

7.1 Adaptation and Variation

SBI3U

MS. DE SOUSA

The
ROYAL SOCIETY
of COMICS
presents

Survival of the SNEAKIEST

AH... THE MOON, STARS,
A GENTLE BREEZE,
CHIRPING CRICKETS...
LOVE IS IN THE AIR, WANDA.
IT'S A PERFECT NIGHT FOR...



... LESSONS IN THE
MATING HABITS OF CRICKETS
AND NATURAL SELECTION!

ARGH... I'LL
GO WAIT IN
THE CAR.



NATURAL SELECTION:
WE'VE ALL HEARD IT EXPLAINED
AS "SURVIVAL OF THE FITTEST."
THE STRONGEST AND FASTEST
WIN. IF YOU'RE TOO WEAK
OR SLOW, WELL, TOO BAD, RIGHT?

GRR!



NOT QUITE.
LET'S START
WITH A
SINGLE, MALE
CRICKET.



OUR GUY IS A BIG, HEALTHY
SPECIMEN—STRONG, CONFIDENT,
AND LOOKING FOR LOVE!



WHAT FEMALE
WOULDN'T WANT
A PIECE OF THIS?

mi mi mi ♪
Cough
a one,
and a two,
and...



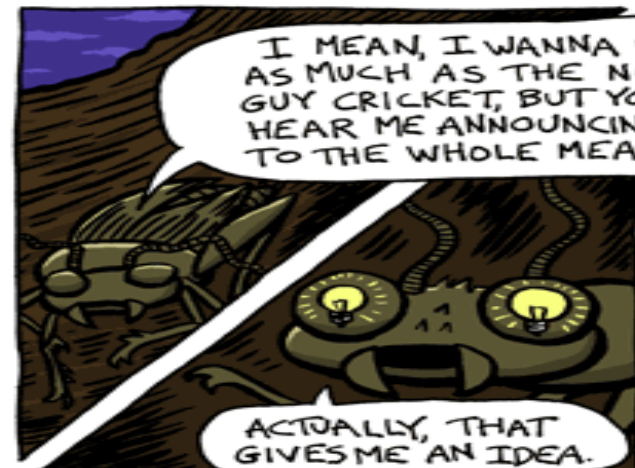
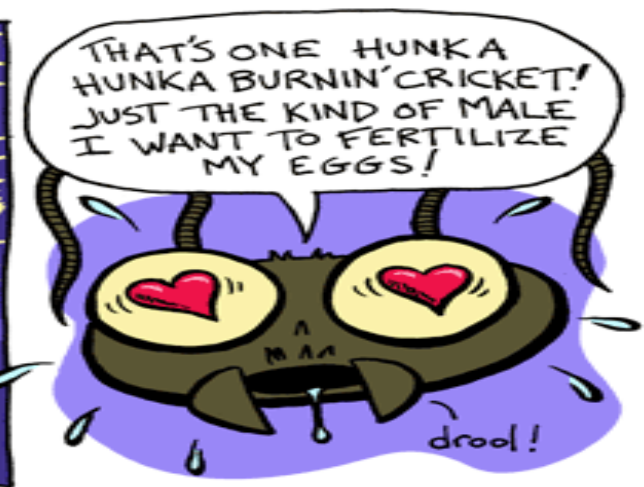
HELLOOO LADIES!!!



NOT FAR AWAY, A FEMALE CRICKET LIKES WHAT SHE HEARS...



