



# Misconceptions about Evolution

FROM: <http://evolution.berkeley.edu/evosite/evohome.htm>

# MISCONCEPTION: EVOLUTION IS A THEORY ABOUT THE “ORIGIN OF LIFE”

The origin of life itself...  
eh, it's not really my bag.  
The origin of species is where it's at!



# RESPONSE:

Evolutionary theory deals mainly with how life changed *after* its origin. Science does try to investigate how life started (e.g., whether or not it happened near a deep-sea vent, which organic molecules came first, etc.), but these considerations are not the central focus of evolutionary theory.

Regardless of how life started, afterwards it branched and diversified, and most studies of evolution are focused on those processes.

# MISCONCEPTION:

“Evolution is like a climb up a ladder of progress; organisms are always getting better.”



**wrong**



**right**

# RESPONSE:

It is true that **natural selection** weeds out individuals that are unfit in a particular situation, but for evolution, “good enough” is good enough. No organism has to be perfect. For example, many taxa (like some mosses, protists, fungi, sharks, opossums, and crayfish) have changed little over great expanses of time. They are not marching up a ladder of progress. Rather, they are fit enough to survive and reproduce, and that is all that is necessary to ensure their existence.

Other taxa may have changed and diversified a great deal—but that doesn't mean they got “better.” After all, climates change, rivers shift course, new competitors invade—and what was “better” a million years ago, may not be “better” today. What works “better” in one location might not work so well in another. **Fitness** is linked to environment, not to progress.

# MISCONCEPTION:

Evolution means that life changed “by chance”.



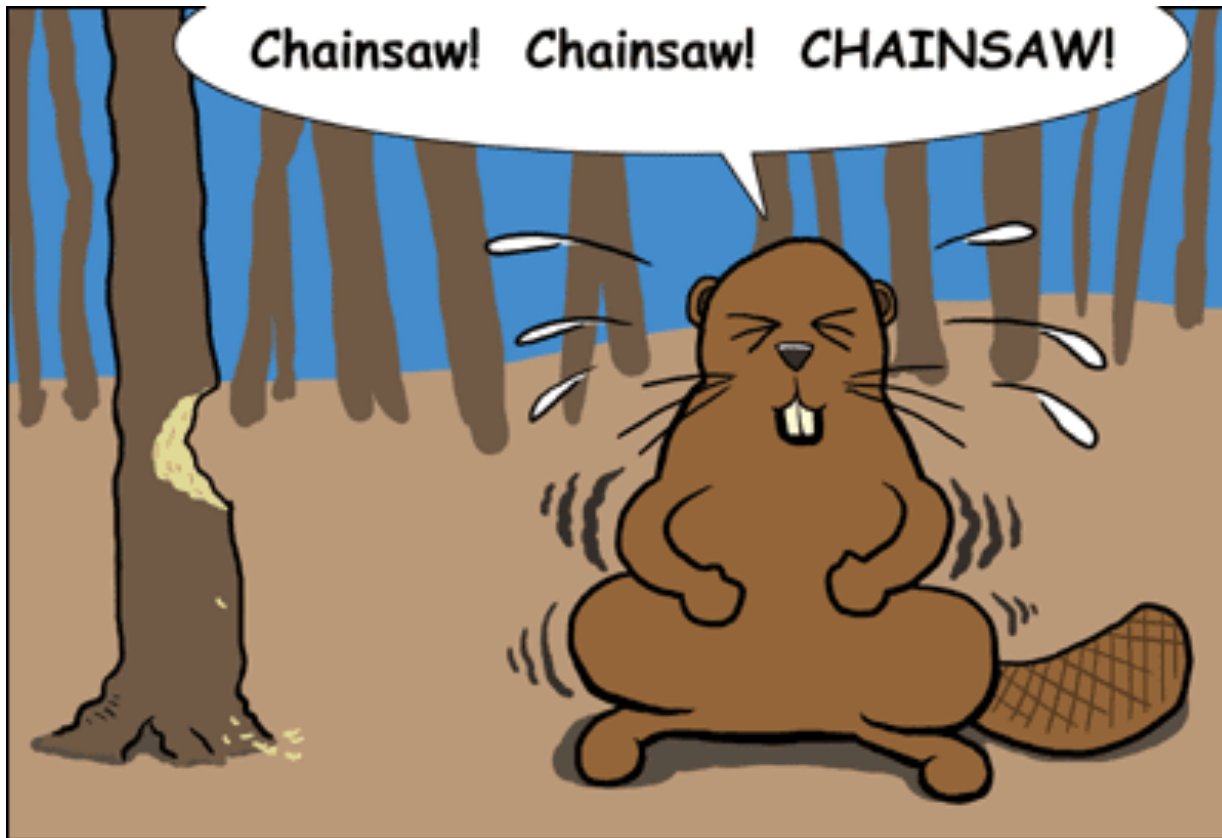
**Chance is certainly a factor in evolution, but there are also non-random evolutionary mechanisms. Random mutation is the ultimate source of genetic variation, however natural selection, the process by which some variants survive and others do not, is not random.**



