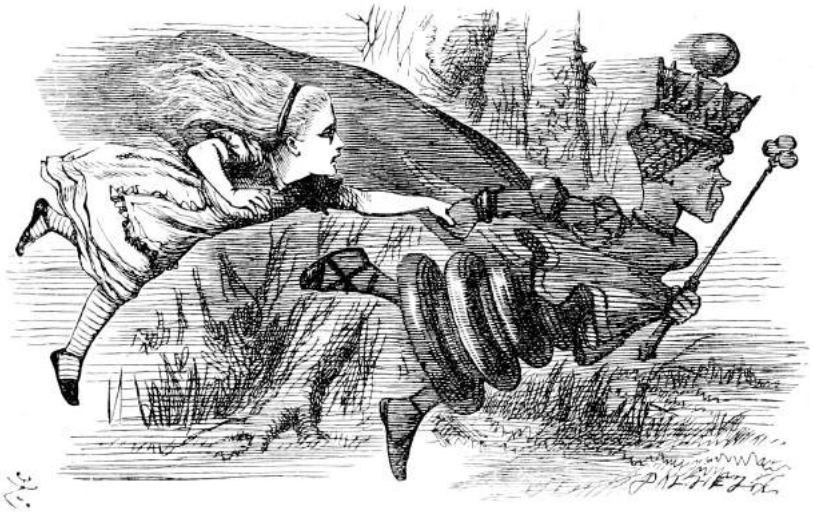
1

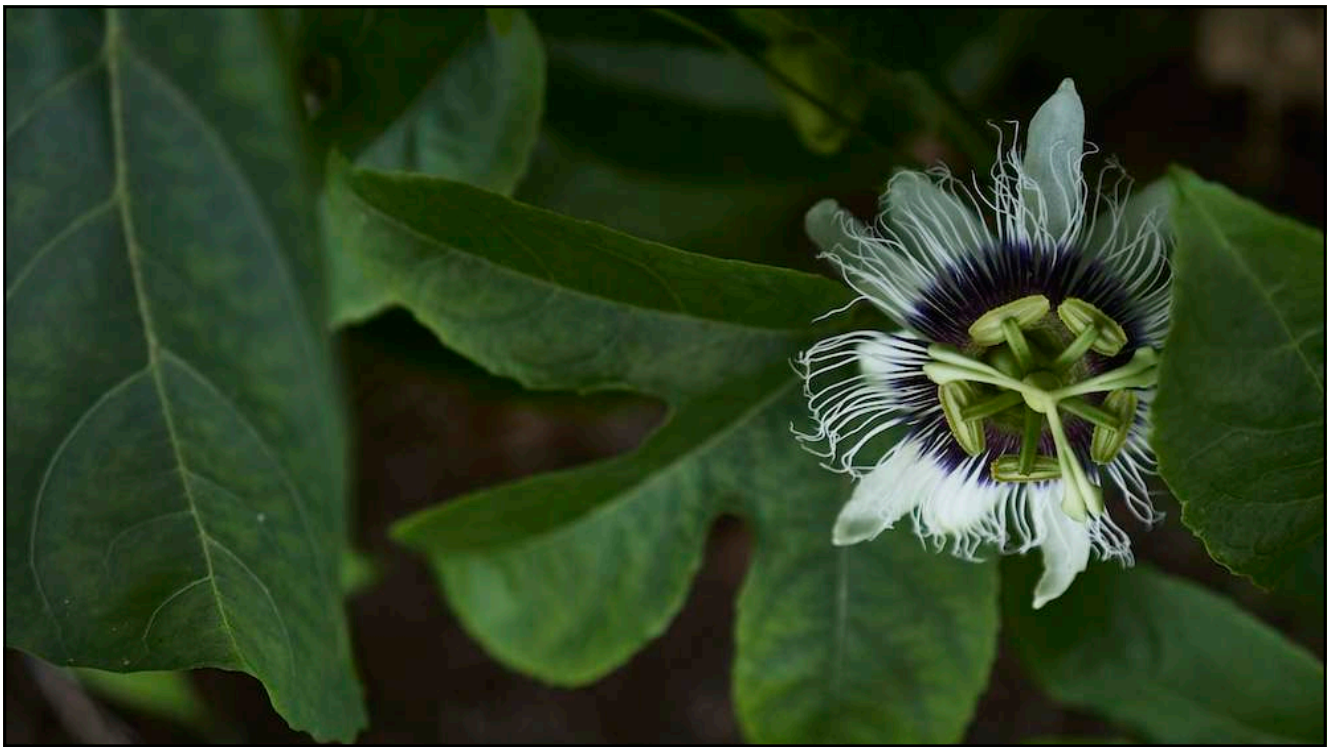
”It takes all the running you can do, to keep in the same place.”



