

Timothy Colston

Biological Science

Harnessing NGS Technologies to Understand
Biological Diversification: From Microbes to
Macroevolutionary Patterns

The Office of Postdoctoral Affairs

The Graduate School | Florida State University



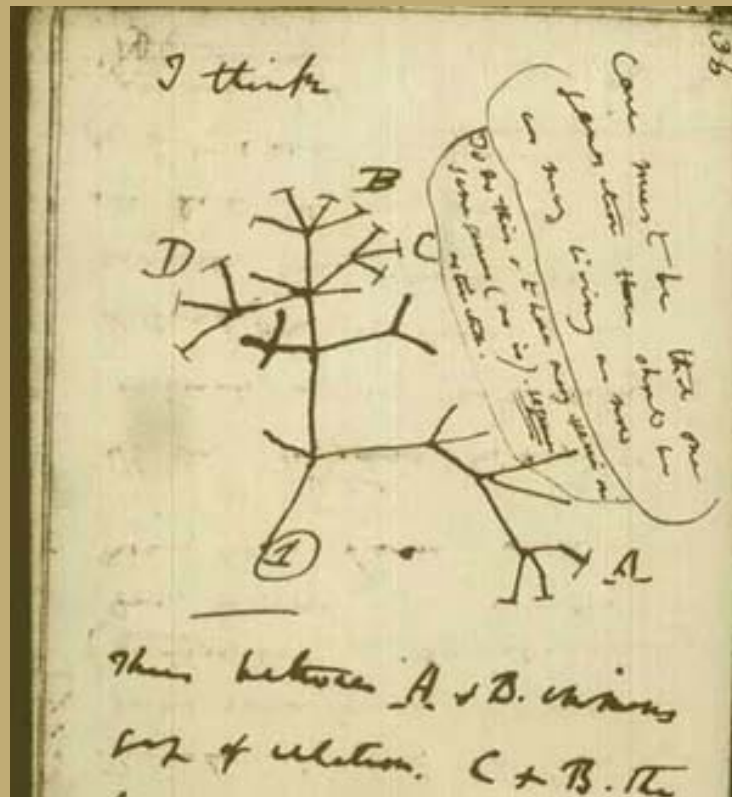
Motivation & Tools – Molecular Methods (NGS)

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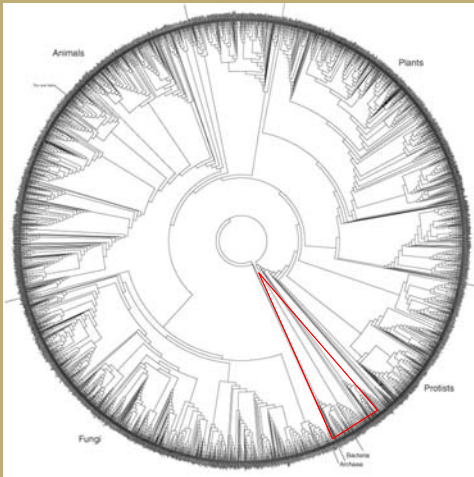


Biodiversity



Biodiversity – the “microbiome”

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NGS Sequencing

Biodiversity – the “microbiome”

