The Origin of Trees

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Abstract

According to Genesis, trees were created on the third day of the Creation Week. Within a Biblical worldview, this suggests that they are discontinuous with other plant forms. Naturalists posit that trees arose by random processes from simpler photosynthetic organisms. Fossil evidence for tree evolution from putative non-tree precursors is evaluated. It is concluded that the fossil record does not support an evolutionary origin for trees from non-tree plant forms. The earliest trees found in the fossil record were well developed, and no plausible explanation exists to overcome the enormous odds against their evolutionary origins from single-celled ancestors. It is concluded that when the fossil record, tree ecology, global Flood, and complex biochemical systems are analyzed within a Biblical worldview, the data are consistent with the Genesis account that God directly created trees.

Introduction

Trees have been powerful life symbols throughout history and across cultures. For example, Tu B'Shevat is Jewish Arbor Day and takes place on the fifteenth of Shevat, sometime between mid-January and mid-February. Shevat is the name of the Jewish month when spring begins in Israel and trees come to life again after the winter. According to Jewish tradition, Tu B'Shevat celebrates trees because they symbolize the Torah and represent beauty and vitality. The psalmist paints the analogy that those who trust and live by God's precepts are likened to solidly rooted trees that have steadfast, fruitful, and vital lives because they are tapped into the source of life.

The word "tree" [Heb. *ēts*; Gr. *déndron (xýlon)*], also "timber" or "wood," is referenced nearly 300 times in Scripture and is a major feature of God's creation (Tenney, 1967, p 869). The Bible specifically names at least 30 species of trees. (See Table I for a sampling of these tree species.) Linguistic difficulties, such as translating Hebrew and Greek words that are more like local common names, and a lack of direct one-to-one correspondence between species and Bible words, make it difficult to identify exactly what tree species is being discussed (Oberpriller, 2011, personal communication). For example, because of the above linguistic challenges, trees identified as pine, juniper, cypress, and cedar often preclude a precise identification. The Genesis account suggests that trees are discontinuous from other vegetational growth forms and did not originate from simpler precursors. Trees were created on Day 3 according to their kinds, or baramin (Gen. 1:11–12; 1:29; 2:9; 2:16), and Genesis chapters 6–9 revealed a historic worldwide Flood that helps explain the world's massive graveyards. It is upon this foundation that creationists can develop scientific models of the origin of trees and fossil strata.

Alternatively, neo-Darwinian evolutionists assume that trees arose by random, natural processes through descent with modification. When discussing the term "evolution," it is important that it be carefully defined because it can be a slippery and confusing word. For

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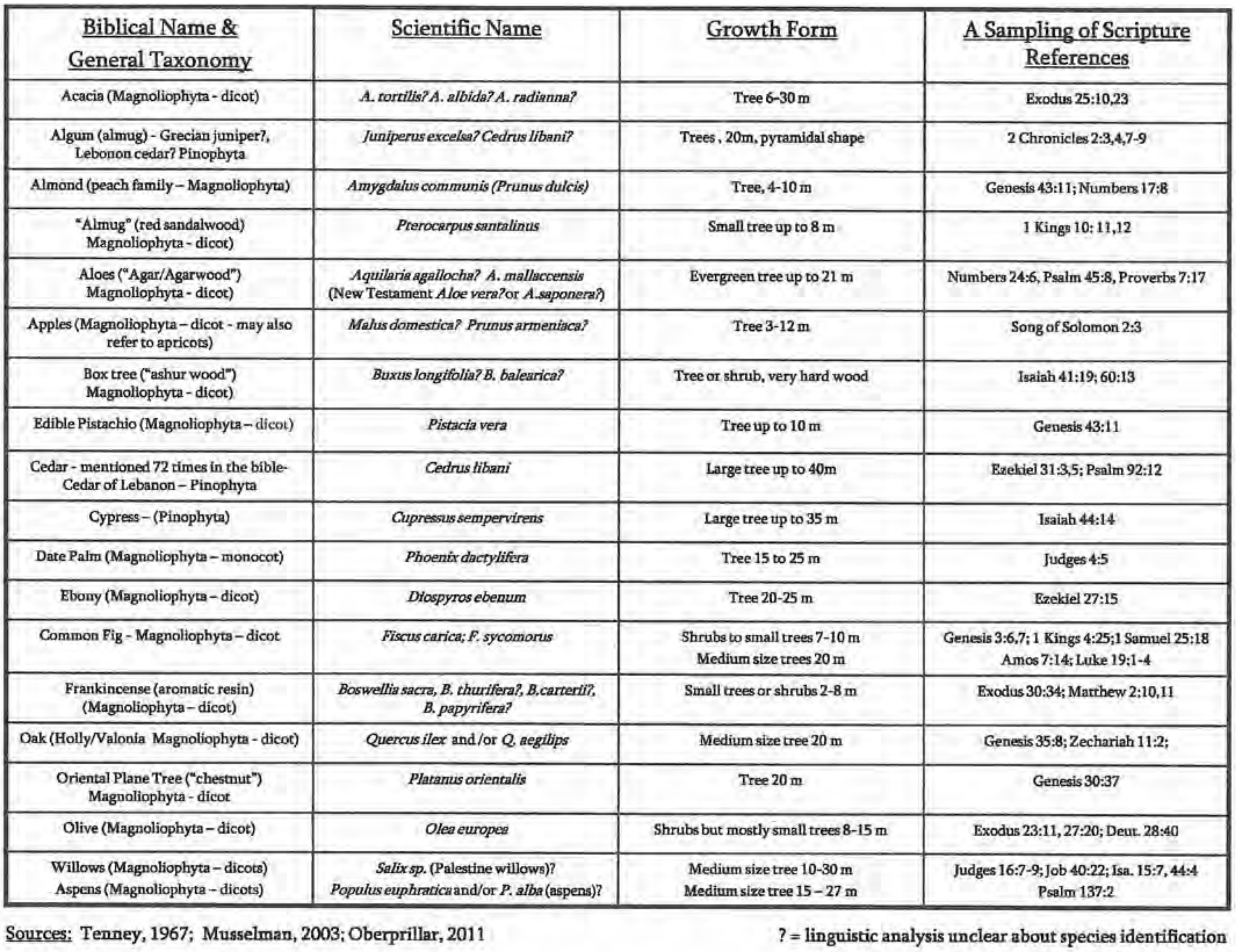
Table I. A sampling of trees mentioned in the Bible



