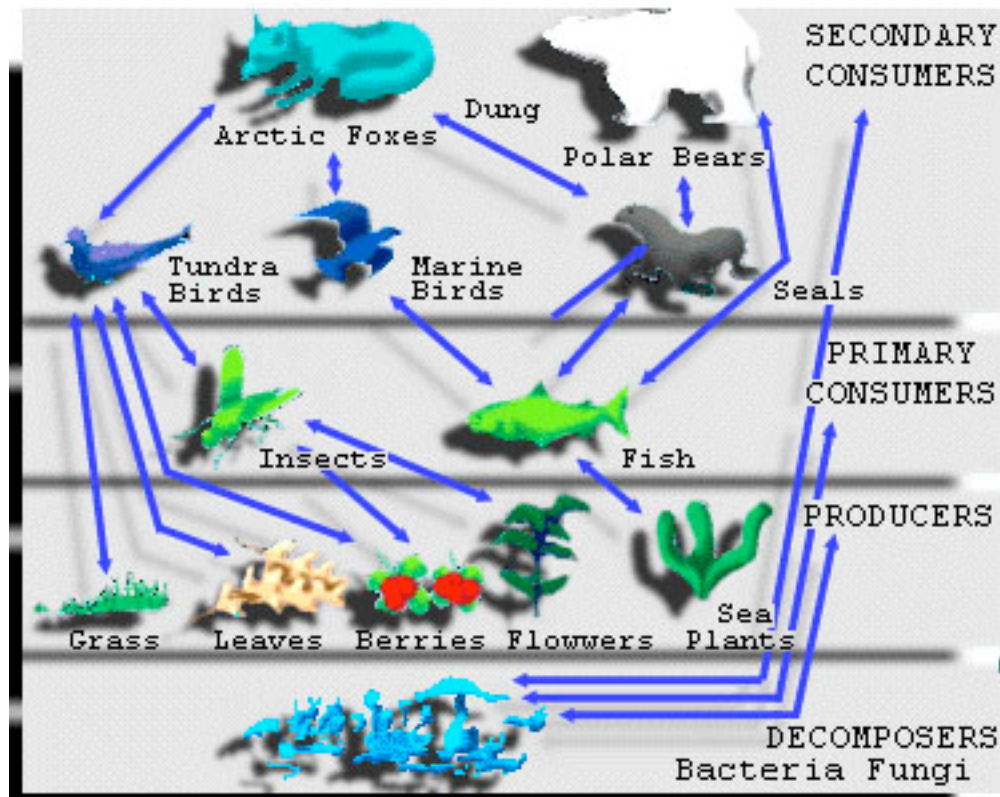


Energy**Objective**

To explore the relationship between energy and the chemical forms of biological material. Specifically, you will analyze your role in the global food chain by recording consumption and subsequent energy production. The energy-producing value of food is measured in calories. In this exercise you will calculate the number of calories as a direct result of consumption of different foods.

Overview

Energy, the ability to do work, has been described as the basic currency of ecosystems. The specific rate of energy flow or amount of energy ultimately controls the size of populations of species in any natural or human-managed ecosystem.

The sequence of organisms, each of which is a source of food for the next, is called a food chain. It is commonly represented in terms of trophic levels. Producers belong to the first trophic level, primary consumer to the second trophic level, secondary consumers to the third and so on.

At each level of the food chain, about 90% of the energy is lost in the form of heat. The total energy passed from one level to the next is only about one-tenth of the energy received from the previous organism. Therefore, as you move up the food chain, there is less energy available. Animals located at the top of the food chain need a lot more food to meet their energy needs.

Procedure

You will need to record all of the various foods that you consume in one day. Write down everything that you consume (food and beverages.) It is also necessary to record the size of the portions that you consume. On the same day that you record consumption, also record daily activities, eg walking, running and the length of time spent on each activity.

