



AppEEL - Applied Evolutionary Epistemology Lab

Faculty of Science of the University of Lisbon

Autonomous Section for the History
and Philosophy of Science

Centre for Philosophy of Science

Campo Grande, Edifício C4, 3.º Piso, Sala 4.3.24

1749-016 Lisbon

PORTUGAL

© Copyright AppEEL 2003

All rights reserved



1st International Winter School on Evolution

Preparing a Future Generation for Interdisciplinary Evolution Research

Ciência Viva Knowledge Pavilion, Lisbon, Portugal

March 11th – 15th, 2013

<http://evolutionschool.fc.ul.pt/winter>

JOHN TEMPLETON FOUNDATION

SUPPORTING SCIENCE – INVESTING IN THE BIG QUESTIONS



CFCUL
Centro de Filosofia das Ciências
da Universidade de Lisboa
<http://cfc.ul.pt>



UNIVERSIDADE
DE LISBOA









Table of Contents

Welcome letter	3
Winter School Program	5
<i>General information</i>	5
<i>About the Winter School</i>	5
<i>Target Audience</i>	5
<i>Credits</i>	5
Course Schedule	6
<i>Macroevoluton and the Major Evolutionary Transitions</i>	7
Bruce Lieberman Paleontology and the Origin of Species: A Macroevolutionary Synthesis.....	8
Folmer Bokma Using Present-Day Species for Macroevolutionary Inferences	9
<i>Language Evolution</i>	11
William Croft Evolutionary Models meet Sociohistorical Linguistics	12
Mónica Tamariz Computational and Experimental Models of the Cultural Evolution of Language	13
Daniel Dor The Co-Evolution of Language and its Speakers.....	14
<i>Symbiogenesis, Lateral Gene Transfer and Virolution</i>	15
Douglas Zook The Dominance of Symbiosis in the Biosphere	16
Francisco Dionísio Symbiogenesis, LGT & Hybridization	17
Michael Arnold Speciation and Reticulate Evolution: Case Studies of Horizontal Gene Transfer, Hybridization and Viral Recombination.....	18
Poster session.....	19
1. Aleksandrs Berdicevskis.....	19
2. Andres Karjus.....	19
3. Andrej Spiridonov	20
4. Dora Szendrei	20
5. Laura Desirée Di Paolo	21
6. Flavia Fabris	21
7. Andreia Miraldo.....	22



8. Krzysztof Kozak	23
9. Kevin Stadler	23
10. Vera Sarkol	24
11. Carl Henning Reschke	24
12. Andreia Miraldo (II)	24
13. Armin Erlacher	25
14. Tomislav Cernava	26
15. Tao Gong	26
Closing dinner	28
Ciência Viva Knowledge Pavilion	29
<i>Floor plans</i>	30
<i>Internet at the Pavillion</i>	31
<i>Area map, places to eat</i>	31
Lisbon	32
<i>Lisbon metro map</i>	32
<i>Lisbon Touristic Information</i>	33
<i>The city</i>	36
List of Participants	39
Our sponsors	42
School Board, Scientific and Organizing Committee	43
<i>Ciência Viva Organizing Committee</i>	43



Welcome letter

Dear Participants to the 1st International Winter School on Evolution,

A very warm welcome to Lisbon!

I hope your journey went well, and that you have arrived safely in one of Europe's most beautiful cities.

A busy week lies ahead of us, one filled with promise, a promise for the future, and the promise lies in every single one of you. For we are gathering to learn about evolution, and more specifically, aspects of evolutionary theories that are currently underrepresented in university curricula worldwide. Internationally renowned, pioneering experts are teaching on macroevolution, the evolution of language, and the various types of horizontal evolutionary mechanisms there exist, and they are teaching it to and for you. They are sharing their work, in the hope that you will take their acquired knowledge to a next level, and, in the near future, will contribute to theory formation yourself.

The organization of this School is the work of many dedicated people. We highly recognize all the efforts, working hours, support, advice, and encouragements that we have received from the numerous institutes and organizations that have made this Evolution School to what it is today.

We are tremendously grateful to all our sponsors, especially the John Templeton Foundation, that provides us with the necessary financial support to bring this endeavor to a fruitful end. Warm and special thanks go out to Rosalia Vargas and Ana Noronha, as well as the whole Ciência Viva Special Events Team, for providing us with such a beautiful, stimulating, and enriching environment.

We want to acknowledge, from our University of Lisbon's Faculty of Science, its president Prof. Dr. José Manuel Pinto Paixão and the vice-president Prof. Dr. António Carlos de Sá Fonseca for providing us full support in the execution of our Templeton-funded project entitled "Implementing the Extended Synthesis in Evolutionary Biology into the Sociocultural Domain", of which the Winter School is one of the major outputs.

It is impossible to organize a School without teachers. We are therefore honoured, humbled, grateful and most of all excited that you accepted our invitation to come and teach at our Lisbon Evolution School. The amount of effort associated with preparing a course, the travel, and the time spent away from home are very much appreciated, and we thank you very warmly, kindly, and cordially.

We want to express our sincere gratitude to Professors Rui Malhó and Fernanda Oliveira, who legalized the Winter School into the Faculty's curriculum and attributed the various courses with the credits.

Dr. Georges Lobato and Paula Montenegro from the Financial Department of the University of Lisbon, and Sílvia Gomes from the Research and Development Department, are kindly



acknowledged, for they did not spare any effort in providing their full administrative assistance to the financial aspects associated with the execution of the School.

And in the name of all participants, who I am utmost confident will one-by-one agree, I want to especially thank Dr. Marco Pina who was your direct contact, and who ever so caringly spend numerous exhausting hours handling your tickets, hotels, registration, course selection, and answering your questions; as well as Márcia Belchior who made the high-tech, beautiful websites. Indeed, it was nothing less than an honor to see the passion, drive and dedication that was present in the whole AppEEL team to bring this School to a successful end.

*Finally, and most of all, I want to thank **you**, the students, for making this event what it is. This is **your** School: learn, ask, discuss, adapt, change, network, enjoy and contribute!*

*Kind regards,
Nathalie Gontier*

*Head Organizer
Director – AppEEL
The Lisbon Applied Evolutionary Epistemology Lab*



Winter School Program

General information

The **International Winter School on Evolution** aims to better prepare a future generation for inter- and transdisciplinary evolution research by providing courses on cutting edge research in biological and sociocultural evolutionary sciences for Master, Doctoral and Postdoctoral students. Emphasis lies on topics that are currently underrepresented in (post)graduate curricula.

About the Winter School

The School is organized by AppEEL - the Applied Evolutionary Epistemology Lab of the Centre for Philosophy of Science of the University of Lisbon, in collaboration with Ciência Viva and with the support of the John Templeton Foundation.

The Winter School courses are centered around the following themes:

- macroevolution and the major transitions;
- symbiogenesis, lateral gene transfer and hybridization;
- language evolution.

Target Audience

All courses are taught at a level accessible to Master, Doctoral and Postdoctoral students in the exact, life, human and sociocultural evolutionary sciences. Bachelor (licentiate) students can enrol as well, but they have to motivate their candidacy.

Credits

Students from the University of Lisbon are able to receive credits for attending the courses. All other participants will receive official certificates of attendance that will include the suggested credit amount attributed by the university to the enrolled students.



Course Schedule

Monday to Friday	MODULE 1 Macroevolution and the Major Transitions ROOM 2	MODULE 2 Language Evolution ROOM 1 (THEATRE)	MODULE 3 Symbiogenesis, LGT & Hybridization ROOM 3
09.00-11.00	Bruce Lieberman	William Croft	Douglas Zook
11.30-13.30	Folmer Bokma	Mónica Tamariz	Francisco Dionísio
15.30-17.30	Eörs Szathmáry *	Daniel Dor	Michael Arnold
Monday evening: 18.00-20.00: Poster Session with Reception Thursday Evening: 20.00: Closing Dinner			

* Canceled



Macroevoluton and the Major Evolutionary Transitions



Bruce Lieberman

Paleontology and the Origin of Species: A Macroevolutionary Synthesis



Bruce S. Lieberman is Professor at the Department of Ecology & Evolutionary Biology, and Senior Curator at the Division of Invertebrate Paleontology Biodiversity Institute, at the University of Kansas, Lawrence. He runs a research lab that investigates patterns and processes of macroevolution. His research focuses on using phylogenetic and biogeographic approaches to study key time periods in the history of life in order to test macroevolutionary hypotheses. A special emphasis is placed on considering the role that earth history change plays in motivating evolution. He has contributed significantly to macroevolutionary theory and the ongoing debates on hierarchy theory and units and levels of selection. His lectures will focus on macroevolution in general, and punctuated equilibria, biogeography, phylogeny, astrobiology and evolutionary radiations in particular, and he will link these topics to philosophical issues of hierarchy theory and the units and levels of selection.

Course description

Lecture content will stress the patterns and processes relating to the birth, death, and persistence of species; another significant focus will be the important contribution that the fossil record has to our understanding of the evolutionary process. To consider these issues I will use case studies from several different time periods in the history of life and spanning several different hierarchical levels of biological organization. In every case, the emphasis will be on formulating and testing macroevolutionary hypotheses. One major topic will be a focus on punctuated equilibria and the mechanisms that govern stasis. Other important topics will be how to use phylogenies to study the tempo and mode of evolution during key time periods in the history of life, to gain insight into the nature of evolutionary radiations, and to study levels of selection. Also emphasized will be how to use techniques from biogeography, especially phylogenetic approaches, Geographic Information Systems (GIS), and Ecological Niche Modeling (ENM), to study macroevolution in the fossil record. A critical aspect of biogeography and its relevance to macroevolution is the ability to consider the role that geological and climatic factors play in governing the evolutionary process. One of the commonalities emerging from macroevolutionary studies in general, and those in the area of biogeography in particular, is the significant role that earth history change plays in motivating evolution; also important is the role of geography in speeding up, or slowing down, the tempo of evolution. My short course lectures will also consider general issues in macroevolutionary theory, and will finish up with work in the area of astrobiology, including research considering large-scale patterns in the history of life.