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nature
microbiology

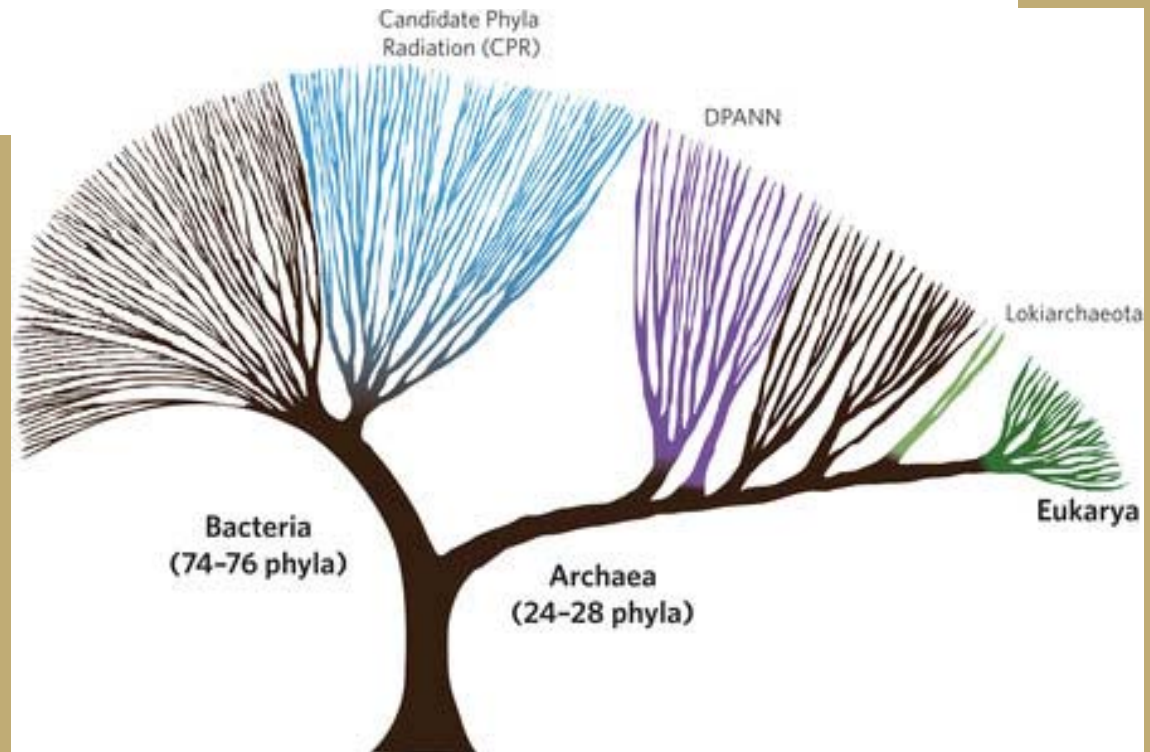
LETTERS

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OPEN

A new view of the tree of life

Laura A. Hug^{1†}, Brett J. Baker², Karthik Anantharaman¹, Christopher T. Brown³, Alexander J. Probst¹, Cindy J. Castelle¹, Cristina N. Butterfield¹, Alex W. Hernsdorf³, Yuki Amano⁴, Kotaro Ise⁴, Yohey Suzuki⁵, Natasha Dudek⁶, David A. Relman^{7,8}, Kari M. Finstad⁹, Ronald Amundson⁹, Brian C. Thomas¹ and Jillian F. Banfield^{1,9*}

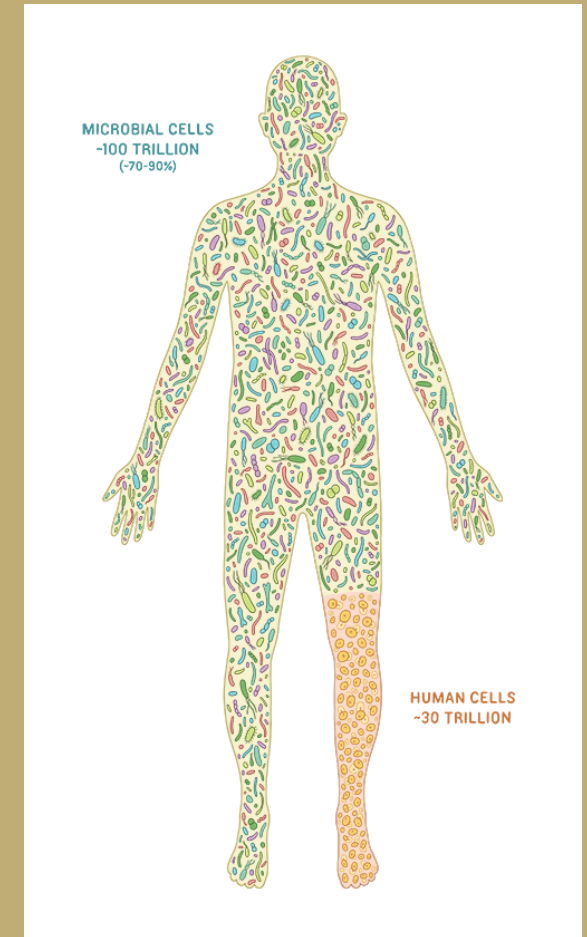


NGS Sequencing



Biodiversity – the “microbiome”