**For example, some aquatic animals are more likely to survive and reproduce if they can move quickly through water. Speed helps them to capture prey and escape danger. Animals such as sharks, tuna, dolphins and ichthyosaurs have evolved streamlined body shapes that allow them to swim fast. As they evolved, individuals with more streamlined bodies were more likely to survive and reproduce. Individuals that survive and reproduce better in their environment will have more offspring (displaying the same traits) in the next generation. That's non-random selection. To say that evolution happens “by chance” ignores half of the picture.**

# MISCONCEPTION:

“Natural selection involves organisms ‘trying’ to adapt.”



*Adaptation doesn't involve trying.*



# RESPONSE:

Natural selection leads to adaptation, but the process doesn't involve "trying." Natural selection involves genetic variation and selection among variants present in a population.

Either an individual has genes that are good enough to survive and reproduce, or it does not—but it can't get the right genes by "trying."

# MISCONCEPTION:

“Natural selection gives organisms what they ‘need.’ ”



*Natural selection does not grant organisms what they "need".*

## RESPONSE:

Natural selection has no intentions or senses; it cannot sense what a species “needs.” If a population happens to have the genetic variation that allows some individuals to survive a particular challenge better than others, then those individuals will have more offspring in the next generation, and the population will evolve.

If that genetic variation is not in the population, the population may still survive (but not evolve much) or it may die out. But it will not be granted what it “needs” by natural selection.

# MISCONCEPTION:

“Evolution is ‘just’ a theory.”

the|o·ry



1 popularly, a mere conjecture, or guess

→ 2 in science, a well-substantiated explanation of some aspect of the natural world

# RESPONSE:

Scientific theories are explanations that are based on lines of evidence, enable valid predictions, and have been tested in many ways.

In contrast, there is also a popular definition of theory—a “guess” or “hunch.”

These conflicting definitions often cause unnecessary confusion about evolution.

# MISCONCEPTION:

“Evolution is a theory in crisis and is collapsing as scientists lose confidence in it.”



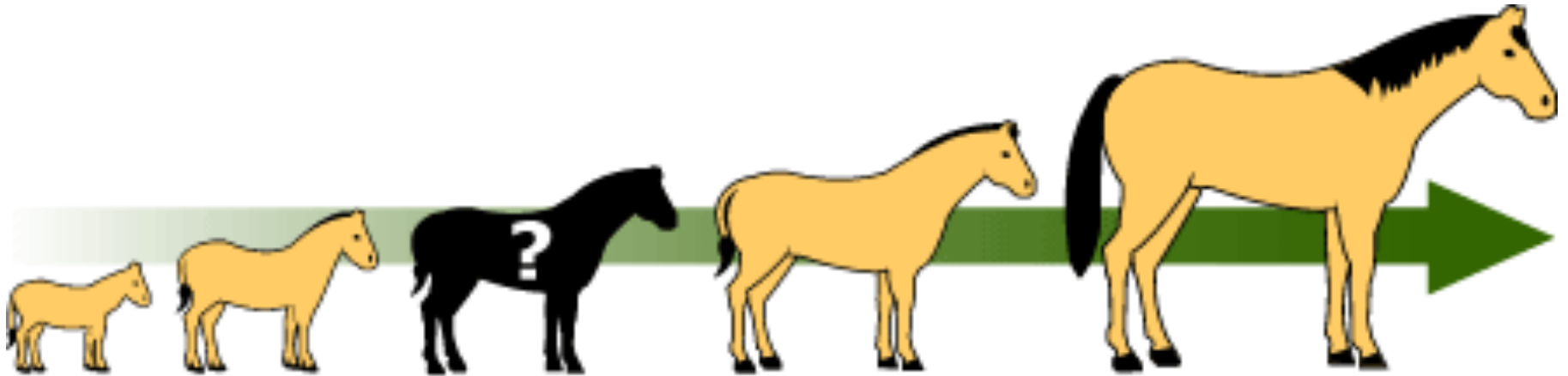
# RESPONSE:

Scientists do **not** debate *whether* evolution (descent with modification) took place, but they do argue about *how* it took place. Details of the processes and mechanisms are vigorously debated.

