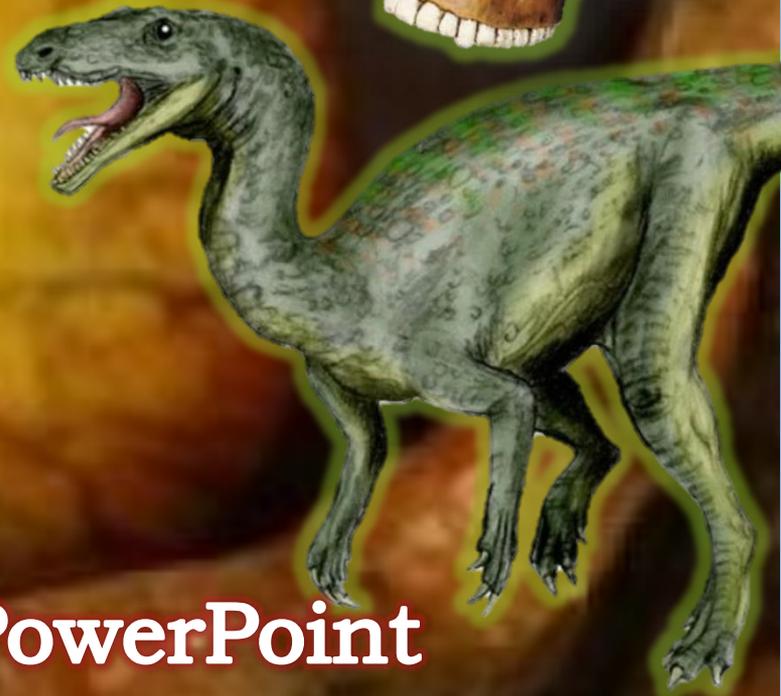


EVOLUTION

A CHANGE THROUGH TIME...



Interactive PowerPoint

Extensive evidence indicates that life on Earth began more than 3 billion years ago.

Fossils found in ancient rocks have given us many clues to the kind of life that existed long ago.

The first living organisms were simple, single-celled organisms. Over time, more complex single-celled creatures developed.

Then, about a billion years ago, increasingly complex, multicellular organisms began to appear.



This is the idea! The explanation of why species are so different and how they survive through a changing environment.

Mutations and nature selecting the most fit are the two potent forces resulting in this product.

This product is called.....

EVOLUTION

FOCUS QUESTIONS



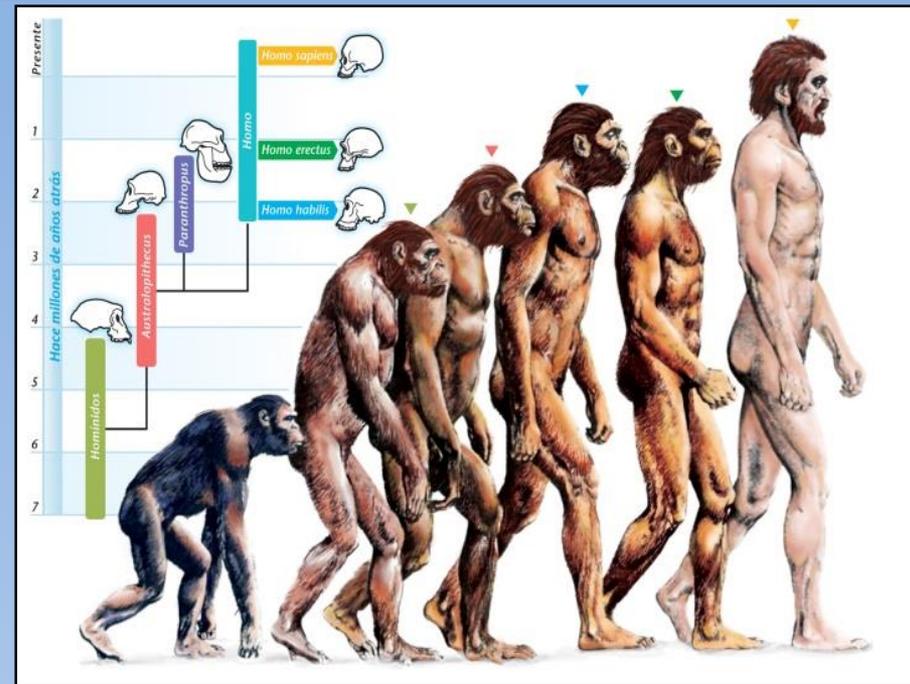
- Write your focus question here?

