The Evolution Dialogues PowerPoint Presentation

Presenter Guide

Many people have ambivalent or even hostile feelings about the teaching of evolutionary science, believing that evolutionary theory is a threat to their religious beliefs. What accounts for these concerns? One answer is that there are deep misunderstandings about what biological evolution is, what science itself is, and what views people of faith, especially Christians, have applied to their interpretations of science. In 2006, the American Association for the Advancement of Science (AAAS), through its Program of Dialogue on Science, Ethics, and Religion, developed a resource called *The Evolution Dialogues: Science, Christianity, and the Quest for Understanding* in order to correct some of those misunderstandings. This presentation is based on that resource.

Each section of the presentation corresponds to a chapter of the book and includes the major points of that chapter along with talking points for each slide. The content offers an understanding of the origin, development and current state of evolutionary theory, the science that produces it, and the history of nature that results from the application of modern evolutionary theory. It also presents the cultural contexts in which the original theory appeared, the initial Christian reactions, how Christians have understood religious knowledge as compared with scientific knowledge, and some of the many ways that Christians today respond to evolutionary theory. Ultimately, it demonstrates that the historical interaction between evolutionary science and Christianity has been more complementary than combative.

An understanding of these issues is important because the quality of public science education and the constitutional provision for religious liberty guaranteed in the First Amendment are at stake. Christians and non-Christians alike benefit from such fruits of science as better understanding of energy, medicine, and ecology. These benefits can be lost if science education is undermined either by those who claim that science is the only source of knowledge or by those who claim that scientific knowledge is only legitimate if it conforms to a particular set of religious doctrines.

Introduction (Slides 2-6)

Slide 2

1. This presentation was created by the American Association for the Advancement of Science (AAAS).
2. AAAS is the world's oldest and largest general scientific society and represents some 10 million scientists worldwide.

3. AAAS is the publisher of the journal *Science,* the premier peer-reviewed general science journal, which was founded in 1880 by Thomas Edison and has approximately one million readers per week.

Slide 3

1. The mission of AAAS is to advance science and innovation throughout the world for the benefit of all people.
2. It summarizes these goals in the statement "advancing science, serving society".

Slide 4

1. Questions of meaning and religion emerge from our deepening understanding of science.
2. The scientific community needs to be in dialogue with the religious and ethics communities in order to understand the cultural context within which science operates and to respond to the societal issues opened up by scientific discovery and technological development.
3. To address these concerns, AAAS established the Program of Dialogue on Science, Ethics, and Religion. "DoSER" is the only program situated within a scientific society to directly address the religious perspective and engage with religious communities.
4. DoSER's mission is to 1) Contribute to the level of scientific understanding in religious communities and 2) Promote multidisciplinary education and scholarship of the ethical and religious implications of advances in science and technology.

Slide 5

1. DoSER also seeks to increase the engagement of scientific communities in the dialogue on science, ethics, and religion; facilitate collaboration among scientists, ethicists, and religion scholars and leaders; and further public understanding of the dialogue on science, ethics, and religion.

Slide 6

1. Evolution is a key issue in the dialogue on science and religion, and objections to evolution often stem from Christian concerns.
2. To address these concerns, DoSER has produced a resource called *The Evolution Dialogues: Science, Christianity, and the Quest for Understanding.*
3. *The Evolution Dialogues* is a conversation on evolution and Christianity that describes the development of evolutionary theory from before Darwin to the present and discusses historical interactions of evolution and Christianity. It also illustrates scientific and Christian approaches to understanding and explains the history of life as revealed through the evolutionary sciences. The chapters of the book alternate in considering the scientific and Christian perspectives.
4. The book was designed for church adult education classes but it has also found a wide audience among biology teachers, college science professors and clergy along with the general public.

5. Its balanced presentation of the relationship between evolution and Christianity may help diffuse some of the tension that arises from the consideration of these issues.

Chapter 1. Science in Darwin's Time (Slides 7-11)

Major points
To understand how evolutionary theory developed, it is helpful to understand what was happening scientifically in Darwin's time. Even before Darwin formulated his theory, evidence was accumulating for an old Earth, species extinction, and changes in nature over time. Darwin was one of many thinkers who offered hypotheses to explain these new discoveries.