Anti-evolutionists may hear the debates about *how* evolution occurs and misinterpret them as debates about *whether* evolution occurs. Evolution is sound science and is treated accordingly by scientists and scholars worldwide.

# MISCONCEPTION:

**“Gaps in the fossil record disprove evolution.”**





## **RESPONSE:**

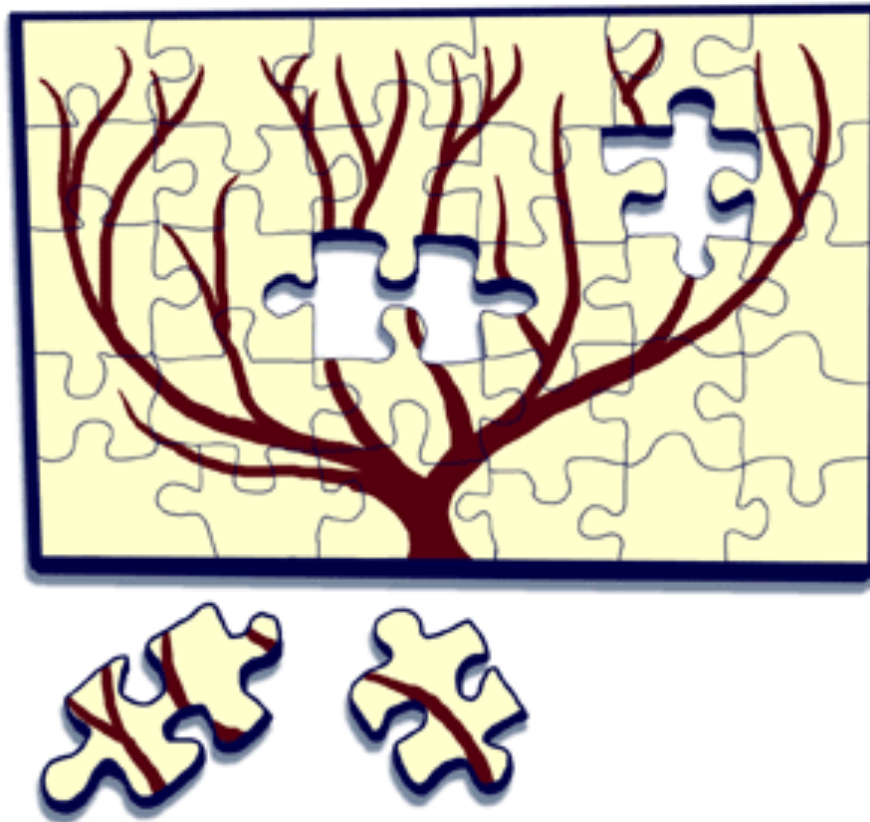
**The fact that some transitional fossils are not preserved does not disprove evolution.**

**Evolutionary biologists do not *expect* that all transitional forms will be found and realize that many species leave no fossils at all. Lots of organisms don't fossilize well and the environmental conditions for forming good fossils are not that common. So, science actually *predicts* that for many evolutionary changes there will be gaps in the record.**

**Also, scientists *have* found many transitional fossils. For example, there are fossils of transitional organisms between modern birds and their theropod dinosaur ancestors, and between whales and their terrestrial mammal ancestors.**

# MISCONCEPTION:

“Evolutionary theory is incomplete and is currently unable to give a total explanation of life.”



# RESPONSE:

Evolutionary science is a work in progress. New discoveries are made and explanations adjusted when necessary. And in this respect, evolution is just like all other sciences. Research continues to add to our knowledge. While we don't know everything about evolution (or any other scientific discipline, for that matter), we do know a great deal about the history of life, the pattern of lineage-splitting through time, and the mechanisms that have caused these changes. And more will be learned in the future. To date, evolution is the only well-supported explanation for life's diversity.

# MISCONCEPTION:

“The theory of evolution is flawed, but scientists won’t admit it.”



# RESPONSE:

Scientists have examined the supposed “flaws” that anti-evolutionists claim exist in evolutionary theory and have found no support for these claims. These “flaws” are based on misunderstandings of evolutionary theory or misrepresentations of evidence.

