Essentials of Geography

- The Science of Geography
- Earth Systems Concepts
- Location and Time on Earth
- Maps, Scales, and Projections
- Remote Sensing and GIS
The Science of Geography

Geography – from *geo* “Earth” and *graphein* “to write”

Geography is
- a method, not a body of knowledge
- holistic
- eclectic

Geographers use spatial analysis

Geographers use Earth systems science
Geography is

The science that studies the relationships among

- natural systems,
- geographic areas,
- society,
- cultural activities,

and the interdependence of all of these over space.
Geographic Themes

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

Figure 1.1 in textbook has explanations of geographic themes
Location

Location identifies a specific address or absolute and relative position on Earth. Mount Cook is the highest point in New Zealand, located at 43°35’ S latitude and 170°8’ E longitude.
Place
No two places on Earth are exactly alike. Place describes the characteristics – both human and physical – of a location. Untracked powder attracts skiers in the backcountry near Mount Hutt.
Region

A region is an area defined by uniform physical or human characteristics. The West Coast region, between the Southern Alps and the Tasman Sea, is dominated by a marine west coast climate, cool and moist.
Movement

New Zealand receives 2.5 million international visitors each year; Milford Sound is a major attraction, Mitre Peak in background. Communication, migration, and diffusion across Earth’s surface represent movement in our interdependent world.
Human–Earth Relationships

Natural hazards are one type of human-environment connection. An equipment shed stands in ruins after being hit by an avalanche at Ohau Ski Field in 2009.
Physical Geography is

The spatial analysis of all the physical elements and processes that make up the environment.
Fields of Geography

- Geographic Techniques
  - Geographic Information Systems
  - Historical Geography
  - Political Geography
  - Economic Geography
  - Political Science
  - History

- Physical Geography
  - Geomorphology
  - Climatology
  - Meteorology
  - Biogeography
  - Soils Geology
  - Pedology

- Human Geography
  - Population Geography
  - Behavioral Geography
  - Anthropology, Psychology, Sociology
  - Economics
Note: your instructor operates from the premise that a **theory** is an *explanation* of some kind of environmental phenomenon; a theory also allows scientists to formulate *predictions* about things not yet known.

Example: Newton’s **theory** of gravity helps *explain* why humans do not fly like Superman, and allows us to *predict* what will happen if a human jumps out of an airplane.
Earth Systems Concepts

- Systems: Inputs, Actions, Outputs
- Open systems: freedom of movement
- Closed systems: restricted movement
- System feedback:
  - Positive Feedback
  - Negative Feedback
- System equilibrium: steady-state to steady-state
**Systems: Inputs, Actions, Outputs**

Systems in *Elemental Geosystems*

- **Inputs**: Components and driving force
- **Actions**: Movements, processes, and storage changes
- **Outputs**: Results and consequences
- **Human-Earth Relation**
Leaf as a System

Photosynthesis process

Respiration process
Earth’s Four Spheres

Elemental Geosystems: Our “Sphere of Contents”

Solar energy

PART IV: Chapters 14–17
The Geography of Soils
Ecosystem Essentials
Terrestrial Biomes

PART III: Chapters 8–13
The Dynamic Planet
Tectonics, Earthquakes, and Volcanoes
Weathering, Karst Landscapes, and Mass Movement
River Systems and Landforms
The Oceans, Coastal Systems, and Wind Processes
Glacial and Periglacial Landscapes

Lithosphere

Hydrosphere

Atmosphere

Older Figure 1.9
Location and Time on Earth

- Latitude
- Longitude
- Geographic Grid
- Great circles, Small circles
- Prime Meridian and standard time
Measuring Earth in 247 B.C.

Measurement: 28,738 miles
Reality: 24,860 miles

Older Figure 1.11
Earth’s dimensions

- **Polar circumference**: 40,008 km (24,860 mi)
- **Equatorial circumference**: 40,075 km (24,902 mi)

**Geoid**: oblate spheroid form
Latitude

Lines of latitude are all \textit{parallel} to one another

Figure 1.10
Lines of longitude (meridians) converge or join at each pole.
Latitudinal Geographic Zones

Get familiar with these names and general locations on the planet...