Slide 8
1. In the late 18th century, many people in the western world were caught up in the spirit of scientific discovery.
2. Fossils were discovered in Russia, Europe, and North America, overseas travel brought discovery of new plants and animals.
3. Geologists and surveyors uncovered suggestive patterns in layers of soil and rocks.
4. This information required a comprehensive theory that could explain the Earth's natural history.

Slide 9
1. At the time, based on recorded lineages in the Bible, Earth was usually held to be only a few thousand years old. However, new thinkers challenged this theory.
2. Comte de Buffon proposed an age of 75,000 years based on experiments heating and cooling iron and other materials that comprised the earth.
3. James Hutton observed the gradual nature of processes like weathering and erosion and concluded that Earth must be millions of years old.
4. Geologist Charles Lyell studied rock layers and found evidence to support Hutton's hypothesis.

Slide 10
1. Scientists also had to account for the discovery of fossils of plants and animals that no longer existed.
2. One hypothesis came from Jean-Baptiste Lamarck who speculated that as an organism's needs changed in response to environmental changes, it would change how it used its body and its body itself would change, so that species would "transmute" into new species over time.

Slide 11
1. Unconvinced by this explanation and others, Charles Darwin explored the question both through his travels around the globe and through years of observation and careful research.

2. Eventually, he proposed that individuals with traits that are more "adaptive" in their particular environment would be more successful and leave more offspring.
3. Those offspring would share the adaptive traits and themselves be more successful.
4. Eventually all members of a species would share the adaptive trait.
5. Darwin did not invent the idea of evolution, but rather articulated the mechanism of **natural selection**, which could be studied as a natural process with testable predictions.

Chapter 2. Christianity in Darwin's Time (Slides 12-16)

Major points
In Darwin's time science was commonly used as a way to try to understand God. Some Christians believed that seeking scientific knowledge was a means of giving praise to God. This approach was different from the prevalent modern perspective that science and religion are antagonistic. Rather, the Bible and nature were considered to be two sources of distinct but complementary truth.

Slide 13
1. The prevailing approach to understanding nature combined knowledge from the bible, nature and history.
2. An exact age of the Earth was derived by James Ussher, Archbishop of Armagh, in 1650 by combining evidence from the Bible, nature, and history to date the creation of the world 4004 B.C.
3. Ussher started with known dates of the reign of Nebuchadnezzar II and subtracted the life spans of the patriarchs as stated in the Bible. With astronomical tables and the assumption that God's creation would correspond with an astronomical beginning he pinpointed the closest Sunday to the equinox and arrived at the specific date of October 23.

Slide 14
1. Generally, the knowledge from the Bible took precedence over other forms of knowledge.
2. Many people at that time believed in "Special Creation" or the idea that God created each living thing in its ideal form or "kind."
3. To many people, the book of Genesis implied that people were created in God's image, and that they held a special place in a linear progression of creatures that started with worms and ended with God.

Slide 15
1. As scientific evidence accumulated, geologists moved from the 6,000 year-old Earth theory toward the idea of a much older Earth.
2. Religious thinkers questioned how then to interpret the first chapter of Genesis.
3. They formulated alternative interpretations such as the Day-Age theory (the idea that each day in Genesis symbolized an entire epoch) and the Gap theory (the idea that there had been a vast gap of time between an initial creation referred to in

Genesis 1:1 and the next day of creation as well as between the later days of creation).
4. A major cultural shift in the 19th century was the emerging conviction that science should be based on empirical evidence, or what can be learned through the natural world.

Slide 16
1. Darwin's own religious views were complicated.
2. He never denied the existence of God, but did not fully embraced God either. His feeling toward nature could be described as religious, yet he did not subscribe to Christian teachings on revelation, redemption, and salvation.
3. He may best be described as agnostic.

Chapter 3: The Theory of Evolution (Slides 17-23)

Major Points
Life on Earth has changed and continues to change. The primary mechanism of evolutionary change is natural selection. Biological evolution is widely accepted by scientists but, as in all branches of science, some details are debated and questions remain to be answered.

Slide 18
1. Evidence supports the conclusion that all species are related to each other through a common ancestor.
2. Through evolution, each species has become distinct as a result of incremental changes to traits that accumulate down through lines of descendants over millions of years.

Slide 19
1. Natural selection is not random--it occurs through the often predicable influence of environmental conditions.
2. But the introduction of tiny changes, or mutations, to DNA is random.
3. Some of these mutations create changes in traits resulting in increased reproductive success and endure through generations.

