Class 2 – 26th March 2025, 1pm

LS1201

Introduction to Biology II

Part B - Evolution

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Touch me not!

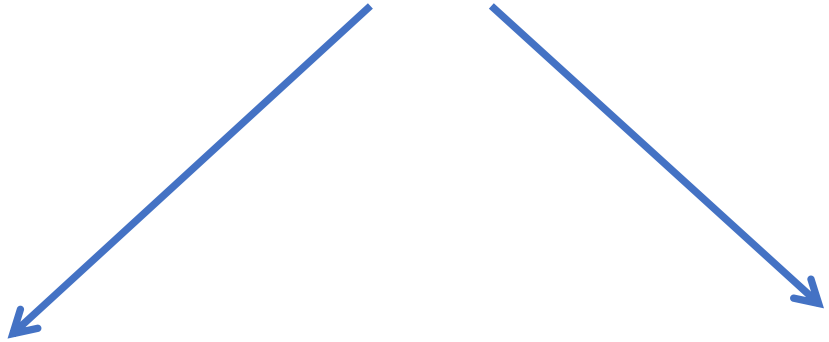
Mimosa pudica

Shy or Shrinking

Touch me not!

Botany

Proximate & Ultimate category of questions



Proximate

- How is it achieved?
- Mechanism

Ultimate

- Why does it occur?
- Advantages

Touch me not!

Mimosa pudica

Proximate

- How it works?
- Mechanism

Ultimate

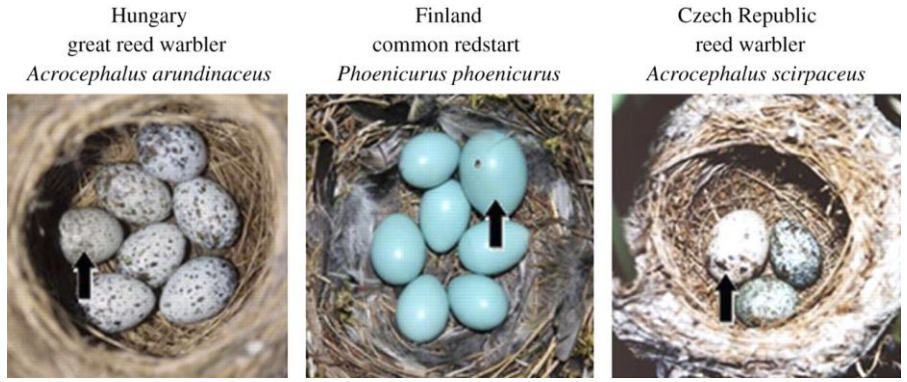
- Why it’s there?
- Advantages

Cuckoos and their hosts

Asking questions

- Examples of some questions from the class
  - Is the parental care enough for the cuckoo? (Proximate)
  - What if the host bird's egg hatch before the cuckoo's egg? (Proximate)
  - Why does the cuckoo eliminate other eggs? (Ultimate)
  - If all the eggs of host are thrown out by cuckoo, then how will the reed warblers increase their population? (Proximate)
  - Do you think what the cuckoo is doing, is right?
  - What evolutionary advantage does cuckoo gain by throwing out the host eggs? (Ultimate)
  - How did this behaviour develop? (Proximate)