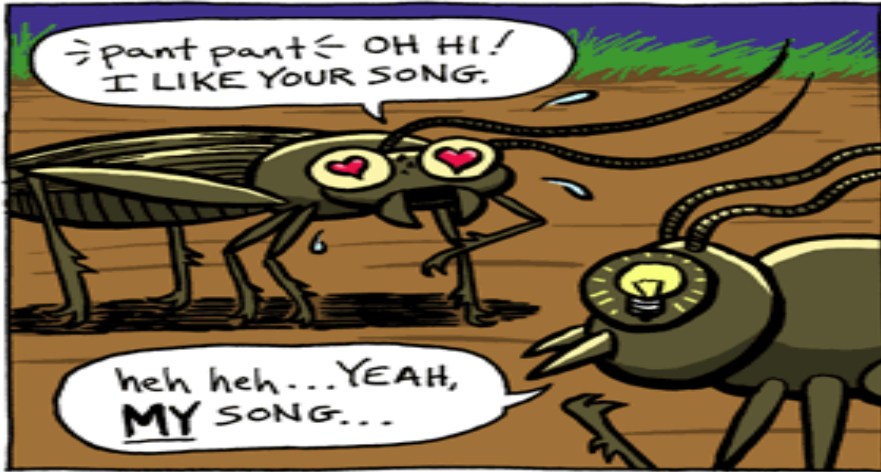
OH YEAH!
MY EXOSKELETON
IS SOOO GLOSSY!
I'M PARASITE FREE!



THIS SILENT, OR "SNEAKER," MALE CRICKET MOVES TO INTERCEPT THE APPROACHING FEMALE.



> pant pant < OH HI!
I LIKE YOUR SONG.

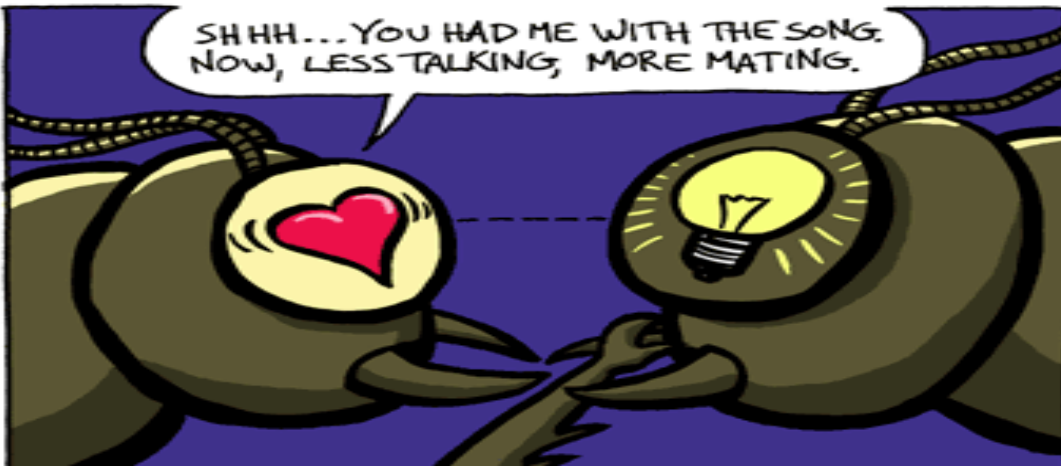


heh heh... YEAH,
MY SONG...

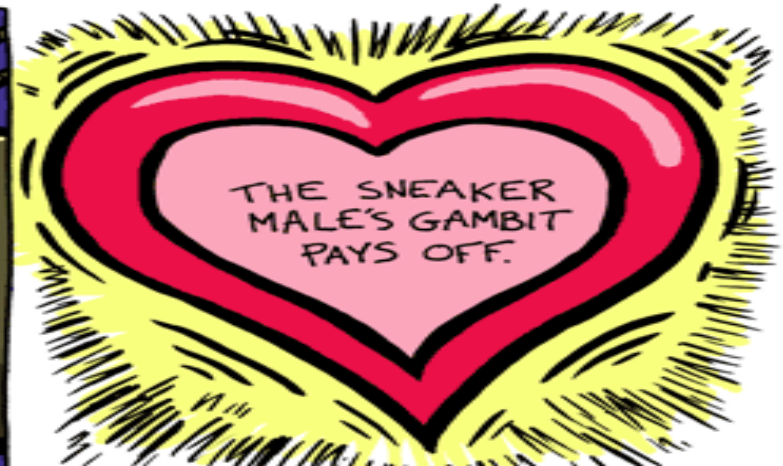
OH YEAH, **I'M** THE ONE WHO'S
PARASITE-FREE AND ALL THAT.



