### Biogeochemistry

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# What is Biogeochemistry?

Biogeochemistry is the study of the<u>cycles</u> of<u>chemical elements</u> and their interactions with and incorporation into<u>living things</u> transported through earth scale biological systems in space through time. Thus biogeochemistry encompasses many aspects of the abiotic and biotic world that we live in.



Biogeochemistry is a systems science closely related to Systems ecology. There is a relationship between global warming, decomposition and respiration in soils and wetlands producing significant climate feedbacks and altered global biogeochemical cycles

Russian scientist<u>Vladimir Vernadsky</u> is the founder of Biogeochemistry.

### Definition

The study of how living systems influence the geology and chemistry of the earth.

#### **Biogeochemists:**

The scientists use to study earth systems.

# **Biogeochemical process:**

• 6 Elements influencing the process:

- 1. H (hydrogen)
- 2. C (carbon)
- 3. N (<u>nitrogen</u>)
- 4. O (oxygen)
- 5. S (sulfur),
- 6. P (phosphorus)

Understanding the relations and cycles mediated between these elements and their ecological pathways ease the understanding of biogeochemistry. Biogeochemistry focuses on 4 chemical cycles (<u>carbon,nitrogen,sulfur</u>, and<u>phosphorus</u> cycles) which are either driven by or have an impact on biological activity.

### **Principles and Tools**

Most of the major environmental problems can be analyzed using biogeochemical principles and tools.

# **Major Environmental problems**

- Global warming
- Acid rain
- Environmental pollution
- Greenhouse gases

The principles and tools can be broken down into 3 major components: element ratios, mass balance, and element cycling.

#### 1. Element ratios

An organism can change only slightly the amount of these elements in their tissues if they are to remain in good health.

#### 2. Mass Balance

Using a mass balance approach we can determine whether the system is changing and how fast it is changing. The equation is:

```
NET CHANGE = INPUT + OUTPUT + INTERNAL CHANGE
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#### 3. Element Cycling

It describes where and how fast elements move in a system.

### Two general classes of systems :

- closed system
- open systems

#### A closed system:

A system where the inputs and outputs are negligible compared to the internal changes.

An open system:

There are inputs and outputs as well as the internal cycling.

# **Biogeochemistry Research:**

#### **Research Fields:**

- global change
- climate change
- biogeochemical prospecting for ore deposits
- <u>modelling</u> of natural systems
- · soil and water acidification recovery processes
- <u>eutrophication</u> of surface waters
- carbon sequestration
- soil remediation

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#### **Reference Links:**

- http://en.wikipedia.org/wiki/Biogeochemistry
- http://www.globalchange.umich.edu/globalchange1/current/lectures/kling/ecosystem/ecosystem.html
- <u>http://en.wikipedia.org/wiki/Ecology</u>

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