Biblical Name & General Taxonomy	Scientific Name	Growth Form	A Sampling of Scripture References
Acacia (Magnoliophyta - dicot)	*A. tortilis? A. albida? A. radianna?*	Tree 6-30 m	Exodus 25:10,23
Algum (almug) - Grecian juniper?, Lebonon cedar? Pinophyta	*Juniperus excelsa? Cedrus libani?*	Trees , 20m, pyramidal shape	2 Chronicles 2:3,4,7-9
Almond (peach family – Magnoliophyta)	*Amygdalus communis (Prunus dulcis)*	Tree, 4-10 m	Genesis 43:11; Numbers 17:8
"Almug" (red sandalwood) Magnoliophyta - dicot)	*Pterocarpus santalinus*	Small tree up to 8 m	1 Kings 10: 11,12
Aloes ("Agar/Agarwood") Magnoliophyta - dicot)	*Aquilaria agallocha? A. mallaccensis* (New Testament *Aloe vera?* or *A.saponera?*)	Evergreen tree up to 21 m	Numbers 24:6, Psalm 45:8, Proverbs 7:17
Apples (Magnoliophyta – dicot - may also refer to apricots)	*Malus domestica? Prunus armeniaca?*	Tree 3-12 m	Song of Solomon 2:3
Box tree ("ashur wood") Magnoliophyta - dicot)	*Buxus longifolia? B. balearica?*	Tree or shrub, very hard wood	Isaiah 41:19; 60:13
Edible Pistachio (Magnoliophyta – dicot)	*Pistacia vera*	Tree up to 10 m	Genesis 43:11
Cedar - mentioned 72 times in the bible- Cedar of Lebanon – Pinophyta	*Cedrus libani*	Large tree up to 40m	Ezekiel 31:3,5; Psalm 92:12
Cypress – (Pinophyta)	*Cupressus sempervirens*	Large tree up to 35 m	Isaiah 44:14
Date Palm (Magnoliophyta – monocot)	*Phoenix dactylifera*	Tree 15 to 25 m	Judges 4:5
Ebony (Magnoliophyta – dicot)	*Diospyros ebenum*	Tree 20-25 m	Ezekiel 27:15
Common Fig - Magnoliophyta – dicot	*Fiscus carica; F. sycomorus*	Shrubs to small trees 7-10 m Medium size trees 20 m	Genesis 3:6,7; 1 Kings 4:25;1 Samuel 25:18 Amos 7:14; Luke 19:1-4
Frankincense (aromatic resin) (Magnoliophyta – dicot)	*Boswellia sacra, B. thurifera?, B.carterii?, B. papyrifera?*	Small trees or shrubs 2-8 m	Exodus 30:34; Matthew 2:10,11
Oak (Holly/Valonia Magnoliophyta - dicot)	*Quercus ilex* and /or *Q. aegilips*	Medium size tree 20 m	Genesis 35:8; Zechariah 11:2;
Oriental Plane Tree ("chestnut") Magnoliophyta - dicot	*Platanus orientalis*	Tree 20 m	Genesis 30:37
Olive (Magnoliophyta – dicot)	*Olea europea*	Shrubs but mostly small trees 8-15 m	Exodus 23:11, 27:20; Deut. 28:40
Willows (Magnoliophyta – dicots) Aspens (Magnoliophyta – dicots)	*Salix sp.* (Palestine willows)? *Populus euphratica* and/or *P. alba* (aspens)?	Medium size tree 10-30 m Medium size tree 15 – 27 m	Judges 16:7-9; Job 40:22; Isa. 15:7, 44:4 Psalm 137:2

Sources: Tenney, 1967; Musselman, 2003; Oberprillar, 2011

? = linguistic analysis unclear about species identification

example, processes such as natural selection, mutation, genetic drift, speciation, and changing allelic frequencies have each been termed evolution. Though the details and magnitudes of importance of these processes may differ in the minds of creationists and evolutionary naturalists, all agree that each of them has been observed. For the purposes of this paper, neo-Darwinian evolution is defined as the random and undirected natural process in which mutation and natural selection are thought to have produced trees from non-tree photosynthetic precursors over billions of years.

Relatively little has been published in creation publications about the evolution of trees. Most creation articles on trees have been related to the issue of chronology (see Lammerts, 1975; 1983; Kreiss, 1985; Bergman and Doolan, 1987; Aardsma, 1993; Beasley, 1993; Lorey, 1994; Bates, 2003; Williams, 2004, and Woodmorappe, 2003). Coppedge (2003) covered the intelligent design of the tree fluid-pumping system. Howe (1987b) argued the importance of creationist explanations for plant biogeography from the perspective of Flood and post-Flood geological influences on mountain formation. It is well known that mountains are a big factor in determining weather patterns that influence plant and animal associations all over the world. Because both creation and evolution begin with differing presuppositions, we examine which presuppositional worldview is most consistent with the data.

