COEVOL MULTI-SCALE COEVOLUTION

EVOLUTIONARY GENETICS OF INTERACTIONS GROUP

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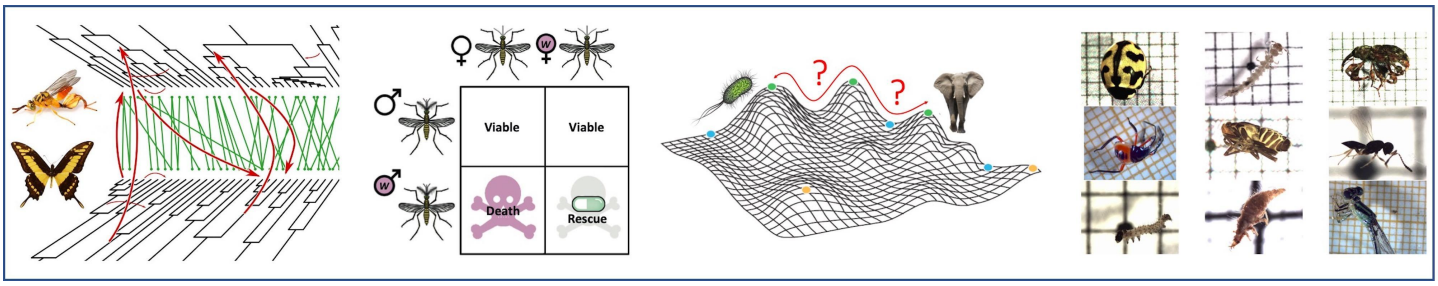
Who are I? Who am we?
These enigmatic questions, borrowed from my colleague and friend Fabrice Vavre, run through most of my work.

- Who are I? What multitude of genes, cells, symbiotic partners, compose biological "individuals"? And to what extent do these different degrees of organization also constitute individuals, i.e., effective targets of natural selection, carrying adaptations of their own, potentially deleterious at other scales?
- Who am we? To what extent should the collective, from the ant colony to the ecosystem, also be perceived as an incipient individual ?

As opportunities of collaborations arose, these questionings gave rise to various research projects that are briefly described below. Symbiotic relationships, approached in particular through evolutionary genomics in arthropods, occupy a prominent place, alongside modeling, didactics, and more recently, epistemology.

To discuss these topics, or to learn about possible opportunities to join us, please feel free to contact me.



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AS IT COMES...

