversity. Policies that support and foster diversity are reflected in the gender neutral toilets newly introduced at the institute.

5.10 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.