Cuckoos and their hosts



Asking questions

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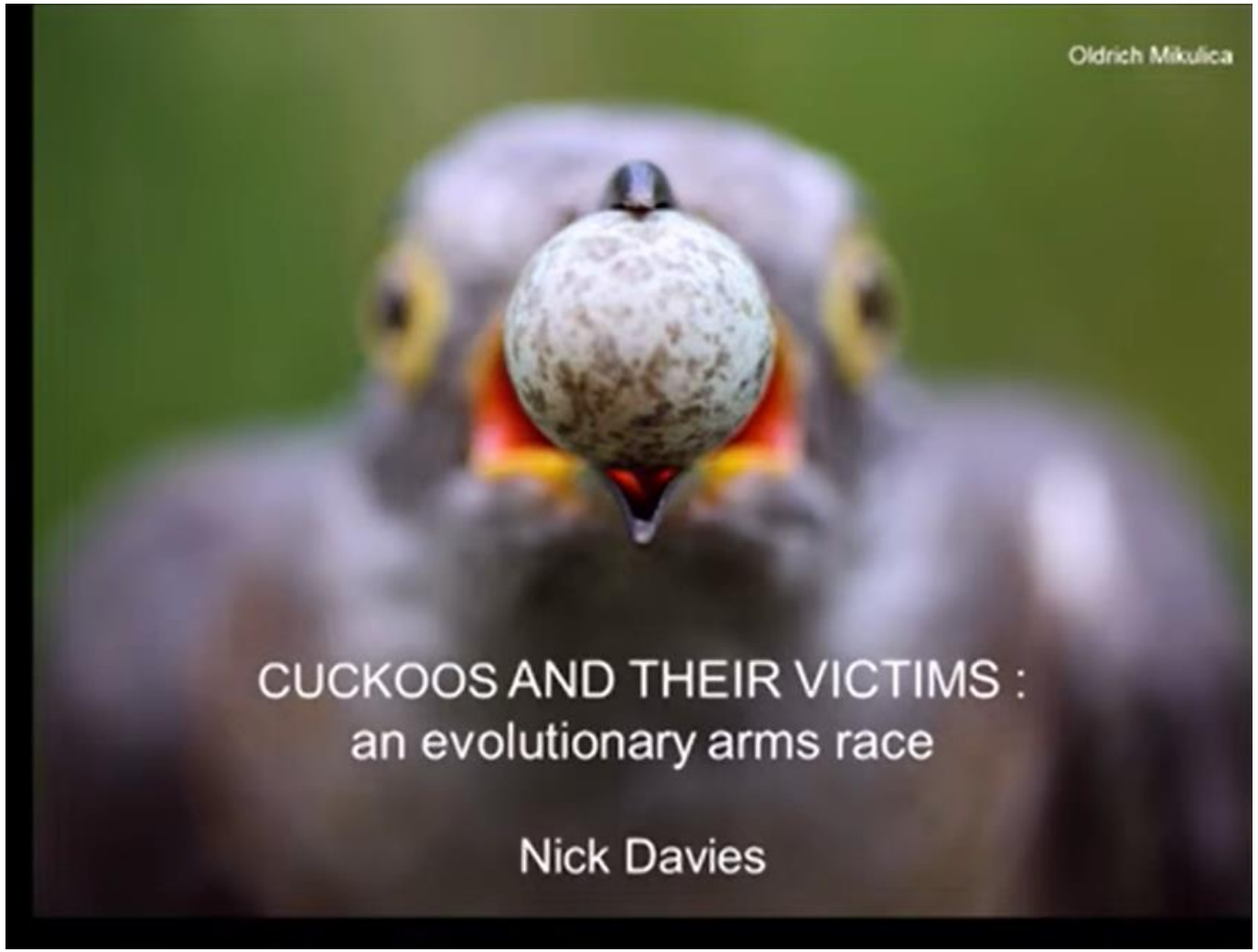
Cuckoos and their hosts