Day-by-Day Program

- Lecture 1: Applying Biodiversity Science to Paleontology
- Lecture 2: The Cambrian Radiation: Investigating Biology's Big Bang
- Lecture 3: Patterns and Processes of Stasis
- Lecture 4: Adaptive Radiations in the Context of Macroevolutionary Theory
- Lecture 5: Evolution at the Grand Scale and Astrobiology: Taking a Broader View on the Environment, Evolution and Extinction



Folmer Bokma

Using Present-Day Species for Macroevolutionary Inferences



Folmer Bokma is Professor in the Department of Ecology and Environmental Sciences at Umeå University, Sweden. As a senior researcher, he runs a lab that investigates the premises of punctuated equilibria theory in a neontological context. He is one of the pioneering researchers that uses computation-intensive analyses of molecular phylogenetic data to draw conclusions on macroevolutionary events. He estimates rates of morphological and genetic evolution: speciation rates, extinction rates, and rates of gradual and speciation change of morphology, gene expression, co-expression, gene family size and sequence divergence. His course will focus on macroevolution in general and punctuated equilibria in particular, in a variety of extant species.

Course description

The lectures will concern the question to what extent the theory of evolution can be regarded a scientific theory, with particular focus on the question whether the theory of evolution leads to testable predictions. With these questions in mind, we will trace the development of some important aspects of the theory of evolution from before Darwin's time, through Darwin's time and the subsequent rediscovery of Mendelian genetics which sparked the development of the Modern Synthesis, to more recent claims that the Modern Synthesis is in need of revision. The theory of evolution didn't develop in isolation, and the lectures will draw together progress in paleontology, ecology, and especially (quantitative) genetics to provide a solid background for understanding how evolutionary theory developed. Where the lectures touch on philosophical issues there will be scope for group discussion.

Day-by-Day Program

- Lecture 1: A Case Study: Deep Flowers for Long Tongues?
- Lecture 2: Do Species Adapt?
- Lecture 3: Constraints on Evolution
- Lecture 4: Speciation: Internal versus External Factors
- Lecture 5: Tools for Phylogenetic Macroevolutionary Inferences



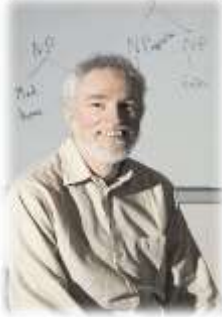


Language Evolution



William Croft

Evolutionary Models meet Sociohistorical Linguistics



William Croft is Professor of Linguistics at the University of New Mexico, Albuquerque. He is a leading expert in the fields of Language Change, Cognitive Linguistics and Typology. He implements population and selection models from biology for analyses language variation and language change. In his approach, he also makes use of the evolutionary epistemological approach that was pioneered by the philosopher and biologist, David Hull. He has also used mathematical models (in collaboration with the physicists Richard Blythe, Alan McKane and Gareth Baxter) to test various evolutionary hypotheses in sociolinguistics, historical linguistics and linguistic typology.

Course description

The application of evolutionary models to language change in the field of linguistics is a relatively recent phenomenon. Historical linguistics and sociolinguistics are well-developed research areas in linguistics, but most of the theories and results are not cast in evolutionary terms, except for occasional analogies. Yet linguistics has perhaps the most concrete and substantial data for testing evolutionary models of cultural transmission. Much theorizing by nonlinguists about cultural evolution makes proposals about language change, but without reference to the detailed results of linguistic research. I will discuss competing evolutionary models for cultural transmission, as applied to language change; examine the mechanisms of variation and selection in language change, including some mathematical models of those mechanisms; and discuss issues of comparative linguistics (phylogeny) and language contact (reticulation) from an evolutionary perspective.

Day-by-Day Program

- Lecture 1: Evolutionary Theories in Biology, Cultural Change, and Language Change
- Lecture 2: Mechanisms and Models of Variation in Language Change
- Lecture 3: Mechanisms and Models of Selection in Language Change
- Lecture 4: Some Issues in Typology and Comparative Historical Linguistics
- Lecture 5: Contact Languages: Structural and Social Factors in their Evolution



Mónica Tamariz

Computational and Experimental Models of the Cultural Evolution of Language



***Mónica Tamariz** is a Post-doctoral Research Associate at the Experimental Psychology research unit, University of Granada (Spain). Previously she worked at the Language Evolution and Computation Research group at the University of Edinburgh, UK. She is developing new experiments and theoretical frameworks that formalize and conceptualize the units, levels and evolutionary mechanisms involved in language transmission and language evolution. These models will form the basis of her course.*

Course description

Humans have developed the only communication systems that are simultaneously symbolic, internally structured, and socially learned, namely languages. If we want to investigate why human languages are the way they are in a comprehensive way, we must look not only at biological-evolutionary innovations in our species related to socio-cognitive capacities such as imitation, intention-awareness, vocal learning or enhanced memory, but also at social and cultural variables. Recent studies show that factors such as social-cognitive biases, the structure of meanings or social-network structure can give rise to and modify key features of languages including systematic regularity, conventional meaning or phonemic categories. These new findings have been possible thanks to mathematical models, computer simulations and experiments. This course is an introduction to the last two. Computer models can test the effects of variables that would be difficult to manipulate in real life, for instance very large populations or many generations. And experiments with micro-populations learning or using miniature artificial languages allow us to explore the effects of cognitive and social biases on linguistic structure. Over the five days we will discuss the validity and scope of the methods and study a large variety of example cultural-evolution simulations and experiments from the literature. The course will also include some hands-on exercises about experimental design and result analysis and interpretation.

Day-by-Day Program

- Lecture 1: Cultural Evolution. Language. What Computer Models and Experiments Can Tell Us About the Cultural Evolution of Language
- Lecture 2: Computer Models. From Phoneme Categories to Coordinated Communities of Speakers
- Lecture 3: Experimental Studies (I): Iterated Learning
- Lecture 4: Experimental Studies (II) : Communication Explored?
- Lecture 5: Integrating Knowledge: What Do We Know and What New Areas Could Be Explored?



Daniel Dor

The Co-Evolution of Language and its Speakers



***Daniel Dor** holds a PhD in Linguistics awarded by Stanford University. He is Senior lecturer in the Communication Department of the Faculty of Social Sciences at the Israeli Tel Aviv University. Dor developed the theory of Language as a Communication Technology (LCT). This theory provides a new general framework for the description, analysis and explanation of language as a socially-constructed communication technology, originated through cultural evolution to allow for communication across the experiential gaps between its users. Together with Evolutionary Biologist and Philosopher of Science, Eva Jablonka, Dor has published a series of articles on the evolution of language, highlighting the complex co-evolutionary relationship between the cultural evolution of language as a technology, and the cognitive evolution of human individuals as its users.*

Course description

In this course, I will try to introduce the students to the vast and highly-complex discourse that emerged in the last three decades around the all-important question of the origin and evolution of human language. We will work our way from the different interpretations of the question, through some of the answers discussed in the literature, to the perspective that I've been developing in my linguistic work and together with evolutionary biologist Eva Jablonka: Language is a socially-constructed communication technology of a very particular functional type. Human communities developed the collective ability to invent (a first prototype of) the technology before human individuals acquired the cognitive makeup that makes us efficient speakers today. As language gradually changed social life, individuals began to be selected for their linguistic capacities: First we invented language, then language changed us.

Day-by-Day Program

- Lecture 1: Setting the Multidisciplinary Scene: The History of the Question, the Complexities of Argumentation, the Relationship with Evolutionary Theory, and the Different Interpretations of the "co-" in Co-Evolution
- Lecture 2: Perspectives on Language as an Object of Evolution. The Bilingual Program, the Functionalist Perspective, Language as a Communication Technology, Typology
- Lecture 3: Lessons we Learn from our Relatives: On Chimpanzees, Bonobos and Baboons
- Lecture 4: Human Life Before Language: Mimesis, Polymodality, Intersubjectivity, Cooking, Alloparenting, Ritual
- Lecture 5: The Emergence and Development of Language and its Speakers



Symbiogenesis, Lateral Gene Transfer and Virolution



Douglas Zook

The Dominance of Symbiosis in the Biosphere



***Douglas P. Zook** holds a PhD in Biology awarded by Clark University, USA and the German University of Tübingen. He is Associate Professor of Science Education and Global Ecology and directs the MAT program in science education at Boston University. Boston University was also the home base of Professor Lynn Margulis, founder of the modern field on Symbiosis studies, before she moved to the University of Massachusetts, Amherst. Zook now teaches her course on Symbiosis. He is the former president and current vice-president of the International Symbiosis Society (<http://iss-symbiosis.org>). He is a select member of the National Academy of Sciences' Science Education Standards. He is a leading expert in symbiosis, global ecology, and in bringing symbiosis studies into the science curriculum. He will teach a course on symbiosis and symbiogenesis.*

Course description

Once seen only as an interesting biological curiosity, we now know that symbiosis is a dominant expression amongst life on earth. Indeed, vast research data for all biomes indicates that it is impossible to find a one-genome individual eukaryote on earth. One plus one does appear to equal one. Moreover, symbiosis may often exceed recombination and mutation in many systems as the basis for genetic novelty upon which natural selection "acts." Symbiosis understanding and appreciation in the course is enhanced by a uniquely operational symbiosis definition.

