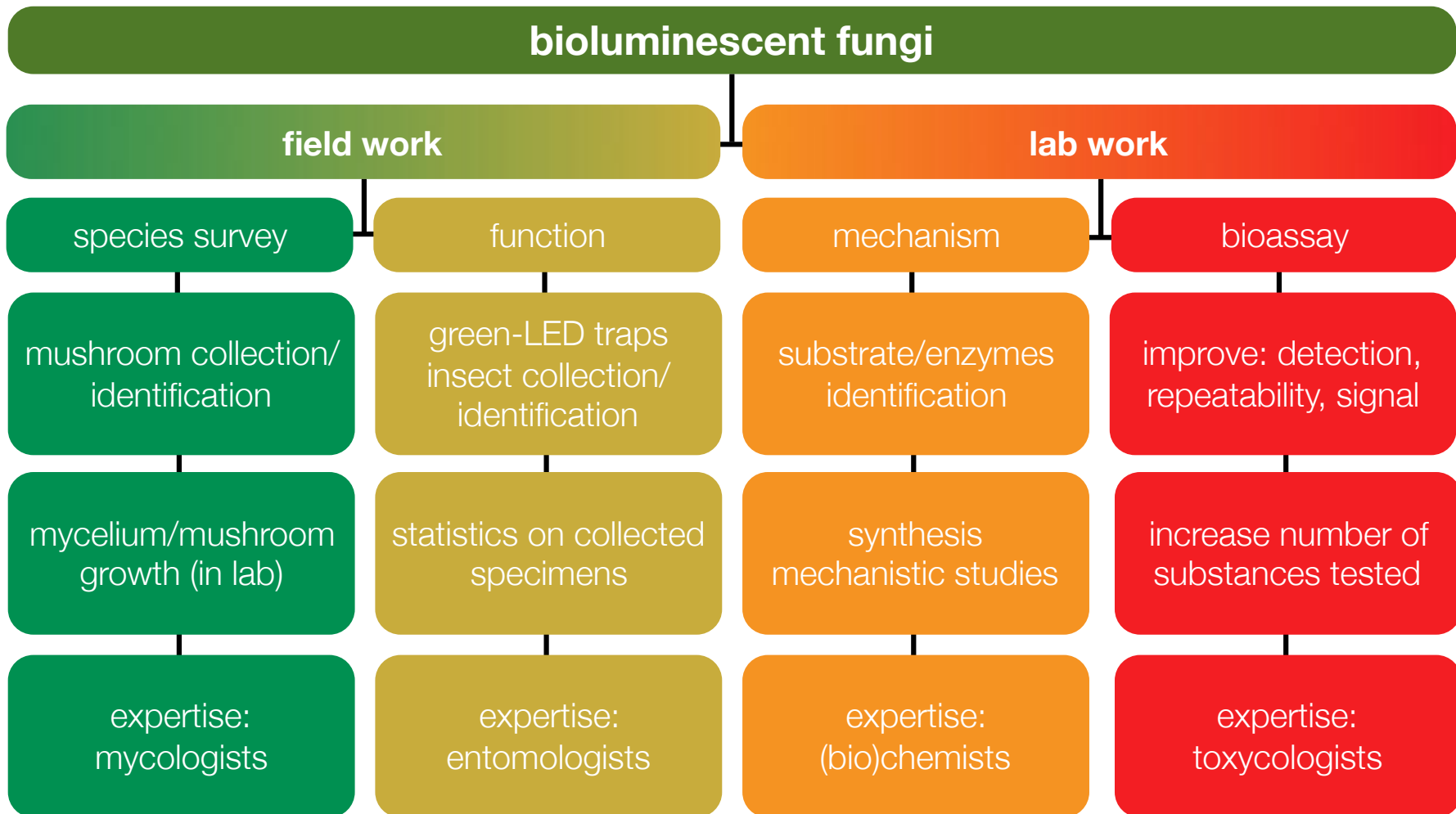




# Research | what have we been doing?



# Media | fungal bioluminescence



# Media | fungal bioluminescence



## Jungles

### Episode 3 of 6

Jungles provide the richest habitats on the planet - mysterious worlds of high drama where extraordinary animals attempt to survive in the most competitive place on earth. Flooded forests are home to caiman-hunting jaguars and strange dolphins that swim amongst the tree tops, while in the dense underworld, ninja frogs fight off wasps and flying dragons soar between trees. Acrobatic indri leap through the forests of Madagascar, while the jungle night conceals strange fungi and glow-in-the-dark creatures never filmed before.