The Red Queen
Alice's Adventures in Wonderland

2

3



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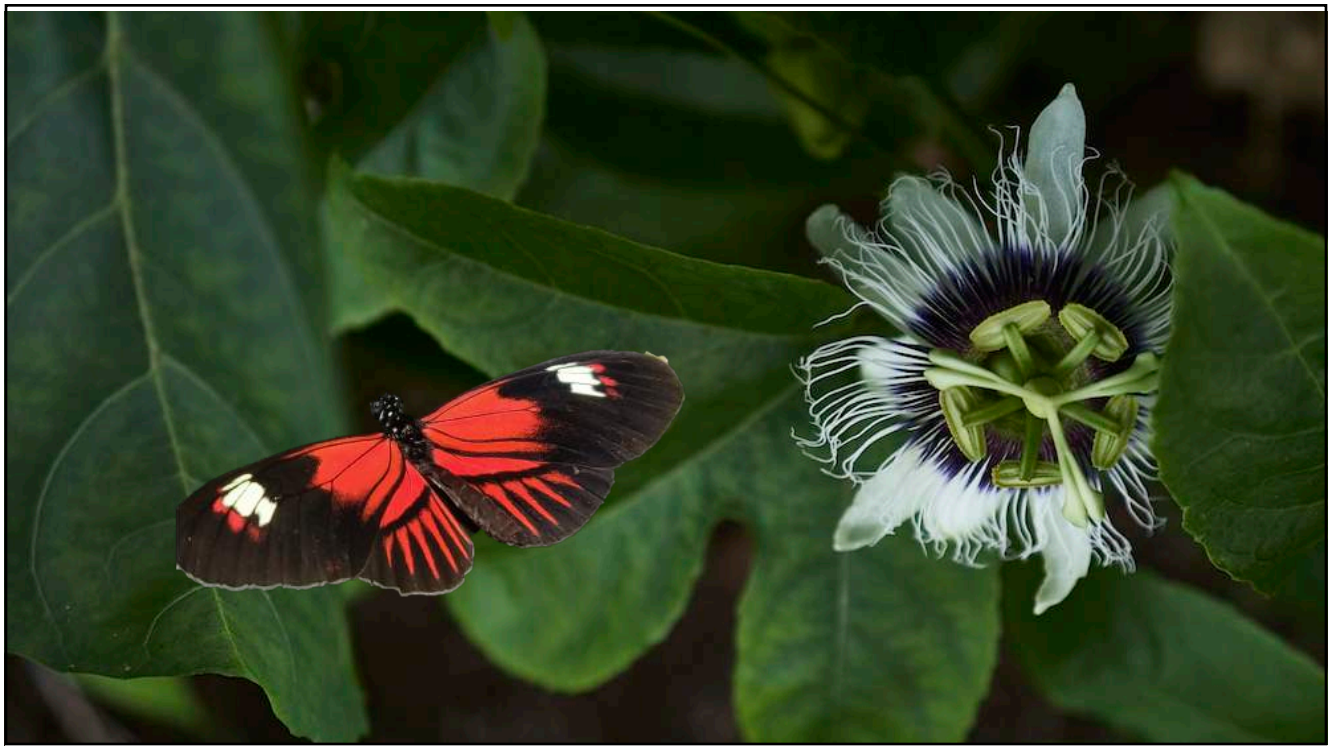

