



Laboratory of Evolutionary and Adaptive Physiology

www.evolution-physiology.be

Frédéric Silvestre 's lab



Personality traits in fish : focus on the Mangrove rivulus



THE UNIVERSITY OF
ALABAMA

UC DAVIS
UNIVERSITY OF CALIFORNIA

Pollutants

T°

Salinity

How animal cope with new environmental conditions?



Different level of biological organization

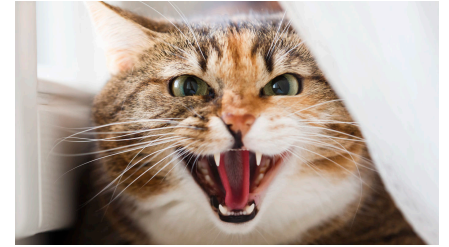


Physiological
Biochemical
Behavioral
Molecular

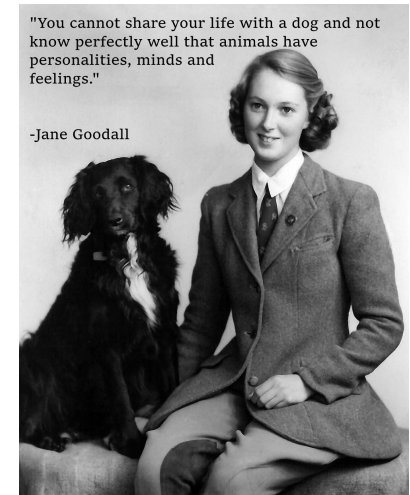
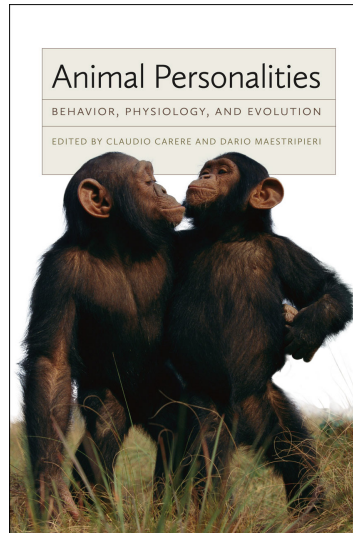
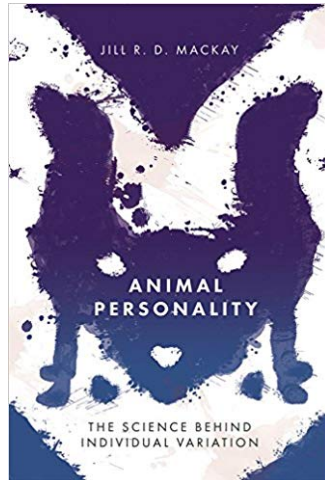


What creates your personality and how environment affects it?





What creates your personality and how environment affects it?



What's a behavior ?

« All movements, postures, vocalizations and body demonstrations
that can be observed in animals »



(Bovet, D -)

« Behaviour mediates interaction between animal and its environment »

(Sih et al, 2010)

Organisms ability to behave appropriately → **survival in a changing environment**



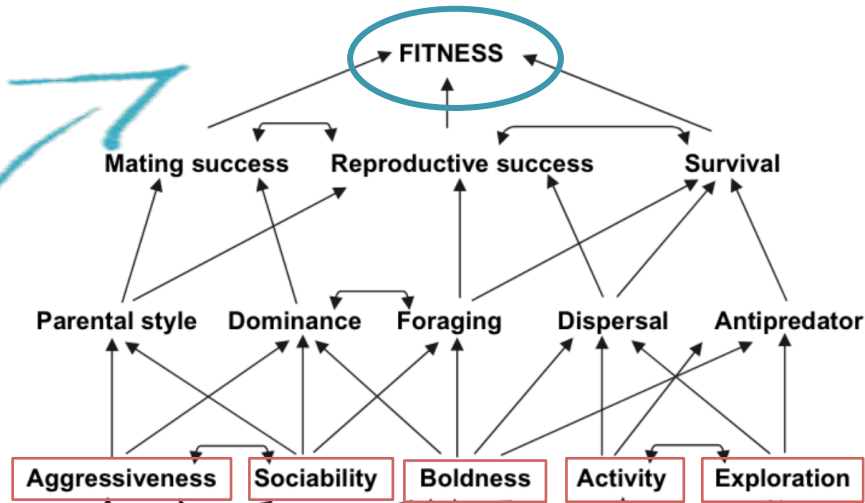
Particular behaviors → Personality traits



Consistent individual behavioral differences across time and context

Strongly influence:

- social relationship
- reproductive success
- food access
- survival



(Reale et al., 2007)

Particular behaviors → Personality traits

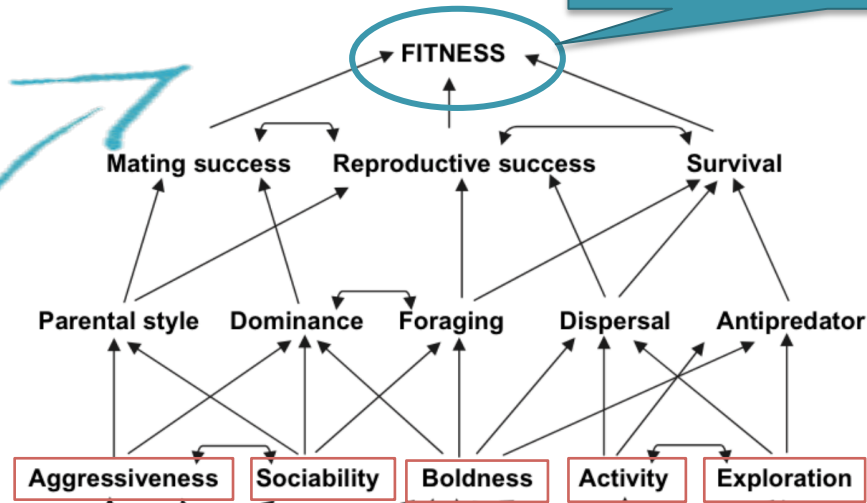


Consistent individual behavioral differences across time and context

Ability to survive to reproductive age, find a mate and produce offspring

Strongly influence:

- social relationship
- reproductive success
- food access
- survival



(Reale et al., 2007)





Mangrove rivulus (*Kryptolebias marmoratus*)



© Frederic Silvestre



Mangrove rivulus (*Kryptolebias marmoratus*)



© Frederic Silvestre

Not a common fish...



Mangrove rivulus (*Kryptolebias marmoratus*)



© Frederic Silvestre

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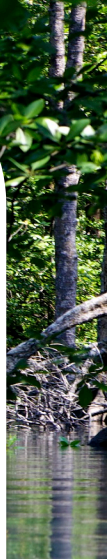


MALE



HERMAPHRODITE

NO FEMALE !





Mangrove rivulus (*Kryptolebias marmoratus*)



© Frederic Silvestre



Not a common fish...



MALE



HERMAPHRODITE



Androdioecy

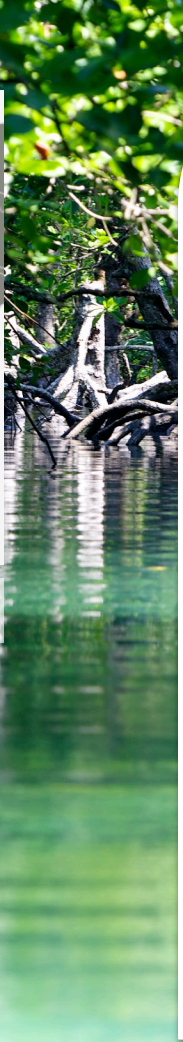
Only vertebrate capable of self-fertilization



Mangrove rivulus (*Kryptolebias marmoratus*)



© Frederic Silvestre



Not a common fish...



Androdioecy

Only vertebrate capable of **self-fertilization**

Live in very variable and harsh environment (O_2 , T° , salinity, ...)



Mangrove rivulus (*Kryptolebias marmoratus*)



© Frederic Silvestre



Not a common fish...



MALE



HERMAPHRODITE

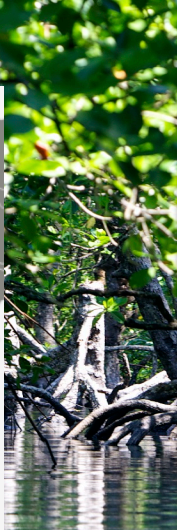


Androdioecy

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Not a common fish...