# Overview | organization of this presentation

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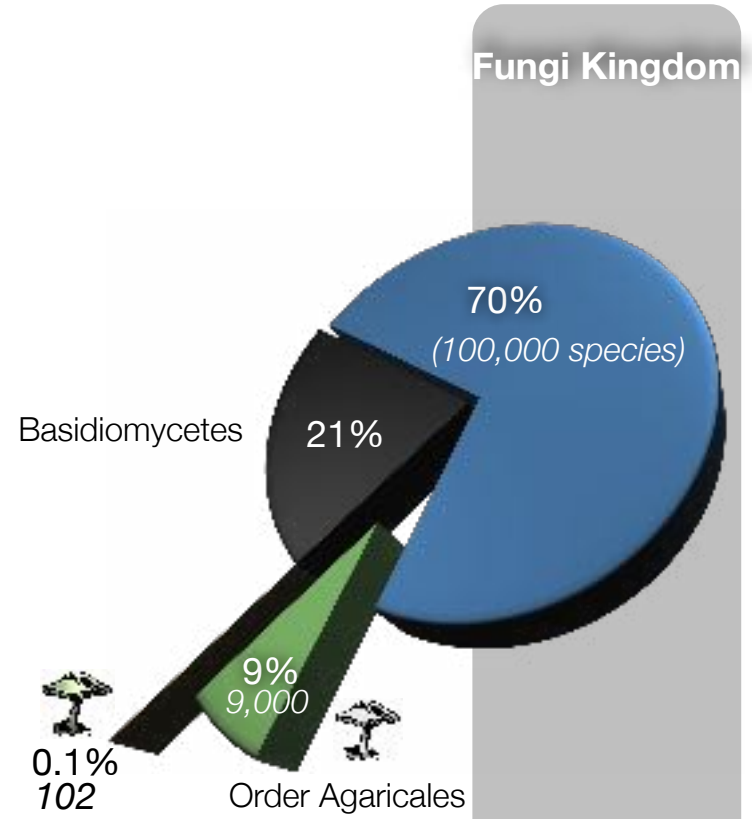
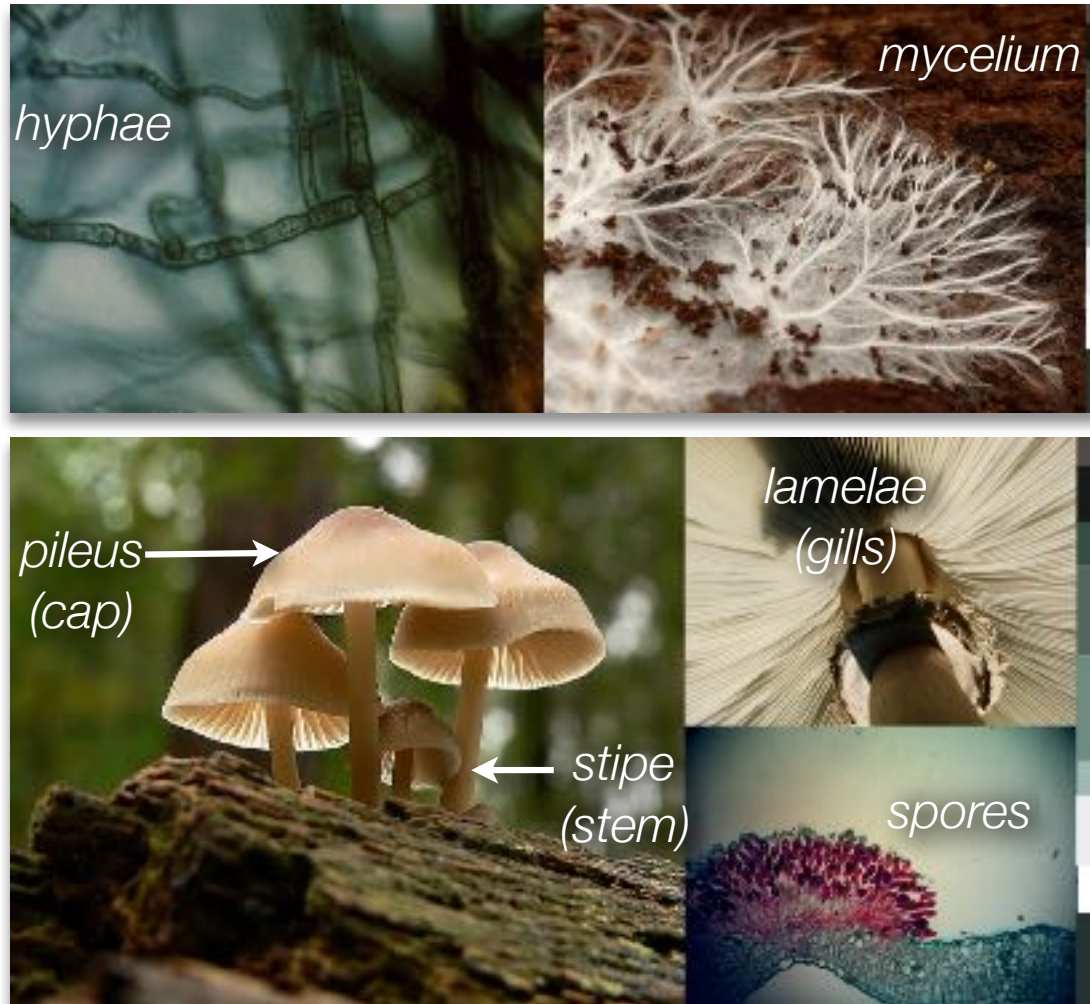
1. Introduction

