Creationism, Intelligent Design, & Evolution for HPC
THE EVOLUTION WARS
A Christian Perspective on Human Evolution
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Let me set the stage for tonight's discussion. Two years ago I gave a presentation on the evolution wars. I discussed the life of Charles Darwin and his intellectual pursuits. I covered the judicial trials over the past century regarding the teaching of creation, creation science, and intelligent design in high school science classes.
And, I promoted the concept that the evolution wars are not a faith versus science issue. Rather, one should strive to integrate God given spiritual and scientific truths,/ including evolution,/ and combine them into a healthy holistic worldview,/ which seeks justice, honors God given human values, and honors our creator.

Evolution actually just means evolving or changing. But, I will more specifically define the term by using Webster's third option: "A process in which the whole universe is a progression of interre lated phenomena."

It is hard for us humans, who live at most for 100 years, to conceive that when we talk about evolution, we are talking about changes in the universe that have occurred over 13.7 billion years; and, that the planet Earth was formed 4.54 billion years ago. And according to the study of Zircon crystals, which contain Uranium which decays at a known rate, they reveal that the first life on earth was 3.8 billion years ago, the first complex cells with a nucleus 2 billion years ago, the Cambrian Explosion (the first significant appearance of primates, vertebrates, etc.) about 470 million years ago, the appearance of pre-humans (hominids) about 7 million years ago, and modern humans (Homo sapiens) about 150-200,000 years ago.

Tonight I only have time to discuss the scientific evidence for: "How We Became Human."

Which takes me to the last two bullets of our timetable; as I focus on the evolution of Pre-humans starting in Africa 7 million years ago, and Modern Humans or Homo sapiens starting with a group of hunter-gathers, perhaps just a few hundred strong, originating about 200 to 150,000 years ago in eastern Africa.

Humans (Homo sapien) lived in tiny separate bands for 100,000 years. These tiny bands of early Homo sapiens were forced apart starting about 175,000 years ago into various parts of Africa and the Middle East by harsh environmental drought conditions and were brought to the brink of extinction. But they reunited and starting about 70,000 years ago they again migrated out of Africa.

They now populate the whole world. From a band of about 2,000 individuals,// human beings have grown, and in the last 2000 years there has been a population explosion.

They now number just short of 7 billion Homo sapiens. And they are the only surviving Homo species. This truly epic drama is substantiated in our mitochondrial and Y chromosomal DNA.

Evolutionary theory therefore indicates that the creation of the current human species is the culmination of a long, ongoing, and continuing creative biological process which started billions of years ago. That statement is both thought provoking and I am sure difficult or impossible for some of you to accept.

Here is an outline of what I have chosen to focus on. I will cover anthropological and biological evidence, and then discuss the evolution of the brain, language, spirituality, consciousness, abstract thought, and culture.

I will start with Anthropological and Anatomical evidence.
This pictorial, flow-chart presentation summarizes the hominid-human evolutionary time span. It points to the scientific belief that both chimps and hominids, including early humans, descended from a single, unknown, primate 7 million years ago. The Gorilla, Chimpanzee, and H. sapiens are the only living survivors from this flow chart. The "early hominids—Australopithecus, and archaic humans—such as H. habilis, H. erectus, and the Neanderthals have all become extinct. The oldest hominid, discovered in 2002, believed t o have lived 6-7 million years ago.

It is named Sahelanthropus tchadensis because it was discovered in Chad in central Africa.

The Chimpanzee is our closest living primate relative. They are similar to humans in many ways: they are socially complex, sensitive, self aware, and communicative. They are closely related to us genetically and yet indisputably on the animal side of the man/beast divide. They have much less of a moral conscience, and do not possess a spiritual dimension.

Comparative anatomy studies of the Chimpanzee and Homo sapiens give further evidence of the close relationship between the two, but there are profound differences.

On the right, humans have a better opposing thumb and index finger; have teeth that work better for a high protein, fat diet, as opposed to the chimp's large canine teeth and other teeth which do better with a course fiber diet. Humans have shorter arms and longer legs, an S-shaped curved spine, a shorter pelvis, and arched feet; which are all better for walking, but leave us prone to numerous aches and pains.