The Importance of Trees

Trees cover at least 27% of the terrestrial landscape (Petit and Hampe, 2006, p. 188) and are called *groves* (*copses*) if they grow in small groups and *forests* when they are in high densities over large areas. They are extremely diverse and numerically successful. Over 80,000 known species are found in locations ranging from the tropics to the Arctic Circle (Ennos, 2001, p. 5).

Trees play a crucial role in life. They are critical to the biosphere in maintaining biodiversity through a complex of symbiosis sets including sheltering organisms, absorbing carbon dioxide, preventing erosion, producing oxygen, regulating climate, cycling and distributing crucial nutrients, providing raw materials, and cleaning the air. Tudge concluded that trees are required for the very existence of the world as we know it (2006, p. 56).

Figure 1. Eastern white pine *(Pinus strobus)*. Division: Pinophyta. Historically it was used for ship masts and continues to be used as lumber, Christmas trees, and in medicine. It is an ecologically important tree for many reasons, including food production for many organisms, structure for nesting birds such as the American bald eagle *(Haliaeetus leucocephalus)*, and refuge trees for American black bears *(Ursus americanus)*. Notice the single bole and apical dominance. (Photo by Tom Hennigan)

Morphology and Biosystematics

Trees are not a single taxonomic entity, and their characteristics are very diverse. They comprise many families and differ in reproductive systems, leaf morphology, stem growth, and bark characteristics. These differing traits correspond to the environment in which they live. Complicating their taxonomic status is the tree and shrub differentiation. Trees are defined as single stemmed, perennial, woody plants with secondary branches emanating from the trunk above the ground (Figure 1). Mature tree morphology is characterized by apical dominance, where the main stem dominates the lateral stems (Harlow and Harrar, 1969, p. 2; Ennos, 2001, p. 7).

In contrast, shrubs are defined as small diameter woody plants with many basal stems (rather than a single bole) and many branches off multiple stems (Figure 2). Because there is no apical dominance, their appearance is bushy. Some species, such as pomegranates (*Punica granatum*) and olives (*Olea europaea*), depending on environmental factors, can have both shrub and tree morphologies (Musselman, 2003).

Trees tend to be long lived, often reaching hundreds of years of age. The oldest non-clonal extant tree is Methuselah, a Great Basin Bristlecone pine (*Pinus longaeva*) estimated to be over 4700 years of age, assuming each growth ring represents one year (Schulman, 2010; Woodmorappe, 2003). To be classified as a tree generally the plant must reach a minimum height of 3–6 m. The tallest extant tree is a giant coastal redwood (*Sequoia sempervirens*) topping out at 116 m (Gymnosperm Data Base, 2010).

The major tree organs consist of a woody trunk, roots, leaves, and branches. These critical design features allow them to survive on land by solving the difficulties of staying vertical, not breaking in the wind, drawing water up to the canopy, and avoiding desiccation. Growth

Figure 2. Tartarian honeysuckle shrub *(Lonicera tatarica)*. Division: Magnoliophyta. An invasive species common through much of North America, its shrubby characteristics include many small-diameter, woody basal stems (rather than a single bole) and many branches off multiple stems. (Photo by Tom Hennigan)

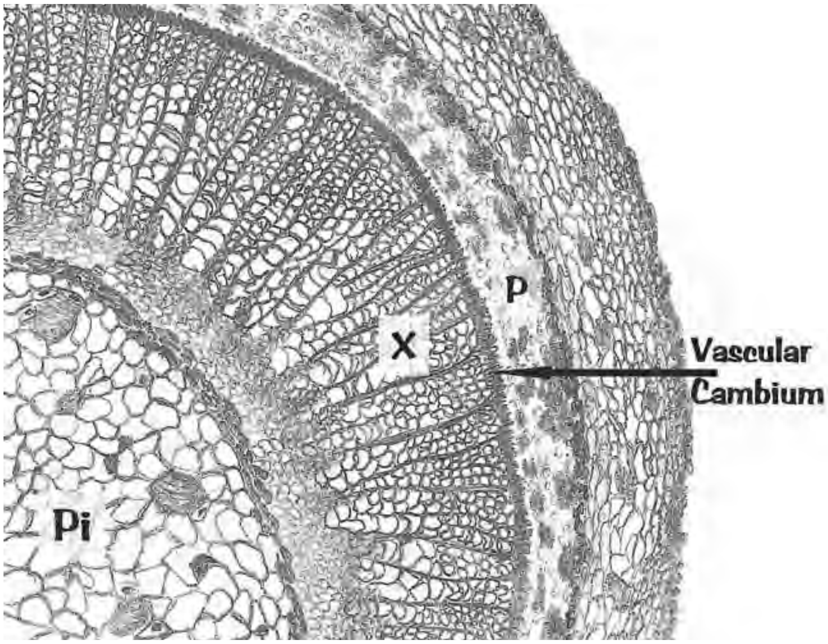


Figure 3. Diagram of woody dicot *(Tilia sp.)* shown with secondary xylem (X), which conducts water and minerals up the plant, and secondary phloem (P), which conducts organic compounds throughout the plant. Both phloem and secondary xylem tissues are produced by meristematic cells in the vascular cambium and grow outward in exogenous trees. Pith (Pi) is involved with nutrient storage and transport. (Drawing courtesy of Jennifer Hennigan)

rate and longevity will vary and depend on the existence of secondary tissue.

Trees are vascular plants and have two major types of transport tissue: phloem and xylem (Figure 3). Phloem is the mostly living tissue of the innermost layer of bark. It transports organic nutrients wherever they are needed. Primary and secondary xylem is the water and mineral transport tissue, made mostly of dead cells. Primary xylem is the xylem formed during primary growth when cells elongate, mature, and cause the plant to grow taller. Trees have secondary xylem (wood), which produces secondary growth causing an increase in diameter of the bole.