THE THEORY OF EVOLUTION

1. The **THEORY OF EVOLUTION** is accepted as the **CENTRAL THEME** of modern biology. It helps biologists understand how the **VARIATIONS** among individuals can lead to **CHANGES** in an entire species of an organism.

2. The concept of evolution has been first suggested by **CHARLES DARWIN**. Since then, there has been massive amounts of **EVIDENCE** offered by thousands of scientists, that **EVOLUTION** now is considered a **SCIENTIFIC THEORY**.

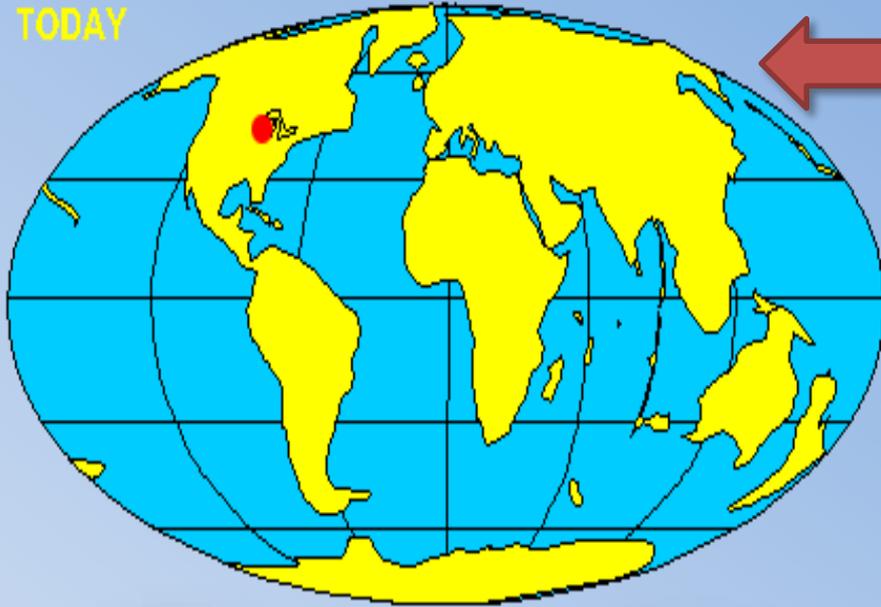
3. A **SCIENTIFIC THEORY** is **TESTED** and **CONFIRMED** in many different ways and be used by scientists to make **PREDICTIONS** about the natural world. The theory of evolution helps biologists understand the **SIMILARITIES** (such as bone structure and biochemistry) among **DIFFERENT** organisms. It also helps to explain the history of life that is revealed by the **FOSSIL RECORD**.



**COLLECTION OF
FOSSILS THAT PROVIDE
CLUES TO THE HISTORY
OF THE EARTH'S
ORGANISMS**

MECHANISMS OF EVOLUTION

TODAY



5. The fossil record spans much of GEOLOGIC TIME.

6. GEOLOGIC TIME:

BILLIONS OF YEARS OF EARTH HISTORY –

REVEALING MANY CHANGES IN THE

ENVIRONMENT AND SPECIES

7. Evolution does NOT necessarily produce long-term progress in any set direction. Instead, evolutionary change appears to be more like the growth of a bush.

8. THE MECHANISMS OF EVOLUTION

Charles Darwin did not only suggest that species EVOLVED. He thought that the mechanism of evolution was like the process of ARTIFICIAL SELECTION. Artificial selection describing SELECTIVE breeding for certain TRAITS. Darwin used the term NATURAL SELECTION to indicate that the process of evolution was controlled by “NATURE” rather than by people.