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HERMAPHRODITE



Androdioecy

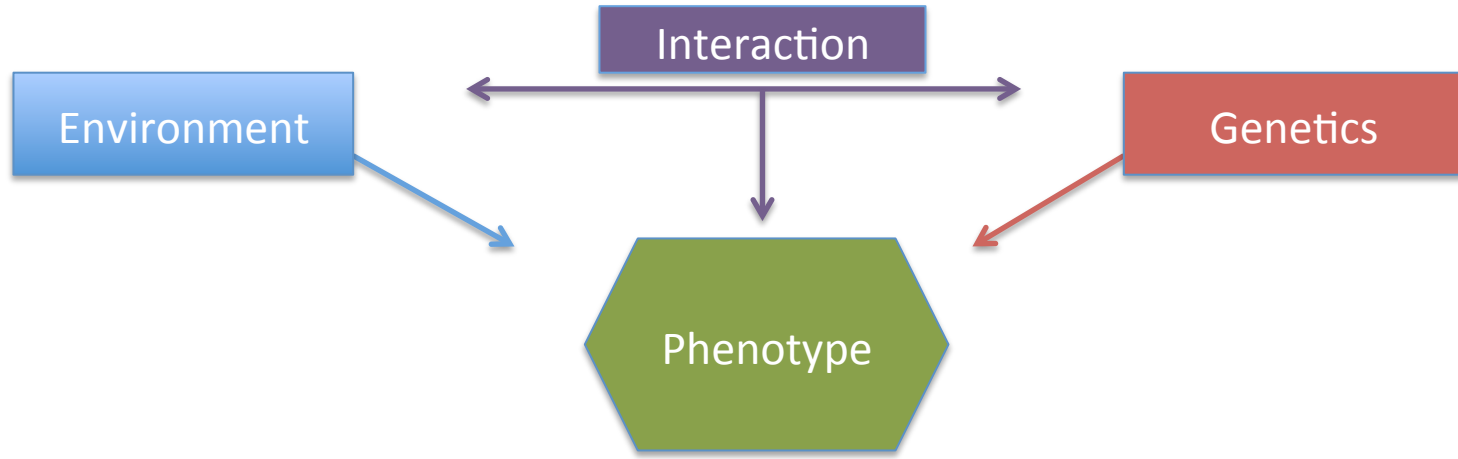
<https://www.youtube.com/watch?v=XUKeObOXpfU>

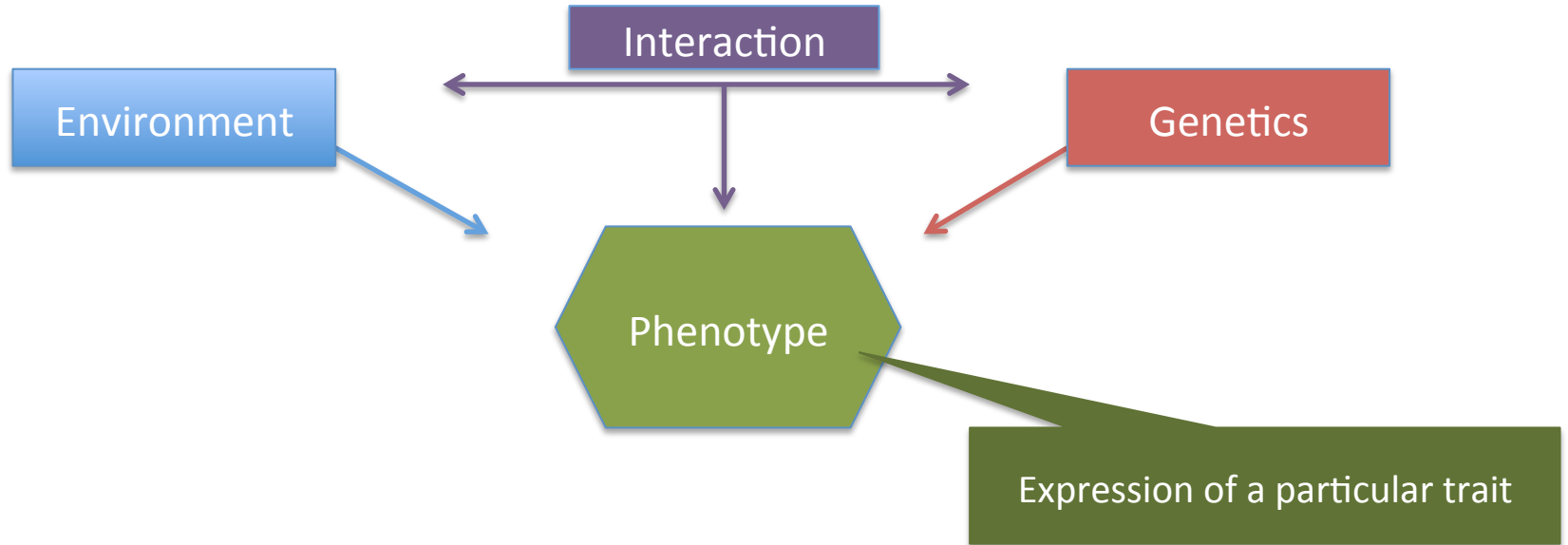


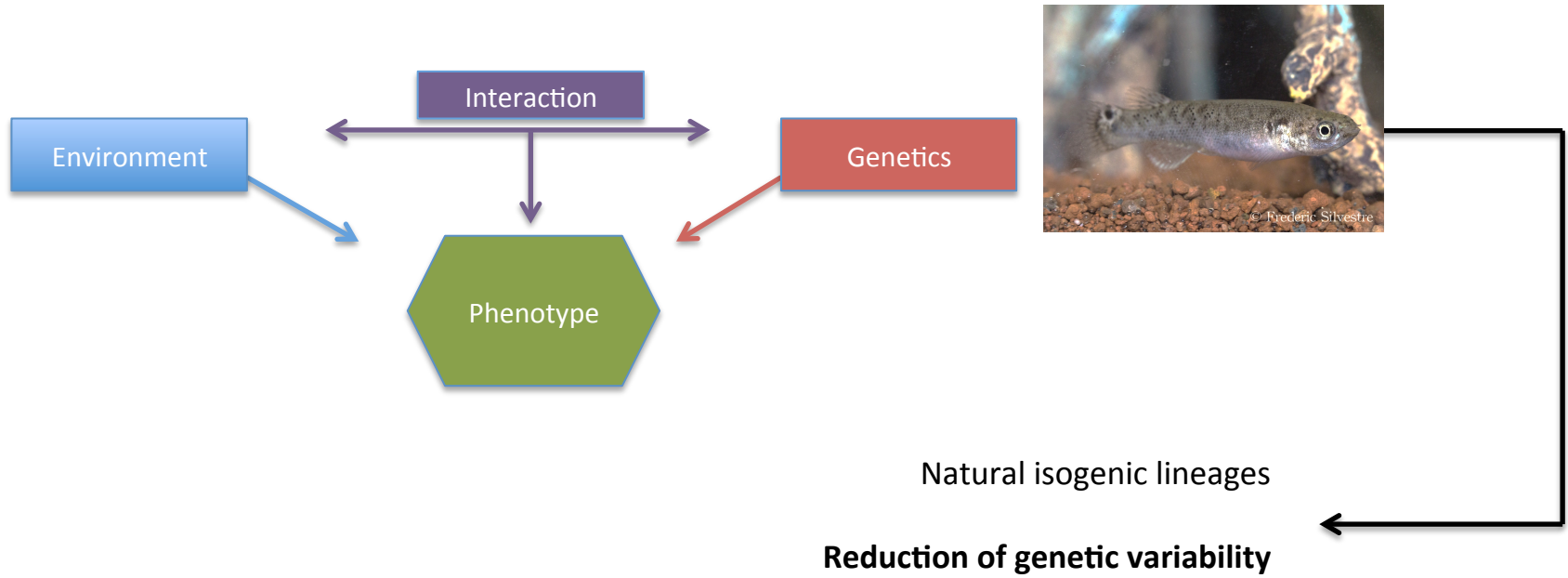
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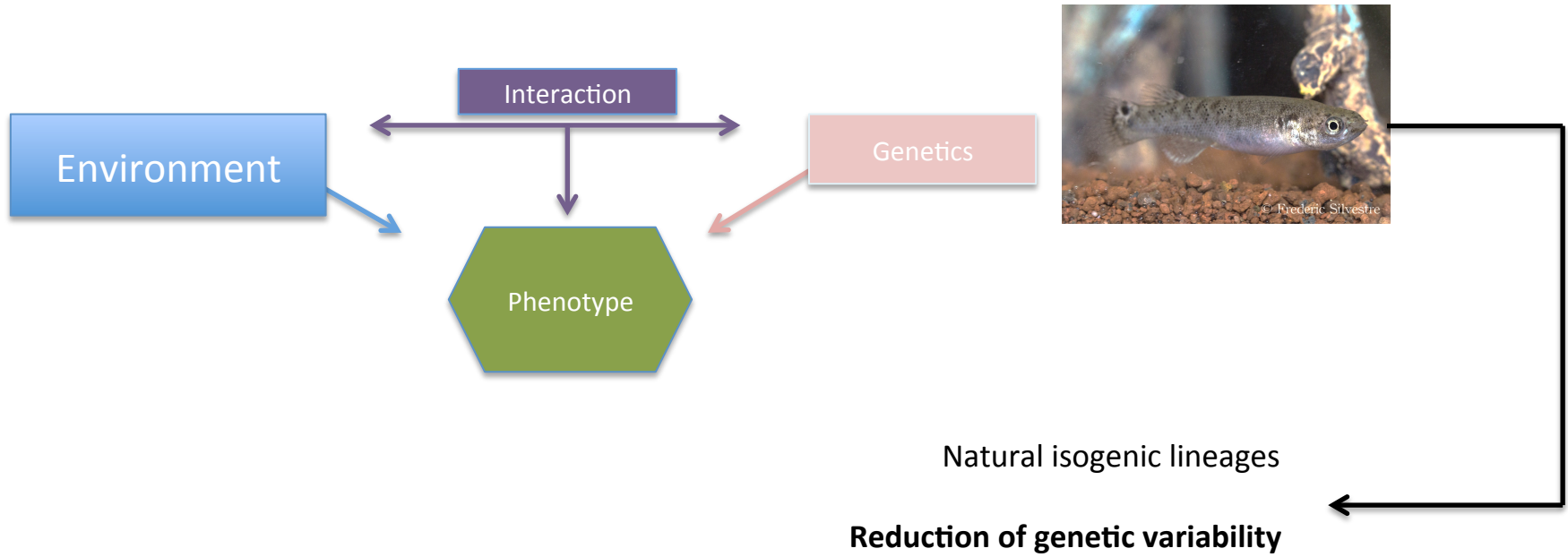
Live in very variable and harsh environment (O_2 , T° , salinity, ...)