Both phloem and secondary xylem tissues are produced by meristematic cells in the vascular cambium (Figure 3) and grow outward in exogenous trees. Exogenous trees make up the majority of tree species and include conifers and broadleaf trees in which growth rings are added as tree girth increases. These are distinguished from endogenous trees (palms and other plants like cacti) where stem diameters grow inward and do not produce growth rings.

With few exceptions, and depending on the source, trees are generally classified as either Gymnosperms or Angiosperms (Figure 4). *Gymnosperm* literally means "naked seed" and refers to the characteristic of uncovered ovules in their unfertilized state. Gymnosperm Divisions include; Pinophyta (conifers like the spruces, pines, firs, redwoods, cedars, and hemlocks), Ginkgophyta (Ginkgos), Cycadophyta (Cycads), and Gnetophyta that consists of small trees or shrubs like "paddy oats" (*Gnetum gnemon*) with vessel elements and flowers that look very much like flowering plants (Gymnosperm Data Base, 2010).

Most trees are Angiosperms (Division Magnoliophyta) because the majority of trees produce flowers and have covered ovules in their unfertilized state. They can be further classified into dicots (seeds having two cotyledons, or

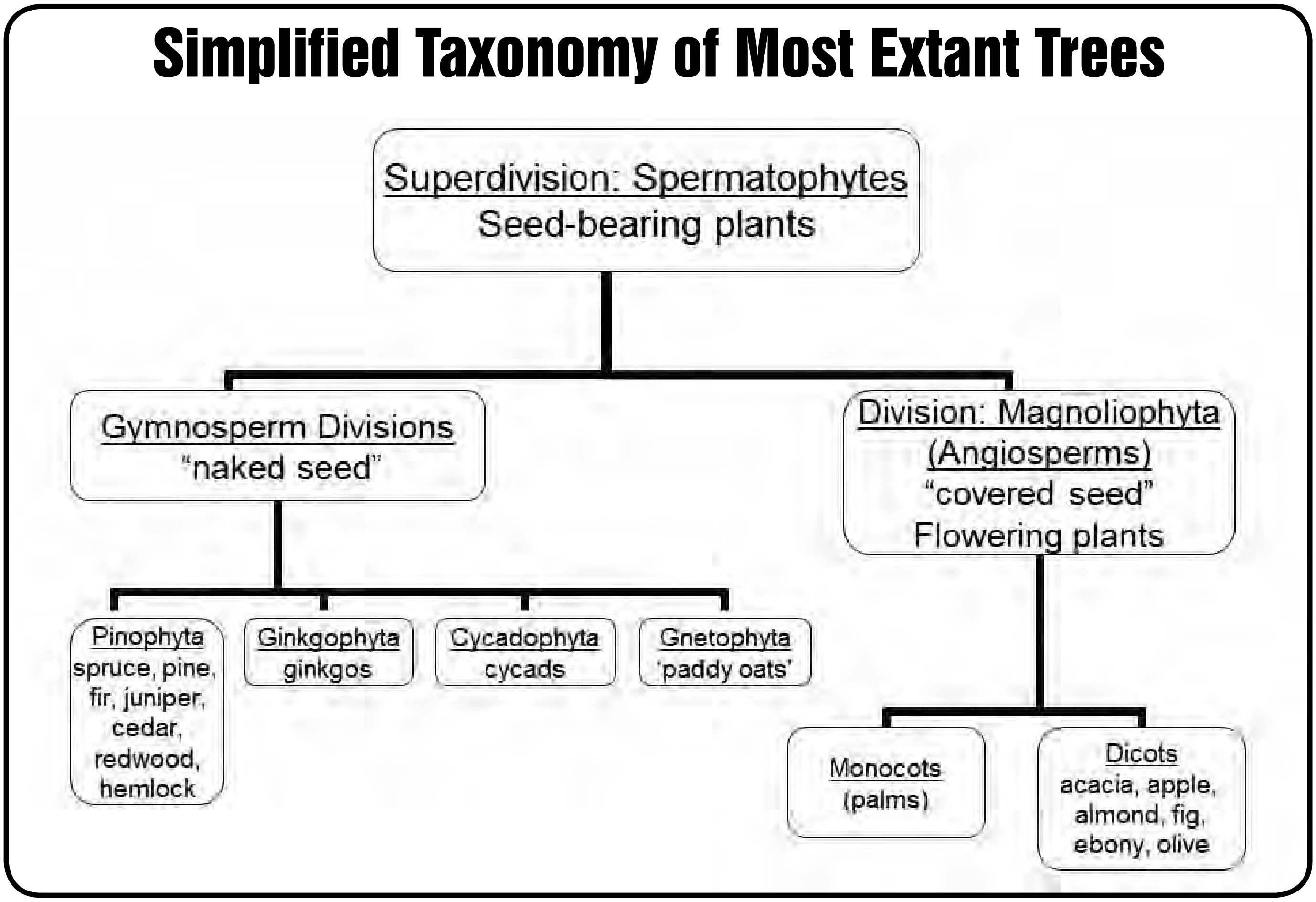


Figure 4. With few exceptions, and depending on the source, trees are generally classified as either gymnosperms or angiosperms. Figure 4 shows the major gymnosperm and angiosperm divisions with example species for each.

embryonic seed leaves such as broadleaf trees) and monocots (seeds having one cotyledon such as palms).

Origin of Trees and the Fossil Record

Evolutionary predictions of general plant evolution, from simple to complex, are highly correlated with rock stratigraphy as one travels up the geologic column. This suggests there is a mechanism generating fossil order in the strata (Wise, 2003). The question discussed later is whether evolution is the only explanation for that order.

