How Evolution Learnt to Learn

Epigenetics of Experienced Context

6. - 10. Juli 2022

Salzburg - Austria

Programme

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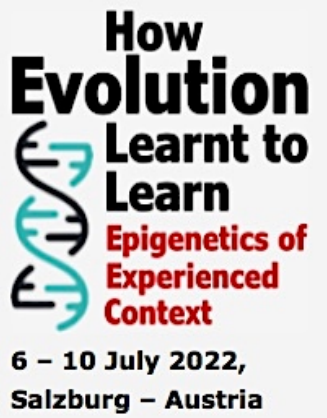
Abstracts



About

The regulatory system that works in development, morphology, cell fate and identity, physiology, genetic instructions, immunity, memory/learning, physical and mental disease depends on epigenetic marks. Genetic sequences of all organisms in all domains of life can be marked according to their environmental and social experiences. The communication of cells, persistent viruses and their defectives such as mobile genetic elements and RNA networks ensures both the transport of regulatory instructions and the reprogramming of these instructions.

With the emergence of epigenetic memory, organisms can fix historical and context- dependent impressive experiences. Evolution from now on learnt to learn. Learning means organisms can avoid reproduction of always the same. This is key to adaptation.

Epigenetic regulation emerges as a fine-tuned genome-wide network that can rapidly remodel and reprogram genetic content. Epigenetic switching outcompetes genetic mutations (error replications) during adaptation to changing lifeworld. Epigenetic markings can have both short-term and long-term functional effects such as soma to germline inheritance.

However, inheritance of acquired characteristics is only one of the many examples of the explanatory power of epigenetics. Behavioral epigenetics demonstrates the way in which environmental and social experiences produce individual differences in behaviour, cognition, personality, and mental health.

Goals

This symposium assembles experts from different fields to discuss a new paradigmatic understanding of how Evolution learnt to learn, i.e., epigenetic marking, transgenerational inheritance, cell fate and identity, morphology, physiology, genetic instructions, neuroepigenetic reprogramming, memory/ learning, physical and mental disease, immunity, and the roles of persistent viruses and their co-opted and exapted defectives such as non-coding RNA networks and mobile genetic elements.

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Programme

Wednesday, July 6 2022

12:00 - 20.00	Registration at St. Virgil
19:45	Welcome drink and warm reception by the organizer

Thursday, July 7

8.30 Guenther Witzany
Organization Affairs and **Introduction**

9.00 – 9.30 **Eva Jablonka**
Epigenetic learning in the nervous system

9.30 – 10.00 **Jörg Bock**
Epigenetic programming of brain development and emotional behavior by early life stress: A transgenerational perspective

10.00 – 10.30 **Johannes Reul**
Epigenetic regulation of genomic corticosteroid receptor action in the brain in relation to stress coping

Coffee Break – Tea Time (15 minutes)

11.00 – 11.30 **Patrick McGowan**
The role of maternal factors in epigenetic programming of neurodevelopment

11.30 – 12.00 **Moshe Szyf**
How is trauma embedded in our genome? A possible role for DNA methylation

12.00 - 12.30 **Gianluca Ursini**
Genomic risk for schizophrenia and the environment in early life: insights on epigenetic plasticity

12.30 – 13.00 **Minoo Rassoulzadegan**
Progressive decline in the levels of six miRNAs from parents to children in autism

Lunch

Thursday, July 7

14.00 – 14.30 **Hermona Soreq**
Non-coding RNA controllers of acetylcholine signaling as body-brain communicators

14.30 – 15.00 **David Moore**
Evolving Learning: The Exaptation of Epigenetics as a Learning Mechanism

15.00 – 15.30 **Edi Barkai**
A biophysical mechanism for epigenetic inheritance of enhanced complex learning capabilities

Coffee Break – Tea Time (15 minutes)

15.50 – 16.30 **POSTER PRESENTATIONS**

16.30 – 17.00 **Shiv Grewal**
Transmitting epigenetic memory through modified histones

17.00 – 17.30 **Robert Feil**
Genomic imprinting, a stable inter-generational memory mechanism

17.30 – 18.00 **Özgür Bayram**
Epigenetic regulation of fungal secondary metabolite gene clusters: are we seeing the tip of the iceberg?

