

# Plant Life Through the Ages

## *Mural of Plant Evolution*

THE BOTANIC GARDEN OF SMITH COLLEGE

Ever since life originated on Earth nearly 4 billion years ago, living organisms have passed along inherited traits to their offspring. Over time genetic changes occur. When these changes persist in successive generations, the process is called evolution. The fossil record shows a rich and interesting history of plants on Earth. Plants evolved many adaptations, resulting in a vast array of forms. It is estimated that 300,000 to 400,000 plant species exist today.

During the first 2 billion years of life on Earth, single-celled microorganisms were dominant. Cyanobacteria living in the ocean evolved the capability to perform photosynthesis. This process, in which light energy is utilized to produce sugar, releasing oxygen as a by-product, was a profound turning point for life on Earth. As cyanobacteria proliferated, Earth's atmosphere gradually changed, allowing other life forms dependent on oxygen to evolve.

Since chloroplasts, the photosynthetic structures within modern plant cells, were once free-living cyanobacteria that became incorporated into the cells of other organisms, cyanobacteria are often considered the starting point for plant evolution. The first green plants can be traced to the oceans around 1 billion years ago. A significant transition occurred almost 500 million years ago (Ma), when plants that could grow on land evolved.

Evolution is not a linear or predictable process. It is often characterized by bursts of speciation as well as significant extinctions. Such a burst occurred during the Devonian Period, characterized by the rapid appearance of many new plant species. Consequently, three murals are devoted to this period. At 400 Ma, plants were still small, but over the next 100 million years plants became more complex, diversified, increased in size, and more fully colonized the land. The first forests comprised of non-seed-bearing plants emerged 385–360 Ma, followed by the first seed-bearing plants 360 Ma. It was not until about 140 Ma that flowering plants, now dominant, evolved.

In the 11,500 years of human civilization, we have dramatically impacted plant diversity through domestication, breeding, and the agricultural revolution. However, human activity is increasingly causing ecosystem degradation resulting in species going extinct more rapidly than new species are evolving.

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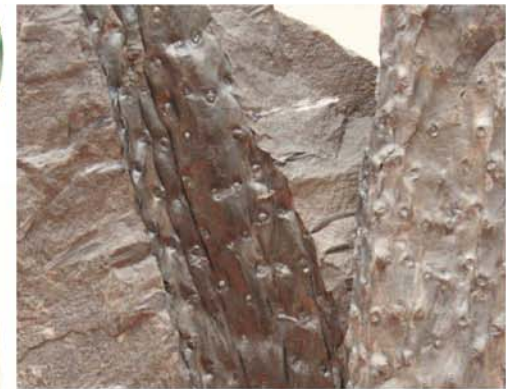
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**FOSSILS**, top to bottom:  
**Stromatolites**, photograph by Michael C. Rygel;  
**Aneurophyton**, photograph by James St. John;  
**Stigmaria; Cordaites; Taxodium; Platanus**

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