With the formation of the Rift Valley, there were changes in the African continents topography, loss of forest cover, and climate changes which demanded bipedelism for survival of hominids, and led to extinction for most species that were not bipedal.

I would like to focus a few moments on the transitional early hominids, starting with the Australopithecus, on the left. Again, the Homo sapien on the right is the only survivor.

This reconstruction of the species Australopithecus afarensis shows a rather intelligent look, don't you think.

Lucy and child, who were from this species, were discovered in 1976 in the rift valley, but lived about 3.4 million years ago.

A three year old female child of the same species, Australopithecus afarensis, was found and reported in NATURE in 2006.

It was discovered in the Awash region of the Rift Valley in northeast Ethiopia.

That discovery included a good set of bones which makes it a valuable find to further support evolutionary theory.

Artist John Gurche caught this later Australopithecus africanis family roaming the ancient South African savanna about 2 plus million years ago.

And next in line, this Homo habilis skull from less than 2 million years ago.& nbsp; This genus is thought to be the first in direct human lineage.

And, in 1984, this 1.6 million year old, almost complete skeleton of a Homo erectus male youth was discovered, very near the Robert and Morrie Swart RCA mission station, near Lake Turkana on the Ethiopian, Kenyan border. He was about 5'9" tall, slender, and had shed all ape like proportions as an adaptation to greater activity including the ability to run.

I had the privilege of filming and documenting the Swarts' mission program 12 years earlier in 1972. It was a most interesting experience to see this desert area, meet the native Dosinetch people, and film the first Christian baptism of a family in the Omo River, after first making sure there were no alligators in the river.

This new species, Homo erectus, accounted for the first of a continuing set of early migrations out of Africa to Asia and Europe. There is common agreement that Africa is the birthplace of humanity.

There is also nuclear chromosome DNA evidence that supports human evolution. Genetic mechanisms are basic to consideration of all aspects of evolution. They furnish the strongest evidence to support mutation, natural selection, and biological evolution.

In 1953, Watson and Crick discovered the structural basis for the storage of genetic information in the chromosomes. And 50 years later in 2003, the Human Genome Project published the first complete human genome in the scientific journal: "Nature". However it was a composite from several human sources.

And last year, Dr. Venter finished the first mapping of his own full, or diploid, genome, made up of DNA inherited from both of his parents. The nucleus of every cell contains 23 pairs or 46 chromosomes, about 22,000 active genes, and three billion base pairs. Half of the nuclear material comes from the mother and half from the father.
All the genes, from all species, are derived from a replication of a common ancestral gene. By comparing the differences in the sequences of these genes, it is possible to make a rough estimate of the time elapsed since the original divergence from the common ancestral gene.

Now I would like to focus your attention to the X chromosome on the end.
Which is shown here on the left magnified 10,000 times. You can see the folding and raveling of the numerous strands of DNA.
Next, let's unravel one of these strands as seen in this diagrammatic presentation, using just one of the 46 chromosomes from the nucleus in this diagram. Watson and Crick found that the information-carrying molecule is deoxyribonucleic acid, DNA, which consists of two matched helices that are connected by base pairs made of four different compounds.
As we follow along this DNA strand: Adenine (A) always pairs with thymine (T), and cytosine (C) only pairs with guanine (G).
A codon or triplet is a three base pair that codes for each amino acid.

Other three triplet combinations that are next to the genes are STOP codons, that signal the end of a particular protein or gene,
And, Promoters which are DNA sequences that modify the activity of the gene. Also called Epigenetic code.

Epigenetic code is a cryptic chemical and physical code written over our genome's DNA sequence. It refers to an extra layer of instructions that influence gene activity without altering the DNA sequence. It addresses the link between nature and nurture, the interactions of genes with their environment, which bring the phenotype into being. It explains how identical genes can express themselves in different ways in identical humans.

This sequence of base pairs is the genetic code. This sequence of four triplets or four amino acids encodes for a specific protein.

How does the DNA function? The DNA information that makes up a specific gene in a cell nucleus is copied into a single-stran d of messenger RNA, in a process called transcription. Something like a half ladder with its rungs dangling from a single side. The half ladder then moves through the nuclear membrane into the cytoplasm, where it enters an elegant protein factory called a ribosome.