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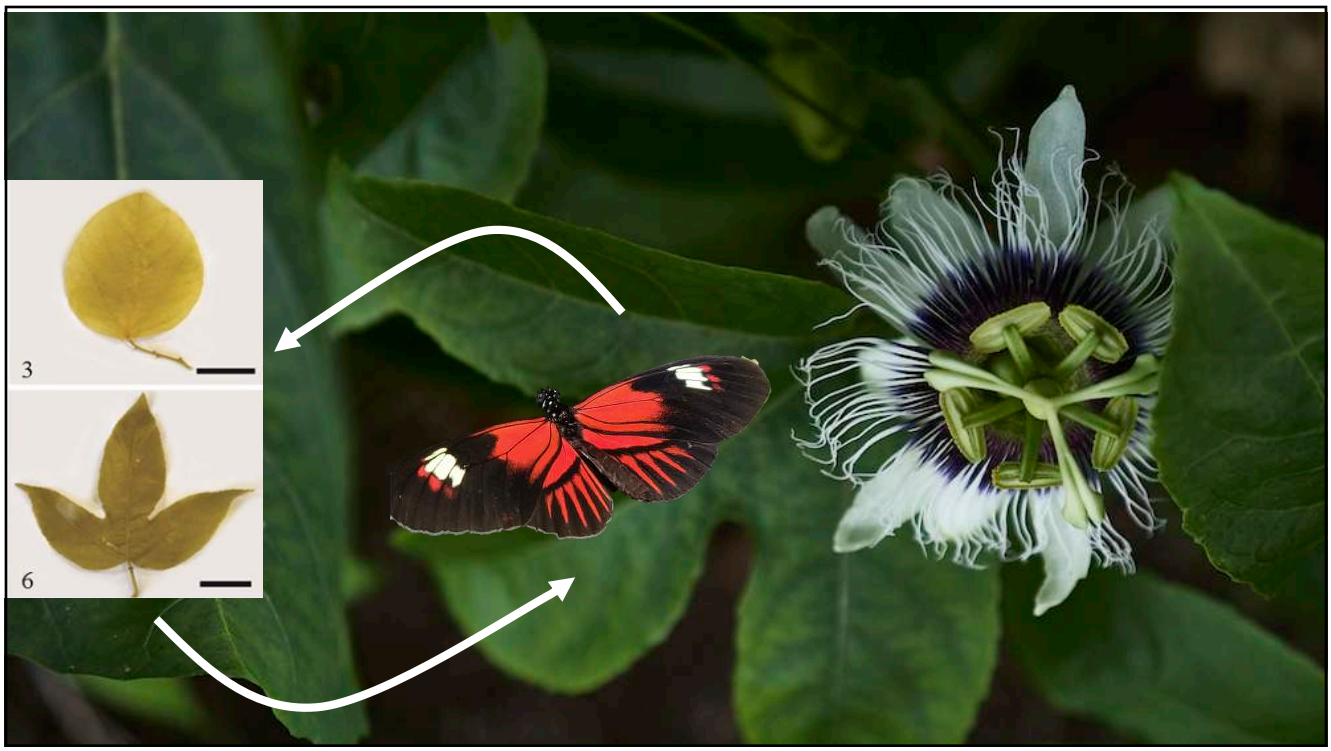

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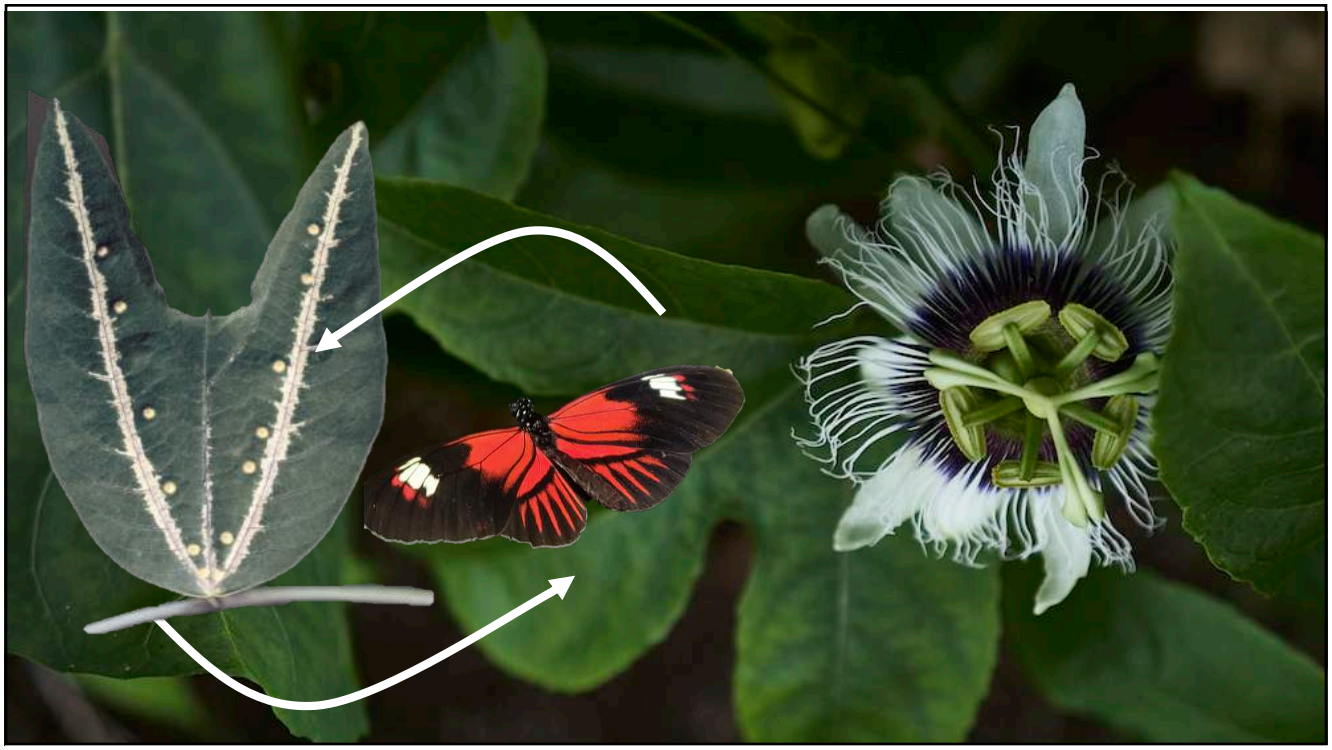