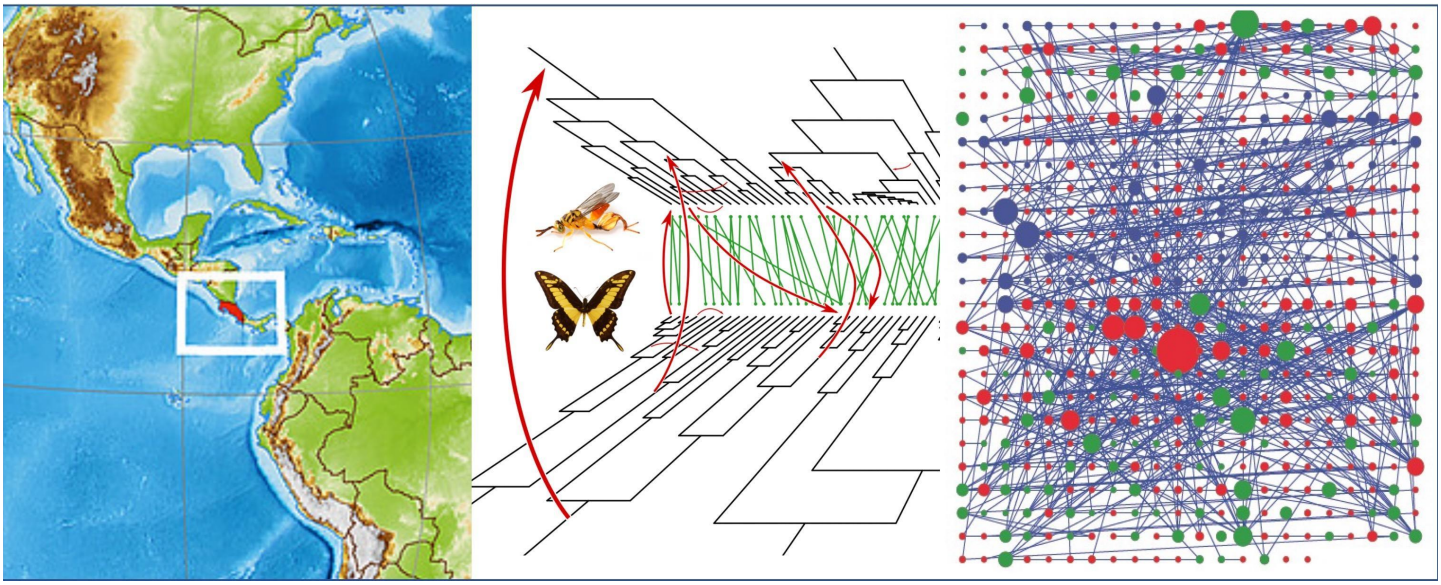
On the emergence of Darwinian processes

- A seminar on this issue given at the Collège de France (you can use youtube english subtitles !)
- Another seminar on this issue at the 'Institut d'histoire et de philosophie des sciences et des techniques' (IHPST) (you can use youtube english subtitles !)

RESEARCH THEMES

orizontal DNA transfer

> *We seek to test the hypothesis that parasitoids, particularly via domesticated viruses, would constitute preponderant vectors of horizontal transfers.*



The Horizon project is based on the genomic analysis of numerous species of Lepidoptera and their parasitoids, in an ecological network documented through long term ecological research in Costa Rica

For more details:

- The website of the Área de Conservación Guanacaste, the field site of this study
- The study by Reiss et al on horizontal DNA transfer

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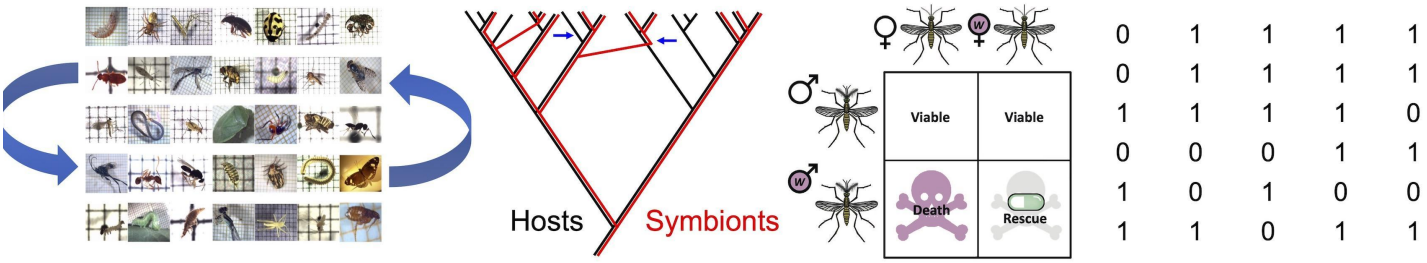
bachia, influential passenger

all symbiotic lineages of bacteria, *Wolbachia* is probably both the most abundant and the most diverse in terms of evolutionary implications. Its rtical maternal transmission has led it to evolve very particular invasion strategies, often beneficial to females (and more precisely, to the toplasmic lineage, transmitted by females) and on the contrary deleterious to males.

> *Wolbachia has always been central to our work, especially concerning its epidemiological dynamics and evolutionary consequences, at the scale of arthropod communities, and the genetic architecture of cytoplasmic incompatibility.*



e evolutionary dynamics of Wolbachia are addressed rough cophylogenetic approaches, and the genetic chitecture of cytoplasmic incompatibility is studied by mbining phenotypic and genomic information

For more details:

- The paper of Beckmann et al, an analysis of different models of cytoplasmic incompatibility
  ,
  and more recently, that of Namias et al
- The papers of Cariou et al (
  2017
  ,
  2020
) on the consequences of *Wolbachia* on mitochondrial evolution
- The paper of Bailly-Bechet et al on *Wolbachia* acquisition / loss dynamics

