

# Explore-exploit trade-off in vocal learning

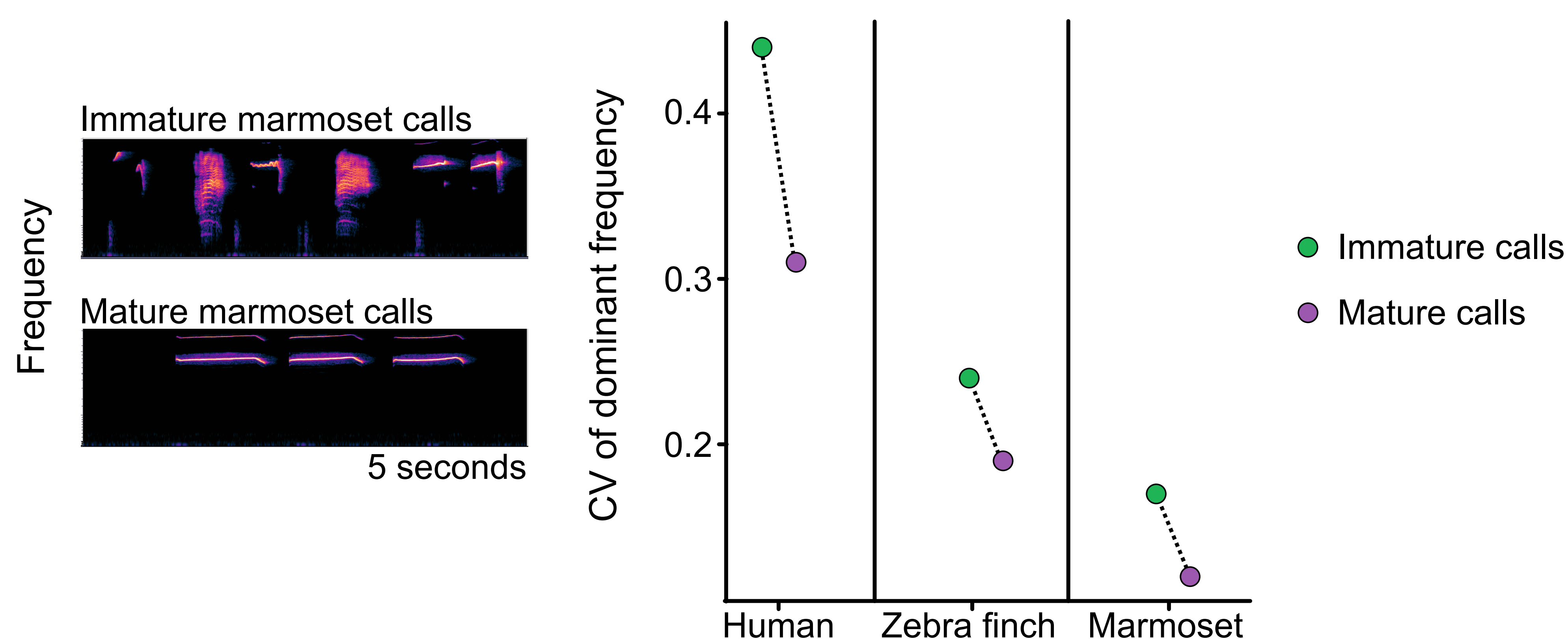
QR  
code

Thiago T. Varella<sup>1,2</sup>, Daniel Y. Takahashi<sup>3</sup>, Asif A. Ghazanfar<sup>1,2</sup>