A team of sophisticated translators in the factory then read the bases protruding from the floating half-ladder messenger RNA to convert the information in this molecule into a specific protein, made up of amino acids. This process is called translation.

The bulk of the DNA in chromosomes is neither genes nor promoters. This material, at the right end of this DNA sequence is termed “junk” or a pseudogene because it has none or little known function.

Pseudogenes are the molecular remains of broken genes, which are unable to function because of lethal injury to their structures.
They serve as genetic fossils that offer insight into gene evolution and genome dynamics
Recent evidence of activity suggests some are not entirely dead after all.

I linger on this detail because, by providing information about genes that were active in the past, junk DNA or pseudogenes are an excellent source for reconstructing evolutionary history.

An example; let's examine this very important family tree of humans and other living primates. Scientific study has completed some genomes and is working on the genomes of all the primates in this illustration. Previously I showed you anthropological fossil or phenotypic evidence,// that these primate relatives split from common ancestors millions of years ago.

Now let’s look at a new way of deciphering species' relationships using genome evidence. I want to prove common descent with modification, following natural selection, as we look for the presence and absence of certain landmarks in specific places in a species DNA.
These landmarks are produced by accidental insertions of junk DNA sequences near genes. Particular chunks of junk DNA, called long interspersed elements (LINES) and short interspersed elements (SINES), are very easy to detect. Once a SINE or LINE is inserted, there is no active mechanism for removing it. The insertion of20these elements marks a gene in a species, and that gene is then inherited by all species descended from it. They are really perfect tracers of genealogy and evolutionary relationships.

On this slide, the presence or absence of a SINE is determined visually by the relative position of bands of DNA in a thick gel used to separate DNA of different sizes. In the top figure, one SINE, underlined in red, is human-specific; in the middle, the SINE is shared by humans, bonobos, and chimps; and on the bottom, a third SINE is shared by humans, bonobos, chimps, gorillas, orangutans, and siamangs.

Another interesting consequence of the study of multiple genome’s, has been the ability to do detailed comparisons of our own human DNA gene sequence with that of other organisms, not just other primates. Using a computer, if one picks a coding region of a functional human gene, here the middle column, there will nearly always be a highly significant match to the genomes of other mammals.
But, if one chooses a bit of human DNA that lies between genes, (right column) then the likelihood of being able to find a similar sequence in the genomes of other distantly related organisms decreases.

More stunning, when we compare the genomes of humans, plants, fungi, archaea, and bacteria we find about 500 genes that exist in all the domains of life.

The 500 genes have withstood more than 3 billion years of the steady bombardment of mutation, and stand out as threads of text whose sequence and meaning have not changed significantly despite the vast differences among the species that carry them. These genes are immortal.
This slide shows a short portion of the sequence of a protein found in all domains of life (called elongation factor 1-alpha). Parts of this slide,// that are highlighted or shaded,// represent 14 amino acids from this gene which have not changed over a span of 3 billion years. The functions of immortal genes are central to fundamental, universal processes in the cell, such as decoding of DNA and RNA and the making of proteins. These studies provide powerful support for Darwin's theory of evolution. I think this is amazing.

As an aside, this is a slide showing the use of forensic DNA analysis to compare a blood stain from a criminal scene to that of seven suspects. And we see that there is a match between the blood stain and suspect three. It is an enigma to me that many, who would accept DNA evidence in criminal cases, would refuse to accept similar evidence to prove evolution.

I think the essence of the issue is an unwillingness to accept the notion that religion and science, or faith and reason, are totally separate entities; are not in conflict with each other, and are not incompatible concepts. One is spiritual and the other is based on natural law. Science and religion are different ways of understanding. Needlessly placing them in opposition reduces the potential of both to contribute to a better future.

In addition to the DNA in the nuclear chromosomes, there are also DNA structures in the cell's cytoplasm called mitochondria that are important in the evolution story.