Day-by-Day Program

- Lecture 1: The Algal Evolutionary Tree as a Symbiotic Construct
- Lecture 2: Establishing a Symbiosis: The Physiological Process
- Lecture 3: Eukaryotic Cells as Chimeras and Prokaryotic Cells as a Superorganism
- Lecture 4: Symbiotic Foundation of Biomes and Geological Features
- Lecture 5: Homo sapiens as a Symbiotic Microbiome



Francisco Dionísio

Symbiogenesis, LGT & Hybridization



***Francisco Dionísio** is Assistant Professor at the Plant Biology Department at the Faculty of Science of the University of Lisbon. He specializes in Evolutionary Ecology of Microorganisms and is the team leader of a group that performs both laboratory as well as theoretical research on the evolutionary ecology of microorganisms, with special focus on bacteria, viruses and plasmids. He conducts this research in collaboration with the Gulbenkian Science Institute in Oeiras.*

Course description

This course addresses the causes for the presence of certain accessory DNA elements within cells in general, with a particular focus on bacterial cells. Bacterial cells often contain plasmids (some of them able to transfer to other cells), viruses (mostly without causing any harm to the host cell), insertion sequences, transposons, restriction-modification systems, toxin-antitoxin loci, and other accessory elements. Apparently, they are not useful to the cell, but they actually form long standing relationships with the cell; why is that so? Are they mutualistic or parasitic elements? And what about accessory elements found in eukaryotic cells, including our own? By the end of this course, I expect that the students are able to reason about the presence of accessory DNA elements and relate these alien presences in terms of what life is all about. The audience of the course is very diverse: biologists and non-biologists, theoreticians and experimentalists, all of them having in common a strong interest in learning evolutionary biology. So, I expect that all the students will strongly interact with each other and make an effort to avoid that any student gets lost with experimental details, mathematical treatments, or bioinformatics data. Read the papers and try to explain them to your colleagues.

Day-by-Day Program

- Lecture 1: Introduction: life, replication, and natural selection
- Lecture 2: How come plasmids are so common? (1)
- Lecture 3: How come plasmids are so common? (2)
- Lecture 4: Plasmids, TA-loci, Bacteriophages and Restriction –Modification systems
- Lecture 5: Viruses and plasmids as mutualistic parasites



Michael Arnold

Speciation and Reticulate Evolution: Case Studies of Horizontal Gene Transfer, Hybridization and Viral Recombination



Michael Arnold is Distinguished Research Professor of Genetics at the University of Georgia, Athens, GA. He is a pioneering and leading expert on the study of hybridization as an evolutionary mechanism and performs research on how hybridization can contribute to fitness, adaptive evolution and speciation. His research group studies reticulate evolution in a wide variety of taxa, including, fungi, plants and animals. Professor Arnold has also authored three books in which he discusses the role of genetic exchange in the evolution of organisms as diverse as viruses and humans. His course will cover a broad range of topics associated with reticulate evolution and speciation.

Course Description

The goals of this course are to 1) (re-)introduce the students to some of the canonical literature concerning the process of speciation and 2) discuss the new paradigm represented by the web-of-life metaphor. The second goal will be accomplished by using Mike's book – Evolution Through Genetic Exchange (2006, Oxford University Press) – as a distillation of many studies of natural hybridization, lateral exchange and viral recombination (i.e. Reticulate Evolution). By the end of the course, I hope that the students will have an increased awareness of both where current studies in speciation/reticulate evolution fit into the history of such investigations and the ongoing shift in the paradigm used to describe the process of evolutionary diversification. Because the format will be discussion, rather than lecture, the success of this course depends upon student interactions. There is a substantial amount of required reading for this course, so I would suggest strongly that the students begin the assignments before the week of classes. This will facilitate the discussion and add greatly to the value of the course material for the students.

Day-by-Day Program

- Lecture 1: Species Concepts
- Lecture 2: Modes and Tempos of Speciation
- Lecture 3: Reticulate Evolution: History, Species Concepts and Hypothesis Testing
- Lecture 4: Reticulate Evolution: Isolating Barriers, Hybrid Fitness and Gene/Genome Duplication
- Lecture 5: Reticulate Evolution: Lineage Diversification, Conservation Concerns and Homo sapiens Origins and Ecology



Poster session

1. Aleksandrs Berdicevskis

In the poster, I address the actuation problem of sociolinguistics, formulated by Weinreich, Labov and Herzog (1968, 102) as “Why do changes in a structural feature take place in a particular language at a given time, but not in other languages with the same feature, or in the same language at other times?”. Developing Maslova’s (2008) idea that the role of selection-level processes in language change deserves special attention, I propose the following direction for the “actuation problem” quest. Linguistic variation both across and within speakers is immense, but few speaker-level innovations get diffused widely enough to constitute a linguistic change. Which speaker innovations do and which do not diffuse depends on the selective pressures that are currently operating in a language. Thus, the identification of these pressures is a necessary step towards the solution of the actuation problem. The main focus of the poster is on how these pressures depend on language-external factors, such as social structure of the community, language contact and communication medium in use. I provide examples of how changes in these external factors (for instance, the intensification of language contact or the emergence of new communication medium, such as writing or computer-mediated communication) affect the selective pressures in language and thus can actuate linguistic change, or, more precisely, make the actuation of certain linguistic changes probable.

- Maslova, Elena. 2008. “Unidirectionality of grammaticalization in an evolutionary perspective.” In *Studies on grammaticalization*, edited by Elisabeth Verhoeven, Stavros Skopeteas, Yong-Min Shin, Yoko Nishina, Johannes Helmbrecht, 15–24. Berlin, New York: Mouton de Gruyter.
- Weinreich, Uriel, William Labov, and Marvin Herzog. 1968. *Empirical foundations for a theory of language change*. Austin: University of Texas Press.

2. Andres Karjus

This paper presents a study on the asymmetries in the number marking of nouns, based on data from four languages. The singular to plural ratios of random words are contrasted with those of a pre-selected set of concepts that are expected to occur more in the plural due to often occurring in pairs or groups in the physical world. A statistically significant difference in terms of the ratio is found between the groups, with subgroups emerging among the concepts, while the ratio also appears to correlate with word length to a degree, with plural-prominent nouns often having shorter plural marking than their singular-prominent counterparts (complying with the economy principle; cf. Haspelmath 2008).

The study is based on large-scale corpora of four languages, Estonian (Finno-Ugric), Russian (Slavic), Norwegian (Germanic) and Latvian (Baltic). A set of six concepts were chosen, each represented by three examples, and the frequency of the nominative singular and plural forms of the examples were counted across the corpora. Additionally, the frequencies for ten random words were acquired in each language sample. The hypothesized effects of the semantic concepts on the singular-plural ratio were modeled using conditional inference



trees (random forests were grown to ensure the stability of the tree model; linear regression was used for comparison). The results showed a statistically significant difference between the asymmetry in number marking in the random sample and that of the pre-selected concepts, with the former group leaning almost universally towards the singular and the towards the plural. The results were largely the same across all four languages, with only minor variation.

- Haspelmath, Martin 2008. Frequency vs. iconicity in explaining grammatical asymmetries. *Cognitive Linguistics* 19.1: 1-33.

3. Andrej Spiridonov

Conodonts were small nektonic vertebrate animals, which spanned from Cambrian up to Triassic periods (Klapper, & Barrick, 1978; Friedman, & Sallan, 2012). Most common fossils left by these creatures are mineralized elements, which are the remains of their feeding apparatuses. Conodont elements are one of the most common and widespread fossils that can be found in Silurian strata of Lithuania. Due to the abundant deep core geological drilling projects, that took place in the past several decades, rich and fairly complete core material with fossiliferous rocks spanning all the Phanerozoic was yielded. In addition, majority of cores are accompanied with geophysical logs data, which can be used as proxies of environmental variables in paleoecological analyses. Excellent fossil preservation and abundance of conodont elements, relative stratigraphic completeness of Silurian sections and availability of contextual information enables us to answer questions about processes that governed evolution, extinction/extirpation, survival and dispersal of conodonts during this dynamic time period. Morphometric analyses of conodont elements and analyses of their abundances and environmental time series from strata of Pridolian age have shown that differences in levels of phenotypic plasticity in two closely related species could be caused by changes in regional (and possibly global) oceanographic states, which controlled biotic and abiotic conditions. Analyses of another kind, where generalized linear modeling approach was utilized, revealed that important determinant of species survival during one of the most profound Silurian turnovers - Ireviken extinction event - was amount of variation in local abundances of elements (Spiridonov & Brazauskas, 2012).

- Friedman, M. & Sallan, L.C. 2012. *Palaeontology* 55(4), 707-742.
- Klapper, G., & Barrick, J. E. 1978. *Lethaia*, v. 11, 15-23.
- Spiridonov, A. & Brazauskas, A. 2012. EGU-2012 abstracts.

4. Dora Szendrei

Since the first genome-scale metabolic network reconstruction has been published in 2000, the number of the genome-scale metabolic reconstructions has accelerated. By now, there are 45 total metabolic networks covering all the three domains of Life, Bacteria, Archaea and Eukaryota. By comparing these networks we can uncover the core of metabolism, pathways that were present in the Last Universal Common Ancestor (LUCA).

To tackle this problem we need to convert the metabolic networks to a format that can be readily compared by computational algorithms. In doing so we also correct several



mistakes related to reaction reversibility and cofactor usage, as well as typos in the representations. We need to check each network manually. By now, we have finished 18 Bacterial reconstruction, which can now be compared.

We analyse these networks, search for common reactions, metabolites, as well as common autocatalytic cycles.

Further metabolic network comparison is available. Despite network analyses published in eminent journals, networks based simply on common set in substrates or products it just not correct. We can choose between protein-based and metabolic-based approaches. We want to merge these approaches and connect metabolites only if their carbon frame has common carbon atoms, if they are really substrate-product pairs. This, we suggest, could give us more insight into the working of metabolic networks, and can lead us to discover how metabolism evolved.

5. Laura Desirée Di Paolo

Social Learning is the apprenticeship of relevant information about foraging techniques and public conducts, that learners take from the context of conspecifics. Without mentioning differences in modalities, learning from the context makes individuals able to efficiently adapt themselves to the environment. This one, built socially by daily activities, is also a selective environment for learners: the good ones survive better into their social context. The constant use of learning strategies, modifying the environment, puts both learners and learning under selection. Consequently, evolution occurs in two directions: on the learning processes and on the apprentices. This process is even more crucial in a cultural scenario, where culture is an outcome of individuals' activities and also learners' selective environment: our aim is to underline how humans are still under biological selection, highlighting that the cognitive correlates, which are pre-requirements of human-like culture, are transmitted and improved by social learning to maximise adaptiveness.