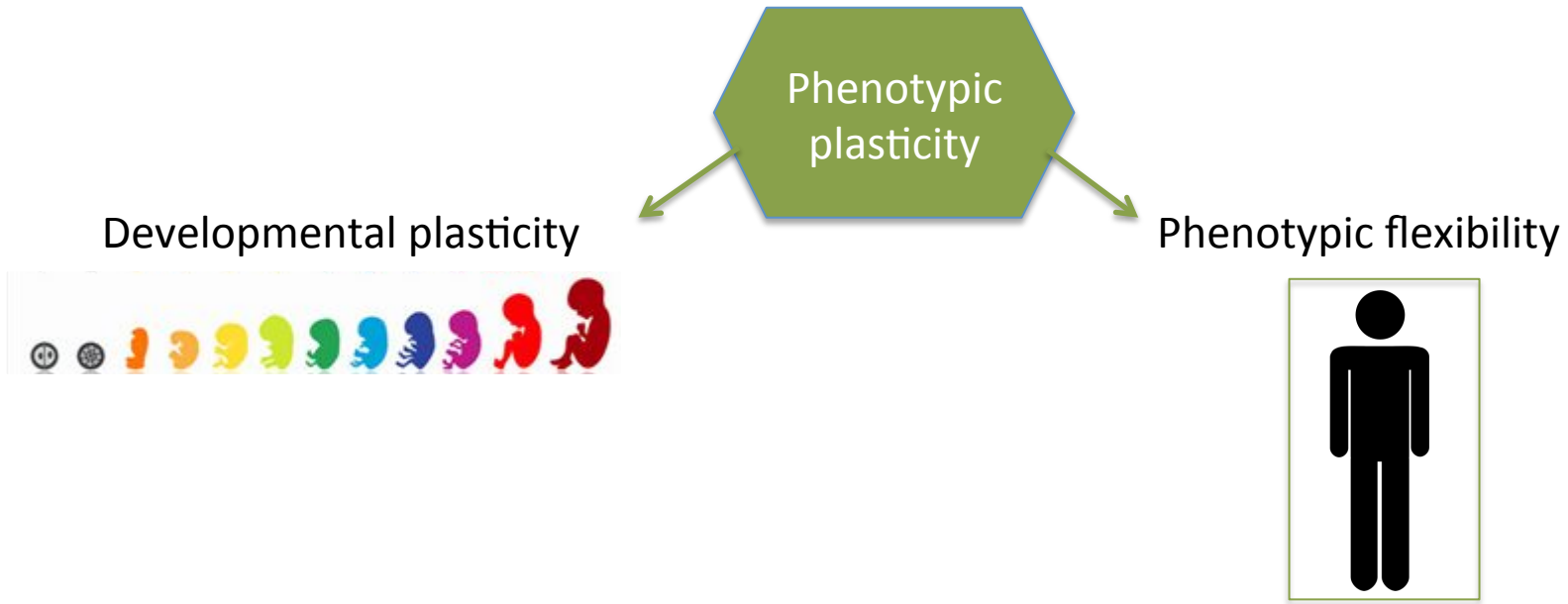
Phenotypic plasticity

organism's capability to express multiple phenotypes from one genotype across environmental conditions

