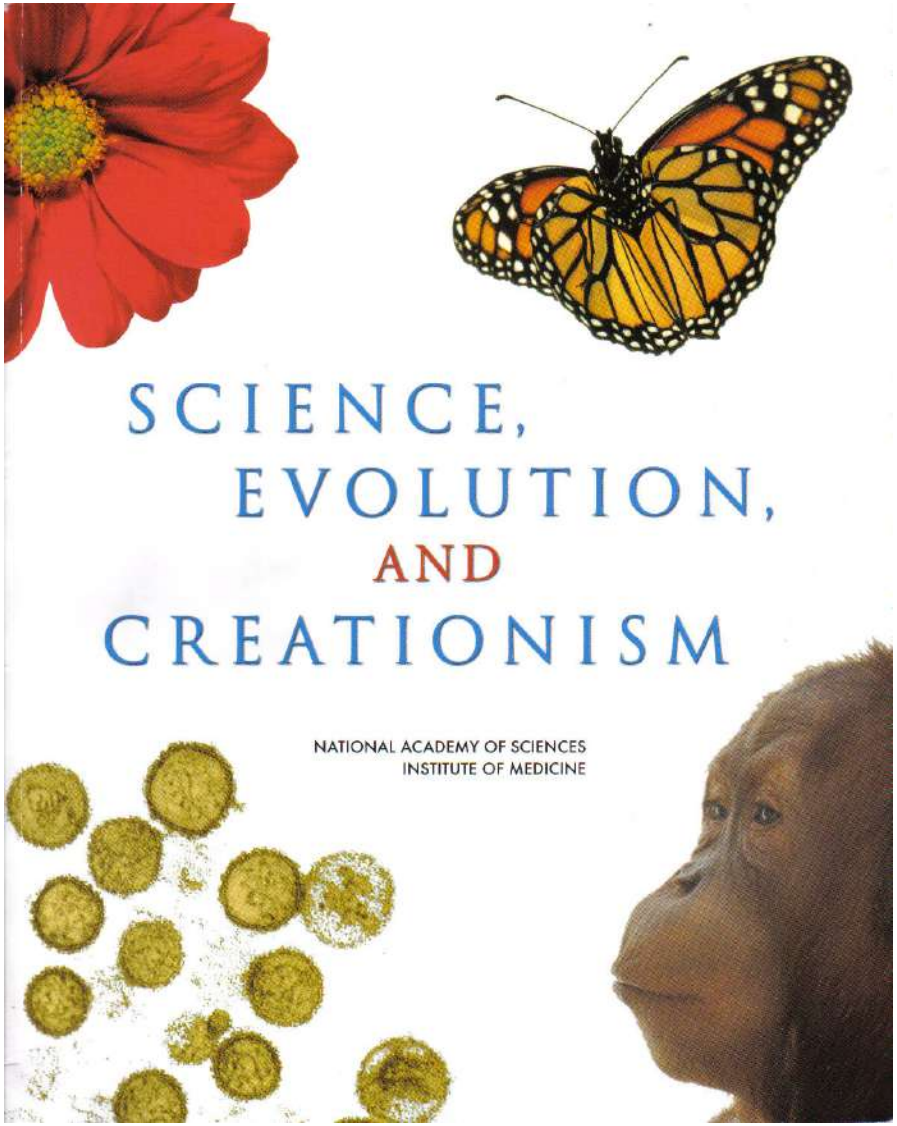

Science, Evolution, and Creationism

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Slide show by Kelly Riedell/Brookings Biology

Isn't evolution "just a theory"?

In every day usage "theory" often refers to a hunch or a speculation. When people say, "I have a theory about what happened," they are often drawing a conclusion based on fragmentary or inconclusive evidence.

The formal scientific definition of "theory" is quite different from the every day meaning.

It refers to a comprehensive explanation of some aspect of nature that is supported by a vast body of evidence.

http://evolution.berkeley.edu/evosite/evohome.htm

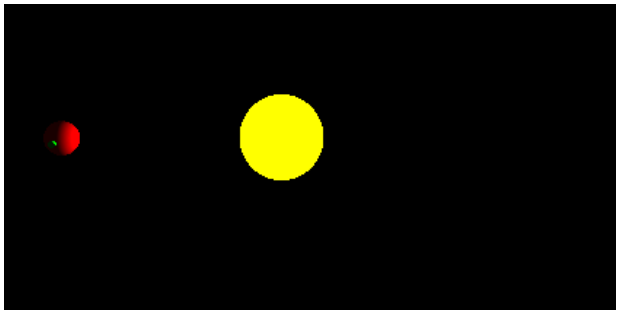
Isn't evolution "just a theory"?

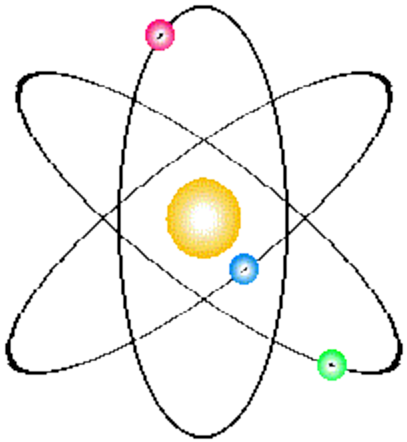
Many scientific theories are so well established that no new evidence is likely to alter them substantially.