NATURAL SELECTION



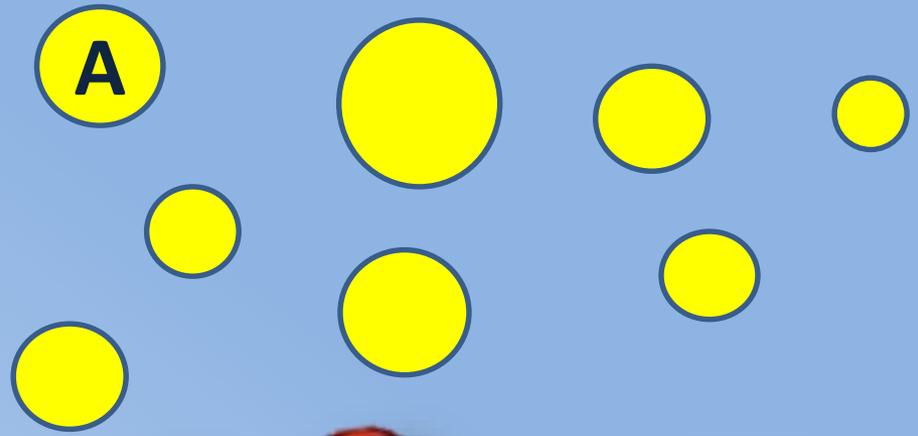
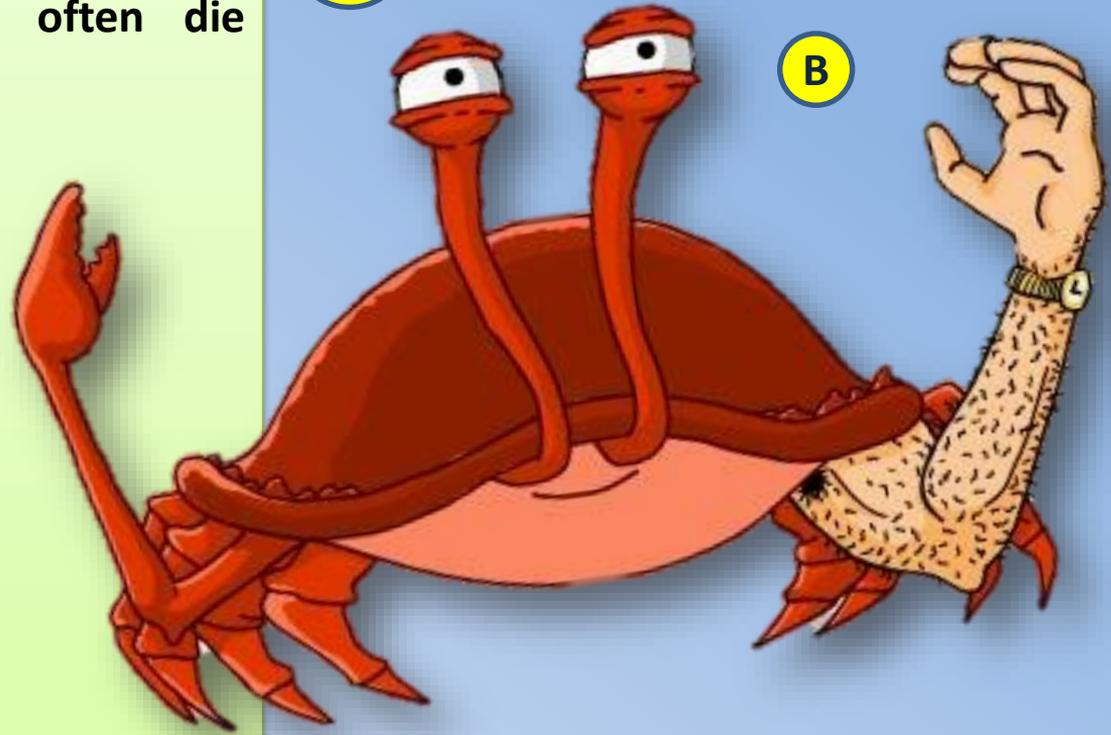
9. NATURAL SELECTION:

SURVIVAL OF THE FITTEST

Individuals that SURVIVE are able to breed and pass their genetic information to the next generation. Those that are not successful in the environment often die without leaving any offspring.