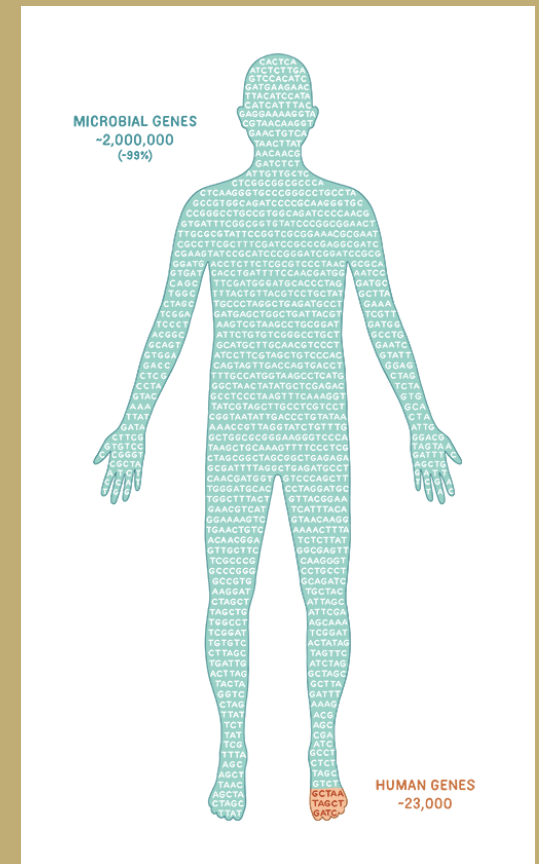
- Plants and Animals are “metagenomic organisms”
 - Co-evolution
- Host-associated microbial cells ~ 10X number of host cells
 - Fitness/Selection
 - Heritable



by Gaby D'Allesandro / © AMNH

Biodiversity – the “microbiome”