2. Field work and species survey

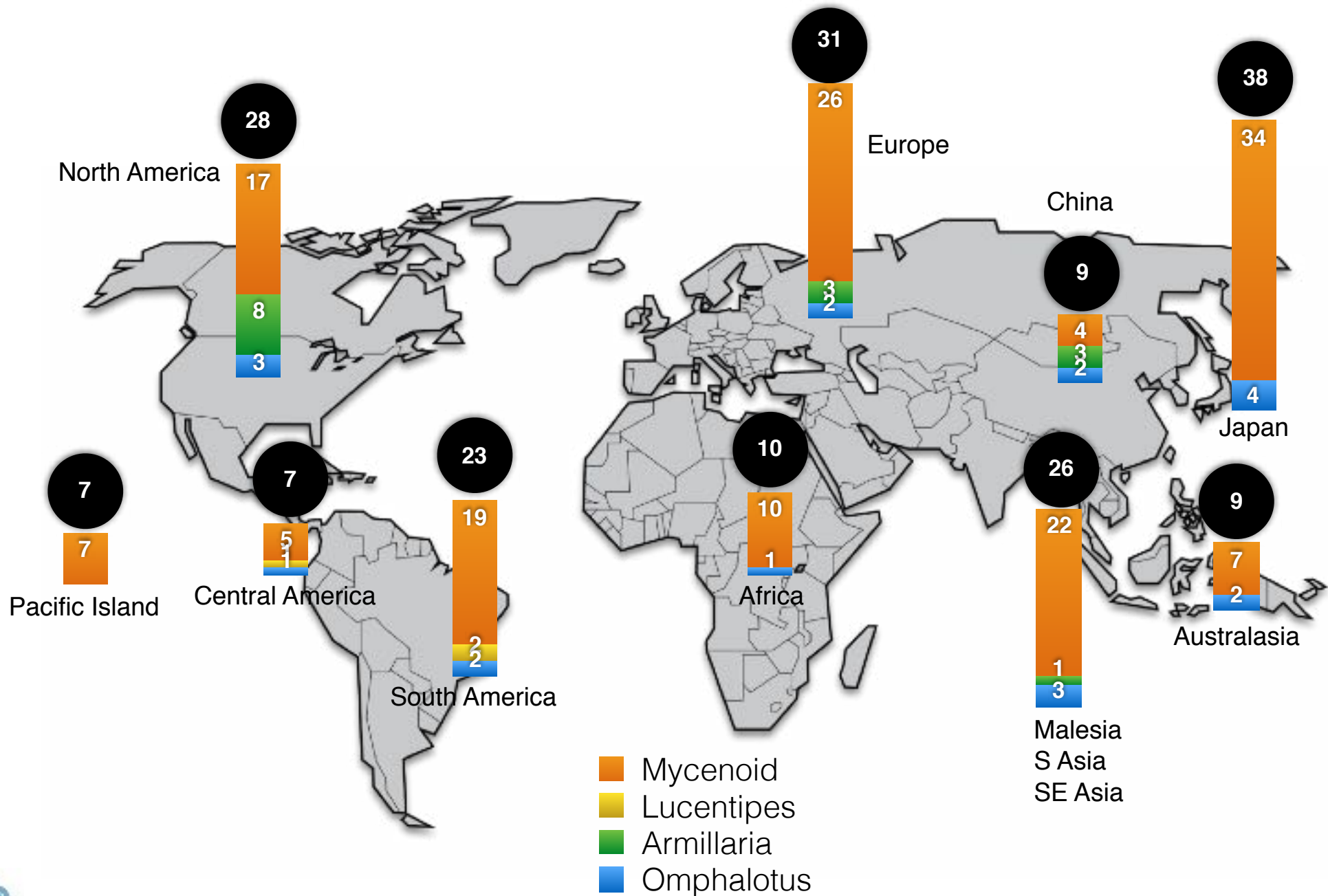
3. Mechanism of light emission

4. Biological function of bioluminescence

# Morphology and number of species



# Bioluminescent fungi | distribution



# Bioluminescence | basic principles

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Bi•o•lu•mi•nes•cence |,bīō,lōōmə'nesəns| (BL) the biochemical emission of visible light by living organisms such as fungi, fireflies and deep-sea fishes.

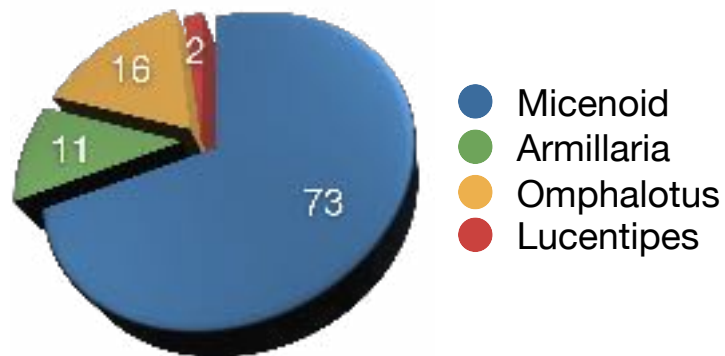




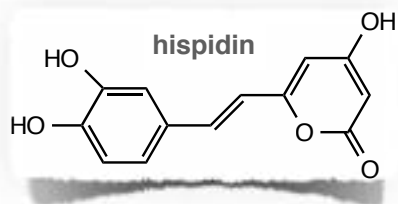
# Fungi collection

**102** species of bioluminescent fungi currently described in **4** distinct evolutive lineages: Omphalotus, Armillaria, Lucentipes e Micenoid

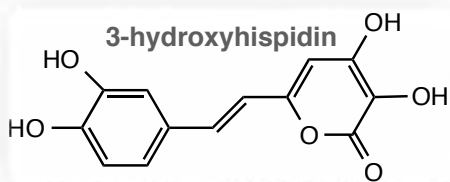
15 out of 102 species (~15%) were described by our group since 2001



# How do fungi emit light? | overall mechanism



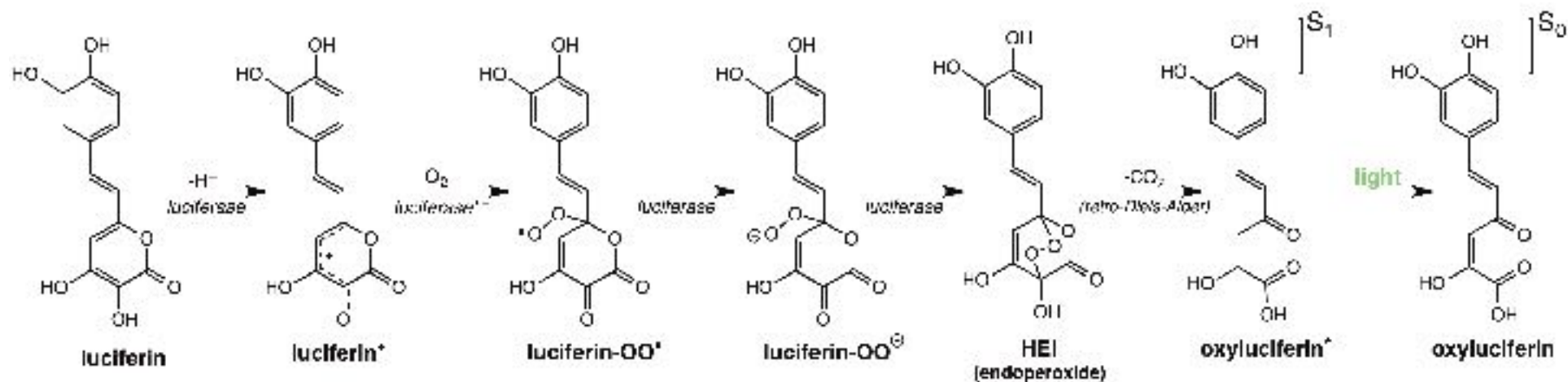
- soluble protein
- cofactor: NADH or NADPH
- MW = 35 kDa