SHHH... YOU HAD ME WITH THE SONG.
NOW, LESS TALKING, MORE MATING.



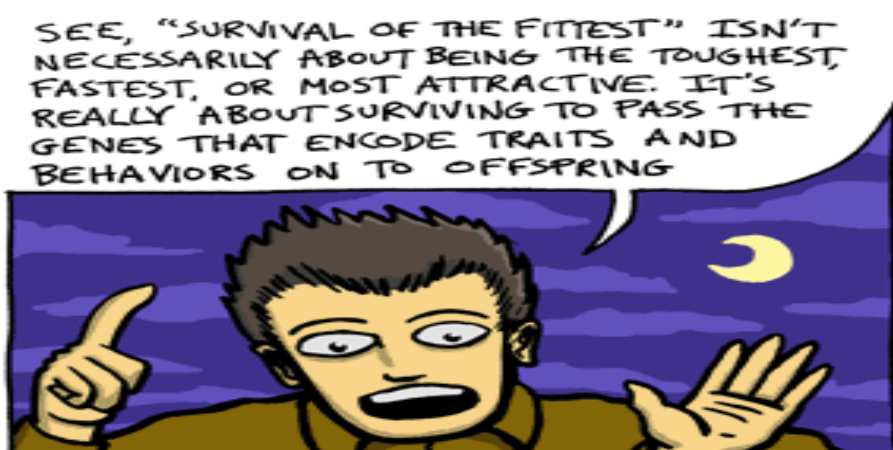
THE SNEAKER
MALE'S GAMBIT
PAYS OFF.



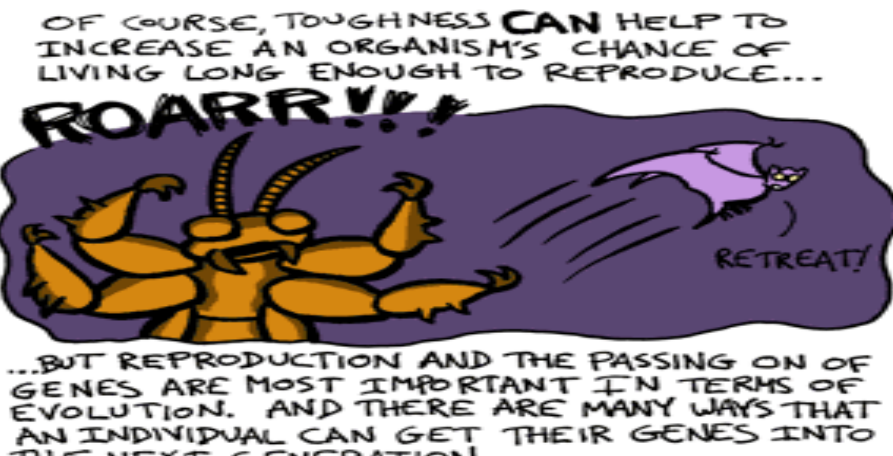
AND OUR ORIGINAL, STRONG, LOUD, CALLING MALE IS OUT OF LUCK.



IN FACT, HIS SONG HAS ATTRACTED SOME UNWANTED ATTENTION.



MAYBE OUR SNEAKER MALE'S KIDS WILL INHERIT THE "SNEAKY" GENES, AND IN TURN USE SNEAKY BEHAVIOR LIKE THEIR FATHER.



Adaptation and Survival

Organisms are constantly facing environmental challenges that can influence their survival. The organism that is able to withstand these changes will survive and pass on their genetic information.



Adaptation and Survival

Adaptation: a structure, behaviour or physiological process that helps an organism survive and reproduce in a particular environment.



Organisms undergo a variety of adaptations that enable them to survive and escape predators.

Adaptations - Definitions

There are three forms of adaptation:

Structural Adaptation:

Behavioral Adaptation:

Physiological Adaptation:

Examples of Adaptations

Many organisms are able to camouflage and blend in with their environment which enables them to escape predators.



