

Thursday, April 23, 2015

Introduction:  
Weather & Climate

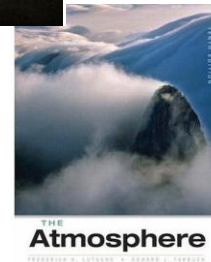
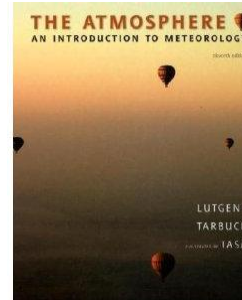
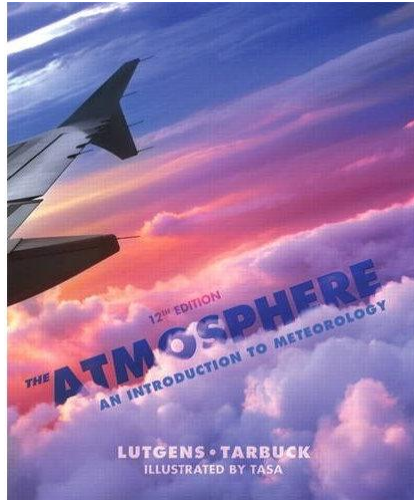
## Introduction

Introduction to

- **Geography**
- **Weather and Climate**
- **The 5 Themes of Geography**
- **Using Maps**

# The Atmosphere 12<sup>th</sup> Ed.

Lutgens, Tarbuck and Tasa



## Earth Systems Science

The understanding of Earth as a complete entity.

An interacting set of physical, chemical and biological systems, that together produce a "Whole Earth."

The science that studies the relationships and patterns among natural systems, geographic areas, society, cultural activities and the interdependence of these all across space.

## The GAIA Hypothesis

The Gaia Hypothesis proposes that our planet functions as a **single living organism** that maintains conditions necessary for its survival.

Formulated in the 1960s this controversial idea has generated several interesting ideas and many new areas of research.

**While this hypothesis is by no means substantiated, it provides many useful lessons about the interaction of physical, chemical, geological, and biological processes on Earth.**

## The GAIA Hypothesis

Throughout history, the concept of **Mother Earth** has been a part of human culture in one form or another. But what do we mean by Mother Earth? Consider a few explanations from different cultures:

The **Hopi** name for Mother Earth is **Tapuat** (meaning mother and child), symbolized by a form of concentric circles or squares. These forms symbolize the cycle of life, the rebirth of the spirit, its earthly path, and its return to the spiritual domain. Within this framework, humankind seeks a path to enlightenment.

Another view of Gaia is the **Hindu goddess Kali**, who represents all the good and bad in the Universe. Kali "creates, preserves and destroys" by combining the absolute power of destruction with the precious motherly gift of creation.

The ancient **Greeks** called their Earth goddess Ge or **Gaia**, who is Mother Earth, the source of all living and non-living entities. Gaia is gentle, feminine and nurturing, but also ruthlessly cruel to any who cross her.

James Lovelock gives Gaia a modern scientific twist. He defines Gaia as:

**"a complex entity involving the Earth's biosphere, atmosphere, oceans, and soil; the totality constituting a feedback system which seeks an optimal physical and chemical environment for life on this planet."**

# Geography

Definition:

**geo** → **Earth**  
**graphy (graphein)** → **To Write (to know)**

The science that studies the relationships and patterns among natural systems, geographic areas, society, cultural activities and the interdependence of these all across space.

## Space: *The Geographic Frontier*

Geographers often refer to “**space**” and geography is often called “**the spatial science**” because space (where something is or something happens) and the patterns of space (how things change over distance and/or time) is **important** to know in order to ***better understand how our world works***

## The Spatial Science

Geographers are always looking for **patterns** in how things change on Earth.

We look at how they change in two ways:

- **Spatially** (*changes in location*)
- **Temporally** (*changes over time*)

**Spatial** refers to:

The nature and character of physical space, its measurement and the distribution of things within it.