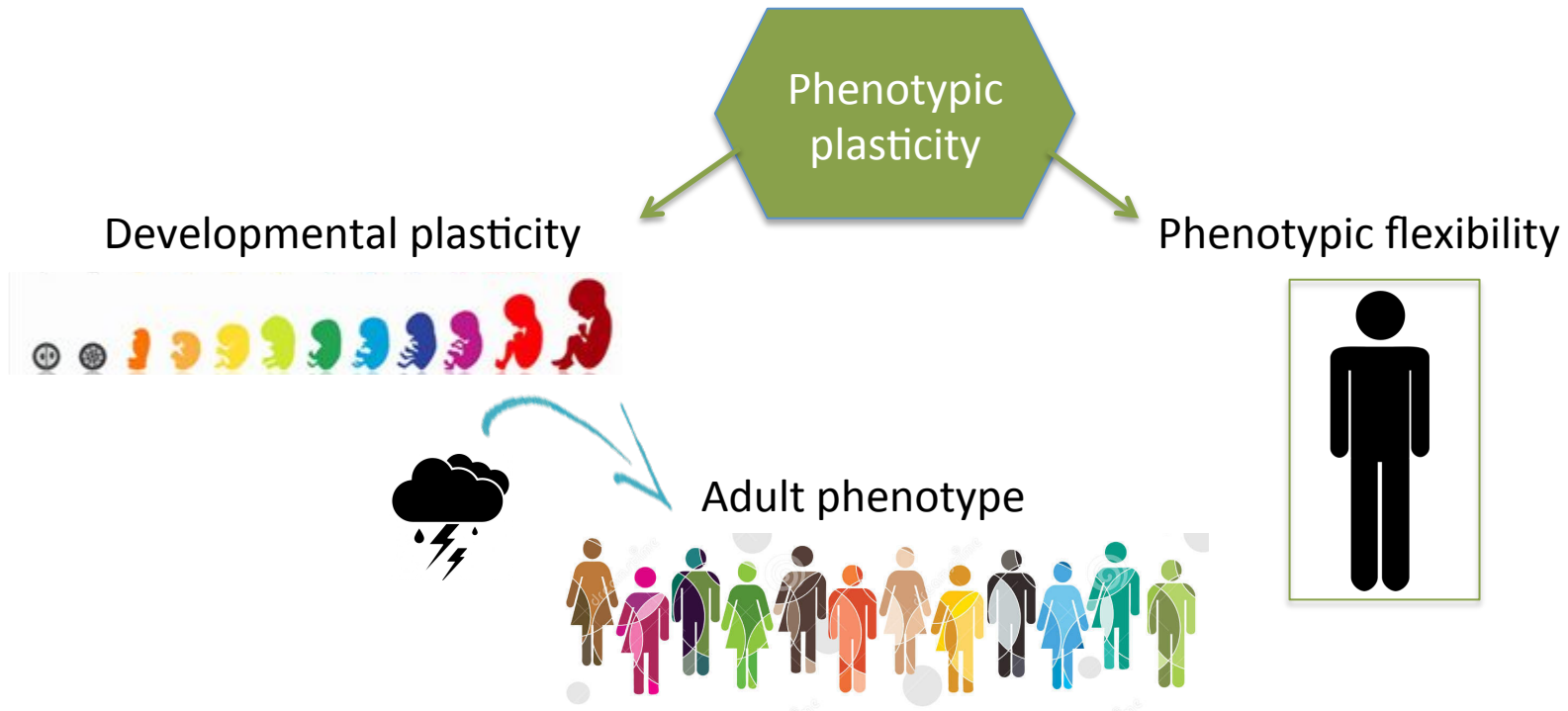
Phenotypic
plasticity

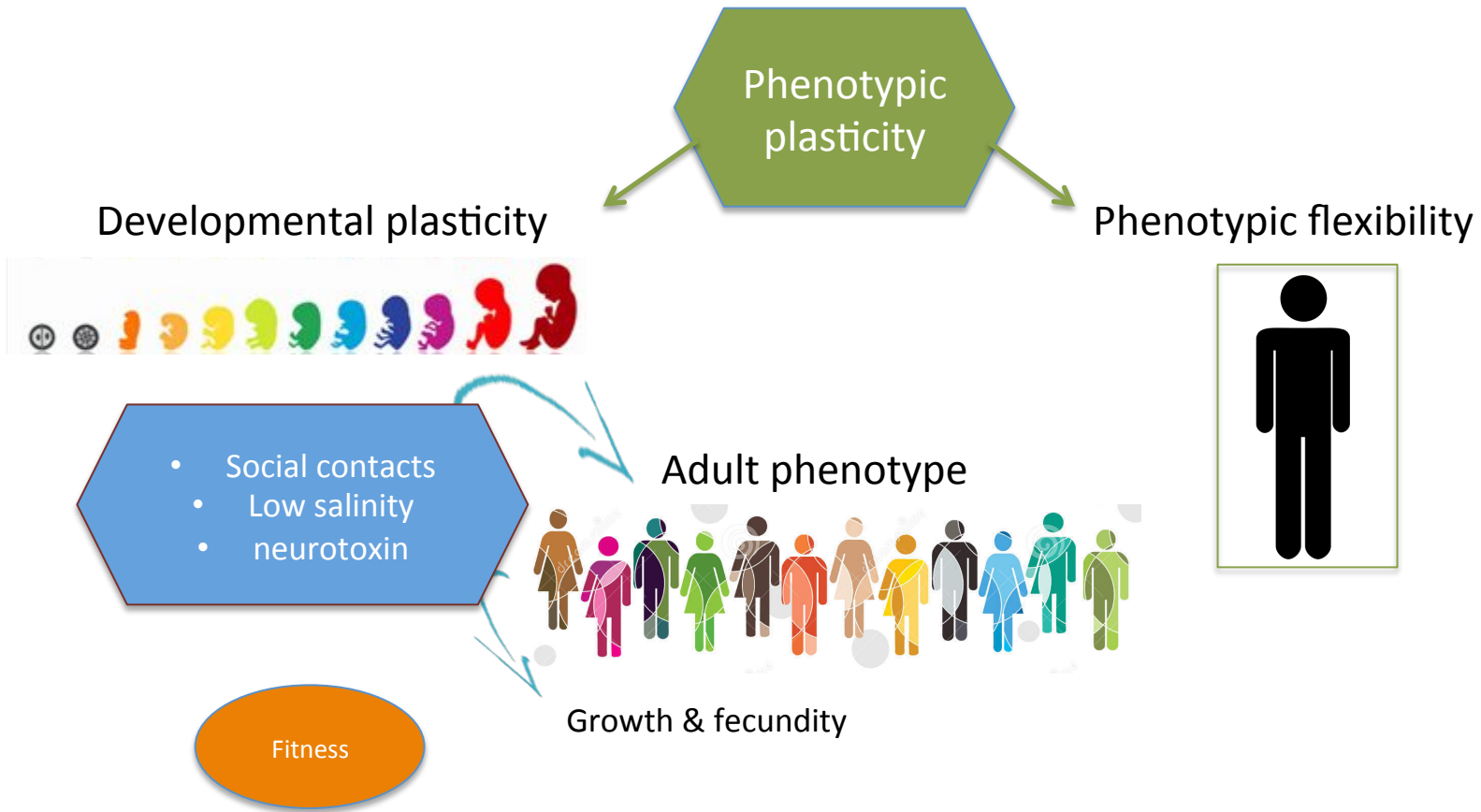
Developmental plasticity

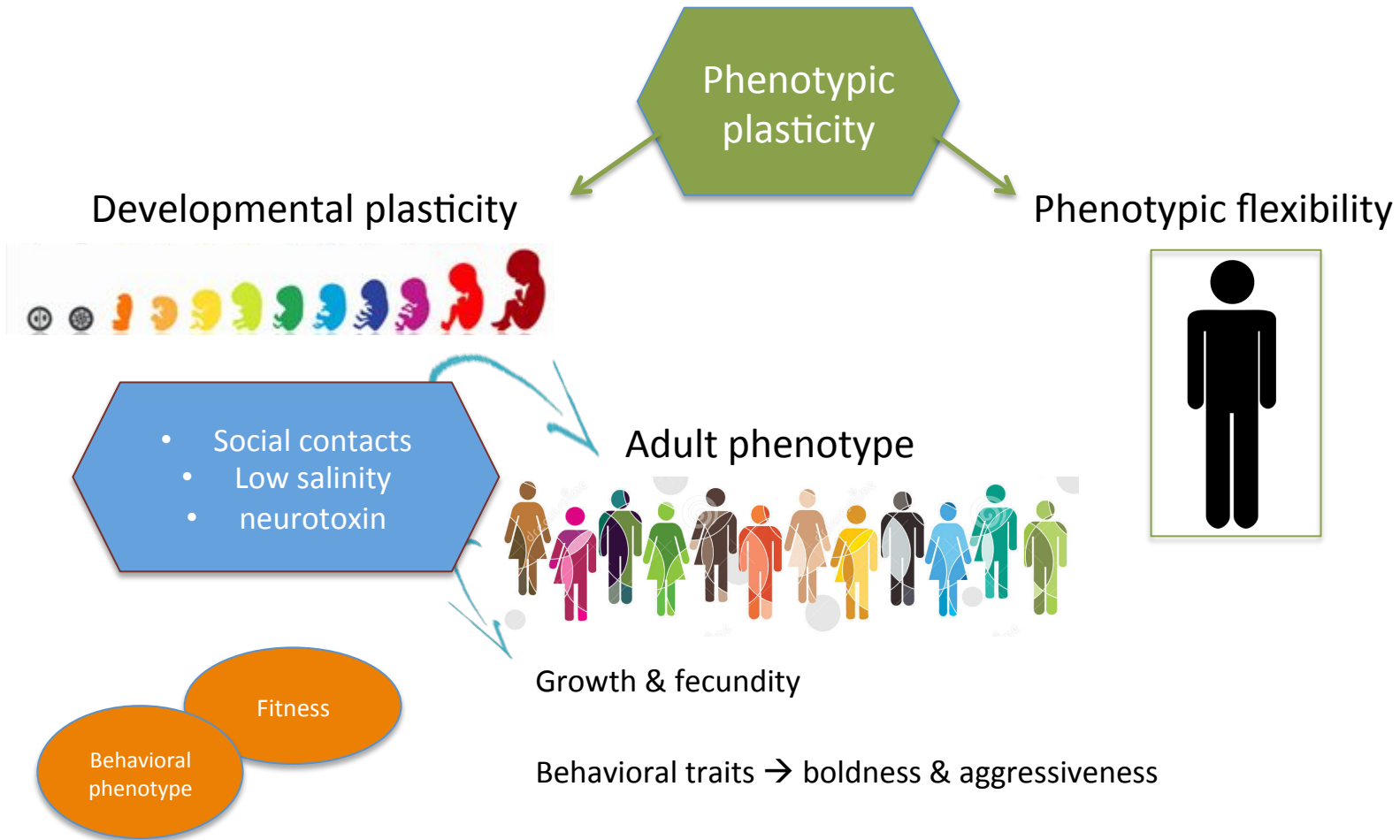




(Pigliucci et al., 2006)