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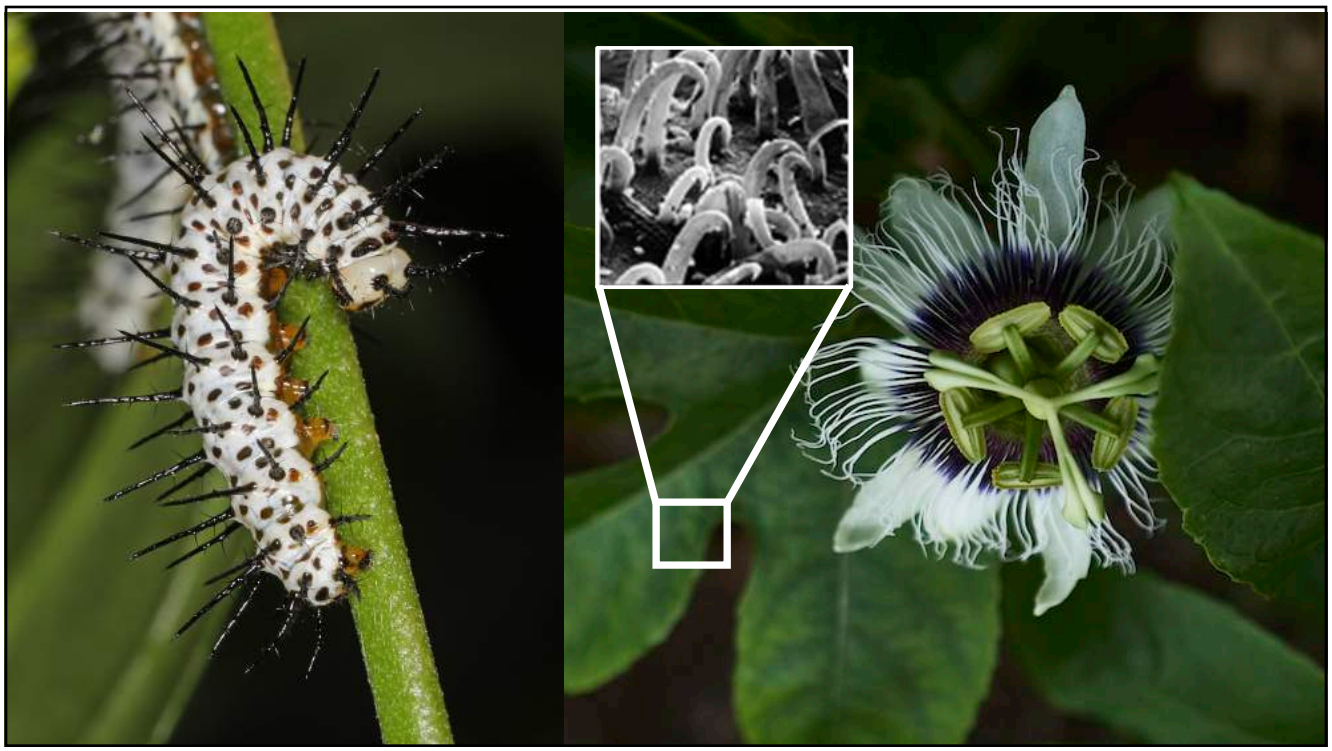