Many of the Carboniferous strata contain fossil remnants of extinct forests consisting of tree ferns (Order Cyatheales), horsetails (Order Equisetopsida), and lycopsids (Division Lycopodiophyta). The Carboniferous is characterized by most of the world's coal seams and takes place from the mid Devonian period to the Permian, roughly 410–250 million years ago (Mya), according to evolutionary presuppositions. Remnants of fossil forests are observed in these layers and much of their evolutionary history comes from the interpretation of these fossils. Evidence suggests that some lycopsid species grew in large floating forests (Scheven, 1996). While tree morphologies in Equisetopsida and Lycopodiophyta are extinct today, tree ferns still exist (Smith et al., 2006).

Extant members of Equisetopsida genus *Equisetum* include unique plants like the horsetails. These plants and diatoms share the unique trait of cell walls impregnated with glass (SiO_2). Because of the SiO_2, horsetails have a rough texture and were used by Native Americans to scrub pots clean. Horsetails, including tree forms, appear abruptly in the fossil record and some extinct forms have more complicated and advanced spore-bearing organs than extant plants in the family (Howe, 1987a). These observations are not predicted by evolutionary presuppositions.

According to evolutionary interpretations of the fossil record, cyanobacteria were the first photosynthetic organisms and arose 3.5 billion years ago. True algae (Kingdom Protoctista) arose 2.4–1.8 billion years ago, the first land plants evolved from Protoctista and appeared 460 Mya (McLamb and Hall, 2010), and trees evolved from those early herbaceous land plants. Paleobotanists claim that trees have dominated terrestrial ecosystems for over 370 million years, which implies that their evolution should be well documented in the fossil record (e.g., Petit and Hampe, 2006, p. 204).

The first forests are widely cited to comprise fernlike trees called *Cladoxylopsids*. A tree in this group, *Wattieza*, is thought to be the earliest tree and is interpreted to have arisen in the later Devonian 380–360 Mya (e.g., Stein et al., 2007; Jannot, 2009, p. 82). In the 1870s, an intact crown was discovered in New York, and its reconstruction suggests that it was at least 8m tall, fernlike, with a trunk bearing long branches and having a root system with complex vascular tissue. Currently, specimens of *Cladoxylopsidi* have also been found in Venezuela and Belgium, indicating that this tree type was widespread.

Figure 5. Fossil tree (Genus *Cordaites*) from the Upper Carboniferous period, Joggins Fossil Cliffs. This tree had secondary xylem, conelike strobili with either seeds or pollen sacs, and advanced sporing systems that produced male and female sex cells. Fossil evidence suggests that they are far more diverse than previously thought and may have occurred in various habitats. Their discontinuity with both gymnosperms and other plant forms continues to be problematic in determining their phylogenetic position with other trees but is consistent with creationist predictions based on the presupposition of direct design. (Photo courtesy of Ian Juby)

Another tall and extinct tree was *Archaeopteris*. It had fernlike foliage, secondary xylem, and was a major vegetative component of the Devonian/Lower Mississippian strata (Muriel and Leponce, 2001; University of California Museum of Paleontology, 2010). Such trees are grouped as Progymnosperms because their secondary xylem had circular bordered pits similar to, but not identical with, modern gymnosperms (University of California Museum of Paleontology, 2010). Because of this, many evolutionists believe that these trees are a distant relative of modern-day gymnosperms. Before Wattieza was discovered in 2007, *Archaeopteris* was thought to be the earliest tree. *Archaeopteris* lived about the same time as *Cladoxylopsidi* but was so different morphologically that no claims have been made that *Cladoxylopsidi* was an evolutionary link to *Archaeopteris*.

About the same time extinct gymnosperm-like trees, genus *Cordaites* (Figure 5) thrived during the upper Carboniferous. These large trees had secondary xylem, conelike strobili with either seeds or pollen sacs, and "advanced sporing systems that produced male and female sex cells much like those contained in seeds" (Jannot, 2009, p. 82. Also see Palaeobotanical Research Institute, 2010). Fossil evidence suggests they are far more diverse than previously thought and may have occurred in various habitats. Their discontinuity with both gymnosperms and other plant forms continues to be problematic in determining their phylogenetic position with other trees but is consistent with creationist predictions based on the presupposition of direct design.

Division Lycopodiophyta (Lycophyta) is considered the oldest living vascular plant division, dated by evolutionists at about 410 Mya (McElwain et al., 2002). Extinct carboniferous trees from Lycopodiophyta, such as the genera *Lepidodendron* (Figure 6) and *Sigillaria* (Figure 9) are common fossils in coal beds around the world and date from the late Devonian (Wang et al., 2002). *Lepidodendron*, also called scale trees because of diamond-shaped leaf scars on the trunk, reproduced by spores, could grow over 30 meters tall, and produced trunks greater than one meter in diameter (Stewart and Rothwell, 1993, p. 128). To some observers