The mitochondria are tiny generators that produce energy for the cell, and their DNA contains part of the sequence that encod es the energy producing enzyme cytochrome oxidase. The mitochondrial genome is small. It has only 37 genes and only 16,569 base pairs, compared to the nuclear genome of 21,000 genes and three billion base pairs in length.

The mitochondria are said to be derived from ancient bacteria that long ago infected cells that were ancestral to animals, plants, and fungi. These invading bacteria brought with them the mechanisms for producing energy through the oxidation of carbohydrates into carbon dioxide and water. These endosymbiotic mechanisms became indispensable to the host cells and were in part responsible for their evolutionary success. Mitochondrial DNA is the residue of the genes of these ancient bacteria.

The mitochondrial DNA present in the egg is transmitted from mother to offspring, and thus is inherited exclusively in the maternal line.

This is demonstrated here, where the pedigree of one individual illustrates the difference between the patterns of nuclear and cytoplasmic mitochondrial inheritance. In this case, all 32 ancestors, (along the bottom of the slide), from five generations, contributed equally to the son's nuclear DNA, (on the top).
But his mitochondrial DNA lineage (blue line) leads back to only one female person. Therefore, studies of mitochondria DNA in the cytoplasm can reveal an individual's maternal ancestry, and estimate the timing of evolutionary events.

In 1987, Wilson, Cann, and Stoneking from the Univ. of Calif., Berkeley, published a landmark paper in Nature, entitled "Mitochondrial DNA and Human Evolution." They reported that all living humans can trace part of their genetic inheritance to a single female, who lived in Africa some 150,000 years ago.
If geneticists are right, all of our current humanity is linked to this first Homo sapien female, through an unbroken chain of mothers.

The scientific facts of human evolution are constantly changing. This National Geographic article, gives a summary of additional evidence in support of the evolution and migration of modern humans, or Homo sapiens. Once in an evolutionary blue moon, a random, harmless mutation can occur in a functionless stretch of DNA, referred to as junk DNA, as I showed previously. This mutation is then passed down to all of that person's descendants. Generations later; finding that same mutation or marker in two people's DNA, indicates that they share the same ancestor. By comparing markers in many different human populations, scientists can trace their ancestral connections.

In most of the genome, these minute changes are obscured by the genetic reshuffling, that takes place each time a mother and father's nuclear chromosomal DNA combines after fertilization. Luckily a couple of regions preserve the telltale variations. One that we just talked about is the mtDNA, which is passed down intact from mother to child.

Also, the small male Y chromosome travels intact from father to son.
All Homo sapien males share this basic male chromosome configuration, shown in the first chromosome on the left, which is rooted in Africa. In the next Y chromosome, all male migrants out of Africa, since 50,000 years ago, carry a new mutation marker, M168, which is found in all male non-Africans. A second mutation, M9, common to all Eurasians, appears since 40,000 years ago in the Middle East or Central Asia.
And a third mutation, M3 (far right), arose in the Asian population that reached the Americas about 10,000 years ago.

This complicated slide gives more details of the latest facts concerning human migration. Please focus on the white circles with the numbers 1 through 6.
(#1) AFRICAN CRADLE. The earliest modern humans, Homo sapien fossils, dating back to 195,000 years ago, were found at Omo Kibish, Ethiopia (red arrow a) in the Rift valley. 100,000 year old sites in Oafzeh, Israel (red arrow b) hold the earliest evidence of modern humans outside of Africa. They probably took a northern route through the Nile valley into the Middle East. That group went no=2 0farther, dying out about 90,000 years ago.

(#2) OUT OF AFRICA. Genetic data show that a second small group of modern humans left Africa for good 70,000-50,000 years ago and migrated to Asia (India), and eventually replaced all earlier types of humans, such as the Neanderthals in the Middle East and Europe. All non-Africans are the descendants of these travelers.

(#3) THE FIRST AUSTRALIANS. Discoveries of artifacts and fossils in Australia indicate that modern humans followed a coastal route along southern Asia and reached Australia nearly 50,000 years ago. Their descendants, Australian Aborigines, remained genetically isolated on that island continent until recently.

(#4) EARLY EUROPEANS. New genetic data shows that the DNA of today's western Eurasians resembles that of people in India. It's possible that an inland migration from Asia split with one segment seeding Europe between 40,000 and 30,000 years ago.