- Arctic: $66.5^\circ$ N to North Pole
- Subarctic: $55^\circ$ N to $66.5^\circ$ N
- Midlatitude: $35^\circ$ N to $55^\circ$ N
- Subtropical: $23.5^\circ$ N to $35^\circ$ N
- Equatorial and tropical: $23.5^\circ$ N to $23.5^\circ$ S
- Subtropical: $23.5^\circ$ S to $35^\circ$ S
- Midlatitude: $35^\circ$ S to $55^\circ$ S
- Subantarctic: $55^\circ$ S to $66.5^\circ$ S
- Antarctic: $66.5^\circ$ S to South Pole
Great Circles and Small Circles

(a) Each pair of meridians forms a great circle
   
   All other parallels form small circles

(b) Great circle

A plane intersecting the globe along a great circle divides the globe into equal halves and passes through its center

(c) Small circle

A plane that intersects the globe along a small circle splits the globe into unequal sections—this plane does not pass through the center of the globe

Figure 1.14
Global Positioning System
Prime Meridian and Standard Time

Figure 1.15

Monday: Add a day
Sunday: Subtract a day
Maps, Scales, and Projections

- Map – a generalized view of an area, as seen from above and reduced in size
- Scale – ratio of map units to ground units
- Projection – process of transforming reality of Earth into a flat map
Map Scales

Representative fraction
1:250,000 or \( \frac{1}{250,000} \)

Graphic scale

4 3 2 1 0 4 8
miles

5 4 3 2 1 0 5 10
kilometers

Written scale
One inch equals four miles
(English units in U.S.)

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Older Figure 1.22
“Scales” used in this course:

a) local: smallest piece of landscape; Moscow, Idaho

b) regional: intermediate piece of landscape; Pacific Northwest

c) global: largest piece of landscape; Terra
Process of Map Projection

Figure 1.18
Map Projection Properties

a) equivalent: equal area; preserves surface areas
b) conformal: true shape; preserves the shapes
c) azimuthal: true direction; preserves compass directions
d) equidistant: true distance; preserves distances

All map projections are *compromises* between these four properties.

A single map property can be perfectly preserved on a map projection, but the other three will be distorted. There is no perfect projection…
Classes of Projections: Cylindrical

(a) Cylindrical projection

Mercator projection
Classes of Projections: Planar

Figure 1.19

(b) Planar projection
Classes of Projections: Conic

(c) Conic projection

Albers equal-area conic projection (two standard parallels)
Classes of Projections: Oval

(d) Oval projection
Remote Sensing

- Active remote sensing
- Passive remote sensing
Modern remote sensing is conducted from a wide variety of sensor platforms, transmitted to ground stations, and the resulting images can be manipulated on the common personal computer... if you have the proper software...

The UI Geography program emphasizes skills in computer mapping, geographic information systems, and remote sensing software packages

Nearly 100% placement of graduates in jobs utilizing geographic information systems and remote sensing
Landsat

30 meter resolution (thematic mapper)

Image stored in satellite as matrix of digital values

Satellite receiver on earth

Computer manipulation and enhancement of data

The "digital" image
Passive and Active Remote Sensing

(a) Visible light
(b) Radar
L7: Portland, Oregon and Mt. Hood from the west
Geographic Information Systems (GIS)

- GIS systems combine spatial and attribute data
- “Maps” can contain multiple data layers:
  - Physical features
  - Cultural features
- Layers can be added to create composite overlay
Computer programs that can depict or analyze single maps or “layers” just like a printed map… but can also combine different layers into a composite “overlay” map.

Terms come from map printing techniques which ‘sandwiched’ layers of photographic negatives to produce a final map.
West Nile Virus Predictive Model
Digital Raster Graphic Drape

Angel Island, San Francisco Bay: DRG draped over DEM
For the remainder of the course, we will be studying many different systems of our planet through a geographic perspective… examining the atmosphere, hydrosphere, lithosphere, and biosphere that together form the geosystems of Terra.