6. Flavia Fabris

The aim of my thesis was to understand what kind of role the notion of variation has in genetic and in molecular biology research. My hypothesis is that the notions of "regulation" and "feedback organism/environment play a crucial role in explaining what kind of mechanisms are responsible for the phenomenon of variation. So with the supervision of Prof. Laura Fanti of the genetic and molecular biology lab at the Sapienza University, I could check through the classic model of *Drosophila melanogaster* if the exhibited variation at the phenotypic level could be considered a clue for the thesis of an inner cryptic variability as suggested by Waddington, rather than more complex regulation mechanisms responsible for a phenomenon as such.

Indeed the notion of developmental canalization, far from being a simple influence in the latest years theories in biology, has also have further integration with some molecular hypothesis like the Rutherford and Lindquist's one, or the Specchia et al's another one; both involving the role of a chaperone heat-shock protein, Hsp90. This latest suggested how the phenomenon of variation could not be explained by a preexisting genetic variability, hidden



behind the robustness of canalized pathways of development, rather from de-novo mutations, caused by the insertions of the DNA jumping transposons. At this regard in my lab I studied the causal correlation between stress and transposons, with the principal aim to see if the morphological mutations that I induced by some particular stress could be explained by the presence of the insertions of the transposons. So I have set up the original Waddington's experiment of the 1952 about the genetic assimilation of the acquired characters. As Waddington did, I used a wild type lab stock of *Drosophila melanogaster* and before starting the experiment, I controlled that the heat-shock treatment could be the cause of the movement of the transposons. After that, the goal was to verify through molecular and genetic technique (pcr and southern blot) the insertions of these transposable elements in new loci of *Drosophila melanogaster*'s genome, induced by heat-shock stress. From an epistemological point of view I was particularly interested to a new kind of evolutionary reflections that a more complex concept of genetic variation carry on. First of all the evolutionary implications about the recent issue involving the evolution of evolvability. At this regard I set up the same Waddington's experiment that I did on the our wild type *Drosophila melanogaster* lab stock also in other natural populations of wild type *Drosophila melanogaster*, proving different levels of genomic plasticity existent as reaction to the heat shock stress between natural wild type populations.

7. Andreia Miraldo

Dung beetles form highly competitive communities and therefore are likely to show patterns of diversification consistent with the diversity-dependent model of radiation, whereby the progressive filling of ecological space, characterized by an initial rapid accumulation of lineages, is followed by a slowdown in net diversification rate. In such cases, further diversification will only be possible following a "key innovation", which would decouple the rate of diversification in the "innovative" lineage from that in the main radiation. Here, we integrate a well-represented species-level dated phylogeny of the most recent but large dung beetle radiation in Madagascar with data on species' geographical ranges, abundances and body sizes. Results demonstrate an overall decrease of lineage accumulation through time. However, we observe a significant secondary burst of speciation associated with one clade composed of large-bodied species (Clade L, for large), consistent with the "key innovation" model. The secondary increase in diversification rate is associated with a significant increase in body size and striking geographical expansion of the species. It is common in dung beetle communities for large species to be competitively superior to small ones in exploitative competition and hence we suggest that a significant increase in body size has allowed the large species in Clade L to diversify at least partly independently of the species in the rest of the lineage. Furthermore, we show that the increased speciation rate in Clade L is most probably associated with competitive release. This is supported by the observation that the total biomass of many species in this large-bodied species clade is far greater than the total biomass in any of the remaining species. Finally, species in this successful clade have small but almost entirely allopatric distributions: the increase in species number is hence importantly due to divergence in their geographical occurrences.



8. Krzysztof Kozak

The Neotropical butterfly genus *Heliconius* is notorious for instances of hybrid speciation and widespread gene flow. The unusual biology makes this clade an intriguing test case for multispecies coalescent methods in phylogenetics. To understand the relations of over 60 species of *Heliconius* and allies we combine Sanger sequencing, ancient DNA techniques and mining de novo assemblies of whole genome resequencing data. Our dataset comprises 16.5 kbp in 22 loci sampled from multiple individuals per species, balancing alignment length with taxonomic representation. We also present a whole mitochondrial alignment for the majority of the species. Although the histories of individual loci are highly incongruent, MP, ML and Bayesian phylogenies based on nuclear and whole-mitochondrial supermatrices show nearly identical, well-supported topologies. In contrast, multispecies coalescent methods produce the same general topology, but with much lower support values. An inherent incongruence is demonstrated further by a good fit to a highly reticulate network. The observed patterns have likely resulted from both gene flow and from Incomplete Lineage Sorting during recent bursts of speciation. Consistently, model-fitting based on a calibrated phylogeny confirms shifts in diversification rate at the time of major geological events in the Amazonia 10-5 mya, which likely drove speciation in *Heliconius*. Our study (i) provides a robust phylogenetic hypothesis for an emerging model system; (ii) demonstrates how different phylogenetic techniques can either obscure or highlight heterogeneous signal in the data; and (iii) evaluates the hypotheses of *Heliconius* diversification dynamics.

9. Kevin Stadler

The fact that human languages change over time has already been known to the scholars of antiquity, and the continuous development and replacement of linguistic conventions lies at the core of much of the linguistic diversity we see today. But despite significant progress in describing the different instances of language change observed in the world and characterising their commonalities, the question of what exactly the cause or driving force behind language change is remains largely unanswered. Recent investigations using mathematical and computational modelling indicate that the oft-invoked characterisation of language change as gradual mislearning accumulated over time is most likely an inadequate explanation. Instead it has been shown that only differential replication of competing conventions, i.e. some process of directional selection, can lead to the s-shaped logistic growth transitions that are observed in language change, corroborating the sociolinguistic approach which associates succeeding variants with extra-linguistic social prestige. We note that this explanation is unsatisfactory in that it does not address the core problem of how a population can take an arbitrary choice in a distributed and directed manner, but simply defers it to another level where this arbitrary choice is assumed to have already been taken. In this work we pursue a different approach where the differential replication of linguistic variants is based on intra-linguistic factors alone. In particular, we propose a model in which the desirability of linguistic variants is influenced by relative changes in their observed frequency in the immediate past. We discuss the plausibility of this approach and present preliminary results from a computational model.



10. Vera Sarkol

Prior research indicates that East Asians think holistically (taking context into account) while Westerners think analytically (focusing on categories). These different cognitive styles are reflected in paintings: Western portraits devote more space to an individual than East Asian portraits. Generally, differences in these cognitive styles are thought of as static traits of societies, as is evident from theories attributing contemporary differences between societies to their origins in either ancient Greek or Chinese culture, assuming that cognitive styles have not changed over the past millennia. Study 1 investigated if cognitive style is static or dynamic by looking at Dutch and English art history. Approximately 200 portraits per country were selected and measured for the relative size of the face. Quadratic models best fitted the data. The ratios were significantly lower around their vertices in the 1700's than current day levels.

Study 2 looked at the influence of personality in differences of portrait styles, because personality has been shown to differ significantly between East Asia and the West. Sixty participants filled out the NEO-IPIP Questionnaire and took a portrait photograph. There was a significant positive correlation between Agreeableness and the face-to-frame ratio in portraits

Study 1 shows that cognitive styles clearly are dynamic, and not static. In both countries portraits from the 1700's had low ratios comparable to those found in East Asia, and a steep increase to present day Western levels. Study 2 shows that culturally divergent Agreeableness levels could also explain cultural differences found in portrait style. A recent finding, that being in the army decreases levels of Agreeableness, suggests there may be a relation between the high number of intergroup conflict in Western Europe in the centuries before the 1700's, low face-to-frame ratios in portraits, and low Agreeableness.

11. Carl Henning Reschke

This paper discusses the perspectives of a unification of concepts of systemic evolutionary biology and the economics of organization of information. Systemic evolutionary biology (e.g. Riedl 1978) puts emphasis on the notions of hierarchical organization and modular structures to systematize information, which is gained from tests of 'biological hypotheses' in the environment and the efficient organization of these empirical data into successively adapted organisms. Similar arguments on the aggregated processing and structuring of information have been made in economics of organizations and management esp. by Herbert Simon (1962) and Peter Drucker (1986). Related arguments in economics have been advanced by Friedrich Hayek (1932, 1945) and Joseph Schumpeter (1911). The paper discusses the similarities and differences in these approaches to derive a set of suggestions for modelling of information structuring and change in social organisations.

12. Andreia Miraldo (II)

Competition is often viewed as a factor promoting species diversification, because, as theory predicts, closely related species cannot coexist in the same community unless they have diverged sufficiently in ecologically important traits facilitating coexistence. Dung beetles form highly competitive communities and therefore are likely to show patterns of



diversification consistent with the diversity-dependent model of radiation, whereby the progressive filling of ecological space, characterized by an initial rapid accumulation of lineages, is followed by a slowdown in net diversification rate. In such cases, further diversification will only be possible following a “key innovation”, which would decouple the rate of diversification in the “innovative” lineage from that in the main radiation. Here, we integrate a well-represented species-level dated phylogeny of the most recent but large dung beetle radiation in Madagascar (Nanos-Apotolamprus radiation, Canthonini) with data on species’ geographical ranges, abundances and body sizes. Results demonstrate an overall decrease of lineage accumulation through time. However, we observe a significant secondary burst of speciation associated with one clade composed of large-bodied species (Clade L, for large), consistent with the “key innovation” model. The secondary increase in diversification rate is associated with a significant increase in body size and striking geographical expansion of the species. It is common in dung beetle communities for large species to be competitively superior to small ones in exploitative competition and hence we suggest that a significant increase in body size has allowed the large species in Clade L to diversify at least partly independently of the species in the rest of the lineage. Furthermore, we show that the increased speciation rate in Clade L is most probably associated with competitive release. This is supported by the observation that the total biomass of many species in this large-bodied species clade is far greater than the total biomass in any of the remaining species. Finally, species in this successful clade have small but almost entirely allopatric distributions: the increase in species number is hence importantly due to divergence in their geographical occurrences.