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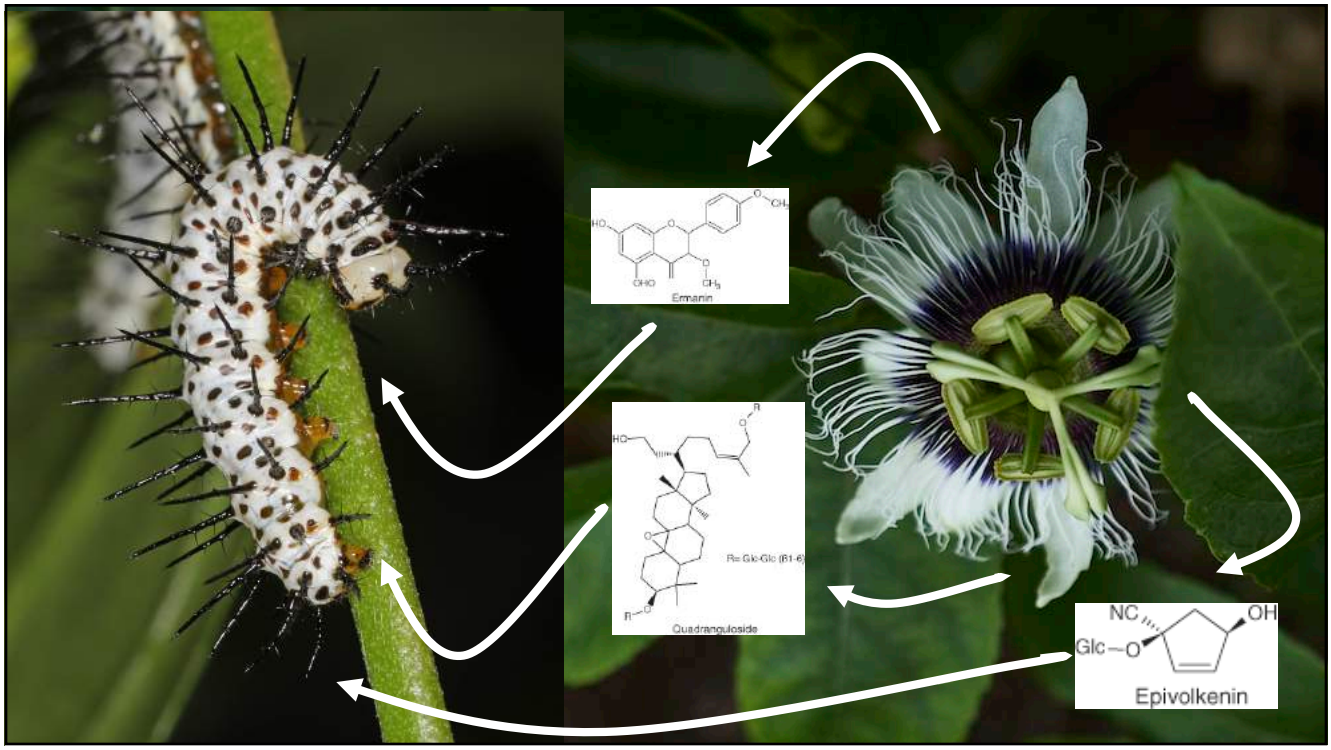
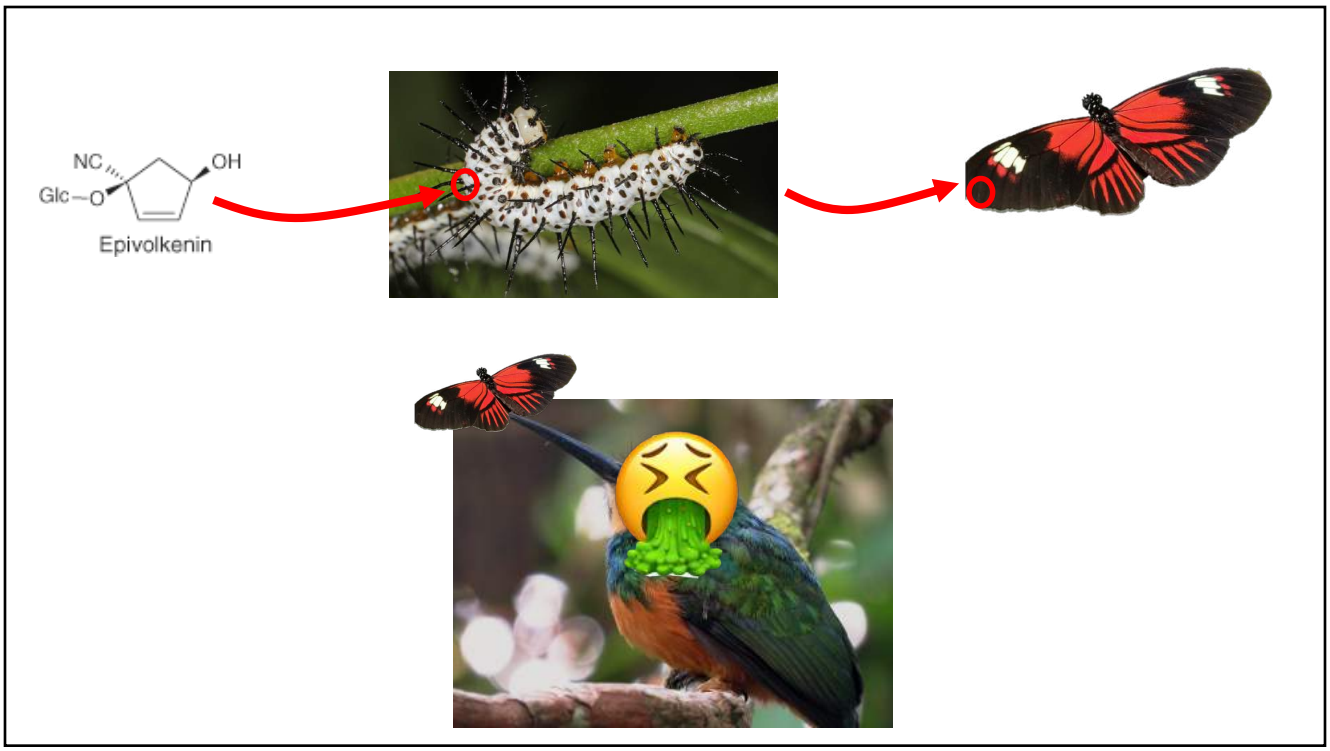