- membrane proteina

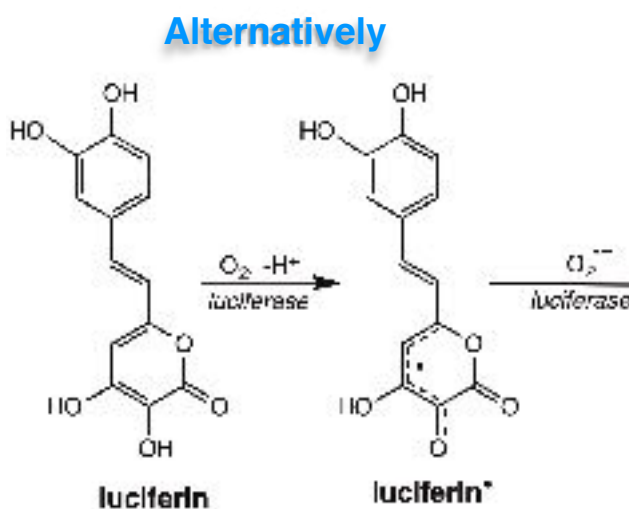
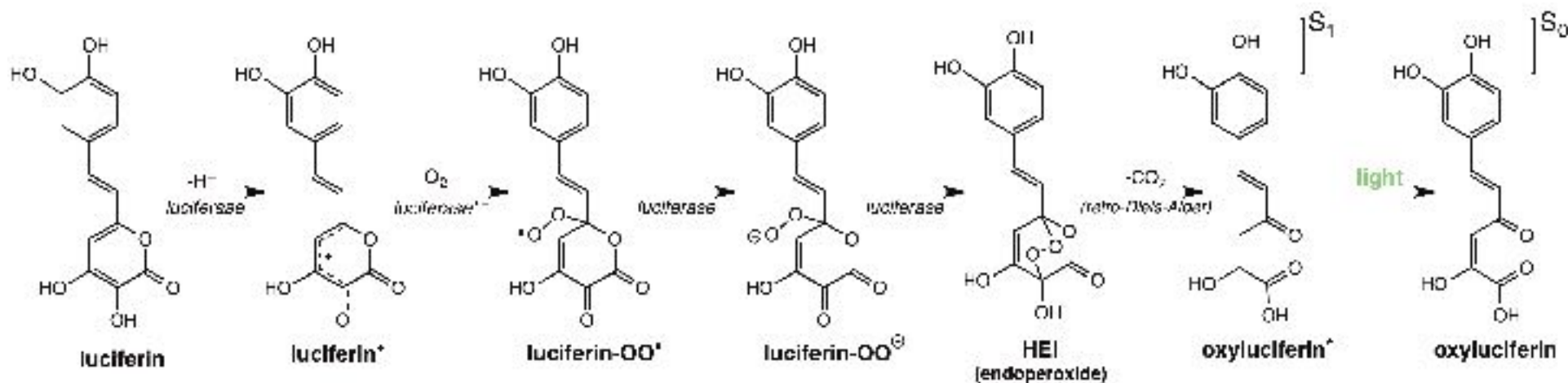
# How do fungi emit light? | mechanistic proposal

ScienceAdvances MAAS



# How do fungi emit light? | mechanistic proposal

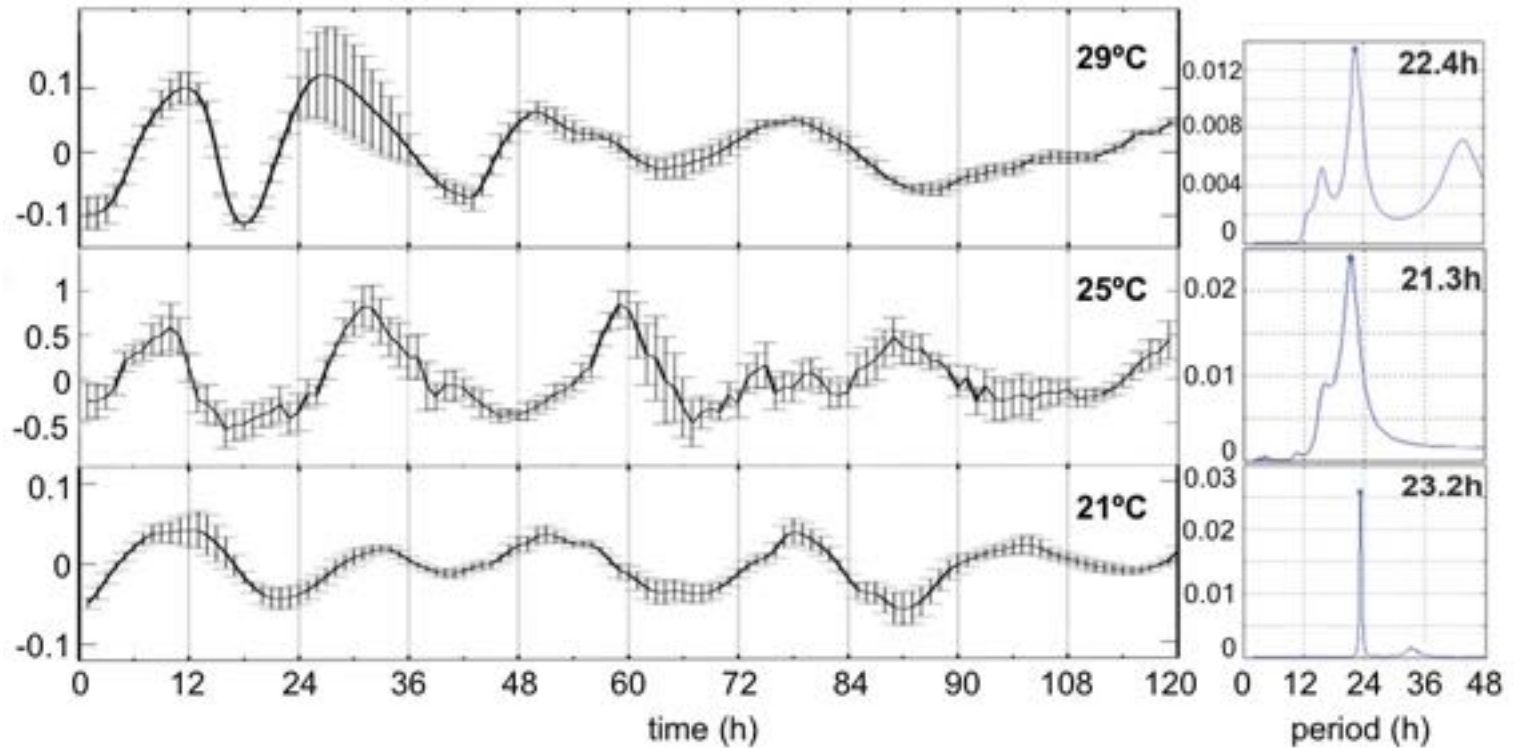
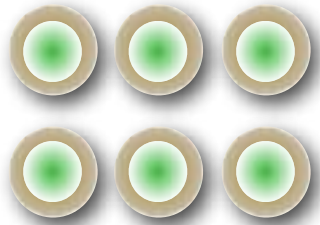
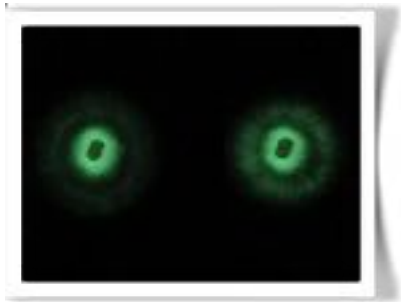
ScienceAdvances MAAS