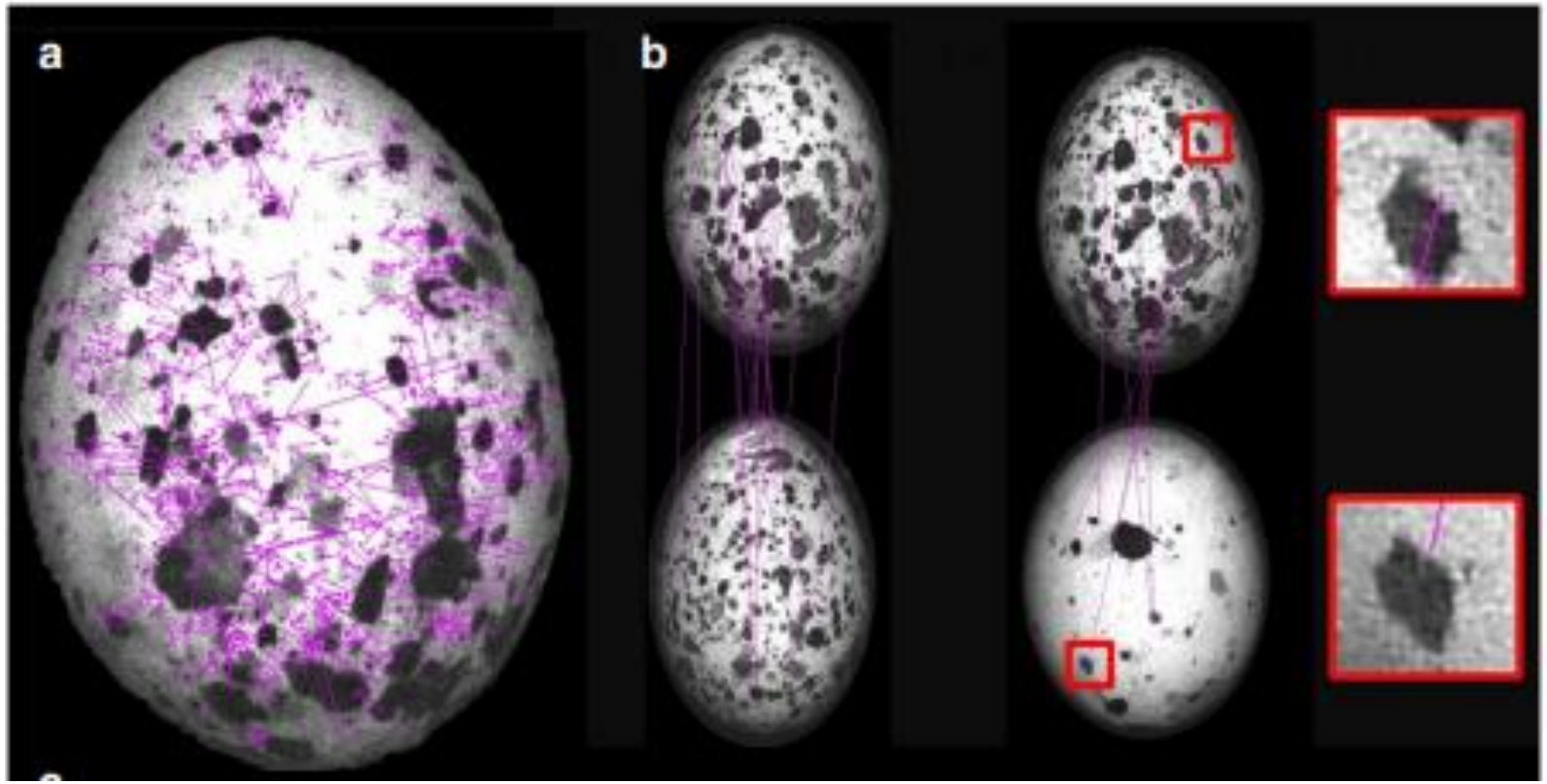
Female Cuckoo removing one egg from the host's nest while she lays her egg

Cuckoos and their hosts

In Africa
This host has developed unique signatures on their eggs and they are good in rejecting cuckoo eggs

Pattern recognition algorithm

Egg pattern recognition – using avian visual inputs
Advanced computer vision tools



Hosts subjected to the best cuckoo mimicry have evolved the most recognizable egg pattern signatures.

Stoddard et.al 2014
DOI: 10.1038/ncomms5117

Cuckoos and their hosts

- 40 million year ago.
- Only about 1% of bird species are brood parasite

Evolutionary Arms Race

Talk by Prof. Nick Davies

https://www.youtube.com/watch?v=n0O6S4hDDfE

Why questions

Why do some organisms parasitize other organisms?

Why do we have such a variety of organisms?

Why do individuals belonging to the same species not look completely alike?