Slide 20
1. Natural selection is not the only evolutionary mechanism.
2. Another mechanism is **sexual selection**, where females prefer to mate with the most impressive male and these males transfer more DNA to the next generation.
3. A third is **genetic drift,** where the genetic structure of a population changes randomly over time. This is most common in small, isolated populations where the gene pool is small.

Slide 21
1. Some people discriminate between **microevolution** and **macroevolution**.

2. **Microevolution** is the small-scale, observable change that occurs over time within a species.
3. **Macroevolution** is the production of new species through evolutionary processes.
4. However, the only difference between these two is time-scale; they occur through the exact same mechanisms.

Slide 22

1. Evidence for evolution abounds and takes a variety of forms.
2. These include **homologies**, the anatomical structures that are similar across species (e.g. the forelimbs of frogs, lizards, rabbits and birds).
3. A variety of **transitional fossils** document the step-wise changes within species, across species and across lines that separate one type of body plan from another (e.g. Tiktaalik, a fossil with features of both aquatic and land animals)

Slide 23

1. The vast majority of scientists agree that the evidence for evolution is overwhelming.
2. But, just as is true of any scientific theory, a number of questions remain.
3. Scientists continue to explore these questions including the following:
   When did the various species first evolve?
   How much is the evolution of one species related to the evolution of another?
   How did life originate?

Chapter 4: Initial Responses to Darwin's Theory (Slides 24-32)

Major Points

In the continuously changing world of the 19th century, the purpose of humanity and its relationship to God was less clear-cut. Still many people, including many Christians, gave the theory their support and, after the initial hubbub, for many years the theory was not viewed as particularly controversial. Opposition to evolution by American Christians did not gain ground until the early 20th century.

Slide 25

1. In 1859, Charles Darwin published *On the Origin of Species*.
2. There was widespread interest and the book sold out in the first day
3. Interest was fueled by the challenge the book posed to the understanding of God as creator and the origins of human morality.
4. Readers varied widely in their response to the book.

Slide 26

1. Some rejected Darwin's theory because they believed that change in nature was part of God's plan but that Darwin's theory contradicted this.
5. Some also thought that the theory of evolution lacked sufficient evidence and that it conflicted with a literal reading of Genesis.

Slide 27

1. Some colleagues of Darwin supported the old Earth theory and natural selection.
2. But many could not accept that evolution applied to humans

Slide 28

1. Other colleagues responded enthusiastically.
2. These included both scientists and Christians.
3. One example was Reverend Charles Kingsley who believed that God could work through evolution.

Slide 29

1. Evolution was accepted fairly quickly within the scientific community and the general public.
2. Natural selection posed more of a challenge until the discovery of genetics in the 20^{th} century clarified how it occurred.
3. After the initial firestorm, neither of these ideas were particularly controversial and in fact were embraced by many members of the public to justify popular but unscientific views.
4. For example, poor and sick members of society were sometimes labeled "unfit."

Slide 30

1. Among Christians there were surprisingly few issueswith evolution
2. Mainline protestants were generally not resistant to evolution
3. Many evangelical protestants also found evolution consistent with their religious beliefs.
4. Catholics had more concerns, partly due to use of evolution in the U.S. to justify opposition to immigration of European Catholics
5. No major issues among other religious groups
6. No official U.S. stance against teaching evolution

Slide 31

1. This changed with the emergence of several factors including the rise of fundamentalist Christianity, threats to the stability of traditional society and increases in the number of children receiving public education.

Slide 32

1. People grew less comfortable with a theory in which change and contingency were central and a Tennessee law was passed criminalizing the teaching of evolution.
2. The law was challenged by the Scopes Monkey Trial but the case was dismissed and the law stood for forty years.
3. Four other states subsequently banned the teaching of evolution in public schools.
4. Numerous districts banned the teaching of human evolution in particular.

Chapter 5: The Science Behind Evolution (Slides 33-38)

Major Points
The scientific method uses observations and logic to develop testable hypotheses. Scientific theories encompass many tested hypotheses and are continually refined as new data is discovered. By definition, science cannot provide answers to supernatural questions.

Slide 34
1. Science is a process through which to understand the natural world.
2. The scientific method uses observations and logic to develop testable hypotheses.
3. Science seeks natural explanations for natural events.