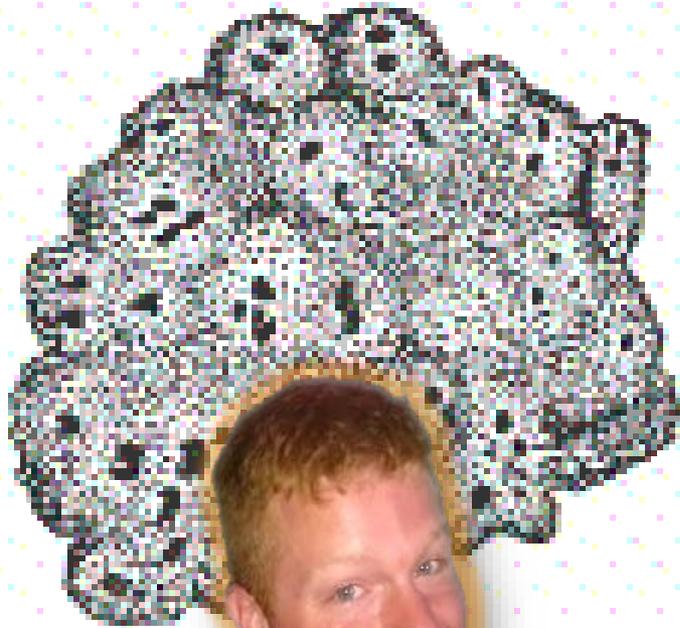


There are only two types of food this crab can eat and survive. Which are they?



B

SURVIVAL OF THE FITTEST



10. In any environment, an individual may be born with a characteristic that makes it STRONGER, FASTER. This is an advantage that will help it both SURVIVE and REPRODUCE.

The individuals that prove to be the BEST ADAPTED TO THEIR ENVIRONMENT

will be more likely to SURVIVE. If they do survive, their FAVORABLE characteristics will be passed on to many of their offspring which will result in USEFUL adaptations, which will become more common with each GENERATION.

Similarly, characteristics that reduce an individual's chance of surviving and reproducing will tend to decrease over time.

INTERACTIONS & EVOLUTION

14. LONG TERM RESULT OF EVOLUTION

The long-term result of natural selection is a **IS THE CHANGE IN THE FREQUENCY OF CERTAIN TRAITS** in a population.

- * Beneficial traits become **MORE COMMON**
- * Harmful traits tend to **DECREASE**

So how does something evolve or is evolving?

15. As the frequency of a trait in a population **INCREASES** or **DECREASES** over time, it can be said that the species is **EVOLVING**.

It is the **population**, not the individual, which changes as a result of evolution.

16. The driving force behind evolution is the interaction between **INDIVIDUAL ORGANISMS** and their **ENVIRONMENT**.

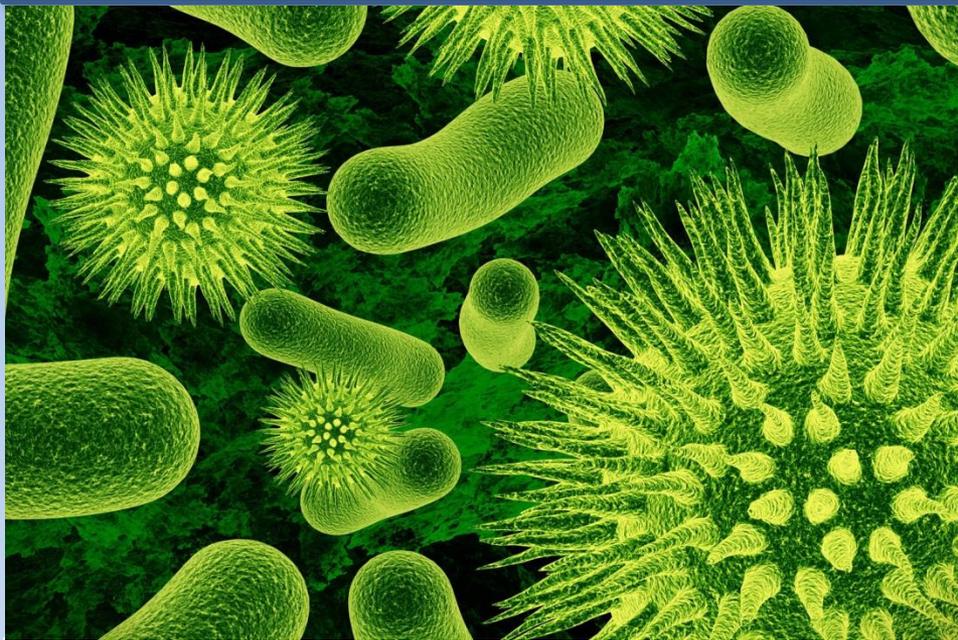


Conditions that are vital to the process of evolution include:

- [1] **THE POTENTIAL FOR A SPECIES TO INCREASE IN ITS NUMBERS (OVERPOPULATION)**
- [2] **THE FINITE (LIMITED) SUPPLY OF RESOURCES NEEDED FOR LIFE**
- [3] **THE GENETIC VARIATION OF OFFSPRING DUE TO MUTATION AND GENETIC SHUFFLING**
- [4] **THE SELECTION BY THE ENVIRONMENT OF THOSE OFFSPRING BETTER ABLE TO SURVIVE**



OVERPOPULATION



17. In each generation, a species has the potential to PRODUCE MORE OFFSPRING than can possibly survive.

Some species with high reproductive potential:

- [1] BACTERIA
- [2] INSECTS
- [3] DANDELIONS
- [4] RABBITS



18. In *stable environments*, the population of a species remains about the same. This happens because not all of the new individuals that are born or hatched will SURVIVE to adulthood.

Example: Fish species lay millions of eggs, but by the next year, there the population of that species is the same as it was the previous year.

STRUGGLE FOR SURVIVAL

19. Overpopulation leads to COMPETITION among members of a species. Not all offspring survive long enough to REPRODUCE. In many cases, CHANCE determines which offspring survives.

20. Chance is not the only factor that determines which offspring will SURVIVE and will DIE.

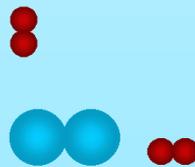
All offspring will have to cope with environmental conditions such as:



1. TEMPERATURE
2. DISEASE
3. PREDATORS

The offspring will also need resources such as:

1. OXYGEN
2. WATER
3. FOOD
4. SHELTER



VARIATIONS WITHIN SPECIES



VARIATION

“There are so many different types!”

20. If offspring are to survive, they must COMPETE FOR LIMITED RESOURCES.

Depending on their SUCCESS as competitors, individuals will get the resources they need to survive, or they will not.

21. Those that are BEST SUITED to their environment are more likely to survive. Many of the losers in this struggle for resources will DIE before they have a chance to REPRODUCE.

22. The NEW TRAITS that can lead to evolution come from normal VARIATIONS within species. **Organisms within a species are never exactly alike.**

MUTATIONS & GENETIC SHUFFLING

23. In SEXUALLY REPRODUCING organisms, only changes in the genes of SEX CELLS can be passed on to the next generation and become the basis for evolutionary change.