## Physical Geography

Definition:

**The spatial analysis of all the physical elements and processes that make up the environment:**  
*Energy; Air; Water; Weather; Climate; Landforms; Soils; Animals; Plants; Microorganisms and the Earth itself.*

**Especially these impact on humans and human activity**

# Meteorology

Definition:

**The scientific study of the atmosphere and the phenomena that we usually refer to as weather, especially as to its impact on humans and human activity**

# Weather

Definition:

**The state of the atmosphere at any given time and place.**

**You can think of Weather as a snap shot of atmospheric conditions.**

# Climate

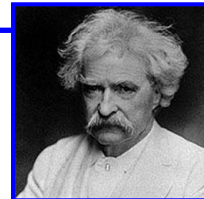
Definition:

**A description of the  
long-term Patterns of Weather  
for a certain place and time.**

**Often called the *Average Weather* for a place,  
this definition is inaccurate because it  
misuses the statistical term "average"**

# Weather & Climate

Mark Twain:

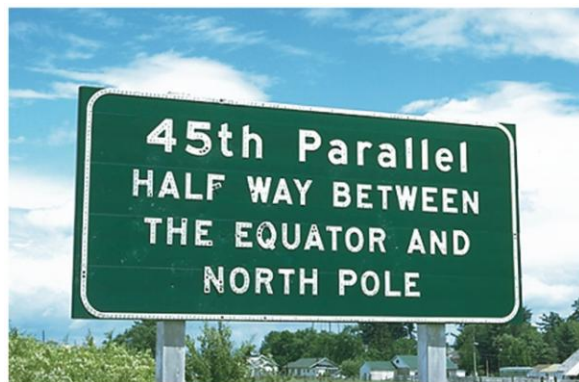


**Climate is what you expect...  
Weather is what you get!**

## 5 Themes of Geography

- **Location**
- **Region**
- **Human-Earth Relationships**
- **Movement**
- **Place**

## 5 Themes of Geography: Location



### **Location**

Absolute and relative location on Earth. Location answers the question *Where?*—the specific planetary address of a location. This road sign is posted on Interstate 5 freeway in Oregon telling drivers their position on Earth.

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## 5 Themes of Geography: Region



### Region

Areas having uniform characteristics; how they form and change; their relations to other regions. In the Arctic region a scene from eastcentral Greenland, at Sydkap on Hall Bredning. The Arctic region of the Northern Hemisphere is experiencing dynamic change as temperatures increase.

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## 5 Themes of Geography: Human-Earth Relationships



### Human–Earth Relationships

Humans and the environment: resource exploitation, hazard perception, and environmental pollution and modification. The western U.S. drought, into its sixth year in 2004, drastically reduced flows in the Colorado River, leaving Lake Mead behind Hoover Dam at only 50% of capacity.

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## 5 Themes of Geography: Movement



### **Movement**

Communication, movement, circulation, migration, and diffusion across Earth's surface. Global interdependence links all regions and places. Hurricane Isabel is a product of atmospheric circulation. In 2003, Category 5 Isabel slammed into Cape Hatteras and the Outer Banks, North Carolina, causing \$4 billion in damage.