Slide 35
1. Observations that have been confirmed again and again are called **facts**. For example, the Sun is 93 million miles from Earth.
2. A tentative proposal used to explain data is called a **hypothesis.**
3. A **theory** is an explanation of how nature works that encompasses many tested hypotheses. Scientific theories encompass many tested hypotheses and are continually refined as new data is discovered.

Slide 36
1. Darwin developed his thoughts about natural selection after his famous journey around the world on the HMS Beagle. But before publishing the theory, he worked for many years to collect data to support it.
2. He primarily studied pigeons.
3. He hypothesized that despite differences between breeds, all pigeons were descended from rock doves and were a single **species**.
4. To test the hypothesis, he mated pigeons from different breeds and found that they produced offspring that could also reproduce.

Slide 37
1. Only one thing is certain in science: nothing is certain
2. Scientists must remain flexible and open to new ideas.
3. New data is always being collected and can require that new hypotheses be generated to account for them.
4. Changes to theories are accepted if they explain observations that conflict with original theories and predict further data.

Slide 38
1. Science can be interpreted non-scientifically
2. These interpretations of science are sometimes born of inflexible worldviews and obscure what science has discovered. For example, some people claim that science supports atheism and others that it supports theism. But, by definition, no aspect of science can address supernatural questions.

3. Science is not the only way of knowing. It can complement and contribute to questions about meaning and purpose but it does not itself provide the answers.

Chapter 6: Christian Worldviews (Slides 39-45)

Major Points
Christian knowledge is gained through revelation, tradition, reason, and experience. Religion begins with faith and deals with the question of what things mean.

Slide 40
1. The Christian worldview is based on 5 sources of knowledge.
2. **The Bible** is the foundation of Christian belief.
3. **Revelation** is a source of Christian knowledge.
4. **Tradition** is based on biblical interpretations, theology, church government, and religious practices.
5. **Reason** is considered a gift from God that leads to deeper understanding.
6. **Experience** is everyday life, observations of the world, religious experiences.

Slide 41
1. The Christian story according to the gospel books of Matthew, Mark, Luke, and John is that Jesus was a rabbi and healer who preached God's love.
2. He was seen as threat to social order and was arrested, tried, and crucified.
3. Three days later Jesus appeared in the flesh and after forty days, was taken up to be with God.

Slide 42
1. Christianity is the world's largest religion with some 2 billion believers.
2. Followers of Christianity declare that Jesus the Messiah is God's chosen one.
3. They believe they are called to love God and others while following the example of Jesus who is revered as the Savior from sin.
4. Because of Jesus' death, Christians believe that if one is repentant, unity with God is possible even after wrongdoing.

Slide 43
1. Religion is the pursuit of answers to life's "big questions" such as those about life's purpose, how to conduct oneself, morality, the meaning of suffering, personal status after death, and the nature of the divine.
2. Through religion, humans seek to understand reality beyond scientific exploration.

Slide 44
1. With faith as the starting point, all systems of knowledge are built through shared assumptions, judgments, and experiences over time.
2. Though religious doctrines are often tested against cultural circumstances, there is not an intentional testing of doctrine.

Slide 45

1. Sometimes there is disagreement and controversy within Christianity.
2. For example, some believe in **biblical inerrancy,** or that the Bible is without error in every detail, and others subscribe to **biblical infallibility**, the idea that the Bible is correct in what it teaches.

Chapter 7: The World as Explained by Evolution (slides 46-52)

Major Points: Evolution explains many features of the world and humanity.

Slide 47

1. Our world is characterized by almost incomprehensible diversity.
2. To date, scientists have discovered and formally described 1.8 million species but most estimate an actual total of between 4 million and 15 million.
3. Evolution provides a framework through which to explore and understand this diversity.

Slide 48

1. Despite their differences, all species are the same in containing **DNA** molecules, which are the building blocks of life.
2. Scientists can determine how closely related two species are by comparing their DNA sequences. Generally, the more similar they are, the more closely two species are related.
3. Similar external traits also reflect relatedness between species.
4. However, sometimes similar traits arise from **convergent evolution**, a process where similar traits evolve even when species are only distantly related. An example is the wings of bats and the wings of birds. The common ancestor of these species did not have wings; rather, wings evolved independently in the two groups.

Slide 49

1. The **Big Bang Theory** is the predominant explanation for origin of the universe.
2. The first single-celled life forms appeared between 3.5 and 4 billion years ago.
3. The scientific definition of a living thing is one that is able to acquire and use energy, has a membrane separating it from its surroundings, and can reproduce on its own.