13. Armin Erlacher

Lettuce (*Lactuca sativa*) is one of the most commonly used raw food plants world-wide and an important source of vitamin A and potassium. Despite its beneficial properties, lettuce when contaminated is often a source of bacterial, viral or parasitic outbreaks in humans. Pathogenic vectors might be found in terms of gastropoda which are widespread agricultural pests. As all plants, it is colonized by specific microbial communities that influence its health and fitness. The microorganisms colonize almost all parts of the plant, including the root-soil interface (rhizosphere) and the inner part (endosphere) where important interactions occur. This study focuses on Proteobacteria, which include pathogenic as well as beneficial bacteria, and therefore might have a crucial impact on human health. We analyzed the variation of taxonomic structure and colonization pattern of the Proteobacteria, and evaluate the influence of i) plant species and cultivars; ii) microhabitats (rhizo- and phyllosphere), iii) presence of the phytopathogenic fungus *Rhizoctonia solani*. We combined a direct microscopic approach (Fluorescence in situ hybridization coupled with Confocal laser scanning microscopy) with deep 454-pyrosequencing of 16S amplicons. Results showed an unexpected spatial repartition of Beta- and Gammaproteobacteria on the lateral roots of young plantlets. Different bacterial populations do not share their space, more over they seem to exclude each other in contact and coat the root as a dense multispecies biofilm. 454-pyrosequencing of 16S amplicons from lettuce associated Gammaproteobacteria showed Pseudomonadaceae associated with both microhabitats and Xanthomonadaceae as



dominant taxa in the rhizosphere. A high number of Enterobacteriaceae in the phyllosphere was also detected. Current experiments and analyses further evaluate this pattern, to reveal which bacterial taxa colonize the host and to understand the plasticity of the lettuce microbiome.

14. Tomislav Cernava

Lichens are generally considered as mutualistic symbioses between fungal mycobionts and algal photobionts. While Cyanobacteria play an important role as photobionts located in specific compartments known as cephalodia, many other bacterial inhabitants without assigned function are found on the lichen thallus (Grube et al. 2009, 2012). The objective was to study the diversity but also the function of the lung lichen microbiome (*Lobaria pulmonaria*) by a polyphasic approach combining cultivation and metagenomics techniques. We have set our focus on antagonistic bacteria producing antimicrobial compounds, which are an important functional group of bacteria responsible for pathogen defense.

Metagenomic data obtained with an Illumina HiSeq2000 run was used to describe taxonomic and functional diversity. Data analysis conducted with the open-source pipeline MG-RAST and the M5NR database revealed predominance of Proteobacteria (44.5%) followed by Actinobacteria (8.6%) and Bacteroidetes (6.2%) within the bacterial fraction. Isolated antagonistic bacteria were tested against a broad spectrum of pathogens; *Escherichia coli*, *Staphylococcus aureus*, *Botrytis cinerea* and a lichenicolous black fungi species were selected as target. A total of 3% of the isolates showed broad spectrum antagonistic activity against these pathogenic microorganisms. These active isolates were identified as Gram-positive genera, e.g. *Bacillus*, *Paenibacillus*, *Microbacterium* and *Micrococcus*. Volatile organic compound (VOC) profiles of particular antagonists were characterized by designed GC-MS headspace solid phase microextraction (SPME) methods. The VOCs analysis demonstrated varying complexity and quantity of detected compounds, especially identified volatile pyrazines secreted by *Paenibacillus* spp.

- Grube et al. ISME 2009; FEMS Microb. Ecol. 2012

15. Tao Gong

Language evolves in a socio-cultural environment. Apart from biological evolution and individual learning, socio-cultural factors also play important roles in many aspects of language evolution, such as shaping particular language structures or diversity (Kirby 1999, Steels 2012, Dunn et al. 2011), diffusing linguistic innovations (Ke et al. 2008, Gong et al. 2012), or converging or diverging linguistic knowledge across different communities of speakers (Gong et al. 2008). In this paper, we discuss, based on the multi-agent, lexicon-syntax coevolution model (Gong 2009), the effects of the major forms of cultural transmission (Christiansen & Kirby 2003) and social structure with power-law distributed connectivity on language evolution across generations or within a population of speakers.

Together with vertical transmission (V, a member of one generation talking to a biologically-related member of the next generation), as simulated in the iterated learning model (Kirby 1999), horizontal transmission (H, communications among individuals of the same generation) and oblique transmission (O, a member of one generation talking to a non-



biologically-related member of the next generation) comprise the major forms of cultural transmission in a multi-individual community. We propose a transmission framework that incorporates all these three forms of transmissions. By adjusting the ratios of these transmissions in total communications among individuals of the same or different generations (the ratios of V, H and O transmissions are respectively manipulated by PCrate, CCrate, and ACrate), we analyze the effects of these transmissions on the origins and maintenance of language. The simulation results not only reveal an integrated role of O transmission combining the roles of H and V transmissions in preserving linguistic understandability within and across generations, but also suggest that both H and O transmissions are more necessary than V transmission for language evolution in a multi-agent cultural environment.

In a realistic social community, individuals may have different opportunities to participate in communications. We propose a power-law distributed social popularity to simulate such social feature. By adjusting the $\hat{\alpha}$ value of the power-law and the population size (N), we discover a critical scaling degree ($\hat{\alpha}=1.0$) in the power-law, which helps retain a relatively high value of linguistic understandability in the population. From an evolutionary perspective, we regard this critical scaling degree as a trade-off of social scaling, mutual understandability, and population size; the power-law distributed social popularity with this critical scaling degree maximally preserves a certain degree of social scaling and alleviates the influence of the increase in population size on mutual understandability. Empirical evidence further reveals that the power-laws in many real-world, large-scale systems actually have their scaling degrees around this critical value (Newman 2006).

This work helps better comprehend language as a complex adaptive system (Beckner et al. 2009) and language evolution as a consequence of biological evolution, individual learning, and socio-cultural transmission (Brighton et al. 2005).



Closing dinner

The closing dinner will be held at the **Fábrica do Braço de Prata** on **Thursday, March 14th**, at **20h00**.

Address

Rua Fábrica de Material de Guerra 1

1950-128 Lisboa

<http://www.bracodeprata.net/>

About the Fábrica

The **Fábrica** is one of Lisbon's most attractive cultural hotspots. Built on the premises of an abandoned colonial war factory, the **Fábrica** brightens up a darker past, by recycling the factory into a vibrant cultural center, filled with concert halls, dance studios, art galleries, cinema rooms, libraries, curiosity shops and bars. Every night, at least 3 events are scheduled, and since its existence, the **Fábrica** has not once repeated its program. It's becoming one of Europe's biggest cultural undergrounds, that provides a free experimental outlet for avant-garde artists. The **Fábrica** asks neither overheads nor commissions, on the contrary, the national and international artists that exhibit their work or perform at the **Fábrica**, receive their full earnings.

How to Get There

The Fabrica is very close to the Pavillion, and is easily reached by buses (**carris**) numbers 28, 718, 755. There is also a NIGHTBUS, number 210. all routes and schedules <http://www.carris.pt/en/buslines/>].

Alternatively, a taxi ride will maximally cost 5 euro from the Pavillion, so if you share with the ride with fellow participants, it might be even cheaper to take a taxi instead of the bus.

Concert program

March 14th 2013

AULA 20H30 - 21H30 Sala Wittgenstein: Argentinian Tango

DANÇA 21H30 Sala Wittgenstein: [Milonga Brava](#)

MÚSICA 22H00 Sala Eduardo Prado Coelho: [Fernando Tordo](#) "Braguêças, Beiroas e Outras Amantes" – special guest Marisa Liz

MÚSICA 23H00 Sala Visconti: Quintas Ecléticas by Nativa Project

MÚSICA 00H00 Sala Nietzsche: Jam Session with [Victor Zamora](#), [Carlos Barretto](#) e [José Salgueiro](#)



Ciência Viva Knowledge Pavilion

Ciência Viva was established in 1996 as an open program to promote alliances, public awareness of science and technology and fostering autonomous actions through the following three fundamental action tools:

1. A support program, aimed at the experimental teaching of science and at the promotion of scientific education in the school. Ciência Viva elected the school as its intervention priority, focusing its efforts on strengthening the experimental teaching of science and on mobilizing the scientific community and its institutions to work towards the improvement of scientific education.
2. National scientific awareness campaigns, fostering the creation of science associations and providing the population with the opportunity to make scientific observations and to establish a direct and personal contact with experts in different fields of knowledge.
3. A National Network of Ciência Viva Centers, designed as interactive spaces aimed at creating an awareness of science among the population. Designed as interactive spaces for promoting science to the general population, but also as platforms of regional development – scientifically, culturally and economically – by establishing partnerships with the most important regional players.

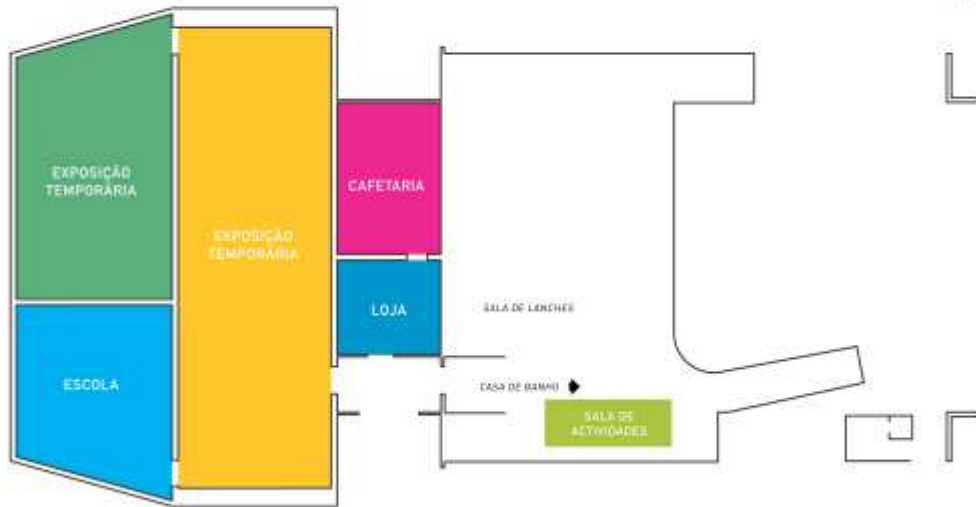


The Pavilion of Knowledge at Parque das Nações is one of the Science Centers from the National Network and also the head office of Ciência Viva.