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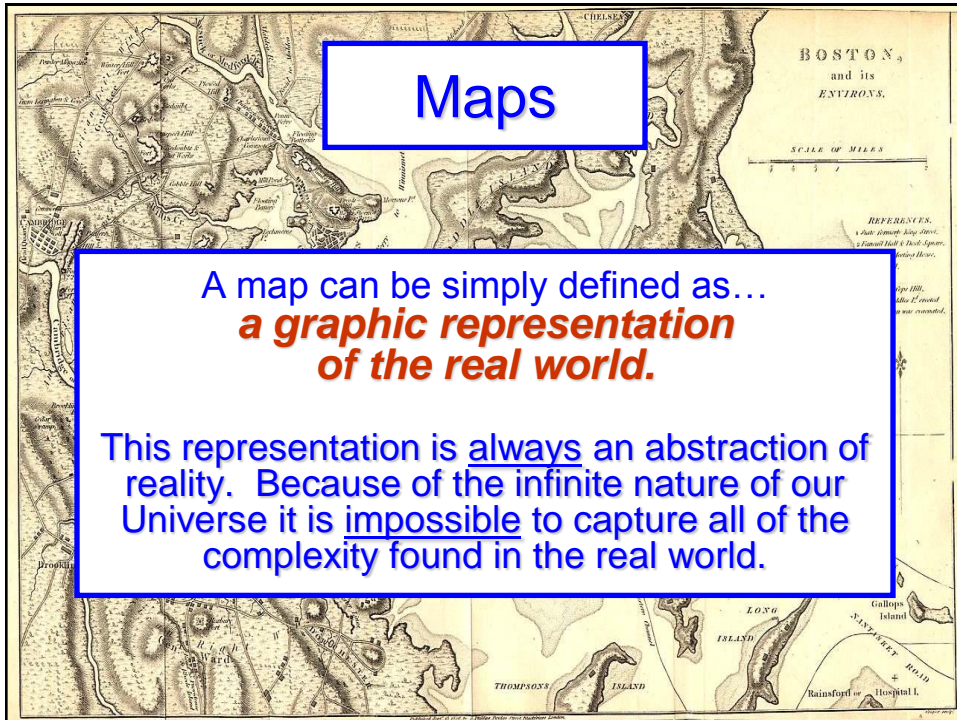
## 5 Themes of Geography: Place



### **Place**

Tangible and intangible living and nonliving characteristics that make each place unique. No two places on Earth are exactly alike. Patagonia in southern Argentina is such a place. The braided channel of the Rio Gallegos laces across the arid and semiarid landscape.

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# Maps

Maps are used to display both **cultural** and **physical features** of the environment.

Standard **topographic maps** show a variety of information including roads, land-use classification, elevation, rivers and other water bodies, political boundaries, and the identification of houses and other types of buildings.

Some maps are created with very specific goals in mind. Here we see a **weather map** showing the location of **low** and **high pressure** centers and **fronts** over most of North America.

The intended purpose of this map is considerably more specialized than a topographic map.

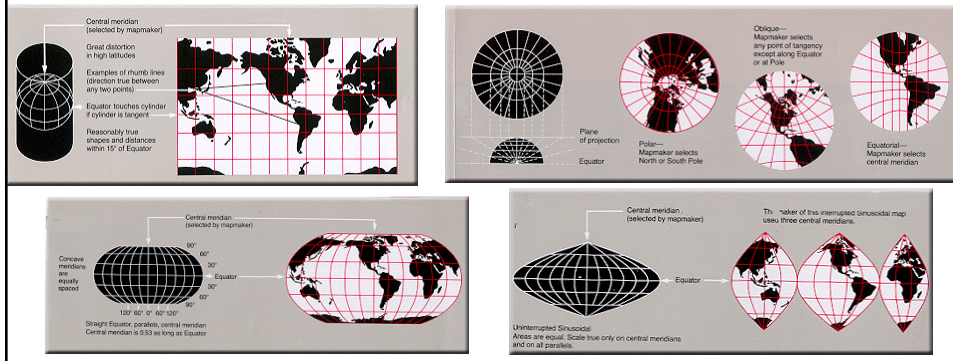





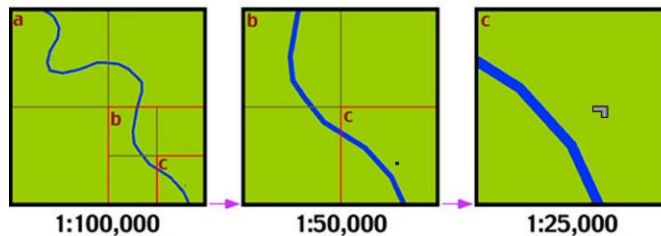
# Map Projections

Projections are how we **represent a 3-D sphere onto 2-D plane** (flat paper)  
There are myriad projection methods and formulae, but all you need to remember is that there are different ways to do this and that each one distorts the view in some way.

**ALL MAPS LIE!  
ONLY GLOBES CAN BE TRULY ACCURATE!**



# Map Scale



Maps are rarely drawn at the same scale as the real world. Most maps are made at a scale that is much smaller than the area of the actual surface being depicted. The amount of reduction that has taken place is normally identified somewhere on the map.