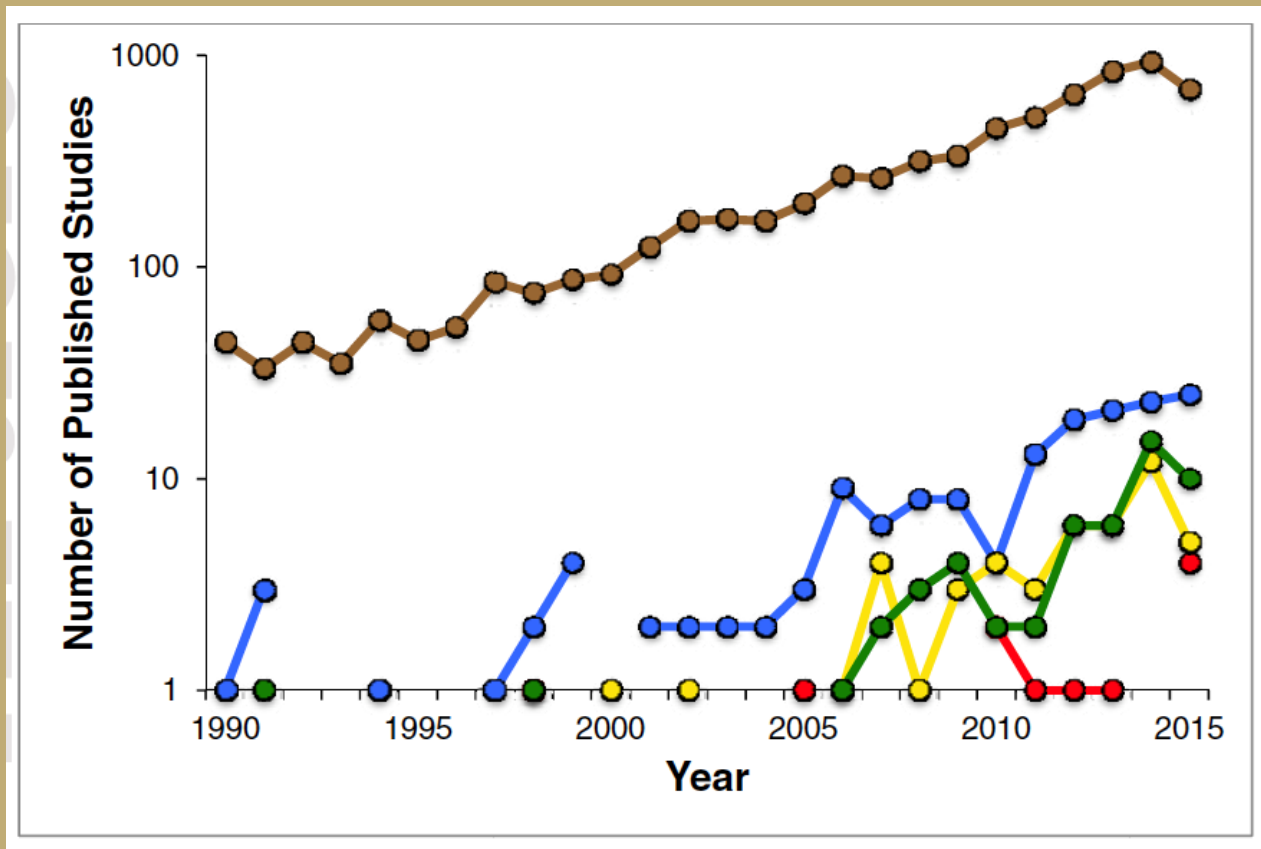
- Plants and Animals are “metagenomic organisms”
 - Co-evolution
- Host-associated microbial **genes** > 10X number of host cells
 - Fitness/Selection
 - Heritable



by Gaby D'Allesandro / © AMNH

Biodiversity – the “microbiome”

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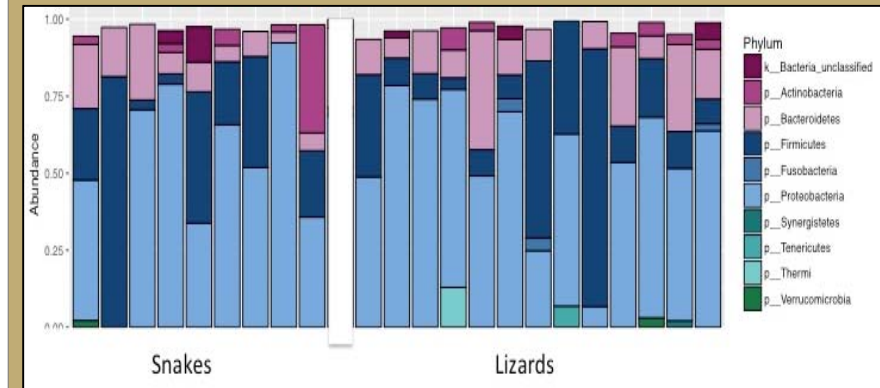
Mammals
Fish
Birds
Amphibians
Reptiles