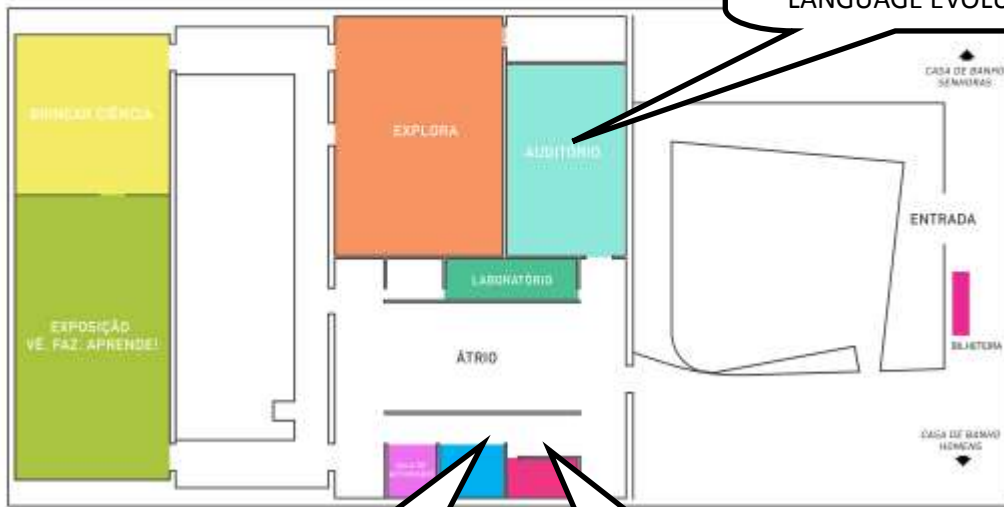


Floor plans

PAVILHÃO DO CONHECIMENTO - CIÊNCIA VIVA PISO 0



PAVILHÃO DO CONHECIMENTO - CIÊNCIA VIVA PISO 1



Room 1 (theater):
LANGUAGE EVOLUTION

Room 2:
MACROEVOLUTION

Room 3:
SYMBIOGENESIS

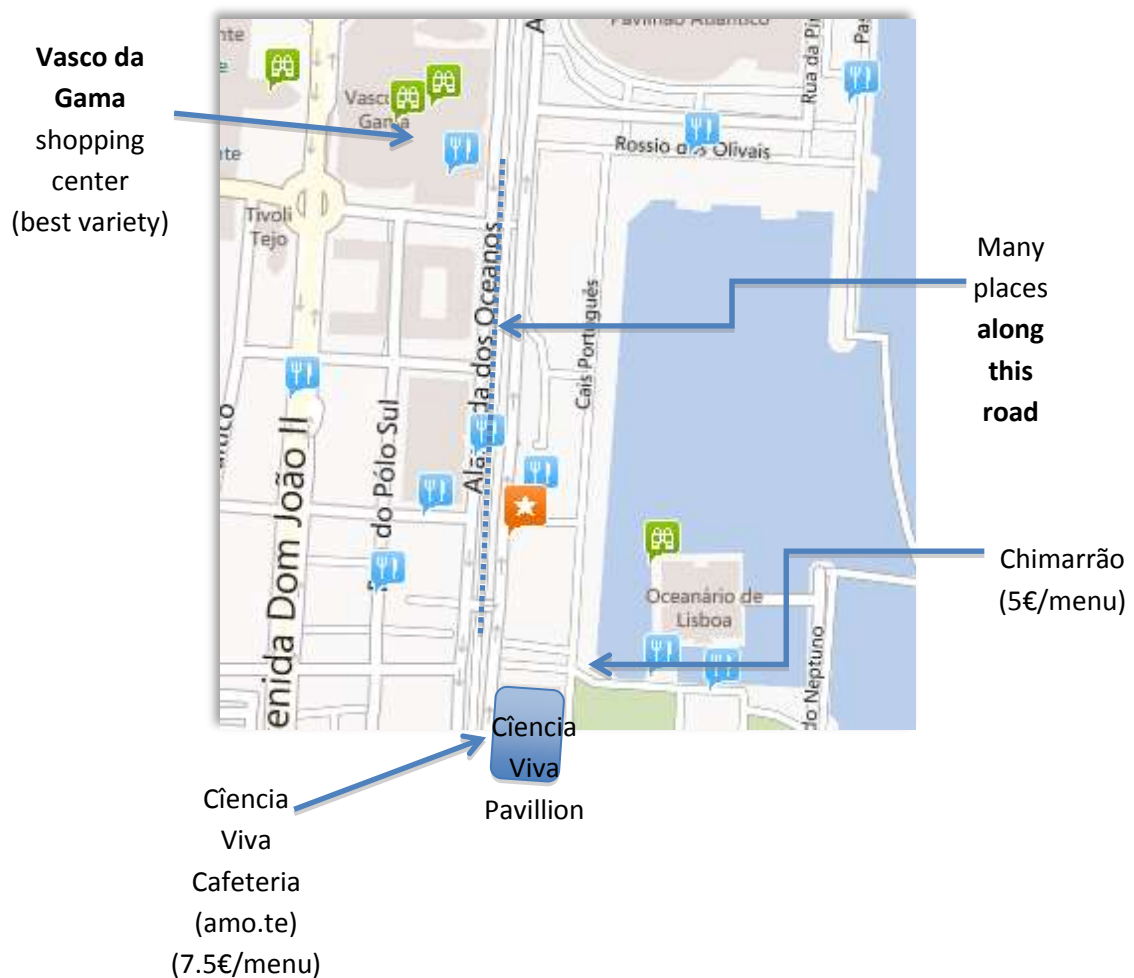


Internet at the Pavillion

The Pavillion of Knowledge provides free WI-FI. To access, simply select the network named “**cvpublic**”. Only in Room 1 (Auditorium) use “**cvauditorio**” instead. No passwords are required.

Area map, places to eat

There are lots of restaurants, bars, and breweries in the area. We just give you some advice:





Lisbon Touristic Information

Parque das Nações

Today, the Parque das Nações is a lively, dynamic and multipurpose space. It is the brand of contemporary Lisboa, a place where the city's inhabitants have fun, enjoy shows, go for a walk, play sport, shop, and work.

The Parque das Nações (Park of Nations) is located in the area where the 1998 World Fair was held. It is a large space for public enjoyment that has joined the city and the river. It has also taken advantage of a vast riverfront area with a magnificent view overlooking the opposite bank of the river and the Vasco da Gama Bridge, the longest in Europe. Also inaugurated in 1998 as part of the World Fair, it is the fifth longest bridge in the world, measuring 17 km in length, ten of which are located over the waters of the Tagus.

The Expo '98 was the landmark event which, ten years ago, transformed this eastern zone of the city into a visionary, ambitious and multidisciplinary project that discovered how to bring together and utilise all of Portugal's areas of activity and knowledge, reconverting an important part of the city by creating a new concept and a modern urban space. It has a train station, an enjoyable shopping centre and an extensive complex that combines culture, leisure, homes and businesses.

There, we find qualified spaces with urban planning suitable for the needs of an ideal, modern city. Residential areas, facilities and services appeared with environmentally integrated urban infrastructures that made decisive contributions to the modernisation and internationalisation of Lisboa. They also brought to Lisboa the features of modern architecture in its most varied expressions.

The scheme drawn up at the time of the World Fair already anticipated the change to an urban environment to be strengthened. The period following Expo '98 witnessed the natural development of the projects anticipated for the surrounding area. In terms of culture, several facilities must be highlighted: the Pavilhão de Portugal (Portugal Pavilion), the Pavilhão Atlântico (Atlantic Pavilion), the Oceanário (Oceanarium), the Área Internacional (International Area), which became the Feira Internacional de Lisboa exhibition centre, and the Estação do Oriente train station.

At the Parque das Nações, one can also find an extensive area of bars, restaurants, esplanades and design shops.

www.portaldasnacoes.pt

www.parquedasnacoes.pt

Pavilion of Knowledge - Ciência Viva

It is an interactive science and technology museum. Mainly games-based, its exhibitions and activities allow children to explore a variety of themes in an interactive and fun way.

Located at "Parque das Nações", the "Pavilhão do Conhecimento – Ciência Viva" was designed by the architect João Luís Carrilho da Graça and awarded with the Grand Prize of the FAD Jury in 1999 and it is an emblematic building, representative of the architectural shift that took place with EXPO'98.

With an average of 800 visitors a day the "Pavilhão do Conhecimento – Ciência Viva" is nowadays one of Portugal's most visited museums. www.pavconhecimento.pt



Oceanário de Lisboa

Opened during the Expo'98, the Oceanário de Lisboa is one of the largest public aquaria in Europe. It is the Oceanário's mission to promote knowledge of the oceans, educating visitors and the public about the necessity of protecting natural resources, through changing their daily habits. Every year, one million visitors walk through the Oceanário's exhibits, which rank first as the most visited attraction in Portugal. Students, teachers, families and organized groups may enjoy quite a few activities, including guided tours, theme workshops, seminars, concerts for babies, birthday parties and even spending a very special evening right next to the sharks. The Oceanário de Lisboa was the first European Public Aquarium to be awarded the 9001, 14001 and EMAS Quality Certificates. Other distinguished acknowledgements include the Valmor Architecture (1998) competition, the International Chiara Science Award and the EMAS Award 2005 (Eco-Management and Audit Scheme).

It also plays a very active role in multiple research and conservation efforts, regularly collaborating with academic and zoological institutions on projects such as CORALZOO, SECORE, FAITAG, and even in situ environmental conservation efforts focusing on Lamprey-eels, from the Tagus estuary, and Sea-turtles in Cape Verde. Together with the Gulbenkian Foundation, the Oceanário created an Award which rewards excellence on scientific projects that encourage a sustainable use of the oceans.