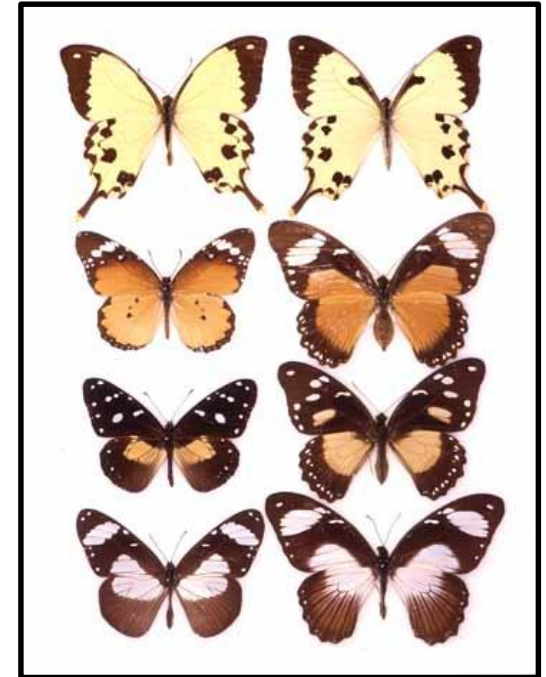
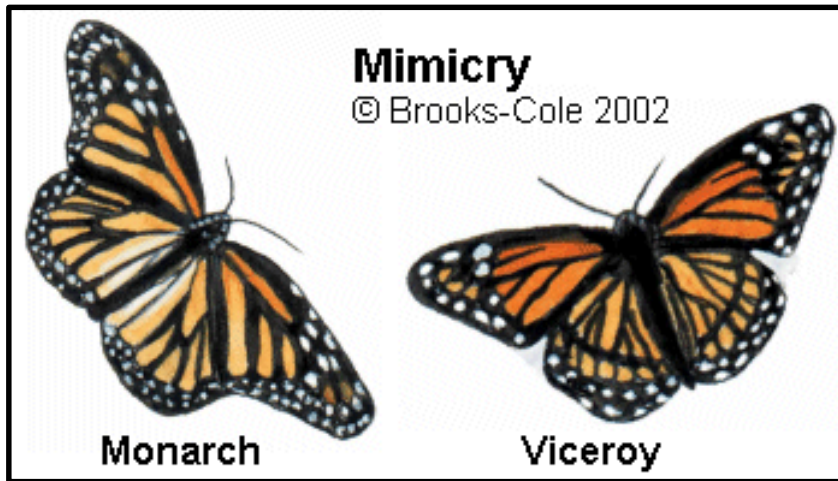
Examples of Adaptations

Hybernation allows organisms to survive in harsh conditions by keeping warm and preserving their energy



Examples of Adaptations

Mimicry is a form of structural adaptation, where the animal is able to imitate something other than what it is.



Butterflies use it as a protection mechanism to trick predators into thinking they are an inedible species.

Development of Adaptation

Adaptations are a result of gradual and accumulative genetic mutations in an organisms' DNA. Depending on the mutations it may help an organism survive in their environment.

These mutations must be heritable in order for the adaptation to persist.



Mutations and Variation

Mutations : changes in the genetic material (i.e. DNA) of an organism. The mutation in the nucleotide sequence creates new versions of alleles.

CGA-CCA-ACG-GCG...

Amino Acids Produced: Arginine - Proline -
Threonine - Alanine ...

CGA-CCA-**GAA**-CGG-CG...

Amino Acids Produced: Arginine - Proline - **Glutamic Acid** - Arginine ...

Mutations and Variation

Mutations in somatic cells:

- These mutations disappear from the population once the organism dies

Mutations in gametic cells:

- These mutations persist in the population. If the mutation happens in the DNA of the gamete, all of the cells within that gamete will contain the altered DNA. Thus it will be passed on to other generations.