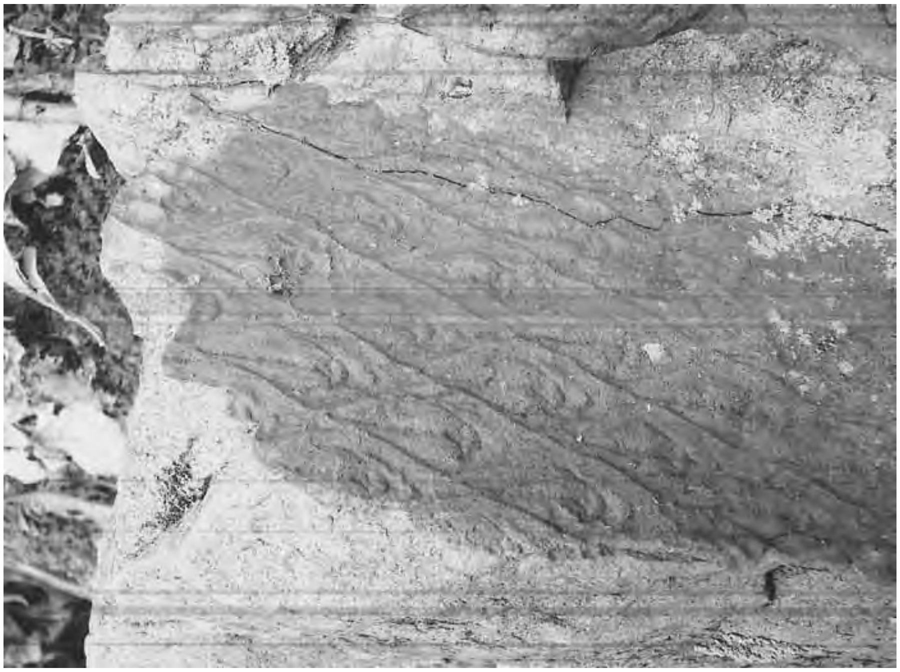


Figure 6. Flattened fossil cast (Genus *Lepidodendron*), Joggins Fossil Cliffs. These are common fossils in coal beds around the world and date from the late Devonian. Also called scale trees because of diamond shaped leaf scars on the trunk, they reproduced by spores, grew over 30 meters tall, and produced trunks greater than one meter in diameter. They seemed to have vanished overnight, geologically speaking, and no evidence exists that they evolved into modern tree types. (Photo courtesy of Ian Juby)

they look like giant forms of modern-day lycopsids (club mosses and quillworts) and are for this reason interpreted to be evolutionarily related. They produced little if any wood and apparently were supported by a barklike region that grew in diameter as the tree aged. The "leaves" of this forest giant looked like pine needles on top of a tall, straight, telephone pole. Raven noted that these trees largely "vanished almost overnight, geologically speaking" and no evidence exists that they evolved into modern tree types (Raven et al., 1986, p. 324).

Problems with Naturalistic Explanations for Tree Evolution

One classic text on tree evolution included illustrations of a large number of ancient trees, all of which are either extinct, or nearly identical to fully modern trees, and none indicate evidence for tree evolution (Berry, 1923). Even the seeds of ancient trees are virtually indistinguishable from their modern counterparts. Professor Berry wrote that his large collection of pinecones from the Lower Cretaceous are morphologically "almost exactly like those of the existing redwood [trees that are]… found in abundance in the coulees of the present arid badlands of Western Dakota" (Berry, 1923, p. 41).

Another example, the Wollemi pine (Figure 7), was thought to have gone extinct with the dinosaurs until it was discovered several years ago in Australia (Bardell, 2006; Wieland, 2003, pp 8–9). The Wollemi pine was long thought to be extinct for 200 million years. Scientists concluded that it is marvelous that the Wollemi pine has survived unchanged for 200 million years, but in fact it is only one of thousands of so-called living fossils known today.

For the above reasons, the "evolution of trees can only be diagrammatically represented in the most tentative way" (Johnson, 1971, pp. 24–25). Although taxonomy and phylogeny have both progressed since Darwin's day, continuity of trees arising from single-cell precursors through evolutionary processes has not been supported by the fossil evidence (e.g., Johnson, 1973, p. 24).

Though the fossil record clearly shows a major discontinuity between trees and non-trees, the naturalistic assumption is that they must be continuous because of their assumed phylogeny and highly correlated fossil order, suggesting an increase in organ complexity through time. Traveling up the strata is assumed to be traveling through evolutionary time. Among the numerous problematic assumptions inherent in date calculations for fossil trees, not the least is the absolute requirement of deep time for evolution to occur (Baumgardner et al., 2003; Humphreys et al., 2004, Vardiman et al., 2003; Woodmorappe, 2001).

Tree Origins and the Fossil Record

Extant trees are highly diverse and contain designed systems that enable them to operate in diverse environments. For example, xylem anatomy varied structurally with trees depending on the ecological zone (i.e., coastal, bog, desert) in which they grew (Howe, 1978). Though they have similarities, depending on their environmental circumstances, trees are more often morphologically unique from each other. Because of the many important ecological roles they play in the biosphere and fossil discontinuity with non-trees, the scriptural account is consistent with the fossil record. When vascular plant groups are compared, vascular tissue patterning is found distributed throughout most plant taxa, making it difficult to determine

Figure 7. "Living fossil"—Wollemi pine *(Wollemia nobilis)* was discovered several years ago and has changed little from its fossil ancestors. Long thought to be extinct for 200 million years, scientists concluded that it is marvelous that it has survived unchanged for 200 million years. In fact, it is only one of thousands of so-called living fossils known today and does not support evolutionary fossil predictions. *A* shows the needlelike leaves at the end of a branch, and *B* is a close-up of the main trunk. (Photos courtesy of David Oberpriller)

what vascular pattern is ancestral (Howe, 1965, p.16). Therefore, a compelling alternative view to the evolution hypothesis is that xylem and phloem are "controlled by physiological laws within genetic limits originally established by the Creator" (Howe, 1965, p. 17).

Instead of interpreting the rock strata as moving through billions of years of time, creationists interpret them an effect of a global Flood (Genesis 6–9). If a great Flood occurred, then billions of fossils would have been produced and evidence of vast continental sedimentation and upheaval would be common (Snelling, 2008). Careful studies of large areas of fossil wood that underwent silicification and charcoalification are evidence consistent with a diluvialist model of the fossil record (Williams and Howe, 1993; Williams, 1993; Williams et al., 1993; 1993b Williams et al., 1995; Howe et al., 2003).