Designed by renowned architect Peter Chermayeff, the Oceanário de Lisboa includes two buildings, connected by a bridge. The exhibits are housed on the main building, which is surrounded by water, evoking a docked ship ready to cast off. The support building features a striking wall with 55 thousand tiles, depicting jumbo sized marine animals.

www.oceanario.pt

Casino Lisboa

The Casino Lisboa, with its minimalist architecture and large glass walls, is distributed across three floors with 1000 slot machines and 22 gaming tables. With a third of its total space used for gaming, the Casino Lisboa also has a large venue for shows, the Oceans Auditorium, as well as bars, three restaurants and entertainment areas, distributed across three floors. Besides being a casino, it also aims to strongly promote art and culture with national and international productions.

www.casinolisboa.pt

Pavilhão Atlântico

The great hall of Lisboa, the Pavilhão Atlântico is one of the biggest and most modern covered pavilions in Europe, capable of accommodating all kinds of events. With a 20,000-person capacity, the enclosure hosts nearly 100 events per year.

With an architecture based on the old ships that played a central role in the Portuguese Age of Discovery, the Pavilhão Atlântico is now the stage for countless sporting events and welcomes the large scale shows that take place in the capital.

www.pavilhaoatlantico.pt



Marina Parque das Nações – Lisbon’s new Marina

An urban marina in the city centre, just 5 minutes from the Airport. With 602 berths for Yachts up to 25m and Cruise Ships/Mega Yachts up to 230m, offering a wide range of maintenance services. Situated in the “Parque das Nações”, it has one of the most important European natural reserves at its doors.

www.marinaparquedasnacoes.pt

Pavilhão de Portugal

A multi purpose space. At the 1998 World Fair (Expo '98), the Pavilhão de Portugal, located at the Parque das Nações in Lisboa, was the building responsible for housing the representation of the Portuguese nation at that event, and it still stands today. The project was developed by Álvaro Siza Vieira with the assistance of the architect Eduardo Souto de Moura.

The entrance area of the building is a wide plaza covered by an imposing panel of pre-stressed concrete, designed like a sheet of paper resting on top of two bricks. It opens up the area to the city to house the many events that are welcomed by a space of this scale.

Gare do Oriente

Upon arrival at the Parque das Nações, it is impossible not to notice the work of the Spanish architect Santiago Calatrava. The Gare do Oriente station dominates the view, serving as an element of urban order, majestic, and includes a bus terminal, car park, underground station, train station and shopping gallery.

Cable Car

Finally, the Cable Car provides an air trip over the whole of the Park of Nations, along the river Tagus. The area of the Park of Nations also provides the visitor with bars, restaurants and street cafés as well as a varied range of services. It is an excellent area for walking and for enjoying quiet moments of true culture, leisure and entertainment.

www.telecabinelisboa.pt



The city

The World Heritage **Belem Tower** is to Lisbon what the Eiffel Tower is to Paris or Big Ben is to London. It is the city's most photographed landmark, which along with the marvelous Jeronimos Monastery should top your list of must-see monuments.



But Lisbon's biggest attraction is the city itself, a city that is not spruced up for the tourist to see, but an authentic place that stands out in such an increasingly homogeneous world. Although it boasts a range of must-see sights, its biggest pleasures are its streetlife and setting, admired from a pavement cafe, from the top of a hilltop miradouro, or simply by wandering around the atmospheric "bairros."

Not too many other cities have such an intriguing mix of the old and the new, or so many contrasting faces, making this a city for unhurried exploration and a place to get lost in, discovering its many distinctive sights and characteristic images.

There are two unique architectural styles -- the elaborate 16th century Manueline of the **Belem district** (named after King Manuel I), and the uniform but elegant 18th century Pombaline of downtown (named after Marquês de Pombal who oversaw the area's rebuilding after the Great Earthquake of 1755) -- along with fine art nouveau shops and cafes that have almost disappeared elsewhere. Just as distinctive are its striking centuries-old tiled façades in the old quarters, and the **turn-of-the-century trams and colorful funiculars** that have been retired throughout Europe but that remain a common sight in this city, as there is no easier (or more charming) way to climb its hills.



Looking down at the pavements, the concrete and asphalt of other cities is replaced here by imaginative cobbled patterns, and even the most modern structures concentrated in the Parque das Nações district are unique in keeping a maritime theme in their architecture. They reflect the city's historical relationship with the sea, which makes it an ideal home to the fantastic

Oceanarium. It too sets itself apart from other aquariums in the world for its innovative design, and even the museums house treasures not found anywhere else, from the unique Lalique jewelry displayed in the **Gulbenkian Museum**, to the one-of-a-kind collection of the **Tile Museum**.

View to **Saint George's Castle** from **Bairro Alto**. All of this is what makes Lisbon such a memorable and charming city for seasoned travellers, although there are also the ostentatious palaces and old churches typical of any great historical capital, and the stunning contemporary architecture expected in any great modern city.



Top 10

1) **JERONIMOS MONASTERY:** The resting place of explorer Vasco da Gama is a church built in the 1500s as part of a magnificent monastery. Its cloisters are considered among the most beautiful in the world and has been listed as a World Heritage Site.

2) **BELEM TOWER:** The city's icon is also a symbol of the Age of Discovery. Built in the early 1500s, this ornate watchtower has been declared a World Heritage monument by UNESCO.

3) **ST. GEORGE'S CASTLE:** From the millennium-old battlements of this castle you have a bird's-eye view of the city in the company of roaming peacocks. Inside is a small archaeological museum and down the hill are a couple of terraces with perfect postcard views over Alfama, the city's medieval village-like neighborhood.

4) **CALOUSTE GULBENKIAN MUSEUM:** Treasures from the East and the West collected by one man is now one of the world's finest private art collections. It includes works by Rembrandt, Rubens, Monet and René Lalique.

5) **PARQUE DAS NACOES:** Contrasting with the city's oldest neighborhoods is this 21st-century district showcasing striking contemporary architecture with Europe's longest bridge as the backdrop. It includes a state-of-the-art aquarium, a casino, and a wonderful waterfront promenade.

6) **BERARDO MUSEUM:** A Portuguese millionaire has put together one of Europe's greatest modern art collections which includes works by Andy Warhol, Picasso, and Dali among others. Best of all, it's free.

7) **MADRE DE DEUS CONVENT:** Unique in the world, this lavish former convent is now a museum presenting an ancient art form (decorative ceramic tiles). Worth the visit for the beautiful church alone.

8) **THE WORLD'S MOST EXPENSIVE CHAPEL:** See what the gold found in colonial Brazil was able to pay for, hidden in the surprisingly rich São Roque Church. The Chapel of St. John the Baptist inside is a European masterpiece (what look like paintings are actually mosaics!) made in Rome for this Lisbon church, and to see more baroque magnificence head to Santa Catarina Church nearby. If you develop a taste for this type of golden art, don't miss the golden carriages of the Coaches Museum.

9) **ANCIENT ART MUSEUM:** Fascinating Oriental and European art makes up the collection of Portugal's "National Gallery." Much of it is related to the Age of Discovery, illustrating Portugal's links with Asia and Africa.



10) **DESIGN & FASHION MUSEUM:** The creations of top international names in fashion and design are presented in a permanent collection and in temporary exhibitions. Opened in 2009 in a former bank's headquarters, this is one of Lisbon's most surprising spaces, recognized as one of the world's leading design and fashion museums. Admission is free.

See also the "lisbon must-do" page: <http://www.lisbonlux.com/lisbon/itinerary.html>

Sightseeing Tips

OPENING TIMES: Most of Lisbon's museums and monuments (especially those in Belem) close on Mondays, so that's the best day to go up to the castle or to visit the Oceanarium, which are both open every day.

TOURIST CARD: You may want to consider buying the tourism office's Lisboa Card that grants access to all public transportation (buses, trams, metro, and even CP trains to Sintra and Cascais) and free entrances or discounts on most attractions.

TOURS: If you're short on time, you may want to consider an organized tour which may also include excursions to some of Portugal's most enchanting towns such as Sintra or Obidos.

[from <http://www.golisbon.com/sight-seeing/>]



List of Participants

Atkinson, Mark

University of Edinburgh, UK
Program: Linguistics
M.D.Atkinson@sms.ed.ac.uk

Berdicevskis, Aleksandrs

University of Tromsø, Norway
Program: Russian language and linguistics
alexberd@gmail.com

Birchall, Joshua

Radboud University Nijmegen, The Netherlands
Program: Linguistics
j.birchall@let.ru.nl

Borda-de-Água, Luís

University of Lisbon, Portugal
lbagua@gmail.com

Cálix, Marta

University of Lisbon, Portugal
Program: Evolutionary Developmental Biology
marta_calix@hotmail.com

Carr, Jon

University of Edinburgh, UK
Program: Msc Evolution and Language and Cognition
j.w.carr@sms.ed.ac.uk

Cernava, Tomislav

Graz University of Technology, Austria
Program: Doctoral school of Molecular Biomedical Sciences and Biotechnology
tomislav.cernava@tugraz.at

Dell'Olio, Enrico

University of Milano Bicocca, Italy
Program: Biology
info@enricodellolio.net

Dias, Antonio

University of Lisbon
Program: Evolutionary and Developmental Biology
toze18@gmail.com

Di Paolo, Laura Desirée

Sapienza, University of Rome, Italy
Program: philosophy of Life Sciences
lauradesiree.dipaolo@gmail.com

Dobell, Sarah

University of Northumbria, UK
Program: Mres Language and Cognition
sarah.dobell@unn.ac.uk
sarah.dobell@northumbria.ac.uk

Eessalu, Martin

University of Tartu, Estonia
Program: General Linguistics, Linguistic Anthropology
eessalu@gmail.com

Egorov, Oleg

Moscow Institute of Physics and Technology, Russia
Program: Applied Mathematics
atheit@gmail.com

