

This cycle is far more complex than visualized here, but the importance of the interdependence of plants and animals is illustrated. Basically all the oxygen in the present atmosphere is recycled through plants and animals about once every 3,000 years.

Before the first photosynthesizing organisms captured energy from the Sun, primitive organisms had to rely on a limited supply of organic molecules of purely chemical origin for food. Somehow, an unknown ancestral microbe was endowed with the capability of photosynthesis. Energy could then be utilized from the Sun to convert chemical elements directly into food.

With this enormous advantage, the first known photosynthesizing organisms -- the blue-green algae -- spread through the waters of the Earth. They are thought to have been a key factor in cleaning the air of noxious gases, building the ozone screen and producing oxygen for animals to breathe. They were the hardy pioneers that paved the way for higher forms of life.

THE FIRST POISON -- OXYGEN

It seems incredible to us today, as we relish the fresh air which our bodies require, that oxygen should have been a poison to early life, but such was the case. We must remember that the cells of our bodies, like all *eukaryotic* (nucleated) cells, contain oxygen-mediating enzymes that counteract the otherwise poisonous effects of oxygen. But to the *prokaryotic* blue-green algae, oxygen was a poison, a pollutant.

Today there are bacteria that are killed when exposed to oxygen and therefore live deep within the soil. One of the first indications of pollution in rivers and lakes is the appearance of blue-green algae. They indicate a deterioration of the oxygen supply.

It was therefore very fortunate for the blue-green algae that the oxygen supply increased at a slow rate of speed, even by geologic standards. It is actually a rather puzzling situation. The photosynthetic blue-green algae had the enormous biologic advantage of utilizing the Sun's energy for growth and metabolism. Yet they were producing a byproduct that was poisonous to them -- oxygen. There were no animals present to convert the oxygen back to carbon dioxide as in today's ecologic cycle. What kept the oxygen produced by the blue-green algae at a low level so they could thrive for 2 billion years?