Colston, T.J. & Jackson, C.R. (2016) *Molecular Ecology*



The Reptile Microbiome

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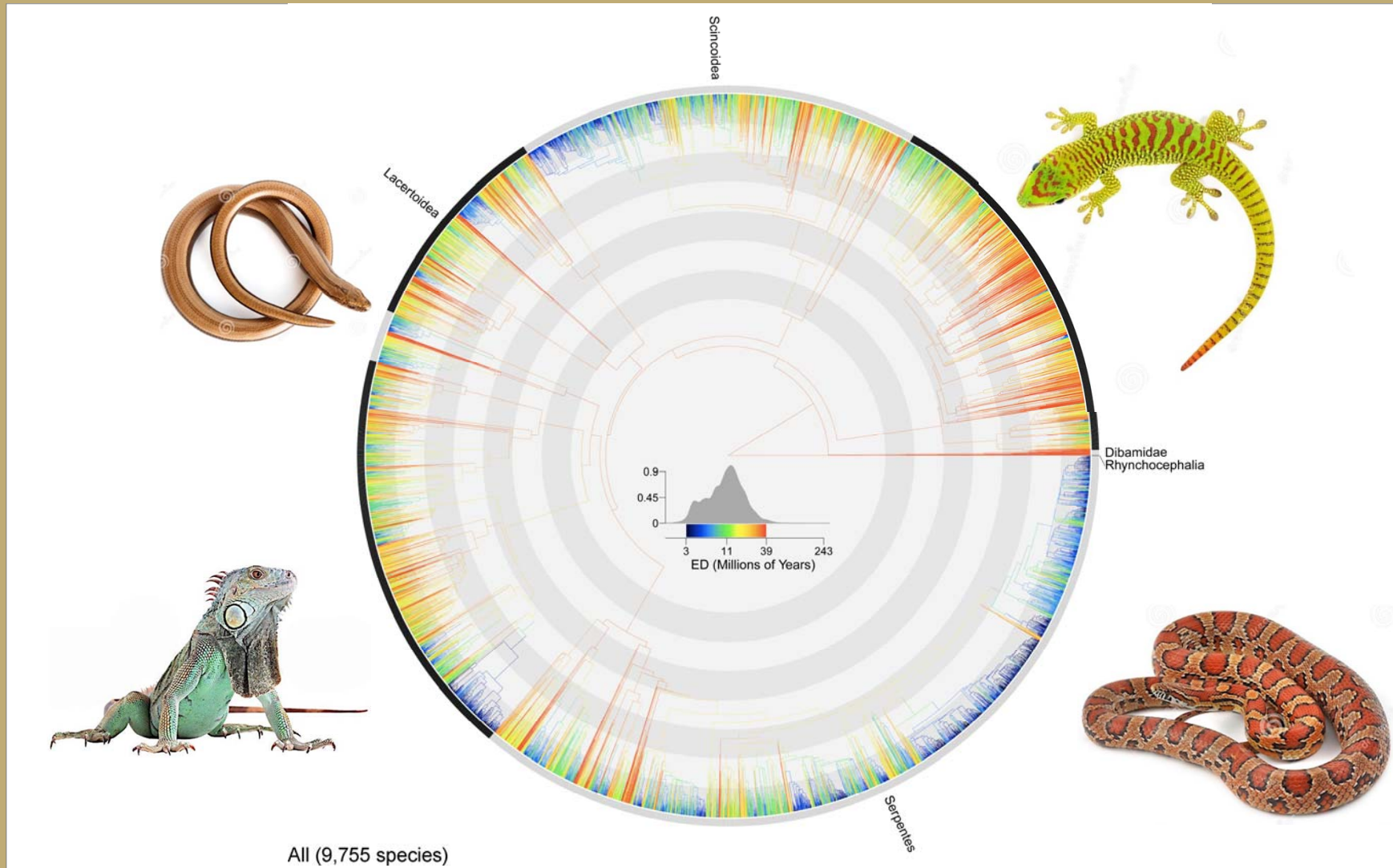


Source	df	F _s	p
Brazil			
Foraging mode	1	3.205	0.002*
Diet breadth	2	0.941	0.523
Habitat	4	1.524	0.020*
Host activity	2	1.546	0.055*
Parity mode	1	3.255	0.001*
Mexico			
Foraging mode	1	1.744	0.047*
Diet breadth	2	0.923	0.562
Habitat	5	1.202	0.144
Host activity	1	1.297	0.193
Parity mode	1	1.229	0.229
USA			
Foraging mode	1	2.966	0.011*
Diet breadth	2	1.460	0.144
Habitat	5	1.702	0.025*
Host activity	1	0.608	0.760
Parity mode	1	1.171	0.255