Ermanin
Quadrangulosside
NC
OH
Glc—O
Epivolkenin

9


NC
OH
Glc—O
Epivolkenin

10

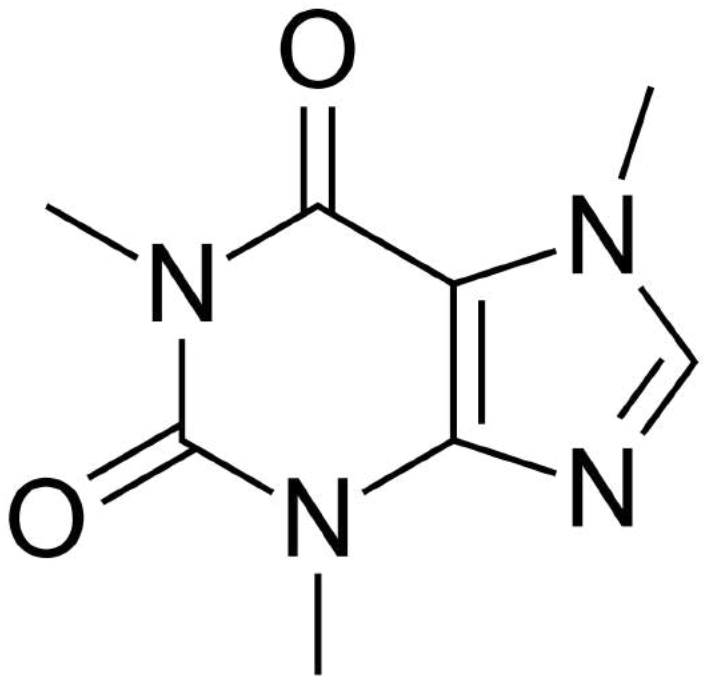
11

Coevolution

Interactions between Species Lead to Diversification

12

Chemical Defenses



13

Tannins: deter herbivores with bitter taste, bind to proteins/render them indigestible

14

Nitrogen-containing compounds synthesized from amino acids

Alkaloids (heterocyclic rings with nitrogen)