Erlacher, Armin

Graz University of Technology, Austria
Program: Doctoral programme in Engineering Sciences;
Area of concentration: Biotechnology, Biochemistry and Food Chemistry
armin.erlacher@tugraz.at

Fabris, Flavia

Sapienza University of Rome, Italy
Program: Philosophy of Science
fabris.fl@gmail.com

Figuerola, Ramon

University Ludwig-Maximilians, Munich, Germany
Program: Research Unit "Quantitative Language Comparison"
ramon.vene@gmail.com

Fingerhuth, Stephanie

ETH Zürich, Switzerland
Program: Computational Biology and Bioinformatics
stephaniefingerhuth@gmx.ch

Fingerhuth, Matthias

University of Cologne, Germany
Program: German Studies
Mfingerhuth@gmx.de

Fugaru, Ioana

University Ludwig-Maximilians, Munich, Germany
Program: Research Unit "Quantitative Language Comparison"
ioana.fugaru@gmail.com

Gardhouse, Matthew

University of Luxembourg, Luxembourg
Program: Modern and Contemporary European Philosophy
mjgardhouse@gmail.com

Gauthier, Anne-Laure

University of Louvain, Belgium
Program: Evolutionary Ecology
anne-laure.gauthier@uclouvain.be

**Gong, Tao**

University of Hong Kong
Professor of Linguistics
gtojtj@gmail.com - tgong@hku.hk

Guérin, Noémie

University of Lisbon
Program: Biology
noemi.guerin@laposte.net

Honkola, Terhi

University of Turku, Finland
Program: Ecology/Genetics
terhi.honkola@utu.fi

Karjus, Andres

University of Tartu, Estonia
Program: Estonian and Finno-Ugric Linguistics
andres.karjus@hotmail.com

Kozak, Krzysztof

University of Cambridge, UK
Program: Zoology
kk443@cam.ac.uk

Kuznetsova, Evgeniya

Lomonosov Moscow State University, Russia
Program: Fundamental and Applied Linguistics
janekzn@mail.ru

Lensink, Saskia

University of Leiden, The Netherlands
Program: ResMA Linguistics
s.e.lensink@gmail.com

Lourenço, Marta

University of Lisbon
Program: Applied Microbiology
marta.mlourenco21@gmail.com

Lima, Margarida

Sichuan University, Chengdu, China
Program: Intensive Chinese
margaridalima@gmail.com

Mann, Daniel

The Graduate Center, City University of New York, USA
Program: Linguistics
danmann23@gmail.com

Machado, Miguel

University of Lisbon
Program: Biology
miguelpmachado@hotmail.com

Matos, Isa

University of Lisbon
Program: Molecular Biology
immatos@fc.ul.pt

Mendonça, Dina

University of Lisbon
Program: Situational Approach to Emotions
mendonca.emotion@gmail.com

Miraldo, Andreia

University of Helsinki, Finland
Program: Adaptive radiations of wet forest dung beetles
in Madagascar
andreia.miraldo@helsinki.fi

Novoszath, Andras

The Open University, UK
Program: Sociology Department
andras.novoszath@open.ac.uk

Oliveira, Gonçalo

University of Lisbon, Portugal
Program: Applied Microbiology
goncalopizarromsoliveira@gmail.com

Orlic, Sandri

Ruđer Boskovich Institute, Croatia
Program: Microbial Ecology
sandi.orlic@irb.hr

Palma Oliveira, José

University of Lisbon, Portugal
Professor of Psychology
jpalma-oliveira@fp.ul.pt

Peona, Valentina

University of Bologna, Italy
Program: Master in Biodiversity and Evolution
valentina.peona@gmail.com

Penha, Bruno

University of Lisbon
Program: Cognitive Sciences
bpenha.fc.ul@gmail.com

Pinho, Joana

University of Lisbon
Program: Evolutionary Genetics
joanafpinho@gmail.com

Pinto, Emiliano

University of Lisbon
Program: Particle Physics
em-jreg@hotmail.com

Pittis, Antonios-Alexandros

UPF, Barcelona, Spain
Program: Bioinformatics and Genomics
alexandros.pittis@crg.es

**Reschke, Carl Henning**

Institute of Management Research Cologne, Germany
carlhenning.reschke@imfk.de

Sarkol, Vera

Queen Mary University of London, UK
Program: Biological and Experimental Psychology
v.sarkol@qmul.ac.uk -v.sarkol@gmail.com

Seltzer, Nicholas

Stony Brook University, USA
Program: Political Science
naseltzer@gmail.com

Sheard, Catherine

University of Oxford, UK
Program: DPhil, Zoology
catherine.sheard@zoo.ox.ac.uk

Silva, Ana

University of Lisbon
Program: Sciences
anacatarina.as@gmail.com

Silva, Mauro

University of Lisbon
Program: Scientific collaborator
maurosilva_14@hotmail.com
maurofzsilva@gmail.com

Silva, Teresa

University of Porto, Portugal
Program: BIODIV
teresaluisafs@gmail.com

Silveira, Rui

University of Lisbon
Program: Communication Design and New Media
ruisilveira83@gmail.com

Spiridonov, Andrej

Vilnius University
Program: Geology (Conodont paleobiology)
s.andrej@gmail.com

Stadler, Kevin

University: The University of Edinburgh, UK
Program: PhD Linguistics
kevin.stadler@ed.ac.uk

Steinauer, Katja

Technical University of Munich – Helmholtz Zentrum,
Germany
Program: Plant Biology
katja.steinauer@web.de

Szendrei, Dora

Eötvös Loránd University, Hungary
Program: PhD Program in Biology, Theoretical and
Evolutionary Biology
szendrgigi@gmail.com

Szubart, Tomasz

Jagellonian University, Krakow, Poland
Program: Philosophy
tomasz.szubart@uj.edu.pl

Vieri, Lorenzo

University of Milano Bicocca, Italy
Program: Biology
lorenzo@highintensityitalia.it

Warschefsky, Emily

Florida International University, USA
Program: Biology (Plant Evolutionary Biology)
e.warschefsky@gmail.com

Winters, James

University of Edinburgh, UK
Program: Linguistics and English Language
J.R.Winters@sms.ed.ac.uk



Our sponsors

JOHN TEMPLETON FOUNDATION
SUPPORTING SCIENCE ~ INVESTING IN THE BIG QUESTIONS



AGÊNCIA NACIONAL
PARA A CULTURA
CIENTÍFICA E TECNOLÓGICA



PAVILHÃO DO
CONHECIMENTO
CIÊNCIA VIVA



CFCUL

Centre for Philosophy of Science
of the University of Lisbon

<http://cfcul.fc.ul.pt>



FACULDADE
DE CIÊNCIAS
UNIVERSIDADE DE LISBOA



UNIVERSIDADE
DE LISBOA



School Board, Scientific and Organizing Committee

Francisco Carrapiço, Centre for Environmental Biology, Faculty of Science, University of Lisbon

Luís Correia, Director of LabMAg – Laboratory of Agent Modelling, Informatics Department, Faculty of Science, University of Lisbon

Nathalie Gontier (chair), Director of AppEEL – Applied Evolutionary Epistemology Lab, Centre for Philosophy of Science, Faculty of Science, University of Lisbon

Rui Malhó, Director BioFIG - Centre for Biodiversity, Functional and Integrative Genomics, Faculty of Science, University of Lisbon

Fernanda Oliveira, Department of Statistics and Operational Research, Faculty of Science, University of Lisbon

Marco Pina, AppEEL – Applied Evolutionary Epistemology Lab, Centre for Philosophy of Science, Faculty of Science, University of Lisbon

Olga Pombo, AppEEL – Applied Evolutionary Epistemology Lab, Director of the Centre for Philosophy of Science, Faculty of Science, University of Lisbon

Emanuele Serrelli, AppEEL – Applied Evolutionary Epistemology Lab, Centre for Philosophy of Science, Faculty of Science, University of Lisbon & “Riccardo Massa” Department of Human Sciences, University of Milano Bicocca

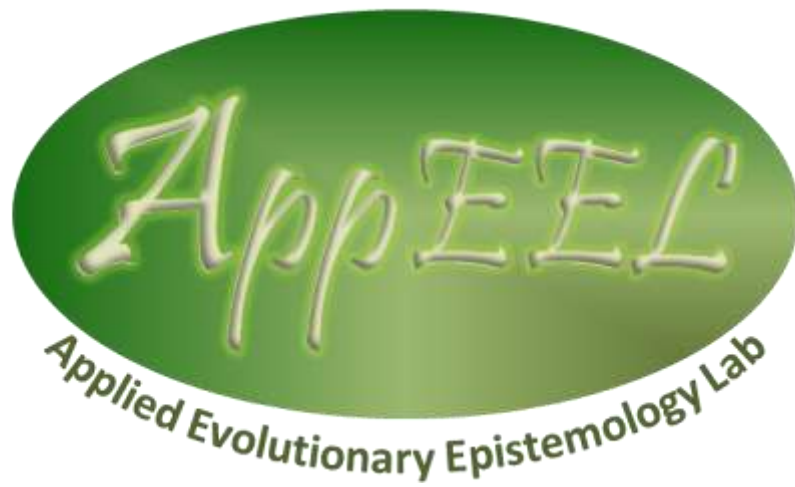
Larissa Mendoza Straffon, AppEEL – Applied Evolutionary Epistemology Lab, Centre for Philosophy of Science, Faculty of Science, University of Lisbon & University of Leiden, the Netherlands

Ciência Viva Organizing Committee

Rosalia Vagas - President of Ciência Viva

Ana Noronha - Executive Director of Ciência Viva

Carla Carvalho, Filomena Ramalhoto, Daniela Martins, Rosário Pereira Sofia Lourenço and others from the Ciência Viva Events team



AppEEL - Applied Evolutionary Epistemology Lab

Faculty of Science of the University of Lisbon

Autonomous Section for the History
and Philosophy of Science

Centre for Philosophy of Science

Campo Grande, Edifício C4, 3.º Piso, Sala 4.3.24

1749-016 Lisbon

PORTUGAL

© Copyright AppEEL 2003

All rights reserved