28 December 2006 By: Stefan Anitei, Science Editor

Oxygen Let Us Grow Bigger Than Bacteria

High oxygen levels permitted the evolution of complex life

Since ever scientists were puzzled by the sudden emergence of complex life forms after a long evolution only under the form of single cell organisms, like bacteria and protozoa. "The sudden appearance of large animal fossils more than 500 million years ago - a problem that perplexed even Charles Darwin and is commonly known as "Darwin's Dilemma" - may be due to a huge increase of oxygen in the world's oceans," says Queen's paleontologist Dr. Guy Narbonne, an expert in the early evolution of animals and their ecosystems. In 2002, Narbonne's research team found the world's oldest complex life forms systems between layers of sandstone on the southeastern coast of Newfoundland. This fossil records pushed back the age of Earth's earliest known complex lifeforms to more than 575 million years ago, soon after the melting of the massive "snowball" glaciers.Oxygen could explain the explosion of complex life after three billion years of mostly single-celled evolution. A huge increase in oxygen levels following the Gaskiers Glaciation 580 million years ago is correlated with the first appearance of large animal fossils at the site on the Avalon Peninsula (Newfoundland). Geochemical studies measuring iron speciation and sulfur isotopes have determined the oxygen levels in the world's oceans when these sediments accumulated in Newfoundland. "Our studies show that the oldest sediments on the Avalon Peninsula, which completely lack animal fossils, were deposited during a time when there was little or no free oxygen in the world's oceans," said Narbonne. "Immediately after this ice age there is evidence for a huge increase in atmospheric oxygento at least 15 % of modern levels, and these sediments also contain evidence of the oldest large animal fossils.""The close connection between the first appearance of oxygenated conditions in the world's oceans and the first appearance of large animal fossils confirms the importance of oxygen as a trigger for the early evolution of animals". Perhaps melting glaciers increased the amount of mineral salts in the ocean, favoring the proliferation of single-celled organisms that liberated oxygen through photosynthesis. The varied and abundant resources led to an evolutionary radiation to complex communities of sedentary filter-feeding animals, then mobile bilateral animals, and ultimately to the Cambrian "explosion" of skeletal animals 542 million years ago, which left many good fossils.