18.00 – 18.30 **Vadim Gladyshev**
Aging and Lifespan Control

Friday, July 8

8.30 Organization Affairs!

8.30 – 9.00 **Bojan Zagrovic**
Understanding the Physicochemical Language of Epigenetics: On the Interaction Preferences between Modified Nucleobases and Protein Residues

9.00 – 9.30 **Lars Jansen**
The nomadic behavior of the epigenetically inherited centromere

9.30 – 10.00 **Jason Brickner**
Interaction with the nuclear pore stimulates heritable histone H3 methylation and transcriptional memory

Coffee Break – Tea Time (15 minutes)

10.30 – 11.00 **Nelson Cabej**
On the origin and nature of the non-genetic information

11.00 – 11.30 **Richard Hunter**
Transposons as environmental stress detection modules, are eukaryotic genomes evolved to evolve?

11.30 – 12.00 **Erez Levanon**
From Mobile elements to RNA editing via dsRNA – a path for genomic novelty

12.00 – 12.30 **Gustavo Caetano-Anollés**
Entanglement: explaining novelty, recruitment and growth in biological systems

Lunch

Friday, July 8

13.30 – 14.00 **Giacomo Cavalli**
Epigenetic inheritance of chromatin states through cellular and organismal generations

14.00 – 14.30 **Ina Anreiter**
Epitranscriptomic regulation of behaviour: Individual differences and gene-environment interplay

14.30 – 15.00 **Eric Greer**
Epigenetics in unicellular to multicellular transition in Dictyostelium

Coffee Break – Tea Time (15 minutes)

15.30 – 16.00 **Mariusz Nowacki**
Evolutionary origins and impacts of genome architecture in ciliates

16.00 – 16.30 **Antónia Monteiro**
Odor preference learning and inheritance in Bicyclus anynana butterflies

16.30 – 17.00 **David Glanzman**
Role of retrotransposition in memory in Aplysia

17.00 – 17.30 **Bryan Cullen**
Epigenetic Silencing of unintegrated HIV-1 DNA

17.30 – 18.00 **John Mattick**
Climbing mount improbable: how did evolution solve the scaling and search problems

19.30 – 20.00 **Music Performance: Heidi Vereno, harp**

20.00 – 21.30 **Conference Diner**

Saturday, July 9

8.30 – 9.00 **Colin Logie**
On the nature of chromosome domain boundaries and their evolution

9.00 – 9.30 **Marla Sokolowski**
The foraging gene as a modifier of behavior: gene regulation, pleiotropy and plasticity

9.30 – 10.00 **Corrado Spadafora**
Sperm-mediated epigenetic evolution

Coffee Break – Tea Time (15 minutes)

10.30 – 11.00 **Germano Cecere**
Epigenetic maintenance of animal fertility by piRNAs in C. elegans

11.00 – 11.30 **Katalin Fejes-Toth**
Co-option of the germline piRNA pathway to regulate vertebrate neural crest specification

11.30 – 12.00 **Andreas Werner**
Natural antisense transcripts play different roles in soma and male germ cells

12.00 – 12.30 **Eörs Szathmáry**
Evolution in learning, learning in evolution

Lunch

Saturday, July 9

13.30 – 14.00 **Anton Petrov**
Use of pre-adaptations within the translational machinery during eukaryogenesis

14.00 – 14.30 **Jaques Demongeot**
A candidate RNA as a "proto-ribosome" at origin of life and its remnants in the present ribosomal factory

14.30 – 15.00 **Karin Mölling**
RT/RNase H reflecting evolution

Coffee Break – Tea Time (15 minutes)

15.30 – 16.00 **Sabine Müller**
Mobile genetic elements in the RNA world: How a small ribozyme supports RNA sequence variation

16.00 – 16.30 **Peter Unrau**
The modular evolution of an RNA polymerase ribozyme with promoter recognition and processivity

16.30 – 17.00 **Valerian Dolja**
Global metatranscriptome analysis reveals vast diversity of novel RNA viruses in bacteria and eukaryotes

17.00 – 17.30 **Jordi Gómez**
Viruses as archaeological tools for uncovering archaic molecular relationships

Sunday, July 10

Sunday-Excursion half day (10.00 – 13.30)
to an extraordinary place near Salzburg: **Hellbrunn Palace & Trick Fountains**

(40 Euros including: transfer, guided tour and meals)

In 1612, only a few months after ascending the throne, Salzburg's Prince Archbishop Markus Sittikus von Hohenems commissioned a country residence to be built at the foot of the well-watered Hellbrunn Mountain. A lover of Italian art and culture, Markus Sittikus commissioned the famous Cathedral architect, Santino Solari, to design a "villa suburbana", a summer residence matching the elegance and spaciousness of the magnificent Italian architecture with which he was so obsessed. Within a relatively short period of time an architectural masterpiece was created just south of the city that remains one of the most magnificent Renaissance buildings north of the Alps: the Lustschloss ("pleasure palace") of Hellbrunn with its spacious park and its unique Wasserspiele (trick fountains).


Andreas Werner
John Mathick


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