24. Other types of variation (such as changes to body cells) die with the individual.

***Example:** a father who has built huge muscles due to exercise does NOT pass those large muscles to the offspring.*

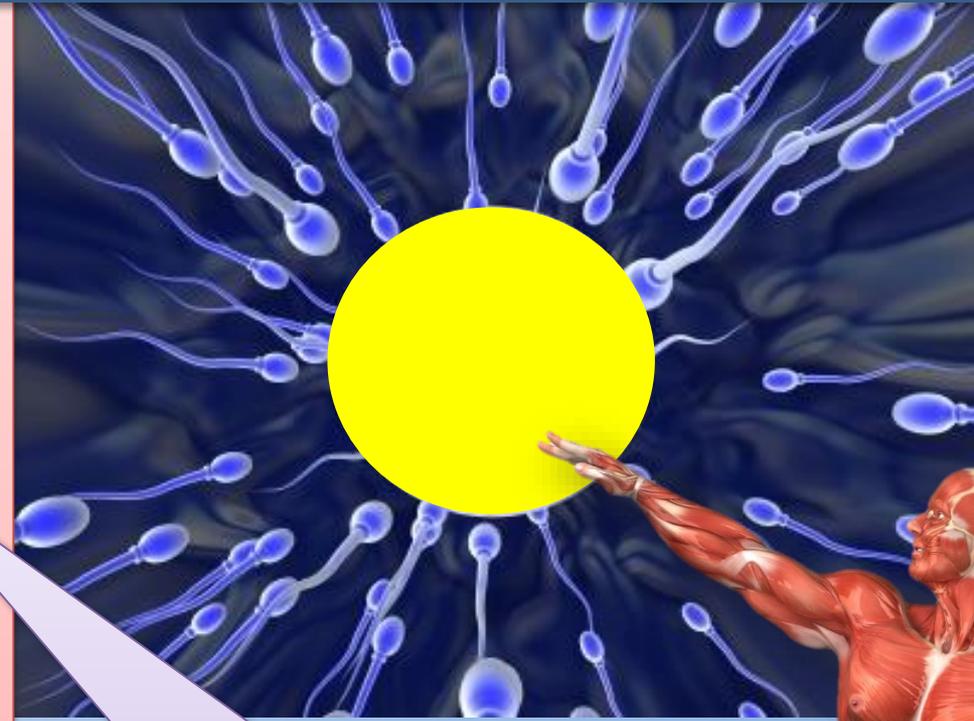


Mutations and Genetic Shuffling

25. A mutation is: IS A CHANGE OR ERROR IN THE BASE SEQUENCE OF A DNA MOLECULE

26. Mutations occur as ERRORS chance events that cannot be PREDICTED. Some mutations occur as errors in DNA as cells function. RADIATION and CHEMICALS can also cause them.

Mutations are an important source of NEW forms of genes.



27. Nearly all mutations are HARMFUL and may affect the offspring so severely that it cannot SURVIVE.



BENEFICIAL MUTATIONS

Although mutations provide NEW genetic instructions genetic shuffling is the main source of the VARIATION that exists among the members of any sexually reproducing species.



A few mutations BENEFIT the individual. It can increase its chance of SURVIVING, REPRODUCING, and PASSING THE MUTATION to the next generation.

28. A BENEFICIAL mutation may lead to the evolution of a new species.

Example: The ancestors of polar bears probably had dark fur. If an mutation resulted in a bear with white fur, that bear would have died young. However, if the mutation occurred in a snowy environment, the white fur would be a useful mutation, allowing the bear to stalk its prey.

GENETIC SHUFFLING

29. The SORTING and RANDOM recombining of genes during MEIOSIS and FERTILIZATION results in new and different combinations of genes. The genes can be passed on to individual offspring.

RESULTS OF GENETIC VARIATION

The changes that result from mutation or genetic shuffling in the sex cells may affect the offspring in several ways. Most of the changes can be categorized as **structural**, **functional**, or **behavioral**.

STRUCTURAL CHANGE

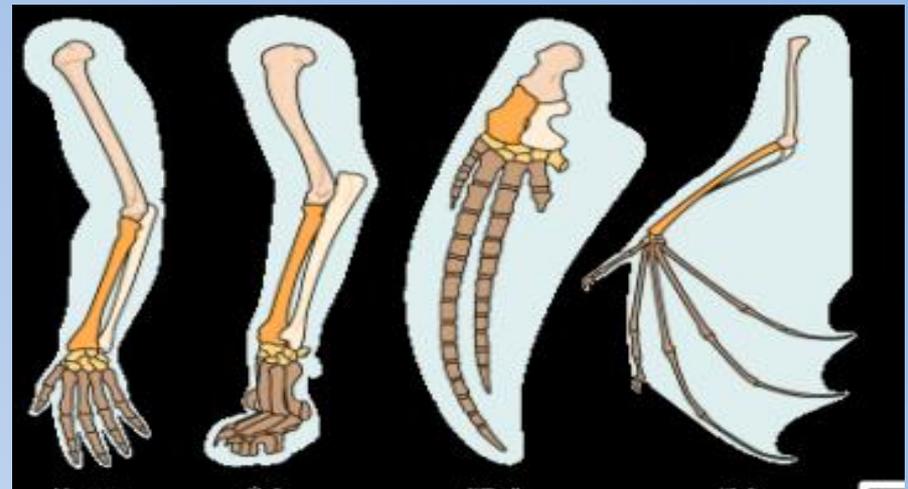
The structure of any organism is the result of its species entire evolutionary history. There are millions of examples of variations that have resulted in structural changes. Structures that are no longer used by modern organisms give scientists clues to the evolutionary history of a species. Snakes have tiny leg bones.