EXAMPLES: No new evidence will demonstrate that the Earth does not orbit the Sun (heliocentric theory) or that living things are not made of cells (cell theory) or that matter is not composed of atoms (atomic theory) or that the surface of the Earth is not divided into solid plates that have moved over geological timescales (theory of plate tectonics)

http://www.avgoe.de/StarChild/DOCS/STARCH00/questions/apple_falling.gif

http://www.fearofphysics.com/SunMoon/sunmoon1.html





http://sixthsense.osfc.ac.uk/chemistry/atomic_structure2/atom.gif

Isn't evolution "just a theory"?

Like these other foundational scientific theories, the theory of evolution is supported by so many observations and confirming experiments that scientists are confident that the basic components of the theory will not be overturned by new evidence.

However, like all scientific theories, the theory of evolution is subject to continuing refinement as new areas of science emerge or as new technologies enable observations and experiments that were not possible previously.

http://www.npr.org/programs/fa/features/2005/04/flat_200.jpg

http://atmos.pknu.ac.kr/~swimm/wall/1024/EARTH.JPG

Aren't there many questions that still surround evolution? Don't many famous scientists reject evolution?

As with *ALL* active areas of science there remain questions about evolution.

There are always new questions to ask, new situations to consider, and new ways to study known phenomena.

BUT EVOLUTION ITSELF HAS BEEN SO THOROUGHLY TESTED THAT BIOLOGISTS ARE NO LONGER ASKING *WHETHER* EVOLUTION HAS OCCURRED AND IS CONTINUING TO OCCUR.

Similarly, biologists NO LONGER DEBATE MANY OF THE MECHANISMS RESPONSIBLE FOR EVOLUTION.

Aren't there many questions that still surround evolution? Don't many famous scientists reject evolution?

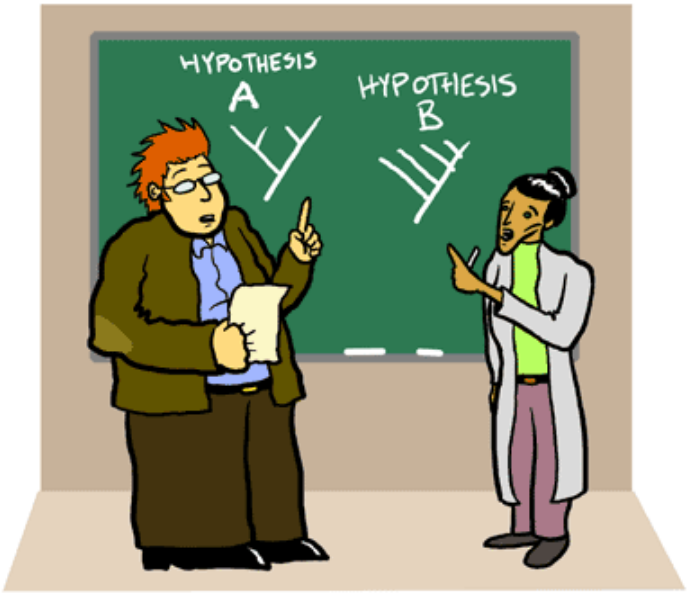
As with any other field of science, scientists continue to study the *MECHANISMS* of how the process of evolution operates.

The existence of such questions and continued study neither reduces nor undermines THE FACT THAT EVOLUTION HAS OCCURRED AND CONTINUES TO OCCUR.

Aren't there many questions that still surround evolution? Don't many famous scientists reject evolution?

Some who oppose the teaching of evolution sometimes use quotations from prominent scientists taken out of context to claim scientists don't support evolution.

However, examination of the quotes reveals that the scientists are disputing some aspect of HOW evolution occurs, NOT WHETHER evolution occurred.



http://evolution.berkeley.edu/evosite/evohome.htm

Aren't evolution and religion 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 be 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.

http://evolution.berkeley.edu/evosite/evohome.htm

"[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.

What's wrong with teaching critical thinking or "controversies" with regard to evolution?

Nothing is wrong with teaching critical thinking!

Students need to reexamine their ideas in light of observations and accepted scientific concepts.

Science knowledge is the result of the critical thinking applied by generations of scientists to questions about the natural world.

Scientific knowledge must be (and is) subjected to continued reexamination and skepticisms for human knowledge to continue to advance.

What's wrong with teaching critical thinking or "controversies" with regard to evolution?

Nothing is wrong with teaching critical thinking, but . . .

Discussion of critical thinking or controversies does NOT mean giving equal weight to ideas that lack essential supporting evidence.

Ideas of Intelligent Design are not the products of scientific reasoning. Discussing them in science class would not be appropriate given their lack of scientific support.

What's wrong with teaching critical thinking or "controversies" with regard to evolution?