Scheven (1996) argued that the fossil evidence suggested a continent-sized, floating forest ecosystem primarily composed of arboreal lycopods. These lycopods had unusual hollow stigmarian roots or rhizophores (Figure 8). They contained numerous scars spirally distributed around the surface of their rootlike cylinder called a *stigmaria*. Instead of typical root systems that grow downward in the soil, these secondary roots spiraled around a cylinder and were similar to roots found in water plants today. The arrangement suggests that these plants lived in an aquatic ecosystem. Rather than being interpreted as an early primitive tree, lycopod anatomy is better understood as an arboreal plant designed to thrive in an aquatic ecosystem. Scheven further hypothesized that at the outset of the Flood, this large biome was torn apart and left to drift. As the Flood receded, these massive mats were buried under large amounts of sediment, producing much of the Carboniferous strata observed today. The burial of these massive log mats was also consistent with a creationist explanation for coal formation on a global scale (Austin, 1979).

Polystrate trees (Figures 9 and 10), found all over the world, are another example of rapid burial on a large scale, consistent with both the global Flood and log-mat models. Polystrate trees are fossil trees that span more than one layer of strata (Oard and Giesecke, 2007). Rupke (1966) used polystrate fossil observations to argue that these provided evidence that there was a unique "cataclysmal" sedimentation process that occurred in the past. Polystrate tree and animal fossils have been found erect and at various angles with fossils varying 6–9 meters long and intersecting two to twelve different strata (Rupke, 1966). These trees are commonly just as well preserved at the bottom as they are at the top and their internal microscopic structure is often well preserved, indicating that they were buried quickly and sealed off from decay organisms. Two of the many global example locations are the Joggins formation in Nova Scotia and Gingko Petrified Forest State Park in Washington. The Joggins formation is classified as early Pennsylvanian strata and has numerous lycopsid trees and casts 5–6 meters tall that span several coal seams. These coal seams are often

Figure 8. Unusual and hollow stigmarian root (right) with radiating rootlets (left). Numerous scars are spirally distributed around the surface of the rootlike cylinder called a *Stigmaria*. They are similar to roots found in water plants today. Rather than being interpreted as an early primitive tree, lycopod anatomy is better understood as an arboreal plant designed to thrive in an aquatic ecosystem. (Photo courtesy of Ian Juby)

Figure 9. Polystrate fossil Lycopsid (Division Lycopodiophyta, Genus *Sigillaria*) Joggins Fossil Cliffs. This is a treelike plant, with occasional forked trunks, tall stature, and no wood. Polystrate trees, found all over the world, are another example of rapid burial on a large scale, consistent with both the global Flood and log mat models. Polystrate trees are fossil trees that span more than one layer of strata and are commonly just as well preserved at the bottom as they are at the top, indicating that the tree was buried quickly and sealed off from decay organisms. (Photo courtesy of Ian Juby)

interbedded with sandstone and sandy slate, another indication of rapid burial on a large scale (Rupke, 1966). The polystrates of Gingko Petrified Forest State Park consist of over 200 species of trees from widely divergent climatic zones (tropical to northern temperate), and span through layers of Miocene basalt (Oard and Giesecke, 2007). Trees discovered include eucalyptus (*Eucalyptus sp.*), teak (*Tectona sp.*), spruce (*Picea sp.*), and birch (*Betula sp.*)

Wise (2003) took Scheven's hypothesis further, using the modern-day analog of a bog. Acknowledging that evolutionary predictions for the fossil record of plants were highly correlated with global stratigraphy, he proposed that ecological zonation, rather than evolution, explained the fossil order better. He suggested that rather than seeing an evolutionary progression from simple to higher plants, what is observed is an ecological progression from plants growing close to the water to plants growing inland. These would include the progymnosperms, herbaceous lycopods, and arborescent lycopods of the inland forest canopy.

In general, creationists predict that all major tree families were present in their respective environments since the beginning and that evidence such as the polystrate trees found in Washington will continue to be found. Another recent example is the finding of fossil tree resin in carboniferous coal assumed to be 320 Mya. At this time lycopods are assumed to have ruled the swamps and forests before angiosperms evolved (Oard, 2010). However, the chemistry of the resin is consistent with angiosperm chemistry, something creation predicts, not evolution.

Complex Biochemical Systems

Many evolutionists have been forced to conclude that trees have evolved several times from many ancestors through convergent evolution (Ennos, 2001, p. 5). The highly complex genetic systems

Figure 10. Polystrate fossil tree (Division Lycopodiophyta, probably Genus *Lepidophloios*), Tennessee coal mine. (Photo courtesy of Ian Juby)

involved in the production of the intricate and diverse machinery driving trees to function in a diversity of habitats and climates falsifies the view that random chemical events could produce such features even once, not to mention many times. No analogue exists to draw such conclusions. Genetic systems and machinery go well beyond human innovations, and experience informs us that complex, interdependent systems require an intelligent designer.

Consider the photosynthetic system in the chloroplasts that trees depend on daily (Figure 11). This system breaks up water molecules into hydrogen and oxygen (Sarfati, 2008, p. 125). Breaking up water requires a tremendous amount of energy and must be accomplished without destroying leaf structure (2008, pp 126–127). Tree leaves contain a series of protein complexes called Photosystem II. A photon strikes this complex and is guided into a P680 chlorophyll. An electron is knocked out to build sugars from the CO_2 obtained from the environment. P680 must replace the lost electron or photosynthesis would cease and the plant would die. The replaced electron comes from a catalytic core made up of uniquely arranged atoms of manganese (Mn), calcium (Ca), and four oxygens (O) attached to a single Mn. This molecular cube is designed to build up energy in four stages to allow Mn to remove an electron needed for the photosynthetic process from a water molecule. The four stages help to concentrate the energy in controlled amounts so that the leaf is not destroyed in the process.