Scientists continue to refine the theory of evolution, but that doesn't mean it is “flawed.” Science is a very competitive endeavor and if “flaws” were discovered, scientists would be more than glad to point them out.

# MISCONCEPTION:

“Evolution is not science because it is not observable or testable.”



**RESPONSE:** Evolution is observable and testable. The misconception here is that science is limited to controlled experiments that are conducted in laboratories by people in white lab coats. Actually, much of science is accomplished by gathering evidence from the real world and inferring how things work. Astronomers cannot hold stars in their hands and geologists cannot go back in time, but in both cases scientists can learn a great deal by using multiple lines of evidence to make valid and useful inferences about their objects of study. The same is true of the study of the evolutionary history of life on Earth, and as a matter of fact, many mechanisms of evolution are studied through direct experimentation as in more familiar sciences.

# MISCONCEPTION:

“Most biologists have rejected ‘Darwinism’ (i.e., no longer really agree with the ideas put forth by Darwin and Wallace).”





# RESPONSE:

Darwin's idea that evolution generally proceeds at a slow, deliberate pace has been modified to include the idea that evolution can proceed at a *relatively* rapid pace under some circumstances. In this sense, "Darwinism" is continually being modified. Modification of theories to make them more representative of how things work is the role of scientists and of science itself.

Thus far, however, there have been no credible challenges to the basic Darwinian principles that evolution proceeds primarily by the mechanism of natural selection acting upon variation in populations and that different species share common ancestors. Scientists have not rejected Darwin's natural selection, but have improved and expanded it as more information has become available. For example, we now know (although Darwin did not) that genetic mutations are the source of variation acted on by natural selection, but we haven't *rejected* Darwin's idea of natural selection—we've just added to it.

# MISCONCEPTION:

## Evolution and religion are opposing ideas

Newspapers and television sometimes make it seem as though evolution and religion are incompatible, but that is not true.

Many past and current scientists who have made major contributions to our understanding of the world have been devoutly religious.

At the same time, many religious people accept the reality of evolution and many religious denominations have issued emphatic statements reflecting this acceptance.



"[T]here is no contradiction between an evolutionary theory of human origins and the doctrine of God as Creator."

— General Assembly of the Presbyterian Church

"[S]tudents' ignorance about evolution will seriously undermine their understanding of the world and the natural laws governing it, and their introduction to other explanations described as 'scientific' will give them false ideas about scientific methods and criteria."

— Central Conference of American Rabbis

"In his encyclical *Humani Generis* (1950), my predecessor Pius XII has already affirmed that there is no conflict between evolution and the doctrine of the faith regarding man and his vocation, provided that we do not lose sight of certain fixed points. . . . Today, more than a half-century after the appearance of that encyclical, some new findings lead us toward the recognition of evolution as more than an hypothesis. In fact it is remarkable that this theory has had progressively greater influence on the spirit of researchers, following a series of discoveries in different scholarly disciplines. The convergence in the results of these independent studies — which was neither planned nor sought — constitutes in itself a significant argument in favor of the theory."

— Pope John Paul II, Message to the Pontifical Academy of Sciences, October 22, 1996.

"We the undersigned, Christian clergy from many different traditions, believe that the timeless truths of the Bible and the discoveries of modern science may comfortably coexist. We believe that the theory of evolution is a foundational scientific truth, one that has stood up to rigorous scrutiny and upon which much of human knowledge and achievement rests. To reject this truth or to treat it as 'one theory among others' is to deliberately embrace scientific ignorance and transmit such ignorance to our children. We believe that among God's good gifts are human minds capable of critical thought and that the failure to fully employ this gift is a rejection of the will of our Creator. . . . We urge school board members to preserve the integrity of the science curriculum by affirming the teaching of the theory of evolution as a core component of human knowledge. We ask that science remain science and that religion remain religion, two very different, but complementary, forms of truth."

—“The Clergy Letter Project” signed by more than 10,000 Christian clergy members. For additional information, see [http://www.butler.edu/clergyproject/clergy\\_project.htm](http://www.butler.edu/clergyproject/clergy_project.htm).

Religion and science (evolution) are very different things. In science, only natural causes are used to explain natural phenomena, while religion deals with beliefs that are beyond the natural world.

The misconception that one always has to choose between science and religion is incorrect. Many religious groups have no conflict with the theory of evolution or other scientific findings.

In fact, many religious people, including theologians, feel that a deeper understanding of nature actually enriches their faith. Moreover, in the scientific community there are thousands of scientists who are devoutly religious and also accept evolution.