*390 individuals, 22 squamate families, ~150 spp



Reptile Tree of Life



Reptile Tree of Life — NGS Solutions

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- Museum collections
- Next generation phylogenetics
 - 1000's of genes



**THE GEORGE
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WASHINGTON, DC

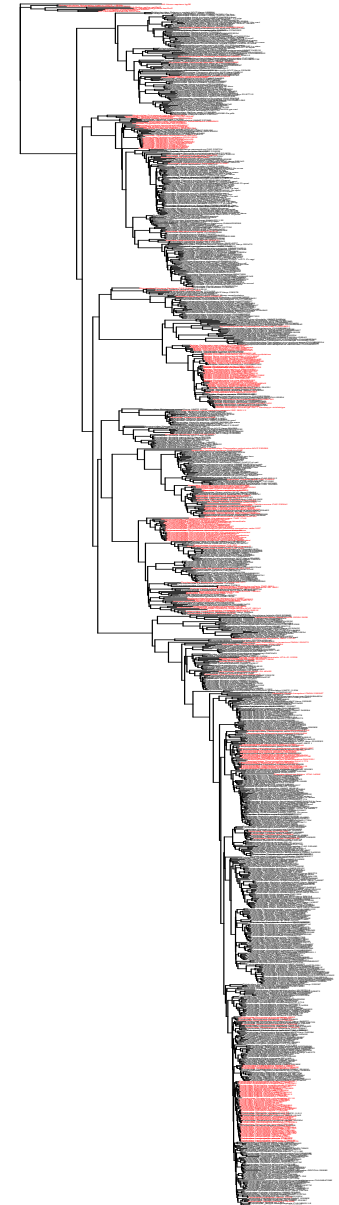
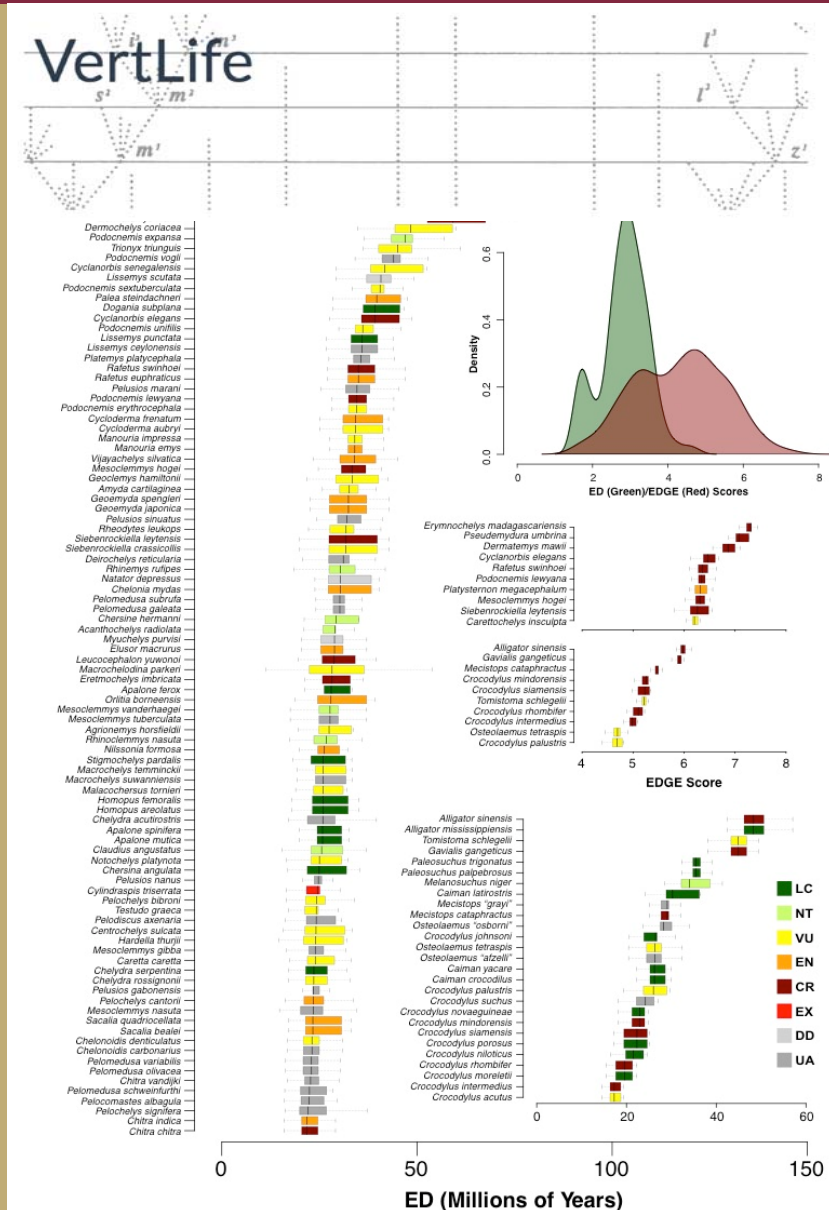