Coca leaves

15

Cyanogenic compounds

Manihot esculenta

16

Physical Defenses

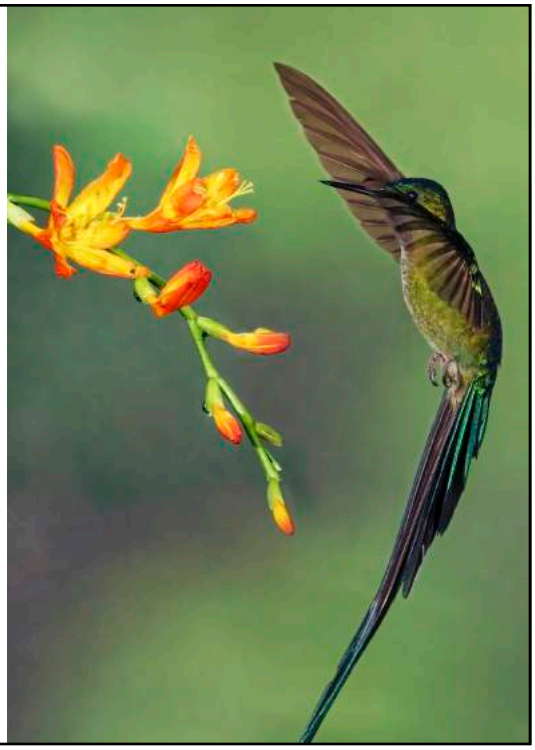
17

Biotic Defenses

18

Coevolution

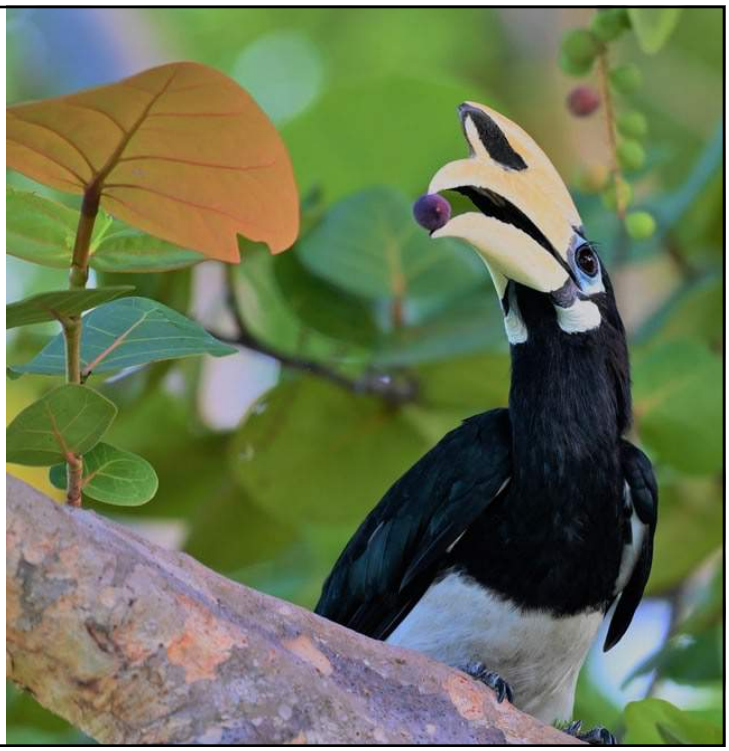
Interactions between Species Lead to Diversification



19

Coevolution

Interactions between Species Lead to Diversification



20

21

22

Wind Pollination

1-2% of plant species

Cecropiaceae (Moraceae), *Cecropia obtusifolia*

Why might this be a tough strategy in the tropics?

23

Most (tropical) plants are pollinated by **animals**!

Bats

New World - Microchiroptera
>500 species of plants in >27 families

Old World – Megachiroptera

Adansonia digitata **(Bombacaceae)**

24

Non-flying mammals

kinkajou (*Potos flavus*)

Ravenala madagascariensis

25

Birds

Neotropics

Trochilidae - ~320 species, N & S America

Paleotropics

Nectariniidae (Sunbirds) 123 species, Africa, SE Asia, N Australia

Meliphagidae (Honeyeaters) ~180 species, Australia, New Zealand, se Pacific, Hawaii

26

The vast majority: Insects

Bees: **most important** (LTRF: ~50% of trees & lianas,

Moths: Sphingidae (sphinx moths), Noctuidae (small moths)

27

The vast majority: Insects

Wasps (Figs)

Beetles (Especially important to aroids, cyclanths, and palms)

butterflies

Thrips, Flies, other stuff

28

Can often tell what visits a plant by flora characteristics: ***Pollination Syndromes***

Animal	*Day/Night*	*Color*	*Odor*	*Shape*
Beetles	Both	Dull/Wht	Frt/Aminoid	Flat, bowl, rad. sym
Flies	Both	Brn/Grn	Fetid	Flat or deep
Bees	Both	Variable	Sweet	Mod. deep,rad sym.
Hawkmoths	Night	White	Sweet	Deep, often w/ Spur
Butterflies	Both	Var/pink	Sweet	Deep or w/ Spur
Bats	Night	Wht/grn	Musty	Fleshy, Brush or Tube
Birds	Day	Vivid/Red	None	Tube

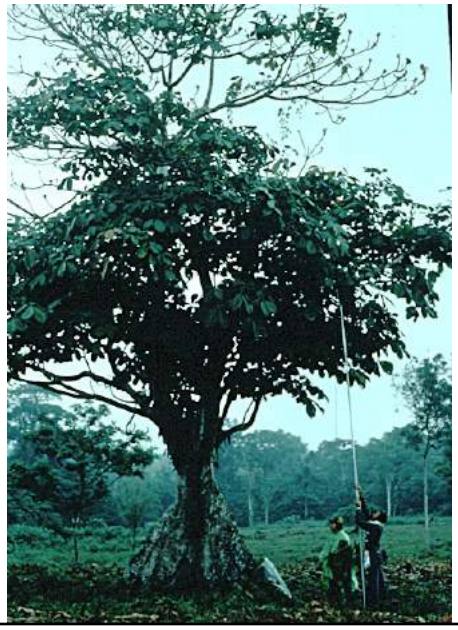
These are generalizations – lots of exceptions!!!!