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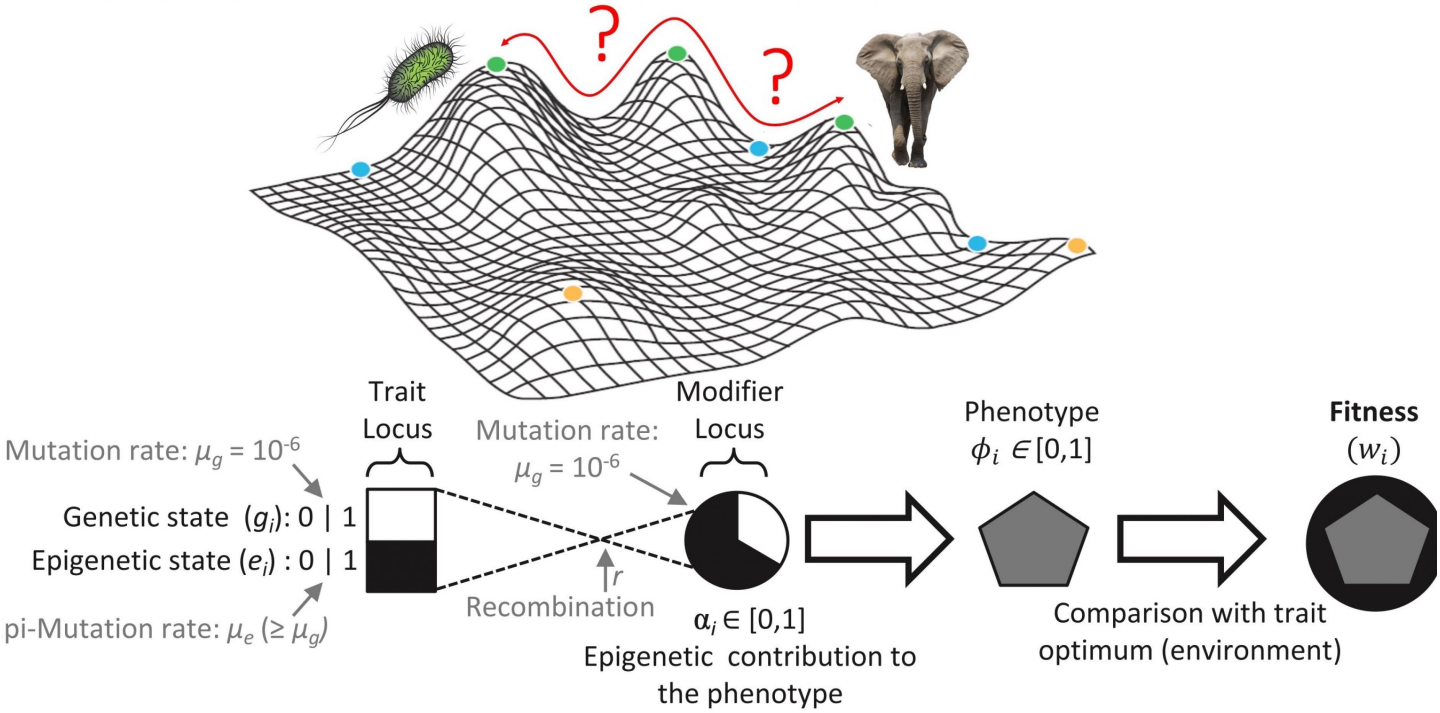
genetic inheritance and its evolutionary implications

As powerful as DNA variations may be in explaining evolution, what might be the contribution of other modes of inheritance adaptive evolution ?



ddress this question through theoretical models,
ng in particular to understand the evolutionary
ications of the high frequency of "epi-mutations"

For more details:

A paper by Rajon & Charlat on this subject

and uncertainty

The teaching of evolutionary biology is reputed to be difficult. Beyond ideological reasons, this reveals how hard (but importa is to deal with uncertainty in science teaching, and science in general.

For more details:

- Some papers (in French !) by Paulin et al (
  2018
  ,
  2019
  ,
  2020
) sur ce sujet
- A short note (also in French !) published in the "café pédagogique"

ity and natural selection: at the origins of life... and beyond?

> *If, in an evolutionary perspective, the individual is recursively conceived as resulting from the merging of individuals of lower sc*
> *how did the smallest scale, the first, come to be?*

e the first units of selection, the first sparks of life? How to define and describe their properties, which necessarily implies combining biological a
chemical concepts? Where does individuality begin, and with it evolution by natural selection? In the uncertain hypothesis that such units of selec
st outside the living world, in other physico-chemical systems, how to recognize them ?

For more details:

cent paper on this topic