**Highlights**

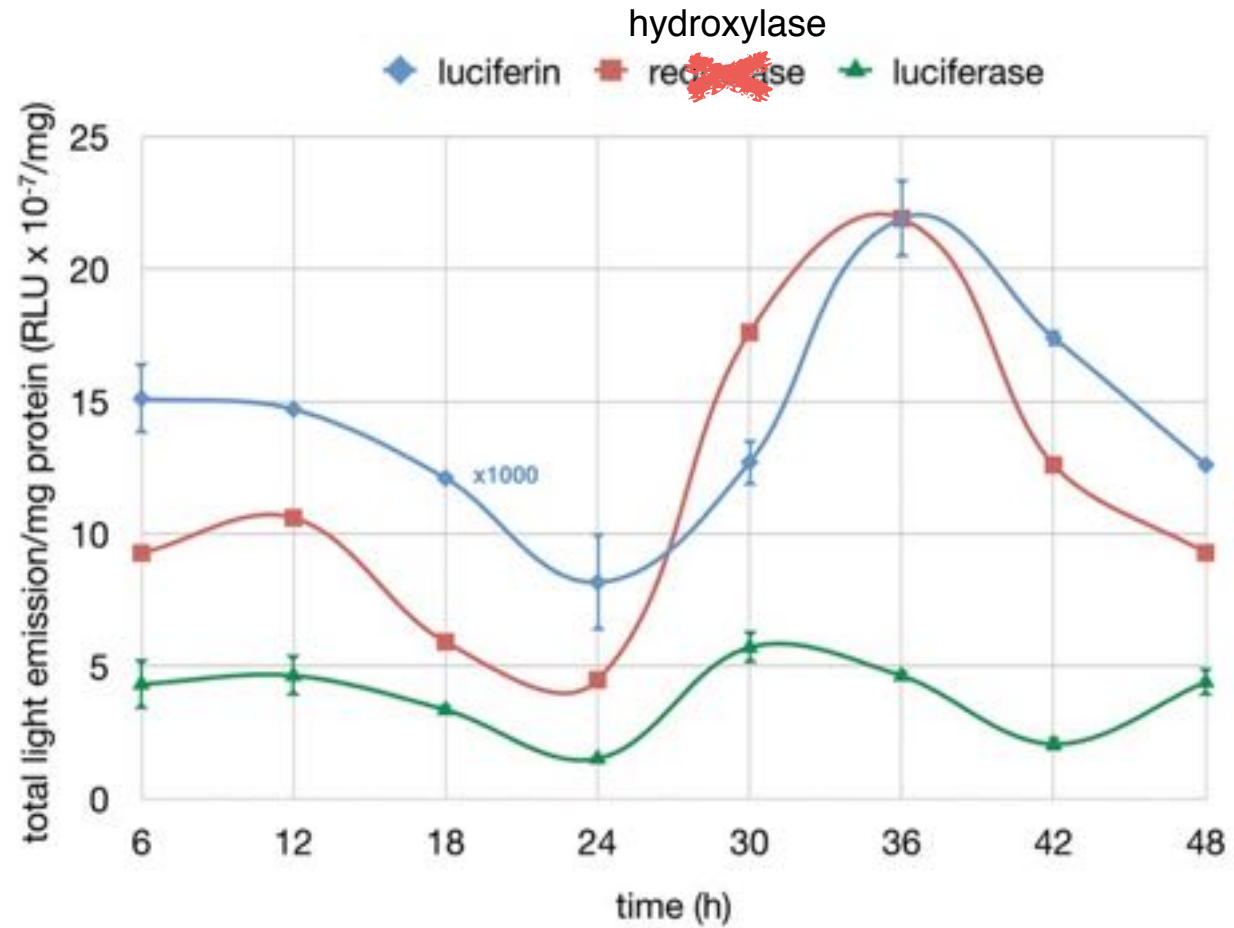
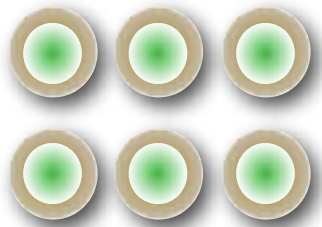
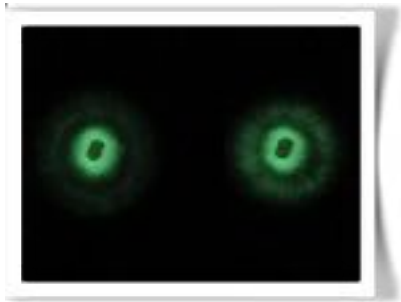
- \* fungal luciferase is a promiscuous enzyme
- \* it is possible to modulate color with substrate
- \* first bioluminescent system with endoperoxide
- \* luciferin is present in plants, like orchids!

# Why do they emit light? | rhythm



- a 24h-rhythm is called circadian
- circadian rhythm keeps constant with temperature

# Why do they emit light? | rhythm



- luciferin concentration and expression/activity of enzymes also follow a circadian rhythm

# Why do they emit light? | hypotheses



## Probable

- \* to attract fungivores for spore dispersal
- \* to attract predators of fungivores
- \* to repel photophobic insects
- \* as warning signal

Sivinski. *Psyche* **88**, 383 (1981)



## Improbable

- \* ambience illumination
- \* heating light
- \* aircraft taxing

Pixar's *A Bug's Life*® (1998)