29

Parkia pendula, Fabaceae

Parkia panurensis

30



Bombacopsis patinoi
Bombacaceae

31

32

Amorphophallus johnsonii
beetle/fly pollinated aeroid

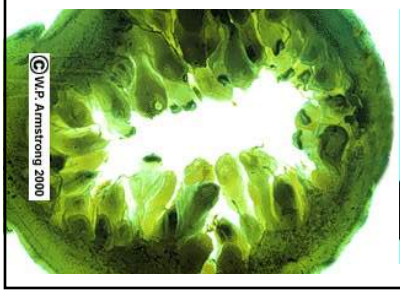
Lamarouxia hyssophifolia
(Hummingbird)

Magnolia grandiflora
(Beetle)

33

Why do animals bother?

34

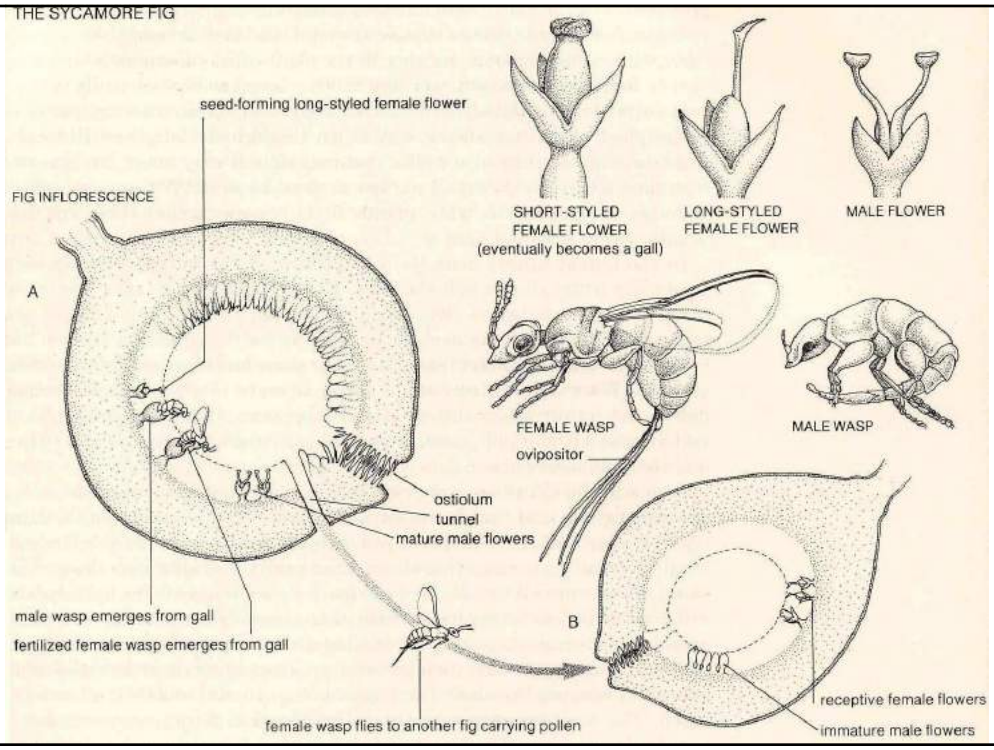


Figs and Fig Wasps
~1000 species of ***Ficus*** (Moraceae), each with own wasp pollinator (e.g., *Pleistodontes imperialis* for *Ficus rubiginosa* in Australia).

fig "fruit" is a synconium: the inside is full of male and female flowers.

Male and female fig wasps: male has a greatly reduced body & two primary purposes:
(1) Inseminating female
(2) Drilling exit tunnels through syconium wall.

35



36

Fig Paste	Insects (AOAC 964.23)	Contains 13 or more insect heads per 100 grams of fig paste in each of 2 or more subsamples
	DEFECT SOURCE: *Pre-harvest and/or post harvest and/or processing insect infestation* Significance: *Aesthetic*	

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How do plants attract pollinators?

- Colors

38

- Aromas

Anthurium formosum:
Euglossines attracted
to spearmint scent

39

Arum nigrum
(dung odor)

http://www.youtube.com/watch?v=4P8YhP5_oig&feature=related

40

- This Titan Arum can be 12 feet tall, and emits a strong smell of decay.
- The stench attracts insects, perhaps carrion beetles, for long distances to lay their eggs. They enter and transfer or receive pollen.
- Male and female flowers mature at separate times to avoid self pollination.

41

- Deception (pseudocopulation)

Bulbophyllum dayanum

Ophrys apifera

42

43