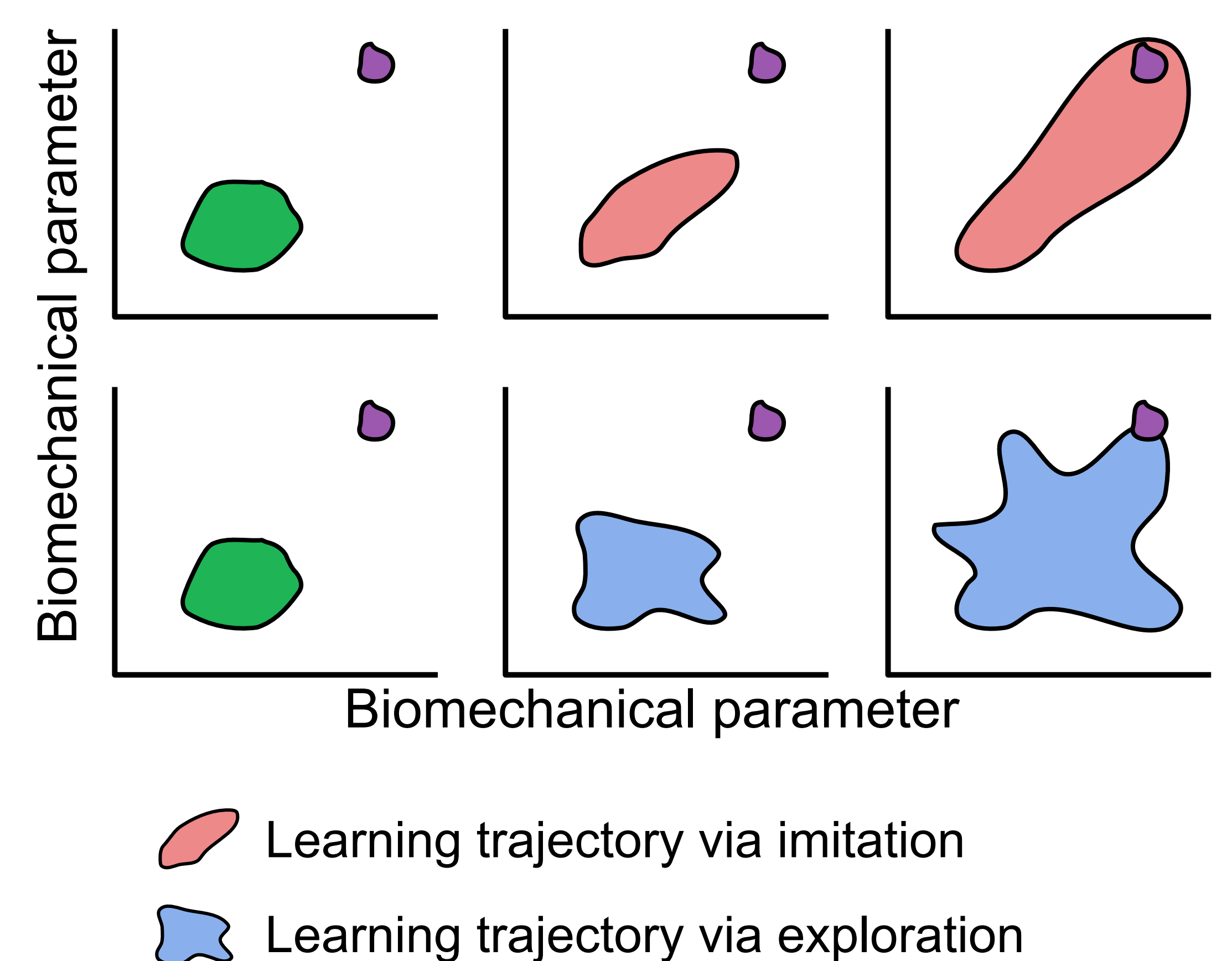
## Early **exploration** facilitates vocal development

- What is the role of **imitation** and of **exploration** in vocal learning?
- How to model this process in an **embodied** manner?
- How do infants solve the problem of "**poverty of stimulus**" when learning?