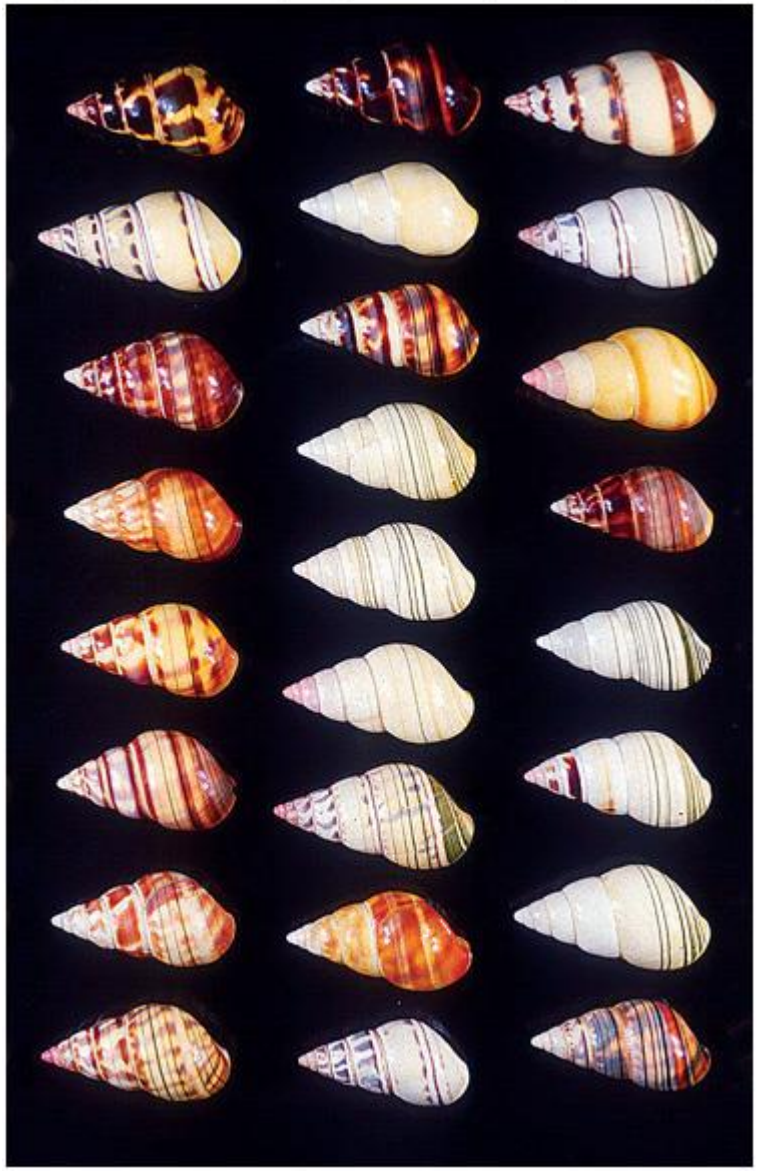
In other words, why do we have so much differences between individuals within a species

Variation

Lets concentrate on a particular species

Common rose

Variation – difference in a given trait among organisms of the same species



Variation

One species of plant at the same age, grown in similar conditions

Mutation causes Variation

Variation

Some examples in Humans

Unattached ear lobes are inherited as a dominant trait.

Attached ear lobes are inherited as a recessive trait.

- Ability to roll your tongue
- Slightly curved little finger
- Blood groups

Discontinuous variables

Mutation

- Sudden heritable change in the genetic material is called mutation
- Chromosome level and/or individual gene
- it is the ultimate source of genetic variation; it provides raw material for **evolution**

Slide from Genetics class - Dr. Mohit Prasad

Mutations

Mutation occurs in the genotype of the organism

This may or may not translate into any change in the structure or function of the organism

Genes + Environment = Phenotype

Changed genome + Environment = Altered phenotype

Variation

Variation and Evolution

- Lots of different variants of a given species are living in the same geographical area at any given time.
- Variation is an inbuilt characteristic for the organism.
- Why would this be important?
- This is because, organisms do not have the capability to make identical copies and errors causes variation?
- Are there any advantages to having variations?

Evolution

Latin word
Which means – to unfold or unroll

Change in the properties of groups of organisms
over the course of generations

Giraffe

Lamarck's Theory of Evolution

1809

1. Use and Disuse

2. Inheritance of acquired characteristics

3. Organisms have a drive to become complex

Questions

Why are the necks of giraffes so long?
What is our current understanding ?