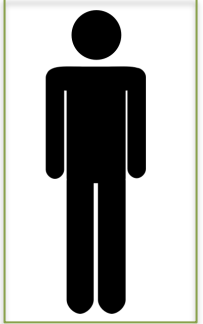




Phenotypic plasticity

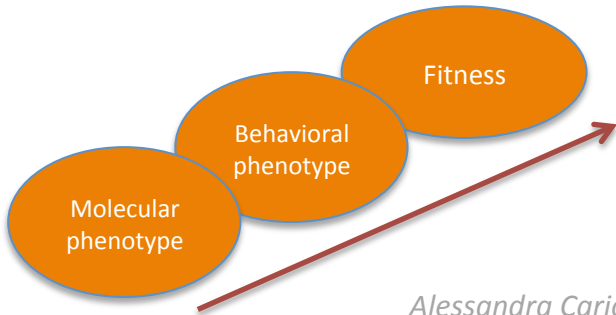
Developmental plasticity

Phenotypic flexibility



- Social contacts
- Low salinity
- neurotoxin

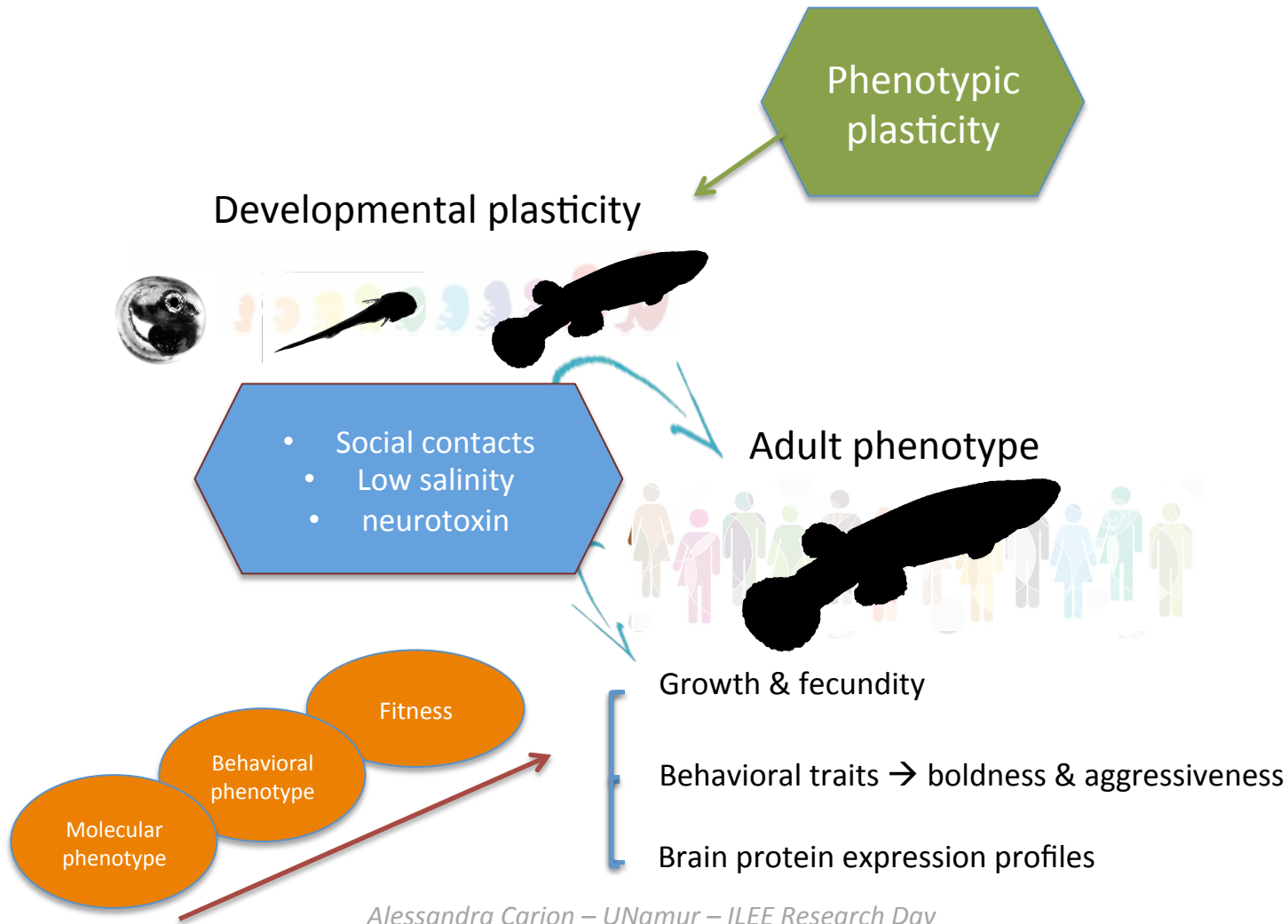
Adult phenotype



Growth & fecundity

Behavioral traits → boldness & aggressiveness

Brain protein expression profiles



→ Behavioral analyses

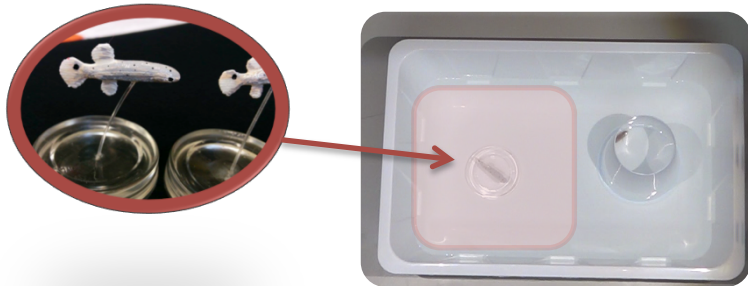
Boldness



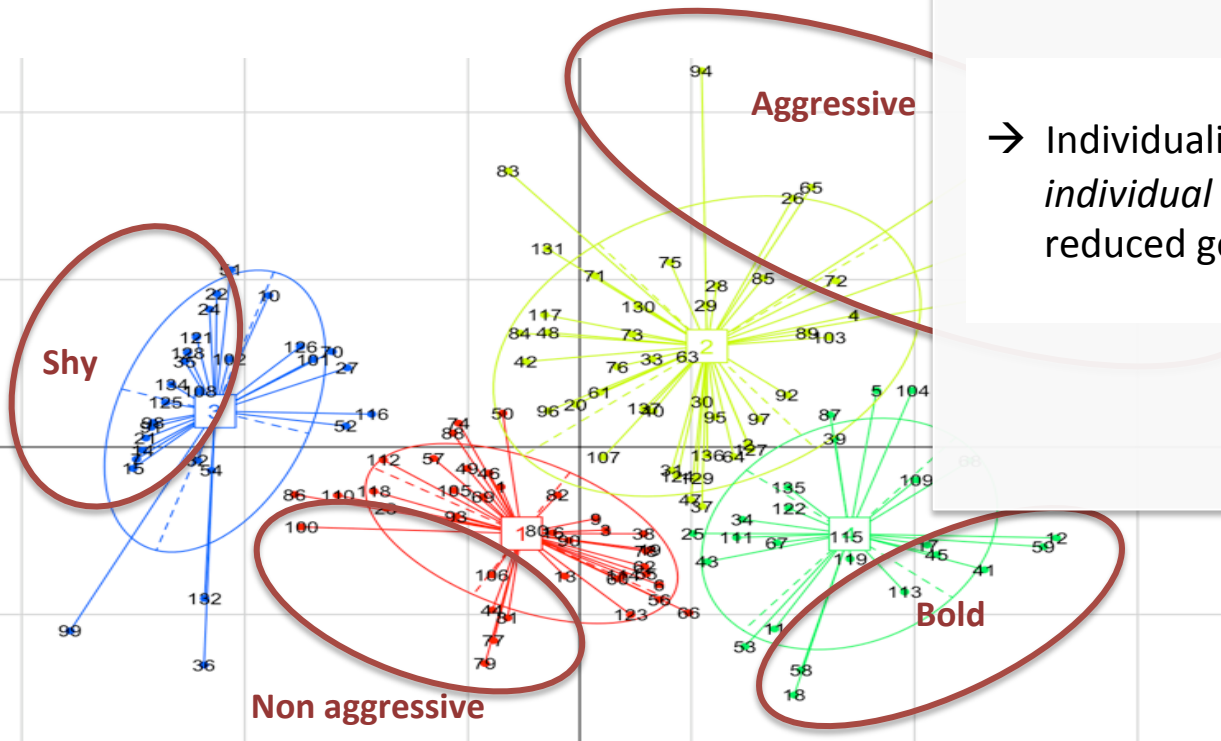
Ethovision analyses

- Total time inside shelter
- Latency to first entry in the arena

Aggressiveness



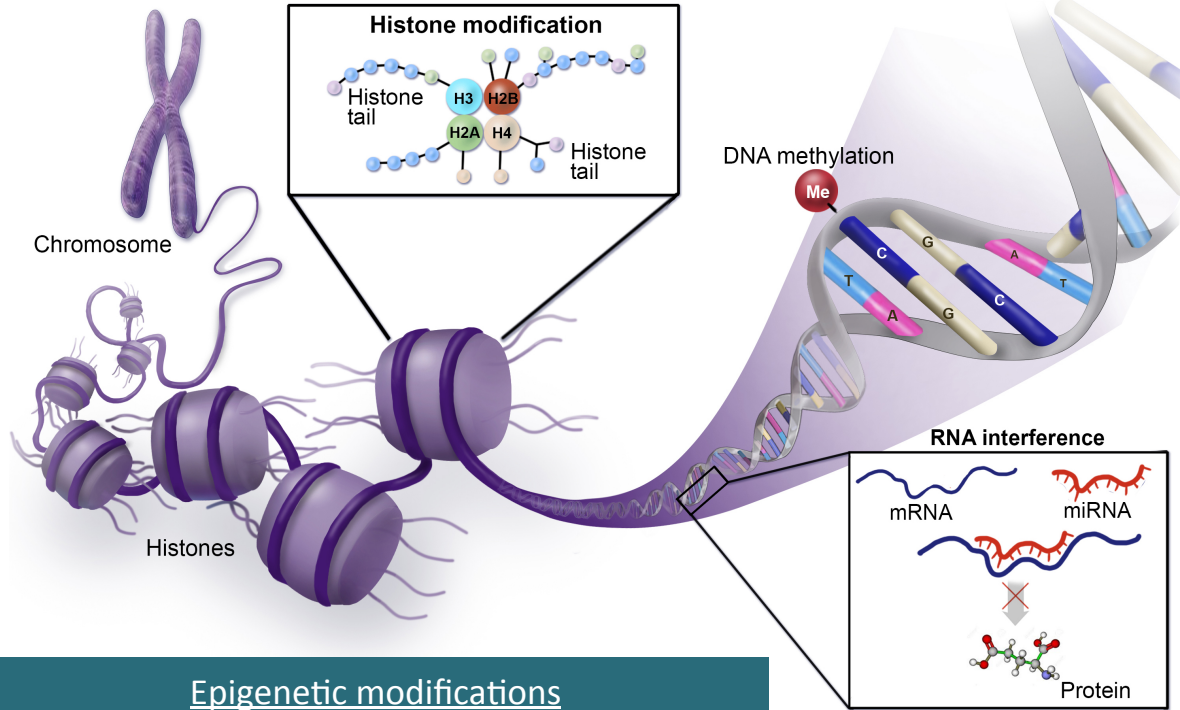
- Number of attack postures
- Number of bites
- Latency to first attack posture
- Latency to first bite



→ Individuality : “substantial repeatable individual behavioral differences” despite reduced genetic diversity

(Bierbach et al., 2017)

Origin of individuality when low genetic diversity between individuals?