This measurement is commonly referred to as the **map scale**.

Conceptually, we can think of map scale as the ratio between the distance between any two points on the map compared to the actual ground distance represented. This concept can also be expressed mathematically as:

$$\text{MAP SCALE} = \frac{\text{MAP DISTANCE}}{\text{EARTH DISTANCE}}$$

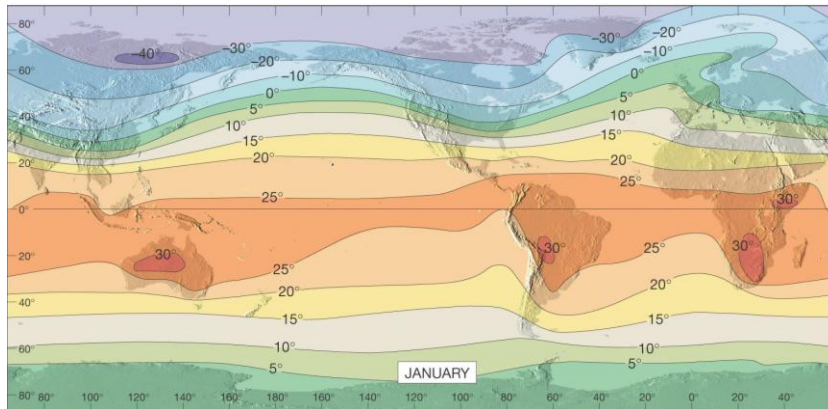
## Lines of the Earth: *The Earth-Sun Relationship*



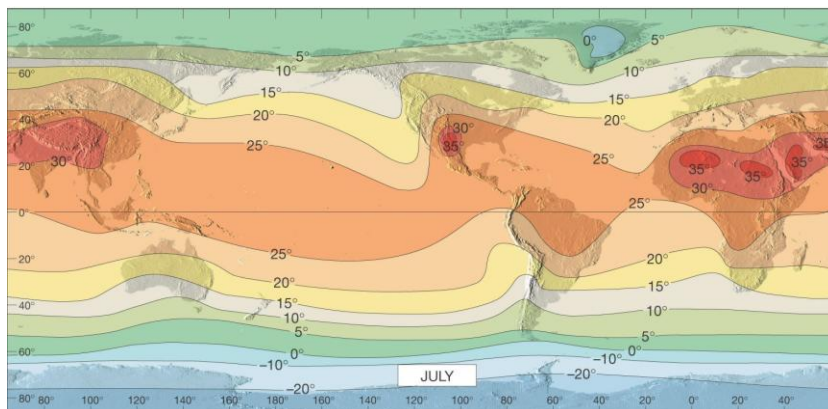
### Lines of the Earth: *The Earth-Sun Relationship*

- **Earth-Sun Relationship**
- **Yearly Variations**
  - **Energy In**
    - Sunlight
    - Temperature
- **Seasons and Tilt**
- **Lines of the Earth**
- **Office Hours**
- **Homework (YEAH!)**