(#5) POPULATING ASIA. And the other segment, about 40,000 years ago, pushed into Central Asia. At the s ame time, they traveled through Southeast Asia and China, eventually reaching Japan and Siberia.
(Slide-Worldwide migration 6)

(#6) INTO THE NEW WORLD. Genetic evidence suggest that humans in northern Asia arrived in the Americas between 20,000 and 15,000 years ago, when sea levels were low and land connected Siberia to Alaska.
So, now you have snip-its of the latest genetic DNA evidence, which supports the evolution and migration of modern humans, H. sapiens, from Africa to throughout the whole world.

Geographic populations may be identified with specific anatomical or physiological features. The Homo sapien, or human genetic genome, is 99% identical throughout the world. What's left is the 1% of our DNA which is responsible for our individual differences and the racial variation within the species; especially in body build, height, color, and hair texture.

The evolution of geographic characteristic traits is typically considered to be an adaptation to specific prevailing environmental conditions. Individuals in colder climates have bulkier body builds and shorter limbs, fingers, and smaller ears. Skin color is assumed to be an adaptation to the prevailing intensity of ultra violet sunlight. However, today population movement and cohabitation has been largely responsible for blurring the boundaries between geographic types or races. By the way, can you tell me what defines whether a specific group belongs to a specific species? /// From a physiologic standpoint, it is simply the ability to co-habit and reproduce. This sets the functional parameter for what constitutes a biological species, and for Homo sapiens defines all the types or races together as one species.

This slide causes me to ponder and correlate these concepts with my Christian perspective? Galatians 3: You are all sons of God …. There is neither Jew nor Greek, slave nor free, male nor female, for you are all one in Christ Jesus.

Spiritually and in the church, the value of individuals does not depend on their race, social status or circumstances of birth. Paul was speaking of our standing before God. In that sense all are equal, despite differing backgrounds, abilities and positions. This correlates so well with evolution and the genomics of God's creation.

Back to science. The two most significant evolutionary changes in the early hominids that led to modern humans (H. sapiens) are bipedelism, and development of the human brain.

Bipedelism which freed up the hands, enabled energy efficient locomotion, //tracking migrating herds,// better hunting skills, fishing skills and food gathering,// provision for providing for offspring,// and avoidance of predators.
This allowed for the development of a superior brain, which enabled an increase in knowledge,/ wisdom,/ language,/ communication skills,/ artistic expression,/ consciousness,/ and spirituality. This enabled the ability to develop communities,/ societies,/ and sophisticated technologies,/ that ultimately enabled globalization. This has evolved over millions of years leading to our current human status,// and it is continuing. These rubber endocast of hominid fossil skulls, demonstrates that the rapid expansion of the human brain began about 2-3 million years ago. This growth of the brain came only after the onset of bipedelism, which occurred about 6 million years ago. Bipedelism allowed Hominids to forage intensively for meat, a rich source of fat and protein that helped fuel our dramatic brain expansion.

The basic unit of the central nervous system is the neuron. The dendrites, on the left, pick up impulses or electrical potentials, which then travel along the axons to the synopses.

More sophisticated brain activity is associated with larger and a more dense concentration of neurons on the right. This led to the principle of "use it or lose it." This study demonstrates that principle by proving that people with more education have longer dendrites or neurons. Obviously the blue represents Hope students, and the maroon represents Calvin students.

Now let's get back to the evolution of the brain. In order for the human brain to increase in size and complexity, several evolutionary adaptive changes had to take place.

This slide demonstrates the progressive prolongation of gestation and life phases in humans as compared to early man and chimpanzees.
In the man column we see a longer gestation period below the birth line,// a longer infancy,// a longer childhood,// a longer adult reproductive phase/ and a new senior citizen post reproductive phase,// which all adds up to a longer life expectancy, now reported to be 80 years. It is associated with the growth of a larger brain during

pregnancy and first few years of life, and a longer childhood which is dependent on parents for protection, food, and nurturing, especially by the mother, all before becoming independent, reproducing adults.