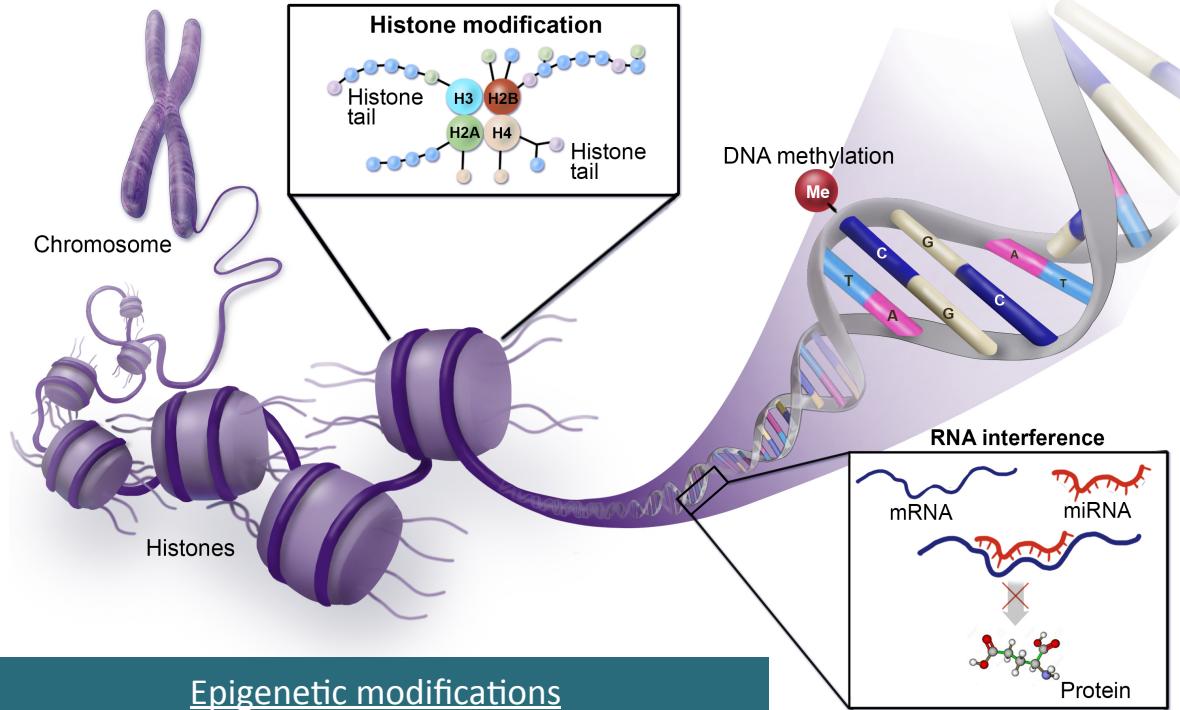


Epigenetic modifications

Heritable changes in gene expression that do not involve changes to the underlying DNA sequence

www.hematology.org

Origin of individuality when low genetic diversity between individuals?

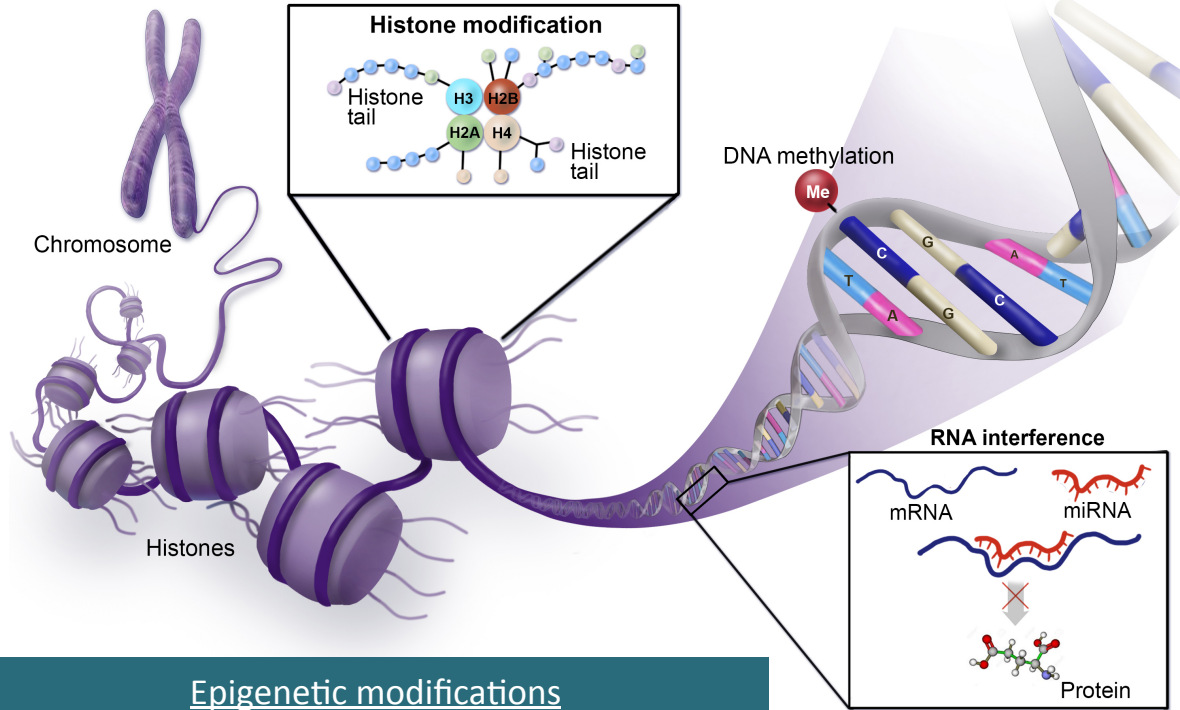


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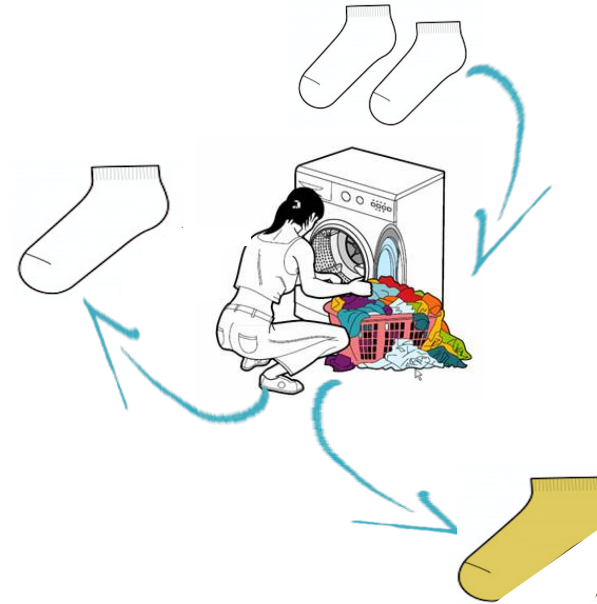
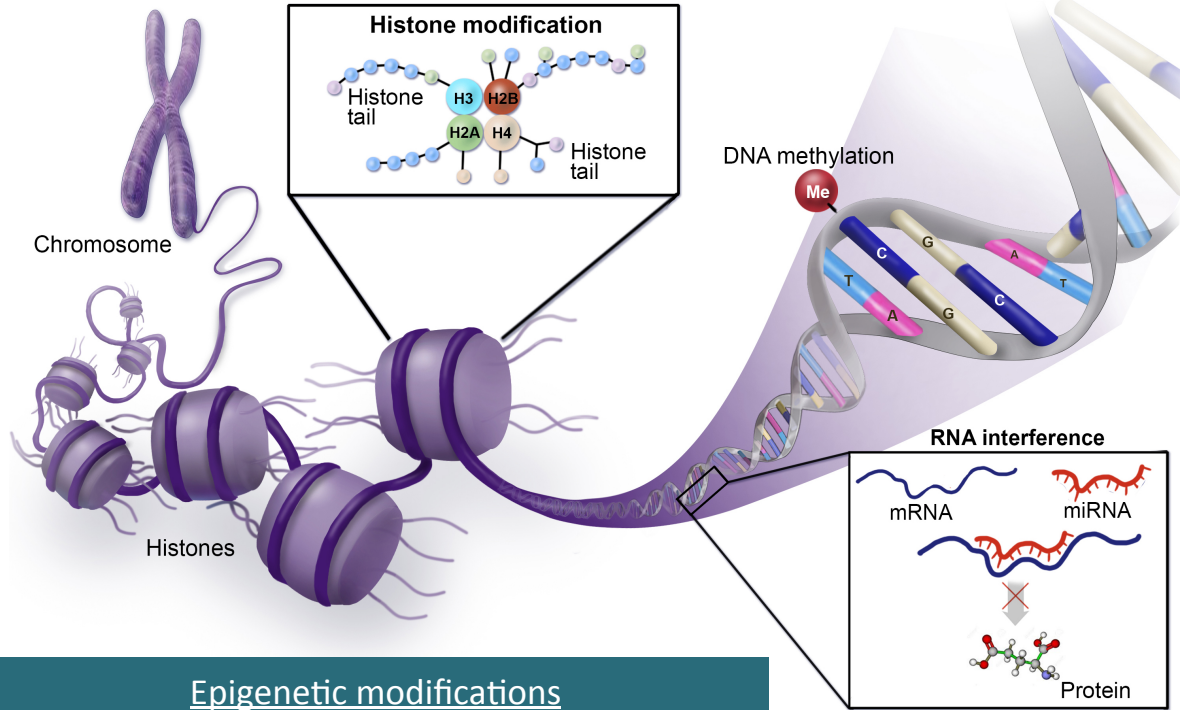