# Why do they emit light? | hypotheses



Coconut Forest



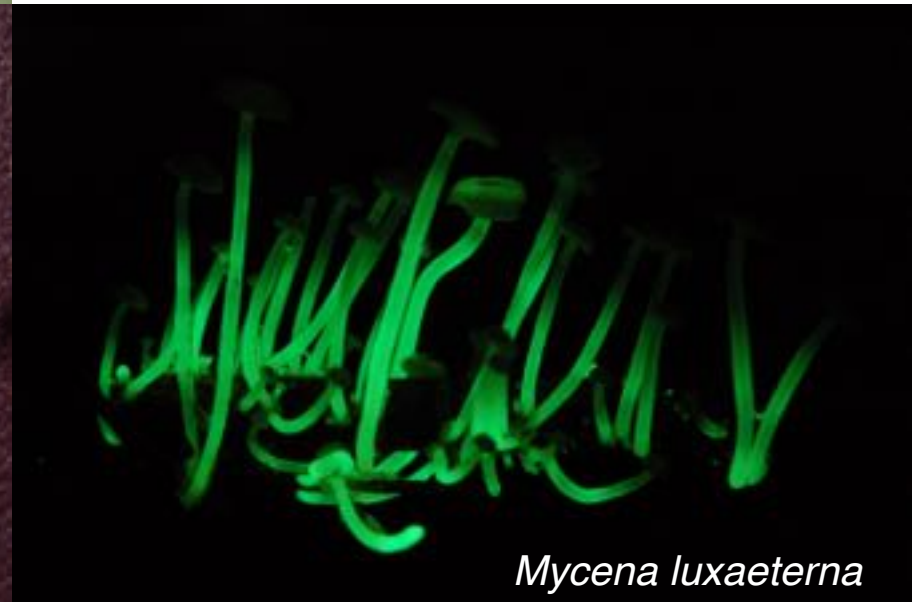
*Neonothopanus gardneri*



# Why do they emit light? | hypotheses

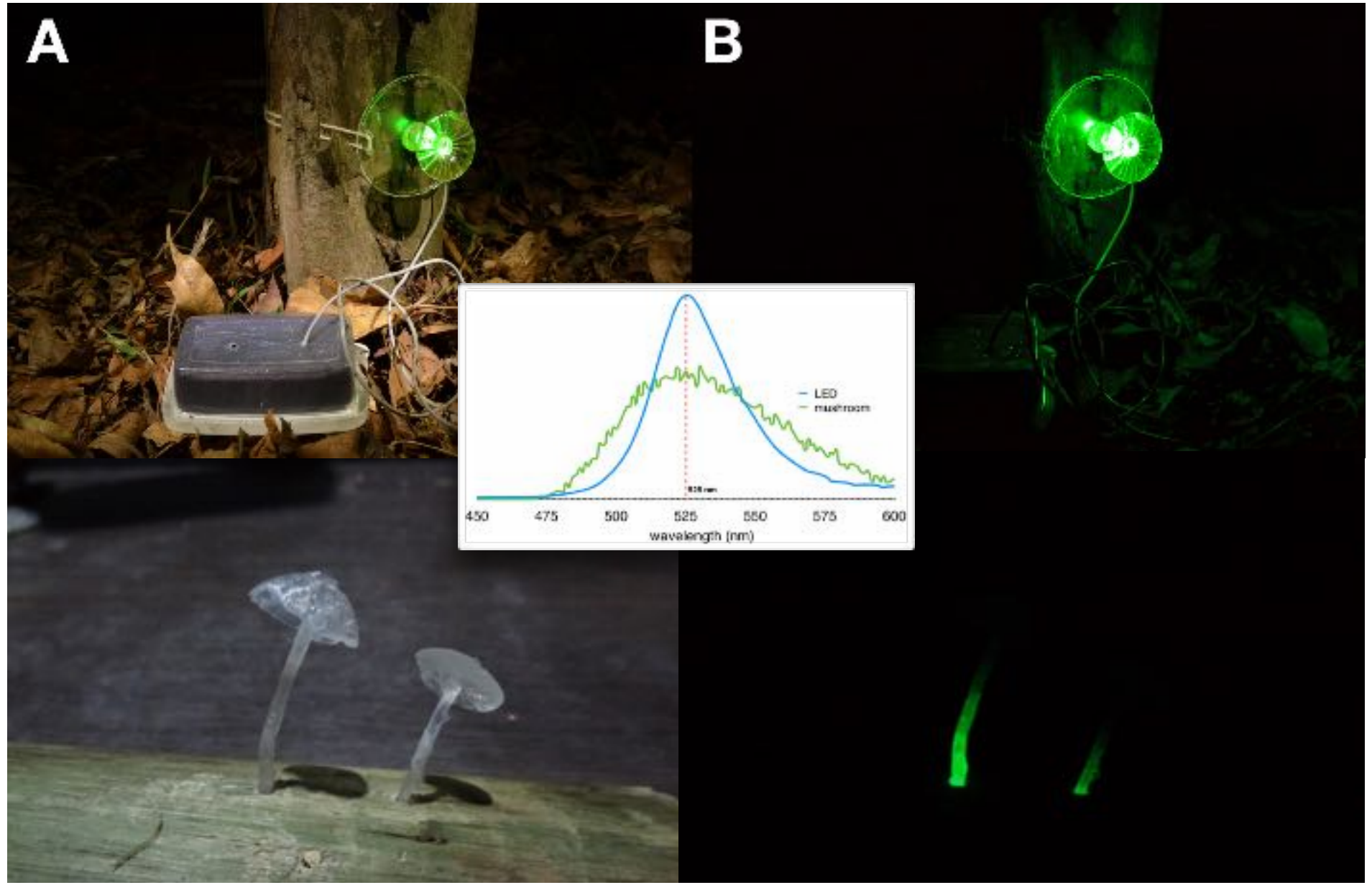


Atlantic Rainforest



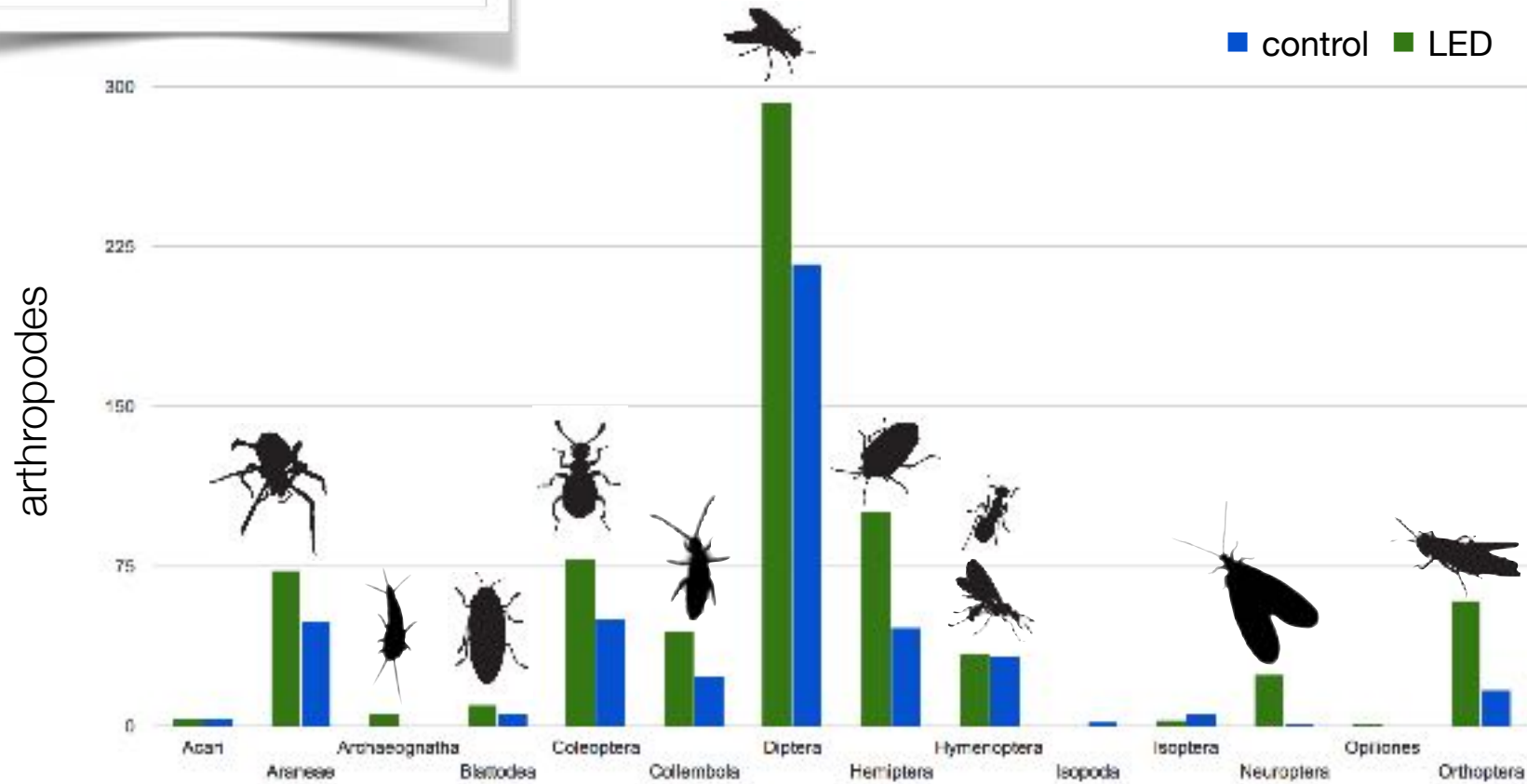
*Mycena luxaeterna*