Therefore, in humans we observe a continuation of the high prenatal growth rate, phase I, throughout pregnancy and throughout the first year of life. The slower growth rate of the brain, Phase II, begins in the second year of life.

Whereas, the chimpanzees and early hominids have an earlier birth when their infants weigh less than 2 kilos, or about 3.5 lbs, and the slower growth rate, phase II, starts shortly after birth. Their brains max out at 400 cc., and the human brain eventually grows to 1500cc.

Of interest to this retired obstetrician, is the fact that the larger human brain is also accommodated by another evolutionary adaptation over millions of years: the development of a larger pelvis. But, birth is still associated with significant risks to both mother and infant. This is now less of an issue, as 30% of deliveries are by Cesarean section.

The larger brain demands a better food supply. Bipedelism, a higher quality diet, on the left, of cooked foods and animal protein and fat led to easier digestion, a smaller gut, more energy for the brain, all leading to a larger brain and a more complex foraging behavior.

Another interesting evolutionary adaptation over several million years is the position of the larynx or voice box. It is high in the neck in chimpanzee and in all mammals. This allows simultaneous breathing and swallowing, but limits the range of sounds that can be reproduced in the pharyngeal space.

In the adult human, the larynx is lower in the neck, enabling a wide range of sound production, but prohibiting simultaneous breathing and swallowing.

This makes possible the development of language, which is crucial to the human gaining intelligence, communication, and community.
What will surprise you is the fact that the human infant's throat has the same anatomy as the chimpanzees.

After age one and a half, the human infant's larynx begins to migrate down the n eck reaching the adult position by age 14 years. Speech development, or the well-known voice change, corresponds to this movement until the adolescent gains full language and voice competence.

The original anatomy in the human infant enables them to breast feed and breath at the same time; they can cry, but they cannot begin to speak until they are over one year of age.

Throughout phase one, this enables the human infant to eat almost all the time and take in the large amount of calories necessary to support the accelerated rate of brain growth. Don't you think that is interesting?

The evolution of human language.

The development of language is another unique human characteristic. Whether language ability came on gradually over millions of years, as shown in upper green line, or suddenly about 50,000 years ago, in the threshold model, lower green line, is not exactly known. Several evolutionary structural changes of the CNS had to occur before language was possible.

First, was the rapid organization of the brain over 2 million years ago, the top orange line.

Second, represented in the lower orange line, there had to be the increase in the brain size and change in vocal tract anatomy, that I showed you before. This occurred gradually.

The most obvious great benefit in humans is the much larger pharyngeal space above the vocal cords, allowing a greater range of sound modulation or modification. The expanded pharynx is the key to our ability to produce fully articulate speech.

Now let's shift to a study of the relationship between genes, languages, and archeology. L.L. Cavalli-Sforza, from Stanford, studied the average frequencies of 120 genes in the various populations listed down the middle of this slide, from West African on the top, to Australian on the bottom. On the left are shown the interrelationships calculated against the scale of genetic distance, or difference in the genes, between the various populations.

On the right are shown the linguistically related language families corresponding to the genetic populations he studied. The result is revolutionary new evidence, which gives us this human family tree; and, suggests that a population's language is linked to its genetic origin.

These three lines of evidence genetics, linguistics, and archaeology—can therefore be brought together to tell a single coherent story.

What about the evolution of the human spiritual dimension, consciousness, and abstract thought?

When did humans first demonstrate an interest in life after death? The rite of burial is the first clear sign of a spiritual or religious feeling to appear in the archaeological record.

Homo Neanderthals were the first to leave evidence of ritual burials. They originated about 500,000 years ago in the temperate zones of the Middle East and Euro pe; they were the first hominids to adapt to and survive in the cold northern climate, during the

beginning of the last Ice Age; But, they became extinct about 33,000 years ago for unknown reasons. They were nomadic, short, and stocky.

This Neanderthal burial site-----was discovered in this Shanidar cave in northern Iraq, and is estimated to be 60,000 years old.

These next two artistic drawings give us an insight into the Neanderthal life and culture at the time.