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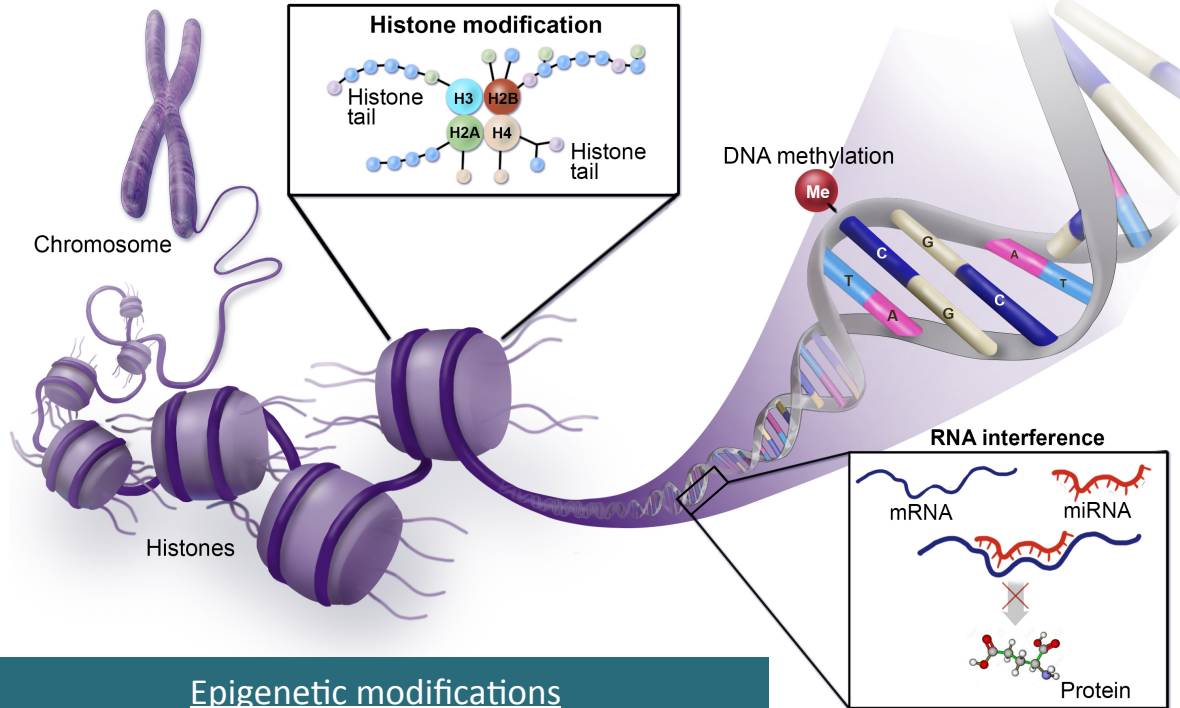


Epigenetic modifications

Heritable changes in gene expression that do not involve changes to the underlying DNA sequence

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Origin of individuality when low genetic diversity between individuals?



Chromosome

Histones

Histone modification

Histone tail

Histone tail

DNA methylation

Me

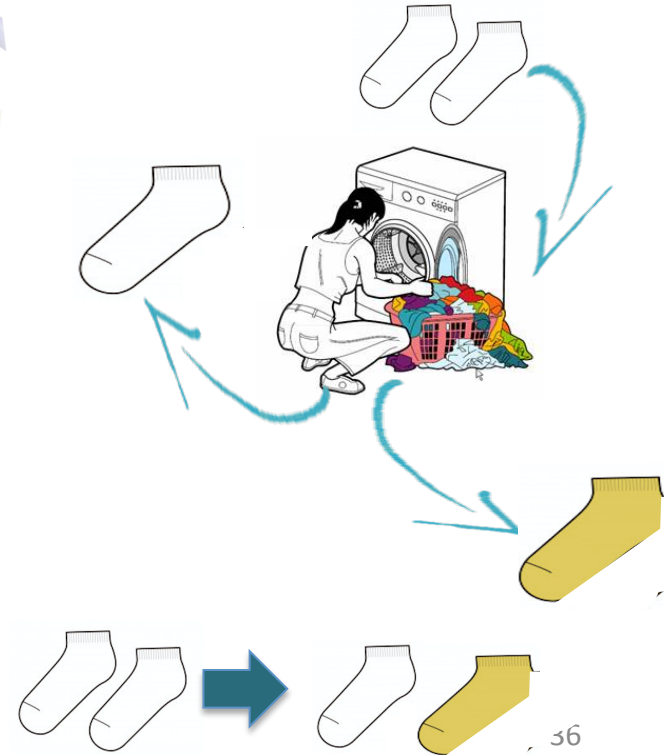
RNA interference

mRNA

miRNA

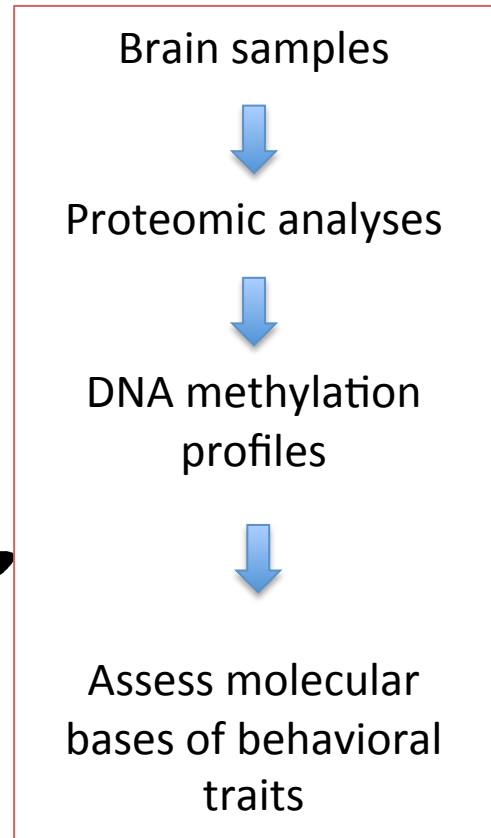
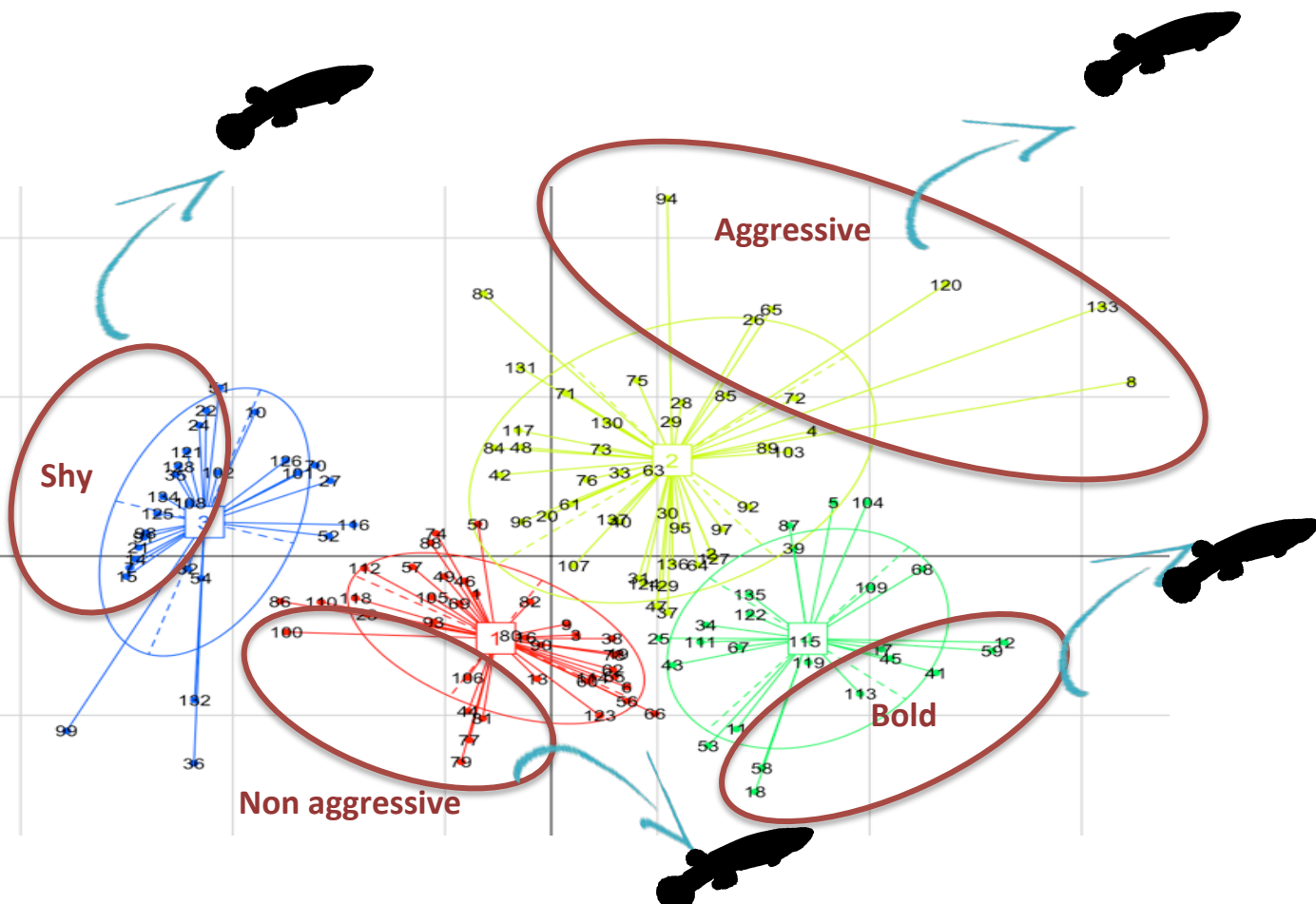
Protein

