



**Principle 4:  
The ocean makes Earth habitable.**

**Oxygen Production**

**Origins of Life**

**A.**  
Originally, all oxygen in the atmosphere came from photosynthetic organisms in the ocean.

**B.**  
Life started in the ocean, and the earliest evidence of life is found in ancient ocean sediments.

**A.1.**  
Earth originally had an atmosphere containing gases toxic to most organisms; there was no life on land until oxygen became common in the atmosphere.

**A.5.**  
Most of the oxygen consumed by organisms living on land and in the water is produced by photosynthetic organisms in the ocean.

**B.1.**  
The fossil record of ancient lifeforms provides evidence for the theory of evolution and the important role that the ocean played in the evolution of life on Earth.

**A.2.**  
Cyanobacteria (blue-green algae) living in the ocean generated oxygen in Earth's atmosphere through the process of photosynthesis, over many millions of years.

**A.6.**  
The process of photosynthesis produces oxygen gas, while respiration and decay use oxygen.

**B.2.**  
Cyanobacteria (blue-green algae), the ancestors of all plants and algae, are among the oldest fossils currently known on Earth. These 3 billion-year-old organisms evolved in the ocean, and are found in ancient ocean sediments.

**B.4.**  
The millions of different species of organisms on Earth today are related by descent from common ancestors that evolved in the ocean and continue to evolve today.

**A.3.**  
The oxygen produced by cyanobacteria through photosynthesis first accumulated in the ocean, and then escaped into the atmosphere, where it formed ozone that blocked much UV radiation from reaching Earth's surface.

**B.3.**  
The chloroplast, which plants use to make food for themselves through photosynthesis, is a remnant of cyanobacteria.

**A.4.**  
By 550 million years ago, oxygen and ozone levels in the atmosphere were high enough that terrestrial organisms could develop and survive.

See Principle 2: B7