Once the Mn removes the electron, hydroxide (OH) and hydrogen (H+) are produced. This fourth stage is where Mn has enough energy to break the OH into O and H+. It is here that the Ca atom plays its crucial role. Ca holds another water molecule in the right location so that the single O atom chemically reacts with it, producing O_2, two more H+ atoms, and two electrons. This unique Mn_3CaO_4-Mn cube is present in all plants, algae, and cyanobacteria. This irreducibly complex photosynthesis process will not function unless the entire system is in place. Such a system could not be produced in stages by neo-Darwinian processes once, let alone several times through the many common ancestors of the variety of plants existing today.

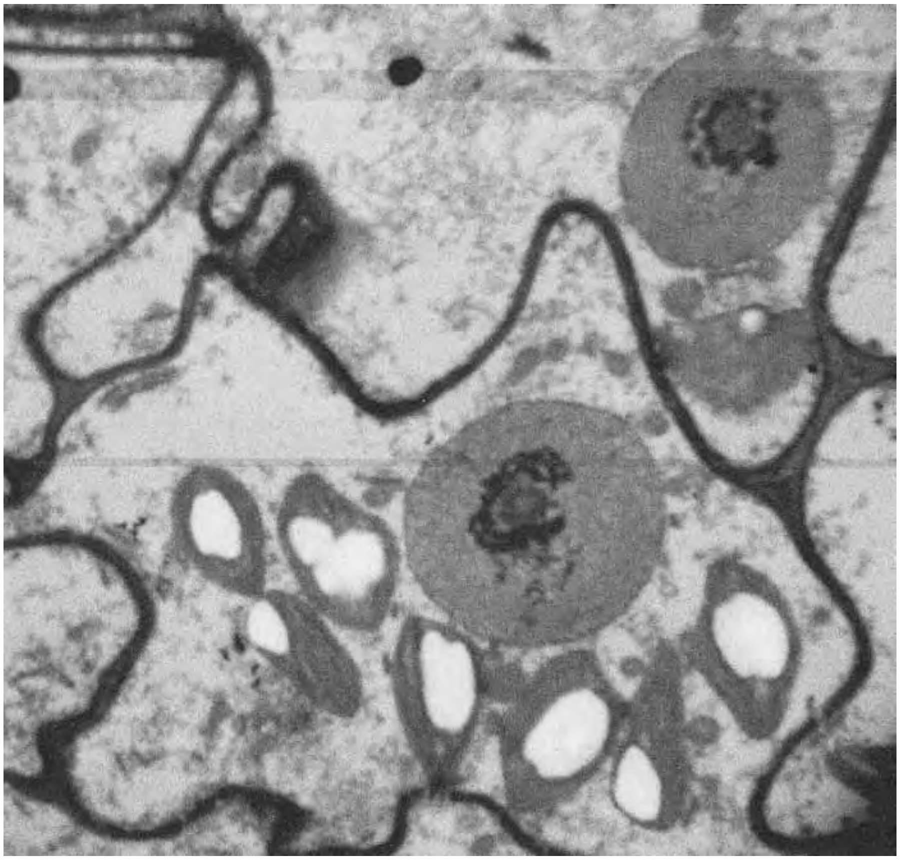


Figure 11. Cell chloroplasts (2500x). The genetic systems and machinery found in chloroplasts go well beyond human innovations. Experience informs us that complex, interdependent systems like these require an intelligent designer. (Photo courtesy of Mark Armitage)

Conclusions

The first trees existing in the fossil record were clearly trees. Furthermore, an enormous gap exists between trees and all other plant forms. Trees are unique creations and a critical part of the biosphere designed for life as we know it (Bergman, 2002). When the fossil record is critically examined, the origin of trees is consistent with the Biblical record. Building our scientific understanding helps us to better understand our world and the one who created it.

There is still much research to be done, with numerous intriguing questions yet to be investigated, such as the genetic mechanisms that allow trees to persist and respond to changing environmental disturbances. Assuming that God has designed His creatures to persist, how did genetic and ecological mechanisms combine to allow trees to rapidly diversify? What is the role of symbiotic relationships with mycorrhizal fungi and trees in the context of forest health, tree diversification, baraminology, and ecosystem functionality (Loucks, I.S., 2009; Hennigan, 2009)? Baraminology, from the Hebrew *bara* (create) and *mîn* ("kind"), refers to the "created kind" and was coined by Frank Marsh in 1941. The word *mîn* is poorly understood, and many Hebrew scholars disagree on its meaning (Turner, 2009). It may be defined as a region of biological attributes within which any combination of these attributes could produce healthy offspring, at any point or period of history (Wood and Murray, 2003). What, then, constitutes the tree baramins that God created in the beginning? For example, a fascinating venue of future creationist research would be to compile tree hybridization data. There are many trees that can hybridize with each other, including species within the conifer taxa and species within the poplar taxa. In baraminology the ability to hybridize suggests a close biochemical relationship between tree taxa and is an important additive evidence for ancestry within a "kind" in the identification of the baramin.

Much devotional insight can be gained by considering specific trees that God has used to teach man about life with our heavenly Father (George Howe, 2011, personal communication). For example, He implanted the principle of choice in a perfect world by creating the tree of knowledge of good and evil (Genesis 2:16–17) and has used them as powerful analogies for how we should live in this life. Like solidly rooted trees, our lives should be rooted in Christ that they may reflect His strength and fruitful purpose.

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TJ: Journal of Creation Technical Journal

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