FUNCTIONAL CHANGE

Molecular or biochemical changes affect how an organism works. Changes in DNA often lead to functional changes. One example is a mutation in the DNA of certain one-celled organisms that led to the ability to make enzymes that digest wood. Another is the evolution of the ability of some snakes to make poisonous venom.

BEHAVIORAL CHANGE

Fighting among males of a walrus population for females is one evolved behavior. Because of the fighting, the stronger, healthier male mates with the most females. The correct rate of “Blinking” allows males and females of firefly species to find each other. A different pattern or rate of blinking would isolate the individual from potential mates.



GENETIC VARIATION/ADAPTATION

30. If environmental conditions CHANGE, organisms that have ADAPTED to those conditions may DIE. If all members of the species had exactly the same combination of characteristics, an environmental change could be disastrous, wiping out the entire species.

31. The variation of organisms within a species increases the likelihood that at least some members of the species will survive IN A CHANGED ENVIRONMENT. Once the diversity present in the species is lost, it is difficult to get it back.

32. Today's endangered species have such small populations that biologists worry that they may not have the GENETIC DIVERSITY to adapt to even slight changes in the environment.

PATTERNS OF CHANGE

33. Evolution appears to follow certain patterns that appear repeatedly in the fossil record:

The patterns include the following:

1. CHANGES IN SPECIES ARE OFTEN RELATED TO ENVIRONMENTAL CHANGES
2. SPECIES WITH SHORT REPRODUCTIVE CYCLES THAT PRODUCE MANY OFFSPRING TEND TO EVOLVE MORE QUICKLY THAN SPECIES WITH LONG LIFESPANS AND FEW OFFSPRING
3. THE FAILURE TO ADAPT TO A CHANGING ENVIRONMENT MAY RESULT IN THE DEATH OF THE SPECIES

DIVERSITY AND NATURAL SELECTION



33. Most of the DIVERSITY of life on Earth today is the RESULT of NATURAL SELECTION occurring over vast periods of geologic time. The amount of time seems to be linked to changes in the ENVIRONMENT.
34. Rapid environmental change often leads to rapid changes in species. It may take MILLIONS of years to accumulate enough differences from its ANCESTORS to be classified as a new or different species.
35. Some species have hardly changed in many millions of years. Others have changed so much that the relationships may not be obvious.
36. The rate of evolutionary change may also be influenced by the # OF OFFSPRING PRODUCED BY SPECIES. Those that have FEW offspring and live a long time generally evolve quite slowly. Those that have BRIEF lifespans and NUMEROUS offspring can change so quickly that evolution may occur in just a few years.

DIVERSITY AND NATURAL SELECTION

36. Extinction THE DISAPPEARANCE OF AN ENTIRE SPECIES

Any time the DEATH RATE of individuals within a species is GREATER than the birth rate, extinction is a possibility.

37. Extinction occurs when the environment CHANGES.

Examples of changes include:

1. TEMPERATURE CHANGE
2. GRASSLANDS BECOME DESERTS
3. CLEAR LAKES BECOME POLLUTED
4. SEA LEVELS RISE AND FALL



38. The VARIATION of organisms within a species INCREASES the likelihood that at least some members of the species will SURVIVE the changing environmental conditions.

39. When the ADAPTIVE CHARACTERISTICS of a species are insufficient to allow its survival in a new environment, the species will become EXTINCT.



ISN'T EVOLUTION JUST A THEORY?

Evolution is often criticized by opponents as being “just a theory.” This argument is especially common in America, where the word “theory” usually means an unproven idea. However, in science, a theory is the highest degree of certainty. Gravity is “just a theory.” The Earth orbiting the Sun is “just a theory”. By definition, a scientific theory is a hypothesis with has withstood rigorous testing and is well-supported by the facts. There is overwhelming evidence for biological evolution, just as there is overwhelming evidence for gravity.

HAS EVOLUTION EVER BEEN OBSERVED?

Yes, Evolution has been observed both in the laboratory (diseases adapting to become resistant to drugs) and in nature (new species of flowers, mice, insects etc.).



THE
END