

# A BRIEF Q&A SESSION ON EVOLUTION



## What is evolution?

In general, evolution is a process of change over time. In biological evolution, the process of change occurs as modifications in successive generations. Only changes in the genetic makeup can be transmitted to the next generation (heritable modifications). The benefits of these modifications are determined by natural selection, the process by which beneficial changes allow a relative increase in the number of surviving offspring of individuals with those modifications.

## Why is it important to study evolution?

The famous biologist T. Dobzhansky best answered this question: "Nothing in biology makes sense except in light of evolution." Evolution is the natural governing principle of the biological sciences. It provides a relevant context for an otherwise unorganized set of facts. Insights gained from evolutionary biology have produced major advances in the medical and agricultural sciences and affect important topics in our lives, such as health and treatment of disease, improvement of food crops, and conservation.

## Does evolution still happen?

Absolutely. We see excellent examples of recent evolution in the appearance of agricultural pests resistant to pesticides and disease-causing bacteria resistant to antibiotics. Some of the most difficult to treat bacterial infections are contracted while the patient is in the hospital, where the constant use of disinfectants and antibiotics provides strong environmental selection in favor of resistance to these chemicals.

## How long does it take for evolution to occur?

It depends on the length of a generation in a given species. As noted above for bacteria, spe-

cies that mature and reproduce quickly can incorporate favorable modifications in a matter of days to months, if selection for or against certain traits is

strong. For most larger animals, which take longer to reach reproductive maturity and have fewer offspring, detectable changes may take thousands of years. On the other hand, some species well-adapted to their habitats may remain virtually unchanged for millions of years (for example, the horseshoe crab).

## Does a person have to be an atheist to think evolution of living organisms has occurred?

No. Many people of diverse religious backgrounds have engaged in unbiased study of evolution and have accepted that the evidence for evolution is overwhelming.

## What is the scientific evidence for biological evolution?

The evidence can come from the following: the fact that the earth is very old; the logical succession of fossils from old to more recent in geological strata; distantly related organisms sometimes display comparable adaptations to specific environments; the correspondence between the geographical distribution of species and their ancestry; the fact that all living organisms share the same fundamental molecular building blocks; the success of artificial selection; the fact that living organisms are not perfectly adapted to their environment, revealing the lack of an intelligent design.

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