Nothing is wrong with "teaching critical thinking", but…

recent calls to "teach the controversy" disguise a broader agenda to introduce creationist ideas as an equally viable alternative to evolution into the science classroom, even though scientists have thoroughly refuted these ideas.

In fact, the application of critical thinking to the science curriculum would argue against including these ideas in a science class because they do not meet scientific standards.

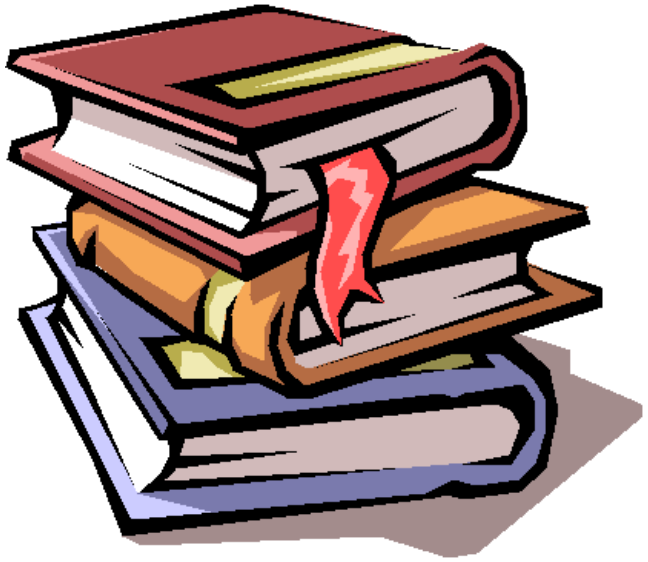
What's wrong with teaching critical thinking or "controversies" with regard to evolution?

Nothing is wrong with teaching "controversies", but . . .

there is NO CONTROVERSY about the basic facts of evolution.

Arguments that attempt to confuse students by suggesting that there are fundamental weaknesses in the science of evolution are unwarranted based on the overwhelming evidence that supports the theory.

CREATIONIST ideas lie outside the realm of science and introducing them in science courses has been ruled UNCONSTITUTIONAL by the U.S. Supreme Court and other federal courts.



Wouldn't it be "fair" to teach creationism along with evolution?

The goal of science education is to expose students to the best possible scholarship in each field of science.

Ideas need to be part of the base of accepted scientific knowledge before they are appropriately taught in schools.

Scientists and science educators have concluded that evolution should be taught in science classes because it is the only tested, comprehensive scientific explanation for the nature of the biological world today that is supported by overwhelming evidence and widely accepted by the scientific community.

The ideas supported by creationists, in contrast, are not supported by evidence and are not accepted by the scientific community.

Wouldn't it be "fair" to teach creationism along with evolution?

Different religions hold very different views and teachings about the origins and diversity of life.

Because creationism is based on specific sets of religious convictions, teaching it is science classes would mean imposing a particular religious view on students and thus is unconstitutional.

Image: http://dlibrary.acu.edu.au/research/theology/ejournal/aejt_9/images/Religions.gif

NATIONAL LIFE SCIENCE CONTENT STANDARDS

BIOLOGICAL EVOLUTION

Species evolve over time. Evolution is the consequence of the interactions of:
(1) the potential for a species to increase its numbers,
(2) the genetic variability of offspring due to mutation and recombination of genes,
(3) a finite supply of the resources required for life, and
(4) the ensuing selection by the environment of those offspring better able to survive and leave offspring. [See Unifying Concepts and Processes]

The great diversity of organisms is the result of more than 3.5 billion years of evolution that has filled every available niche with life forms.

• Natural selection and its evolutionary consequences provide a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms.

• The millions of different species of plants, animals, and microorganisms that live on earth today are related by descent from common ancestors.

• Biological classifications are based on how organisms are related. Organisms are classified into a hierarchy of groups and subgroups based on similarities which reflect their evolutionary relationships. Species is the most fundamental unit of classification.

SOUTH DAKOTA LIFE SCIENCE STANDARDS
Indicator 2: Analyze various patterns and products of natural and induced biological change.

Bloom's Taxonomy Level	Standard, Supporting Skills, and Examples
SYNTHESIS	**9-12.L.2.2. Students are able to describe how genetic recombination, mutations, and natural selection lead to adaptations, evolution, extinction, or the emergence of new species.** **Examples: behavioral adaptations, environmental pressures, allele variations, bio-diversity** **• Use comparative anatomy to support evolutionary relationships.**

Core High School Life Science Performance Descriptors (NO CHILD LEFT BEHIND)

PROFICIENT	**High school students performing at the PROFICIENT level:** •predict the impact of genetic changes in populations (mutation, natural selection and artificial selection, adaptation/extinction); • predict how life systems respond to changes in the environment;

NATIONAL SCIENCE STANDARDS

Unifying Concepts and Processes

**As a result of activities in grades K-12,
all students should develop understanding and abilities
aligned with the following concepts and processes:**

Systems, order, and organization
Evidence, models, and explanation
Constancy, change, and measurement
Evolution and equilibrium
Form and function