#SA 8	Global Climate Factors

LOOKING BACK: We have studied the varied experimental approaches of ecology (SA #5), the emphasis of ecology as a study of distribution and abundance of species (SA #6), and how biotic communities can be characterized (SA #7). Now it is appropriate that we examine the physical environment within which biotic communities exist. We begin with a *global scale* focus, namely a study of global energy relationships powered by the sun.

FORWARD: Our study of Earth's climate can begin with two concepts which you may have encountered in your secondary level Earth science course:

1. Life on Earth depends on a continuous supply of solar energy which is transformed into chemical, thermal, and kinetic energy according to thermodynamic laws.
2. The energy environment at a given geographical location on Earth depends upon complex interactions involving atmosphere, ocean, and land on a revolving planet which rotates on a tilted axis and has one natural satellite.

READING: Textbook: Molles Chapter 2, p 15-21; Chapter 4, p 99-100; and Chapter 23, pp561-62
Lecture Aid: Slides in WebCT
Other Resources: Visit the McGraw Hill Online Learning Center (OLC) and open "Atmosphere, Climate, and Weather" for helpful on-line aids.

PROCEDURE: This assignment is crucial to your understanding of ecology – and how it is that organisms live *where* and *when* they do. First, reread the "Concept" statements above and the three "Concept" given by Molles, Chapter 2 page 16. Then, turn to Ch. 23 and skim pages 561-62 which provide a model for the path of solar energy to Earth. Our focus will be upon how the properties of Earth influence global distribution of energy and precipitation and thus influence the climate of Earth. You will also be introduced to *climate diagrams* which illustrate seasonal temperature and precipitation trends on a standard chart format.

STUDY QUESTIONS:

1. Turn to the energy model presented in Figure 23.2 to answer the following (write out answers):
   (a) Explain the "paths" taken by solar energy to and from planet Earth.
   (b) Define each of the processes included in the model (*see* Chapter 4, p 99-100).
   (c) Finally, according to the model and text, how does the atmosphere affect solar energy income and release? (List several ways.) See the attached "Lecture-Study Outline.".

2. What is the greenhouse effect? What are several common greenhouse gases? How does biological activity on Earth influence the greenhouse effect? Name one practice you engage in that increases the concentration of greenhouse gases? One that would decrease greenhouse gases?

3. Answer question #3 of the "Review Questions" of Chapter 2.

4. What variables are plotted on the x-axis and the two y-axes of climate diagrams (*e.g.* Figure 2.7)? What standard convention is used in scaling the two climate parameters on the y-axes?

5. List all of the climate and geographic information one can learn from a climate diagram. SA #9 will build upon this introduction to climate data and relate it to the concept of *biomes*.

Solar Radiation and Global Climate - LECTURE / STUDY OUTLINE BIO 2130

A. SOURCE _____

B. PATH – See Figure 23.2 and HANDOUT: "Environmental Factors"

C. FACTORS AFFECTING "SOLAR INCOME" at a given point on Earth: (list)

1. _____ 2. _____ 3. _____ 4. _____

Other and notes:

D. ATMOSPHERIC EFFECTS

1. REFLECTING - by _____

2. FILTERING - e.g. _____

3. BLANKETING - e.g. _____

4. TRANSPORTING - BY AIR MOVEMENTS:

a. VERTICAL - _____

b. LONGITUDINAL - _____

c. CIRCULATION - _____

RESULTING IN TRANSPORT OF:

1. MOISTURE, FROM - SALT WATER TO _____

...AND EQUATORIAL TO _____

2. HEAT ENERGY TO HIGHER LATITUDES VIA:

a. WARM AIR (D.4.)

b. WATER VAPOR [VAPORIZATION --> CONDENSATION + _____

c. LIQUID WATER - OCEAN CURRENTS

E. LOCAL ATMOSPHERIC EFFECTS – Microclimate (see SA #9)