Pollen analysis has suggested that, wild flowers were laid by the head of the corpse. Some sites are accompanied by grave offerings, such as food, for the afterlife. Human beings are unique in having religious feelings, and in knowing that their time is limited—that one day they will die. Thus the care, which is shown for the dead, can be taken as some measure of humanity; a mark of understanding of the nature and value of human life.

Incidentally, scientist from the Max Planck Institute in Leipzig, Germany have recently completed analysis of the Neanderthal mitochondria genome DNA from a 39,000 year old bone found in Croatia, and they expect to analyze the complete nuclear DNA by the end of the year. It is anticipated that this will answer whether there was any intermingling of the two species, and might give us some reason for the Neanderthal demise or extinction.

The evolution of consciousness is far more difficult to research.

Language ability and introspective consciousness are linked, and they both have social implications.

Consciousness is an aid to understanding and to predicting more accurately a complex social environment.

Consciousness enables one to understand one's own behavior, and predict the behavior of other individuals, in order to, on a very basic level, maximize reproductive opportunities.

And, the increase in social skills gives the individual many advantages. Mythology--more or less elaborate stories of how the world came to be and how it operates--is the mark of the modern mind; and, is the creation of worlds shared in the medium of language. Central to all this, and the core of the world's religions, is a creation mythology—an explanation of how a people came to be. It is the essence of being created in His Image, which enables us to love God with all our heart and mind, and to love our neighbor as ourselves. The predisposition to religious belief is the most complex and powerful force in the human mind; and, in all probability an ineradicable part of human behavior. It is one of the universals of social behavior. From the moment consciousness burned brightly in the minds of modern humans, there has been a universal urge to account for the rest of the world by telling stories.

And, with awareness of self also comes awareness of death—the ultimate concern.

Now let's examine the evolution of abstract thought.

Archaeologists use two ways to demonstrate the development of abstract thought in early humans-the purple line. First, the development of new technology, and, second, by discovering art as a type of symbolic thought process.
The best example of original art is the cave art found at Lascaux, in southern France. It is estimated to have originated about 20,000 years ago.

The evolution of human culture.

I would like to return to this comparison of all three lines of evidence. If we focus on the far right, starting about 35-50,000 years ago, we observe the increase in brain size and organization coming together, the development of the vocal tract and language competence, and the marked increase in evolution of technology and art. Many paleo-anthropologists refer to this sudden emergence as a rewiring of the brain.

This slide demonstrates the evolutionary anatomical increase in complexity of the brain. On upper part of slide, notice the increase in size and increase in the folding patterns of the lobes. In the middle, view the increase in white matter of the various brains. On the bottom of the slide, note the increase in the density of the neurons. And, on the lower right, evolution of the seven levels of the complex human brain is demonstrated. These changes all illustrate the rewiring process.

Randall White lists seven areas of cultural evidence that point to this rewiring process.
1st. Deliberate burial of the dead, which begins with Neanderthal times, but becomes refined with the inclusion of grave tools in the Upper Paleolithic period,
2nd. Artistic expression, and body adornment, begins only in upper Paleolithic age,
3rd. A sudden acceleration in the pace of technological innovation and cultural change,
4th. The development of real regional differences in cultural development, an expression and the product of social boundaries,
5th. The development of strong evidence of long distance contacts, with the appearance of exotic objects being traded between groups, 6th. Living sites significantly increase in size. Complex language is a prerequisite for the planning and the coordination, which are necessary for the development of significantly larger living sites, and
7th. Increased technology

The increased intelligence associated with the rewiring of the brain gave rise to better communication, better technology, sharper social skills, and more complex subsistence patterns. This enabled a rising social complexity, and the ability to deal with unpredictable social interactions, which led to further increase in intelligence.

And I would again like to suggest that this rewiring of the brain might also demonstrate how God has created us "In His Image". This sets us apart from other animals, and

enables us to develop this spiritual likeness, which allows us to love the Lord our God with all our heart and with all our soul; and to love our neighbors as ourselves.

So, tonight, I have tried to give you a brief dissertation on human biological evolution.

I expect it will take some time for you to integrate this new information into your worldview. But we are constantly challenged to apply this new knowledge into an ethical, moralistic, and holistic worldview.