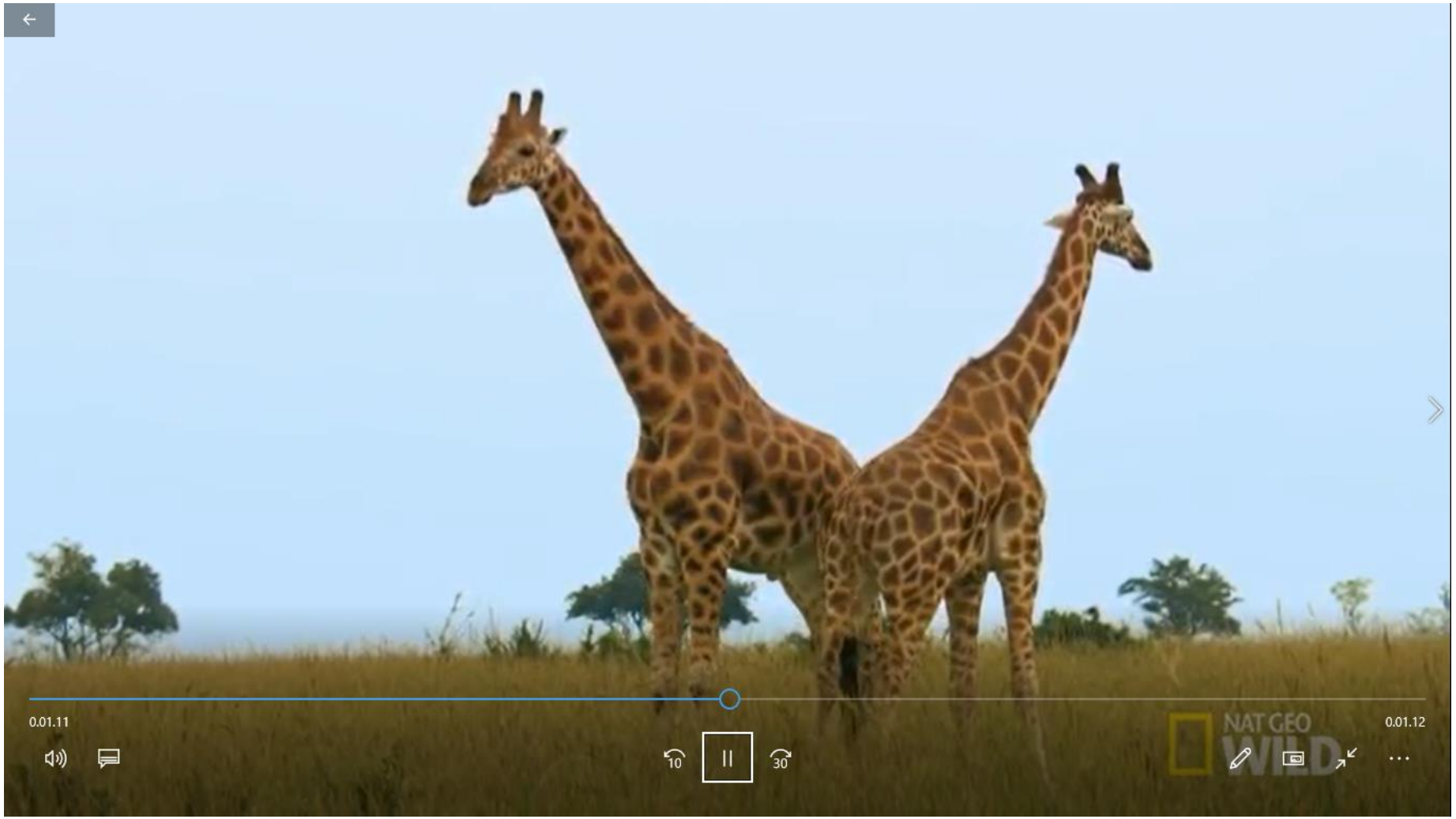
Alternate explanations?

Better Food ?

Latest update
they are so long because female giraffes like to mate with males with long necks. Further this long neck with a heavy head is used as a clubs when males are fighting with each other.

Wining by a neck – Simmons & Scheepers 1996

Sexual dimorphism in Giraffes – Cavener et.al. 2024



Giraffe video