Smithsonian
National Museum of Natural History

Reptile Tree of Life – NGS Solutions

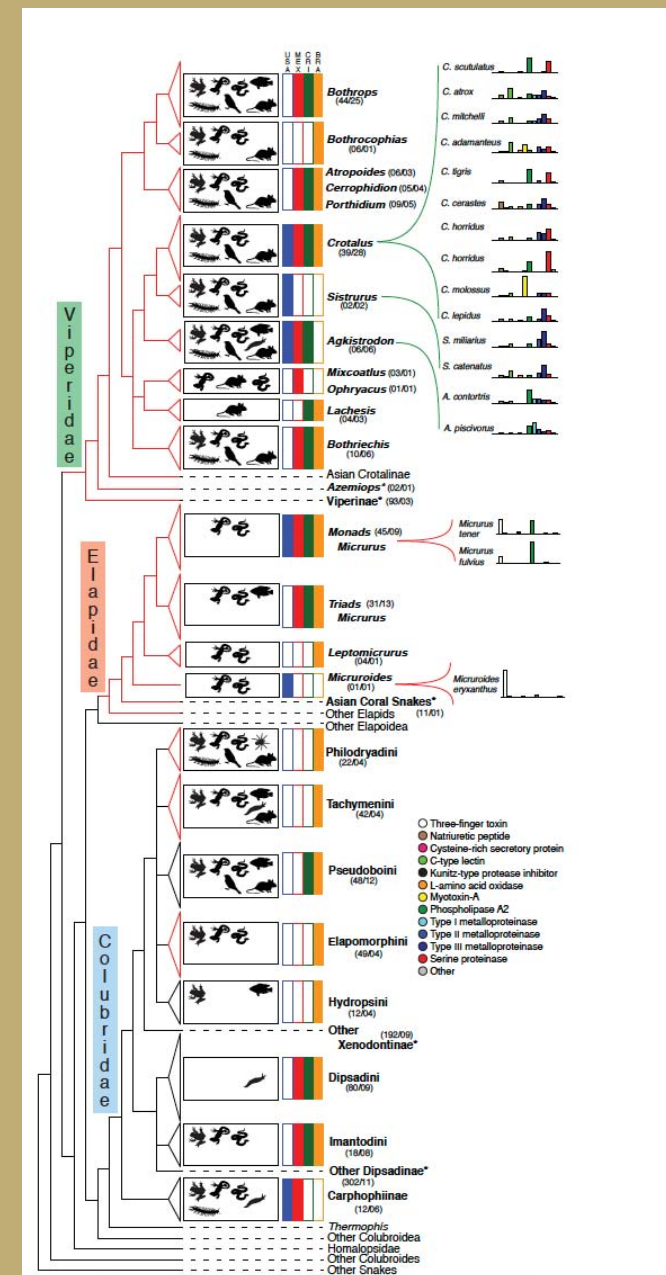
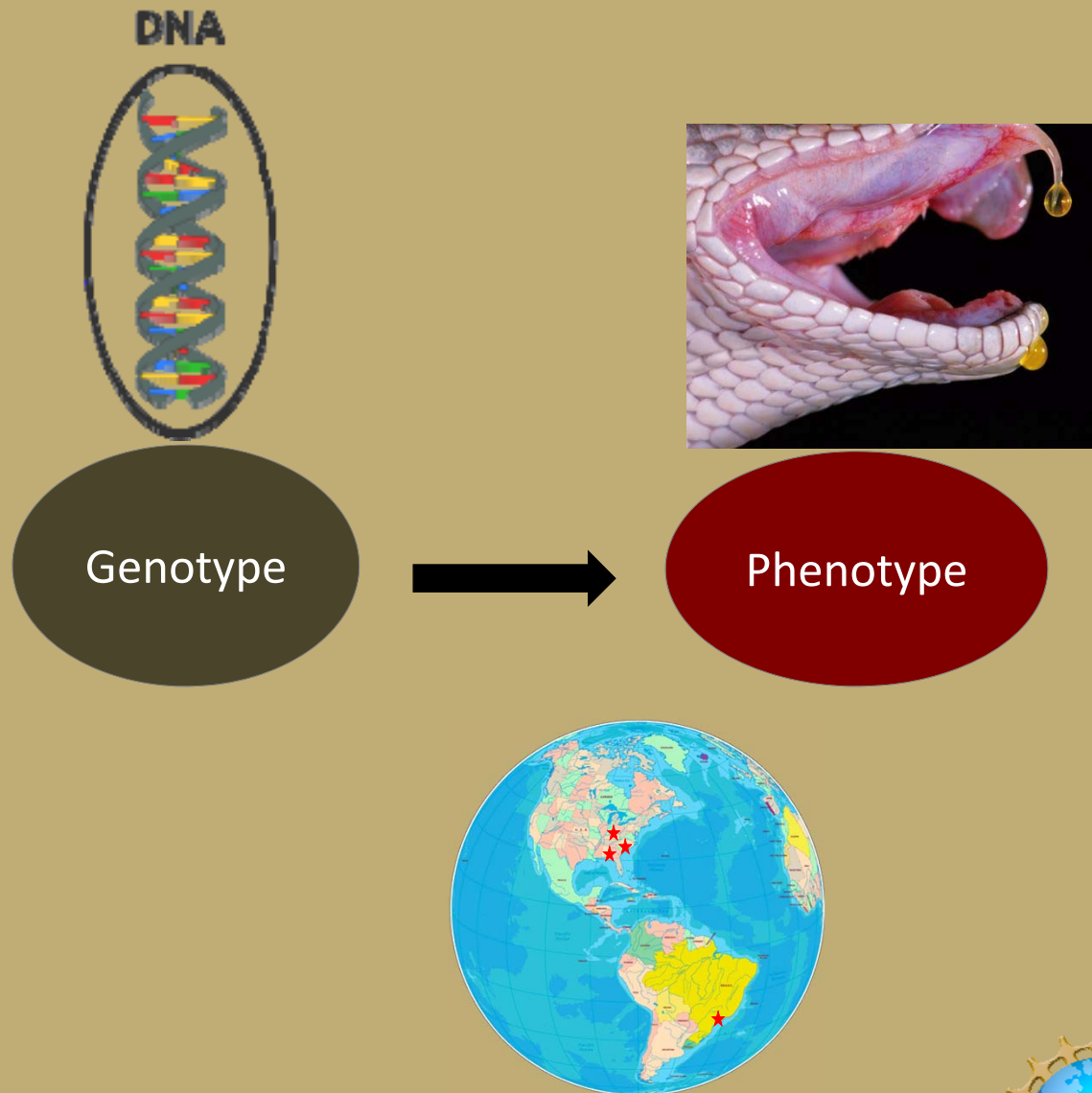
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*Collaboration with Pyron, Jetz, Rabosky

Scales of Biodiversity



Scales of Biodiversity