After recording consumption and activities for one day you will need to calculate the total number of calories from each food and total number of calories burned via activities. To make consumption calculations go to: <http://www.ag.uiuc.edu/~food-lab/nat/> Click on “energy calculator” then Nats version 2.0 and begin. To calculate number of calories burned go to http://www.caloriesperhour.com/index_burn.html.

When calculating the total consumption, make a note of the food items for which you do not meet the dietary recommendations. Scroll down to ‘Suggested Foods’ and rework your way through the consumption calculations. By trial and error basis, try to identify a well balanced diet that meets your daily dietary requirements 100%.

Assignment

A written report which includes the stated objective and how this objective was achieved (1/2 to 1 page). Also, please attach to the report all data sheets, with calculations (you can print the calculations from the website in tabular form) as well as answers to the questions (1 page) that are attached to this laboratory.

Questions

- 1) What are the various units of energy, power and heat (give examples)? What units did you calculate energy in?
- 2) Where in the food chain do you fit in? Which trophic level best represents you? What type of a consumer are you (e.g. herbivore?) What are some reasons for eating lower on the food chain?
- 3) What biological process converts the food you consumed to energy? Are you using organic or inorganic energy sources?
- 4) List the food items consumed in order of decreasing energy provided to you.
- 5) Draw a brief picture *of your personal* food web and give a half page description on how energy moves through the system.

Include the following points in your report

Purpose of assignment (0.5)

Questions: See above (1.5 points each, 7.5 points total)

Observation data sheet (1)

Presentation: Proper heading and subheadings (0.5)

Grammar, spelling, complete sentences (0.25)

Organization (0.25)

Reports submitted without your name, class, subject and date will not be accepted.

Helpful information for this lab:

A calorie is a unit of energy. We tend to associate calories with food, but they apply to anything containing energy. Specifically, a calorie is the amount of energy, or **heat**, it takes to raise the temperature of 1 gram of water 1 degree Celsius (1.8 degrees Fahrenheit). One calorie is equal to 4.184 joules, a common unit of energy used in the physical sciences.

Most of us think of calories in relation to food, as in "This can of soda has 200 Calories." It turns out that the calories on a food package are actually **kilocalories** (1,000 calories = 1 kilocalorie). The word is sometimes capitalized to show the difference, but usually not. A food Calorie contains 4,184 joules. A can of soda containing 200 food calories contains 200,000 regular calories, or 200 kilocalories. A gallon of gasoline contains 31,000 kilocalories.

The same applies to exercise -- when a fitness chart says you burn about 100 Calories for every mile you jog, it means 100 kilocalories. (<http://www.howstuffworks.com/calorie.htm>)

Internet Activity for the day:

Discuss the following questions within your groups and share your views with the rest of the class.

Group 1:

- Concept of Urban Heat Island.
- Example? Is there any in Oregon?
- What are the factors contributing to the generation of one?
- How and why do we need to mitigate the heat island effect?
- What role do trees play in an urban heat island?

Group 2:

- Should the Arctic National Wildlife Refuge be open to oil drilling?
- Comment on the stability of this option as a source of energy
- How would you argue in favor of this option?
- Discuss some environmental threats posed by this proposal?

Group 3:

- How does nuclear power work?
- Is it the most certain future source of energy?
- Discuss the advantages of nuclear energy? Is it an economical option?
- What happens to the radioactive waste generated in the process?
- How does the US govt. plan to dispose of the generated waste?

Group 4:

- What is geothermal energy? Give some examples within and outside the US.
- How do we generate 'usable' energy from geothermal energy?
- What are some direct uses of this energy?
- Review some of the benefits of geothermal energy.
- What are your thoughts on this issue? Mention at least 1 demerit of this form of energy.

Group 5:

- What are Greenhouse gases? What role do they play in sustaining life on Earth?
- Which gas is the largest contributor to global warming? Mention its sources.
- How is global climate change expected to affect human health?
- How has global warming affected other organisms?