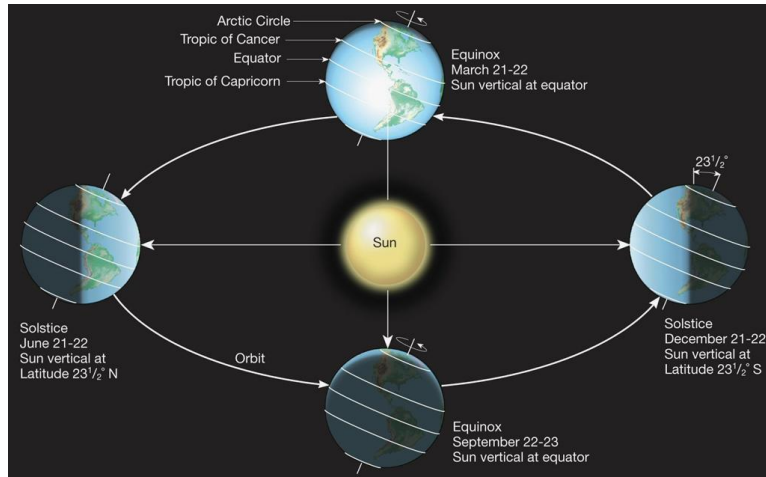
## World Temperature: January



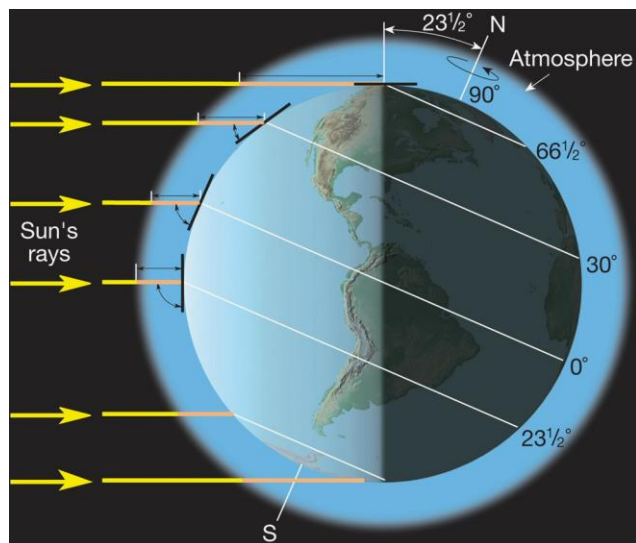
## World Temperature: July



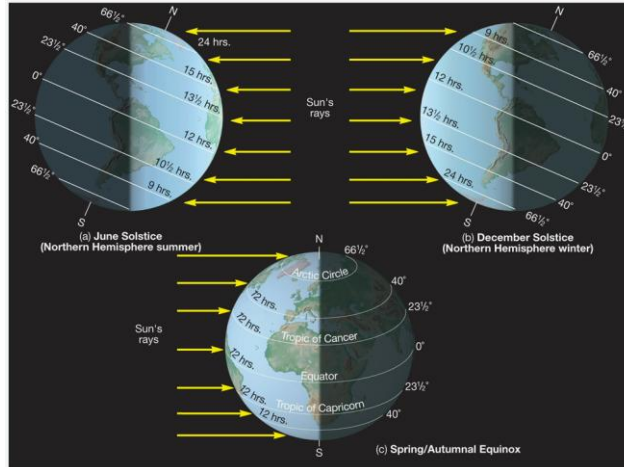
## Earth-Sun Relationship: Seasons



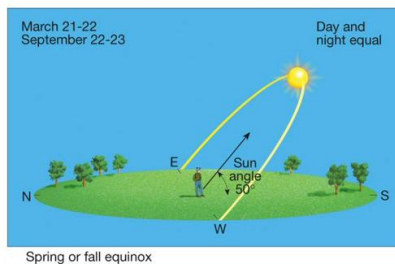
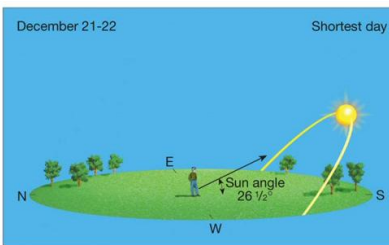
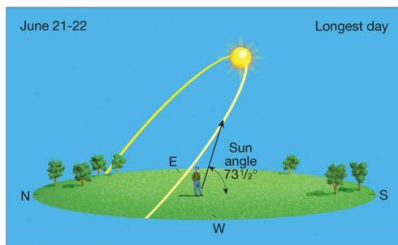
## Earth-Sun Relationship: Axial Tilt



# Earth-Sun Relationship: Seasons and Axial Tilt



# Earth-Sun Relationship: Sun Angle (Northern Hemisphere)



## Lines of the Earth

Lines	Location
<b>Latitude (E-W)</b>	<i>0-90° N/S</i>
North Pole	90°N
Arctic Circle	66.5°N
Tropic of Cancer	23.5°N
Equator	0°
Tropic of Capricorn	23.5°S
Antarctic Circle	66.5°S
South Pole	90°S
<b>Longitude (N-S)</b>	<i>0-180° E/W</i>
Prime Meridian	0°
International Date Line	180°