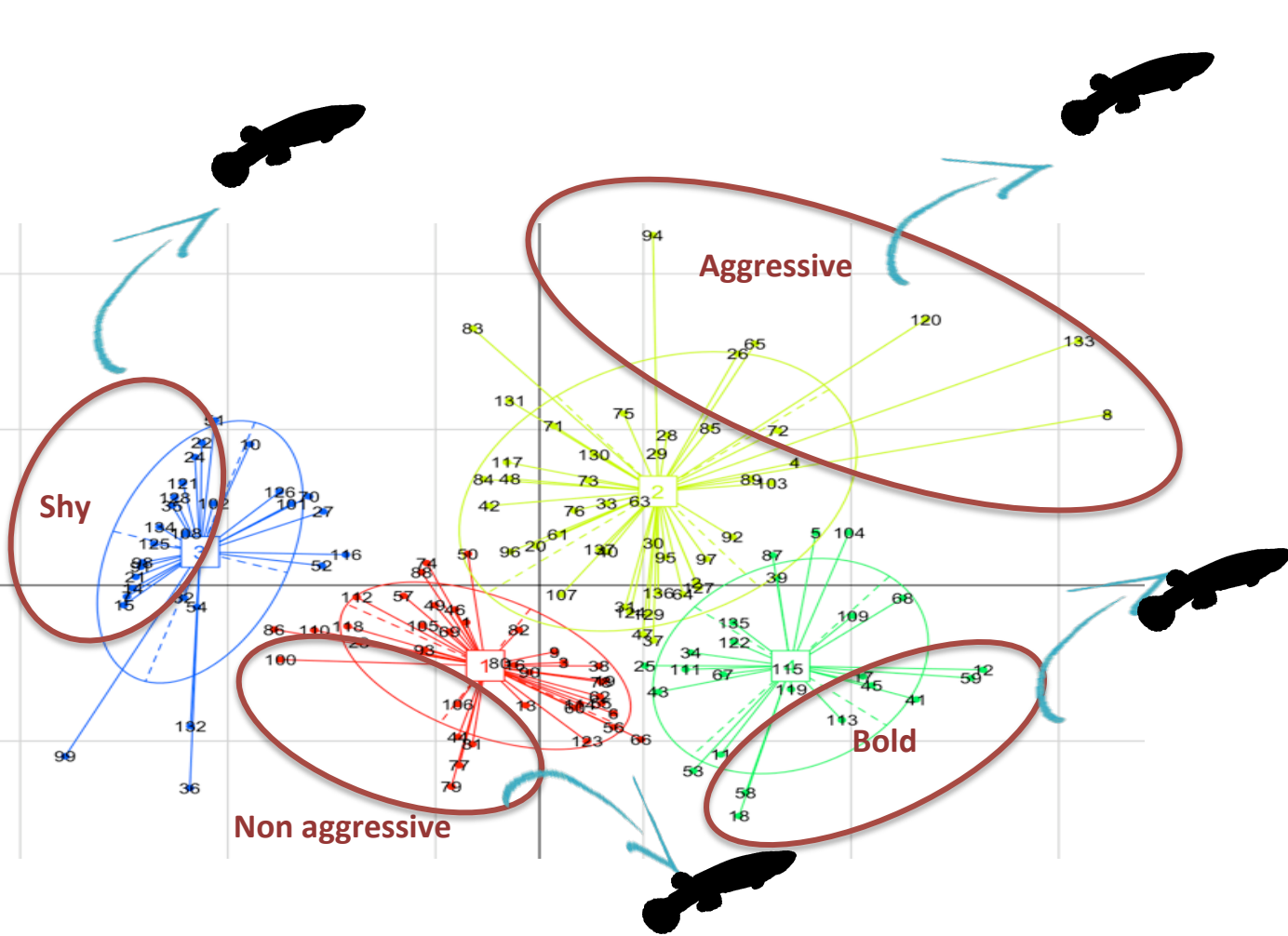
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Epigenetic modifications

Heritable changes in gene expression that do not involve changes to the underlying DNA sequence





Assess molecular bases of behavioral traits



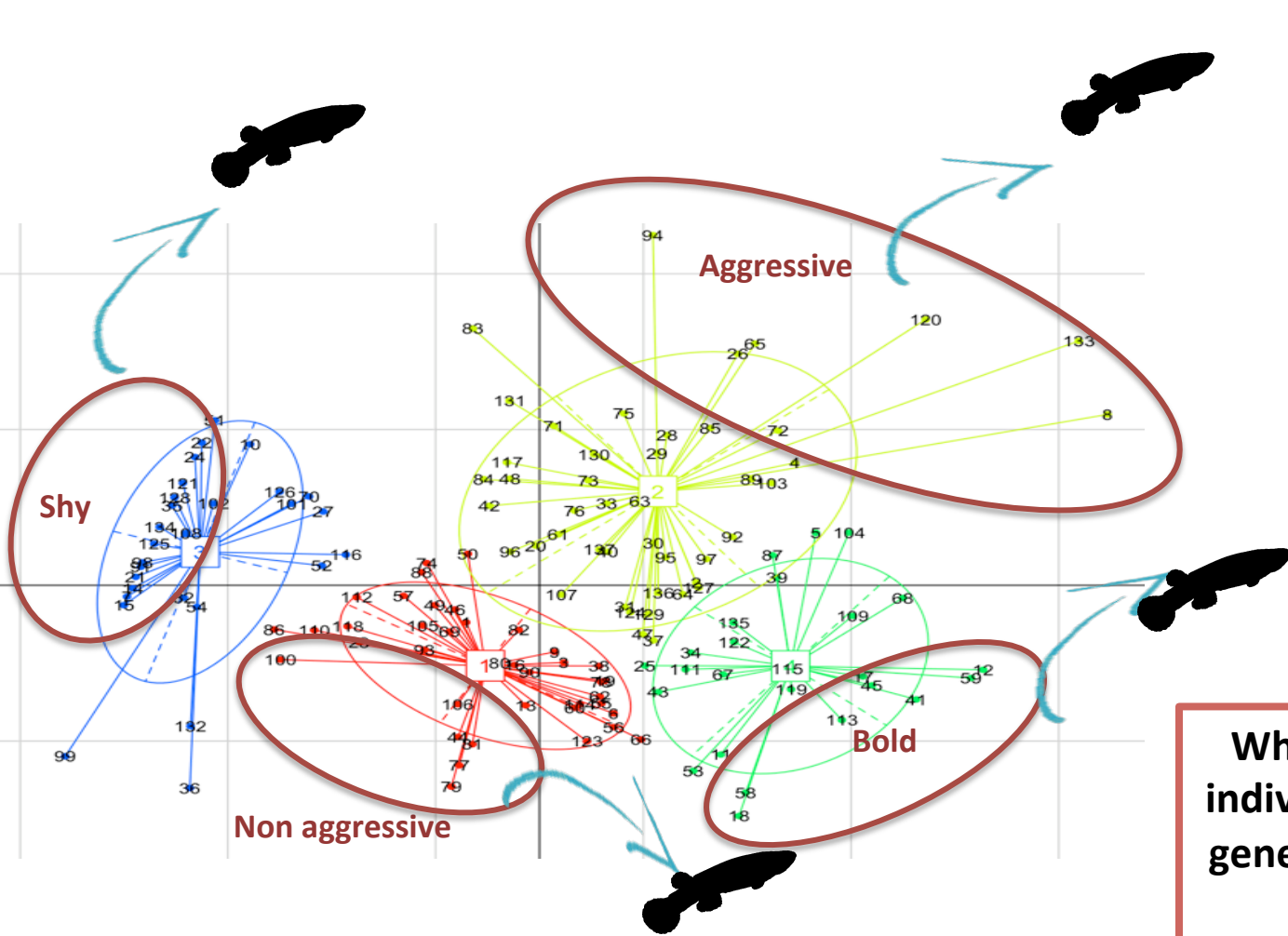
Target genes identification



How gene expression is regulated



Better understand what creates organisms behavior



Assess molecular bases of behavioral traits



Target genes identification



How gene expression is regulated



What creates behavioral individuality when reduced genetic and environmental influences??

A close-up photograph of a fish's head, showing its eyes and the texture of its skin. The fish is positioned on the left side of the frame, looking towards the right. The background is a soft, out-of-focus orange-brown color.

Thank you

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