Mutations and Variation

As a result of the mutations, there are many variations that appear in the population. But not all variations are favoured in the population.

Variations: differences between individuals which may be structural, functional or physiological.



Variation to Adaptation



Peppered moths can be one of the three following colours: black with white specks, black or an intermediate brown.

The colour of the English peppered moth was highly influenced by genetic mutations and their environment.

During the industrial revolution, the peppered moth population was mostly black with very few white moths in the population.

Before the industrial revolution, most of the population was white.

Variation within species

Like other organisms, humans have a lot of variation due to the random combinations of alleles that we inherit from our parents. (*sexual reproduction and mutations*)



The different combinations of alleles contribute to the variation in phenotypes of many species.

Development of Adaptation

As the environment changes, a variation may become useful to an organism's survival. If that organism survives, it is able to pass on that trait to the offspring allowing them in turn to survive in such an environment.



Summer



Winter

Key Term – Selective Advantage

Selective advantage:

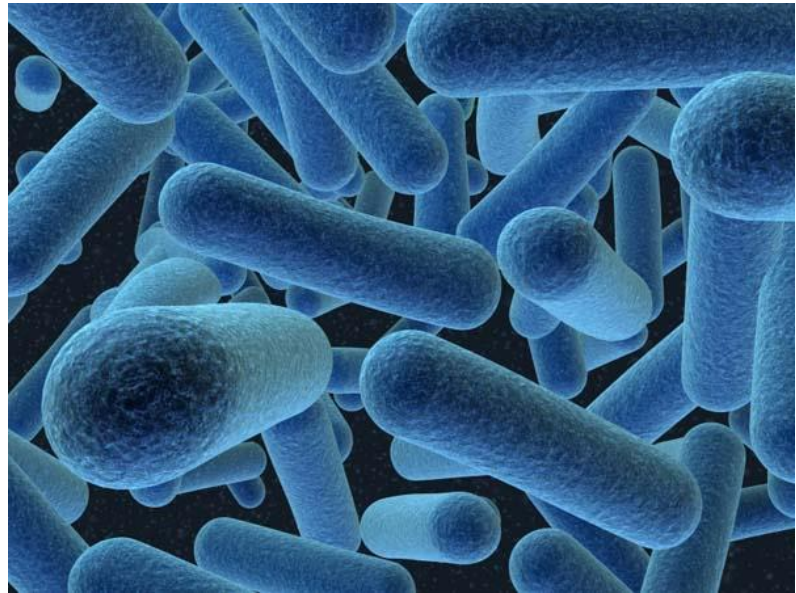
When an organism has a mutation that has a selective advantage, that organism is favored in terms of survival and reproduction.



Bacteria - Selective Advantage

Bacteria and viruses tend to have a rapid rate of reproduction. Due to the rapid reproduction, a mutation that has a selective advantage can be spread into a population quickly

If a bacteria undergoes a mutation that allows it to survive against bacterial drugs, it becomes resistant to the antibiotic.



Checkpoint

Which best described selective advantage?

- A) a characteristic that reduces an organism's chance of survival.
- B) the process by which populations change biologically over time as organisms pass their traits to offspring.
- C) the process by which individuals change biologically over time as organisms pass their traits to offspring. A characteristic that improves an organism's chance of survival.
- D) environmental conditions that select for certain characteristics of individuals and select against characteristics that are not adaptive.

Checkpoint

Which of the following is an example of mimicry?

- A) a toxic chemical excreted by a stinging nettle plant
- B) a syrphid fly that looks like a wasp
- C) the migration of arctic geese
- D) the venom of a rattlesnake
- E) the courtship display of the red-winged blackbird.

Checkpoint

A) Sharks have an excellent sense of smell. Is this an adaptation? Explain.

B) A black and yellow insect starts buzzing around your head. You swat it away trying to avoid it because it looks like a stinging insect. It lands on your arm and you see that it is a harmless fly. Explain the fly's adaptation and what the advantage is to the fly.

Homework

Textbook p. 304: # 1- 4, 7, 8 & 11