# Why do they emit light? | hypotheses



# Why do they emit light? | hypotheses

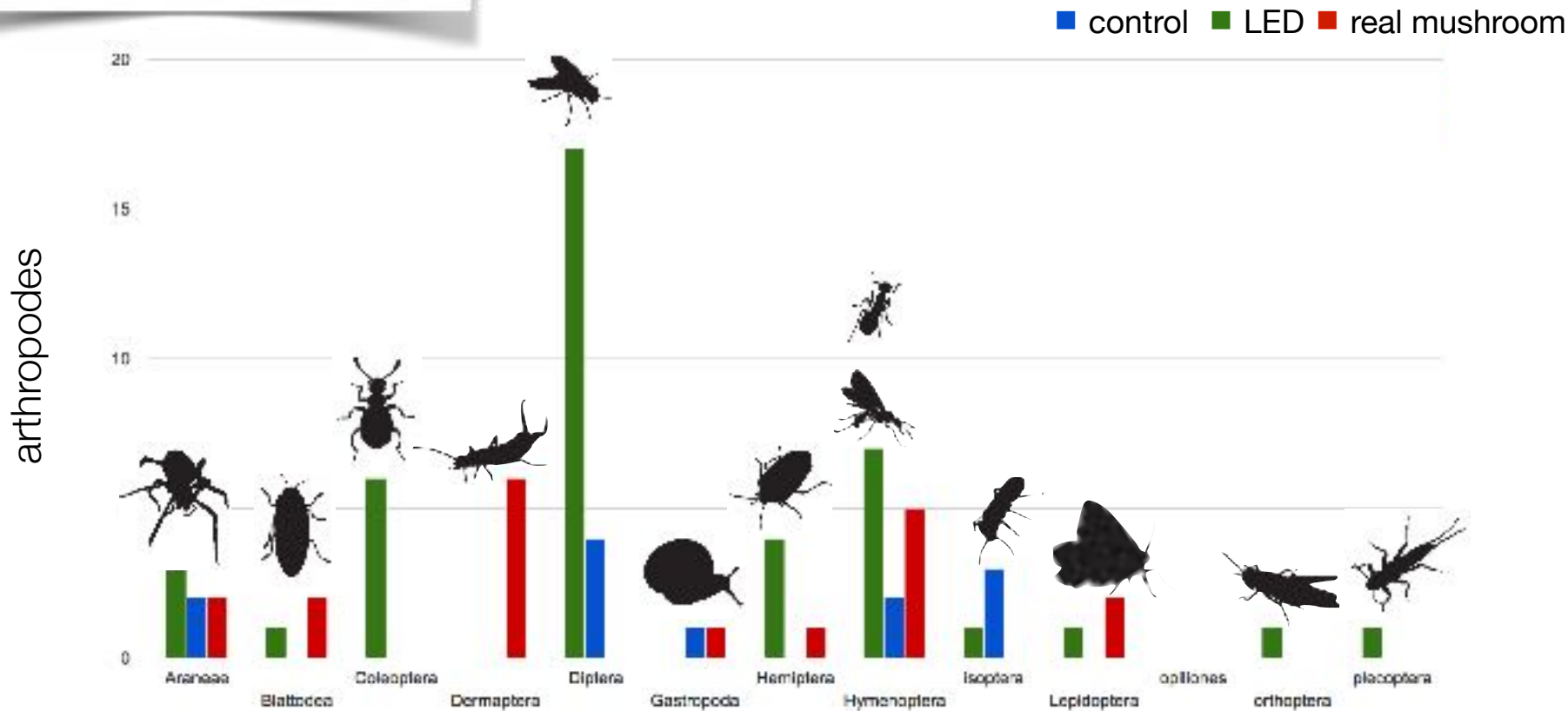
## Atlantic Rainforest



- \* higher biodiversity than Babaçu Forest
- \* more frequent on LED traps: flies, aphids, beetles, spiders and crickets
- \* large insects such as cockroaches and spiders cannot be captured

