These slides have material taken from the National Academy of Sciences.

*The Fall and the Expulsion from the Garden of Eden*  Michelangelo (Sistine Chapel)
"THE AFFINITIES of all the beings of the same class have sometimes been represented by a great tree. I believe this simile largely speaks the truth. The green and budding twigs may represent existing species; and those produced during each former year may represent the long succession of extinct species . . . The limbs divided into great branches, and these into lesser and lesser branches, were themselves once, when the tree was small, budding twigs; and this connexion of the former and present buds by ramifying branches may well represent the classification of all extinct and living species in groups subordinate to groups . . . From the first growth of the tree, many a limb and branch has decayed and dropped off, and these lost branches of various sizes may represent those whole orders, families, and genera which have now no living representatives, and which are known to us only from having been found in a fossil state . . . As buds give rise by growth to fresh buds, and these, if vigorous, branch out and overtop on all a feeble branch, so by generation I believe it has been with the Tree of Life, which fills with its dead and broken branches the crust of the earth, and covers the surface with its ever branching and beautiful ramifications". The Origin of Life
Creator of Evolution Theory

Charles Darwin

There is grandeur in this view of life; with its several powers having been originally breathed by the Creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed laws of gravity, from so simple a beginning endless forms most wonderful and most beautiful have been, and are being evolved.

Last paragraph of The Origin
Evolution explains in general:

Similarities among living things:
- the diversity of life

the filling of niches in the natural world

**Specific practical advantages in modeling evolution:**

Evolution explains why many human pathogens have been developing resistance to formerly effective drugs

Evolution has contributed to many important agricultural advances by explaining the relationships among wild and domesticated plants and animals and their natural enemies

An understanding of evolution has been essential in finding and using natural resources, such as fossil fuels, and it will be indispensable as human societies strive to establish sustainable relationships with the natural environment.

There is no evidence that evolution has not occurred. However, as with all scientific knowledge, a theory can be refined in light of new and compelling evidence. This is continuously happening with evolution.
Evolution represented as a tree
The classic finches from *The voyage of the Beagle* (1839)
A bat wing, a mouse forelimb, and a human arm serve very different purposes, but they have the same basic components. The similarities arise because all three species share a common four-limbed vertebrate ancestor.
The complex eye...

Eyes evolved over many millions of years from simple organs that can detect light.
Ancestors of the Modern Whale
Evolution of the Homo Sapien
A timeline of life on earth...
A geological cross section of the Grand Staircase-Escalante National Monument in Utah shows layers of sedimentary rock. These layers reveal deposits laid down over millions of years. Older fossils are found in the lower layers, revealing the succession of organisms over time.
The microscopic mechanism

DNA genes mutate

Some causes:
1. natural radiation
2. natural recombination

These mutations will have
1. No effect
2. A change which is disadvantageous
3. A change which is advantageous
Pope John Paul II in October 1996

...new knowledge has led to the recognition of the theory of evolution as more than a hypothesis. It is indeed remarkable that this theory has been progressively accepted by researchers, following a series of discoveries in various fields of knowledge. The convergence, neither sought nor fabricated, of the results of work that was conducted independently is in itself a significant argument in favor of this theory.

And, to tell the truth, rather than the theory of evolution, we should speak of several theories of evolution. On the one hand, this plurality has to do with the different explanations advanced for the mechanism of evolution, and on the other, with the various philosophies on which it is based. Hence the existence of materialist, reductionist and spiritualist interpretations. What is to be decided here is the true role of philosophy and, beyond it, of theology....