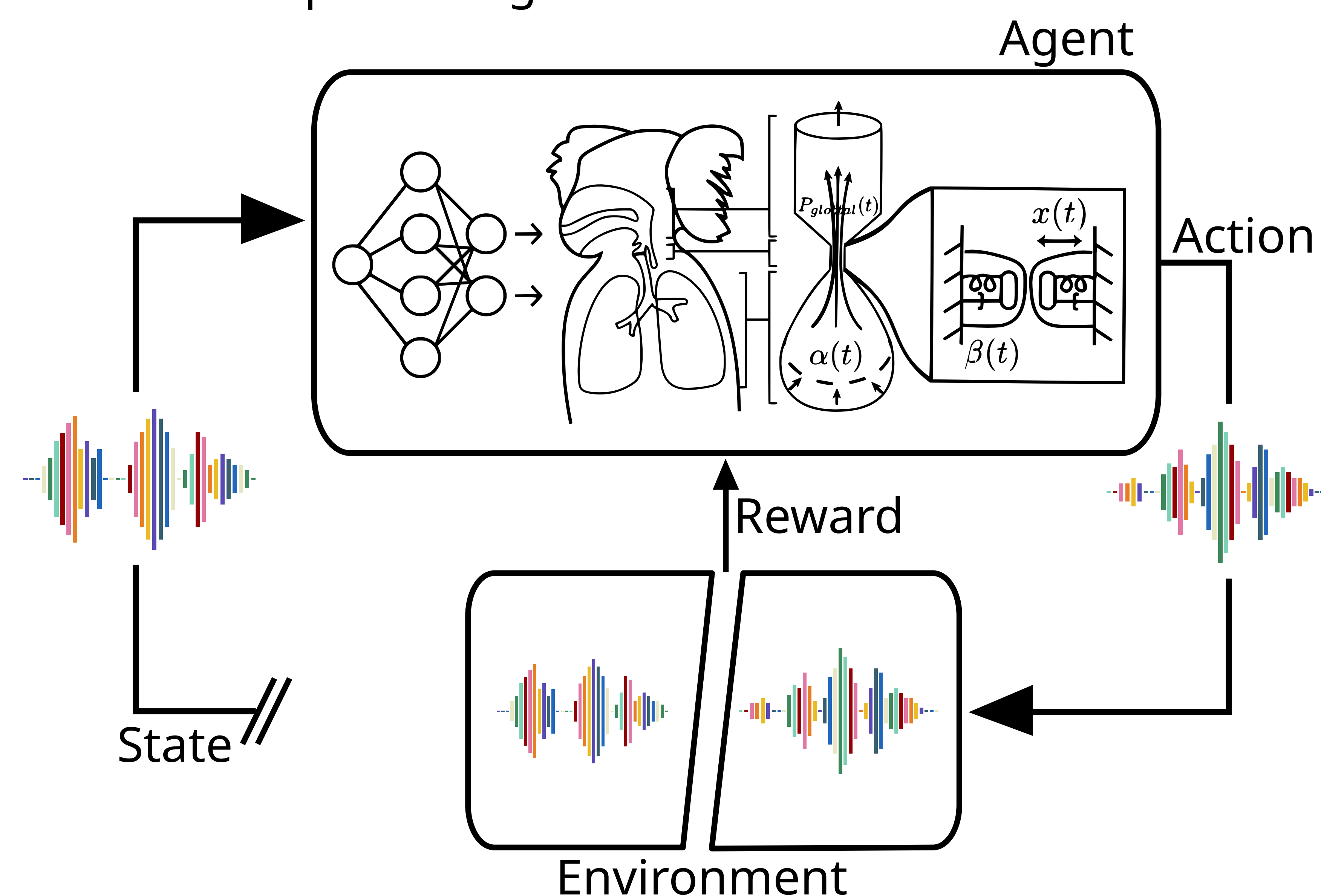
- 1 Immature vocalizations have **higher variability** than mature vocalizations in vocal learning animals.



- 2 Schematics of the space of biomechanical parameters and learned vocalizations over time,



- 3 RL agent is a biomechanical model of vocal tract, and receives reward when producing mature calls



- 4 The learning process is **faster and more robust** when there's higher exploration