Slide 50

1. Soil and bacteria built up on Earth's surface.
2. Simple plants and fungi emerged and over the next couple billion years, eukaryotes appeared.
3. Around 1 billion years ago, the first multi-celled animals formed eukaryotic cells.
4. 500 million years ago, the first animals with spines evolved.

Slide 51

1. 5 to 8 million years ago a fork in the branching evolution of primate species occurred.
2. The chimpanzee lineage evolved from one set of branches and modern humans evolved from the other.
3. This second set of branches is referred to as **hominins.** The human species is the only surviving branch of the hominin family.

Slide 52

1. The story of evolution tells us that humans evolved very late in the history of biological evolution and that, of the millions of species that have existed on Earth, humans stand apart.
2. Humans operate within a framework of cultural evolution. They also have unprecedented effects on the existence of other forms of life on the planet.

Chapter 8: Contemporary Stances Toward Evolution (Slide 53-59)

Major Points: Creationism and "intelligent design" deal with supernatural questions that cannot be addressed through the scientific method. Science and religion ask and answer different questions, but there is a growing body of scholarship encouraging constructive engagement.

Slide 54

1. Debates continue in the U.S. over whether and how evolution should be taught.
2. Views range from the wish to change science to make it consistent with religious views to the desire to modify religious views to account for an evolving universe, to the need to separate science and religion into distinct domains.

Slide 55

1. Those wishing to change science to be consistent with religious views have been most vocal in the U.S.
2. For example, supposedly scientific claims have been made to support creationist doctrines but these have been rebutted by scientists as distortions of science.
3. Advocates of this "scientific" creationism lobbied for its inclusion alongside evolution in public school science curricula.
4. In 1987, the Supreme Court ruled the teaching of "scientific" creationism as unconstitutional. However, they agreed that *scientific* alternatives to evolution could be taught.

Slide 56

1. The Intelligent Design (ID) movement took advantage of this opening to offer a supposedly scientific critique of evolution.
2. ID's argument is that that the emergence of the first living things and other biological phenomena cannot be explained by science and are evidence of a supernatural hand at work.

3. It also advocates that some biological structures are "**irreducibly complex"** such that they could not have developed through evolution and must indicate a supernatural designer.
4. But the examples ID proponents provide are all explainable by evolution.
5. ID advocates undermine evolutionary biology by urging schools to "teach the controversy" but there is no scientific controversy about evolution.

Slide 57

1. Science counters the ID movement by pointing out several philosophical flaws.
2. ID presumes that the actions of a supernatural designer can be detected through scientific inquiry.
3. However, supernatural entities, by definition, operate outside of natural laws and so cannot be investigated using scientific methods which require the assumption that what is being investigated obeys natural laws.
4. ID encourages the abandonment of scientific inquiry about natural causes by prematurely declaring a supernatural cause.
5. Many theologians argue that ID is bad theology, as well as bad science, because as more scientific questions are answered, the "evidence" of God becomes smaller.

Slide 58

1. Many Christians believe that science and religion constitute different but complementary forms of truth.
2. Christians are taking more public stances in support of evolution theory by affirming that Christianity historically encouraged scientific pursuit, that faith in God can be consistent with an evolutionary understanding of life and that evolutionary theory stimulates an evolving understanding of God.

Slide 59

1. Many theologians articulate the view of creation and evolution as interactive
2. One example is Evolutionary Theology, which views God as continuously engaged in an ongoing creation of the universe through evolutionary processes.
3. Another is Process Theology, which suggests that God creates the world by enabling it to create itself and that God is affected as the universe evolves.

Epilogue (slide 60)

1. For those seeking to move beyond the perception that evolutionary science and Christianity are at odds, it is worthwhile to consider that science and the Christian tradition share certain values.
2. Christians and scientists are both committed to *truthfulness*.
3. A sense of *community* is central to both; neither is a socially isolated reality.
4. They both share a respect for and dependence on *tradition*. As Isaac Newton noted, scientists "stand on the shoulders of giants," and contemporary Christian beliefs and practices can be traced back some 2000 years.

5. Contrary to what some people believe, both science and the Christian tradition value analytic *reason*, and reason is a tool that should allow scientists and Christians to discover opportunities for consonance.