# Why do they emit light? | hypotheses

## Coconut Forest

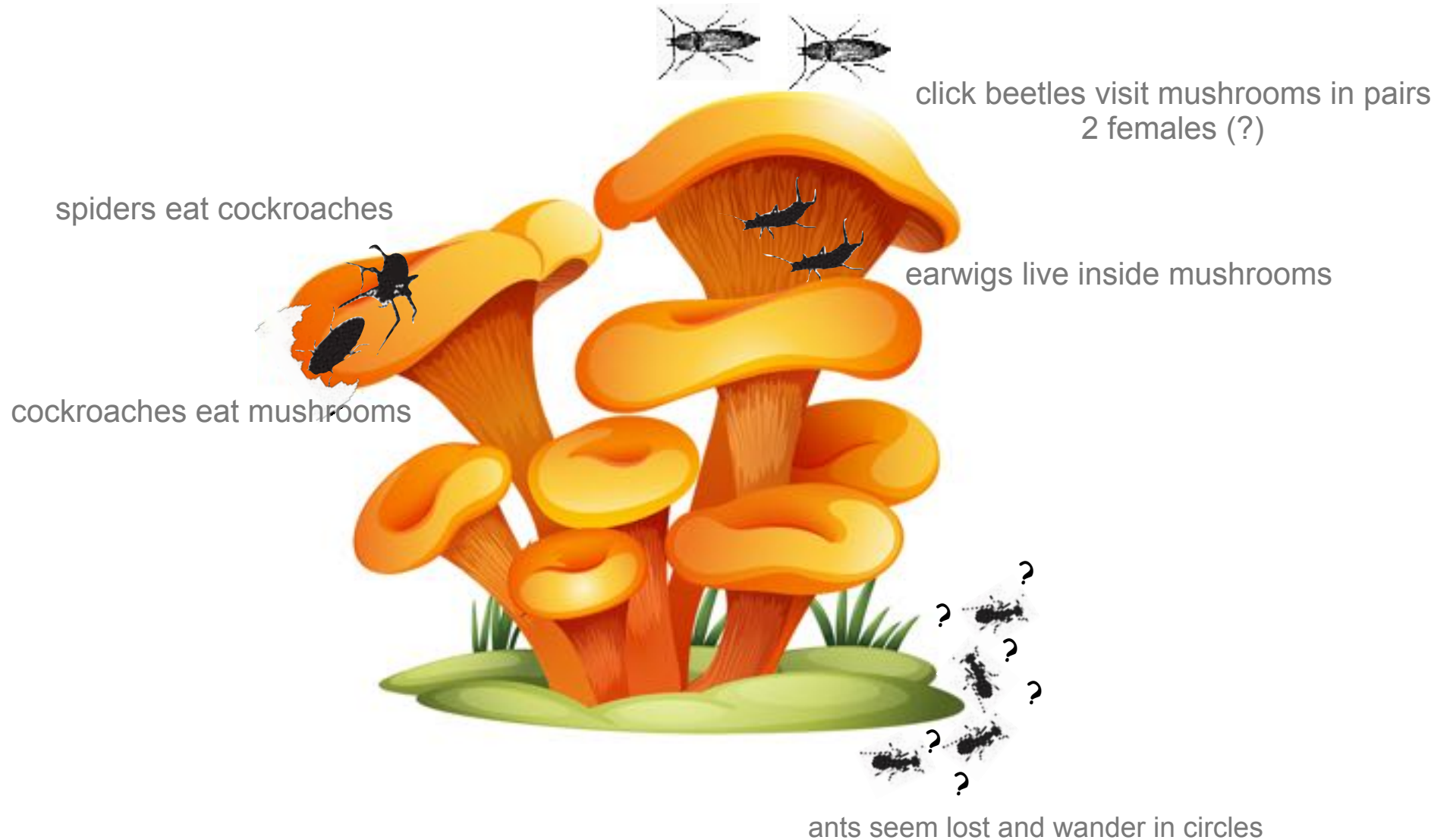


- \* lower biodiversity than Atlantic Rainforest
- \* more frequent on LED traps: flies, ants, beetles and aphids
- \* large insects such as cockroaches and spiders cannot be captured

# Why do they emit light? | hypotheses



# Why do they emit light? | IR videos | Coconut Forest



# Collaborators

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SFSU/USA  
Mycologist

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IFSP/BRA  
Mycologist

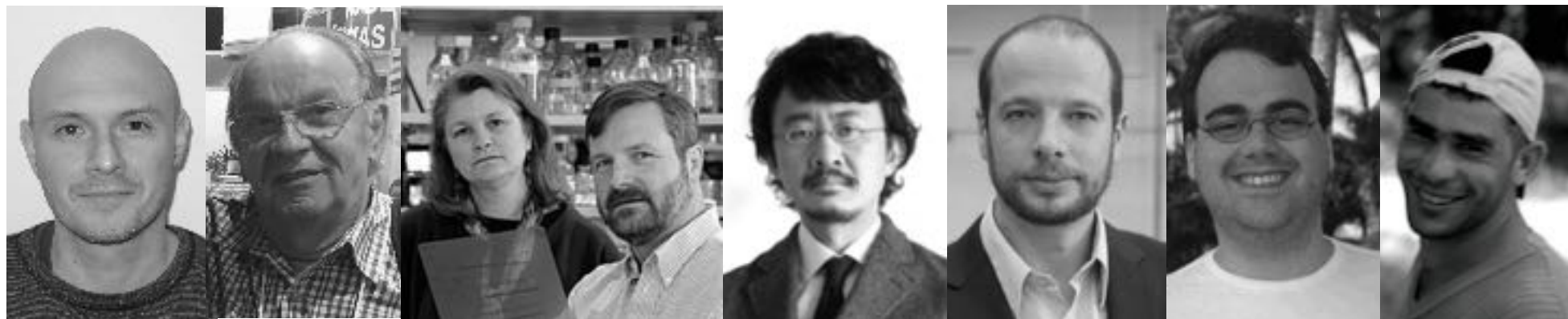
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Forest Guide



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