Hunter College - CUNY
Dept. of Geography & Environmental Science
GEOG 101 Lecture Presentation Summary
Spring 2021

NOTE: In the absence of in-person lecturing and face-to-face explanation of the material presented in the PowerPoint lecture slides, I will summarize the content of each lecture presentation, stressing the concepts and interrelationships that are essential to an introductory geography course. In essence, it is like giving you a transcript of my classroom lectures.

If, after reading this summary and viewing the lecture presentation, the imbedded short videos and hot links to articles, you have any questions, or if you would like to contribute a comment or two, need clarification by other examples or have additional information on the topic, please do not hesitate to email me at agrande@hunter.cuny.edu.

LECTURE 05: Location Systems

- The purpose of this lecture is to review location systems: latitude, longitude, time and GPS.

- **Slide 2: Grid System.** The grid system that is overlain on the earth's surface gives us a means to accurate locate places on its surface. The grid is composed of intersecting lines of latitude and longitude. Once places are located using the grid, we are able to see not only location on the surface, but resulting patterns and interrelationships between locations. The grid gives us a means of measuring linear distance which in turn translates into being able to determine area.

- **Slide 3: Latitude.** Latitude is the distance measured in degrees north and south of the equator. The diagram shows the geometric basis for its development and use. The measured angle from the center of the earth to the surface equals latitude. Lines of latitude are parallel to the equatorial plane: they are EQUALLY spaced; they NEVER cross; they NEVER converge. Each line of latitude is a circle with the equator being called the "Great Circle" because it is the largest. *(Visualization: think about cutting a ball of cheese in a deli slicer. The smallest pieces come from the ends -poles- with the largest slice coming from the center of the ball - equator.)*

- **Slide 4: Astronomical Latitude.** Latitude can also be measured by using a sextant and an Azimuth and Elevation Table to measure the angle of the sun above the horizon at noon keyed to the day of the year. It is simpler to measure the height of the North Star (Polaris) above the horizon at night.

- **Slide 5: Key Lines of Latitude.** The seven lines of latitude that are key to earth science studies are:
  - **Equator 0°:** midpoint of the grid; marks the center point of the movement of the vertical rays of the sun during its annual cycle.
  - **Tropic of Cancer (23.5°N)** and **Tropic of Capricorn (23.5°S):** they mark the furthest poleward movement of the vertical rays of the sun. Together they delimit the tropics, the only region on the earth to experience vertical rays of the sun.
  - **Arctic Circle (66.5°N)** and **Antarctic Circle (66.5°S)**: they mark the edge of the areas that experience 24 hours or more of daylight or darkness. They delimit the Polar Region. The length of day and night increases with latitude until the poles are reached. *We will look at a chart when Climate is discussed in Part II.*
  - **North Pole (90°N)** and **South Pole (90°S).** The North and South Poles are actually a point, but are designated as 90° latitude. Here there is the phenomena of six months of daylight and six months of darkness.

- **Slides 6-8: Longitude.** Longitude is the distance measured in degrees east and west of the Prime Meridian, a manmade line designed as 0°, that runs from the North Pole across the equator to the South Pole.
    - Meridians of longitude are man-made, so unlike latitude, there are no astronomical ways to find them.
    - **Prime Meridian** is designated as **0°** and is called the **Greenwich Meridian** *(see Slide 7).*
    - Meridians of longitude converge at the poles.
    - Because of the spherical shape of the earth, the distance between meridians varies with latitude. They are spaced widest along the equator *(Great Circle)* and getting closer together poleward until they all converge at the poles.
    - There of 360 principal meridians based on the equatorial circle having 360°: 180 meridians are designated "east longitude" and 180 are designated "west longitude". (See diagram on **Slide 8**.)
    - East and west longitude meet at the 180° meridian, which can be designated either east longitude or west longitude or neither. The **International Date Line** roughly follows the 180° meridian.

- **Slide 9: Finding Longitude.** In the early days of navigation, astronomical latitude readings were fairly accurate but longitude (the eastward and westward movement) was guesswork. After many attempts at longitude determination, it was found that the difference in time between the prime meridian and the local location was key *(see Slide 9).* Timepieces were not that accurate and subject to error after experiencing severe movements *(vibrations/jolts, etc.).* Finally, in the early-1700s, the marine chronometer was invented and later perfected to withstand the vibrations and movements of a ship at sea. At least two clocks are needed, both originally set at local time. Once departing a port, the first clock keeps recording the port's time while the second clock is adjusted every day at noon to reflect local or sun time. The time difference between the two clocks (in hours/minutes/seconds) corresponds to the length of longitude traversed. (A third/fourth clock can be added to longer trips to plot segments and eventually return to the original starting point.) By determining latitude and longitude each day at noon, a ship's captain was able to record a ship's movement on a map.

- **Slides 10-13: Creating the Grid.** These slides illustrate how the overlap of lines of latitude and longitude create a grid on the earth's surface. *Use the hot link to watch the 3-minute video.*

- **Slides 14-16: Reading the Grid.** To locate a place on earth we need to be able to read the grid.
    - We start by dividing the earth into **4 quadrants** using the Equator, Prime Meridian and 180° meridian as boundaries. The Equator gives us northern and southern hemispheres. The Prime Meridian and 180° meridian give us eastern and western hemispheres. When these lines are used, we get four quadrants: north and west, north and east, south and east and south and west.
    - To locate places by latitude and longitude coordinates, we look at the numbers on the grid. Remember latitude is ranges from **0 to 90 degrees** and is designed as either **NORTH or SOUTH.** Longitude ranges from **0 to 180 degrees** and is designated as either **EAST or WEST**. If you are unsure, start at the **0/0** point and move your finger to the point you want to locate, always remembering the quadrant you

are in. First count the lines of latitude then do the same for longitude. Latitude is always read first. *(NOTE: Atlas Extra Credit I will allow you to practice locating places.)*

- **Slide 17: Time.** We saw that time differential is a way of calculating longitude. Now we will look a time as a reference point for people's activities and the need for Time Zones in an interconnected world.

- **Slides 18-20: Time Zones.** Times zones were created US railroad companies in the late 1800s to facilitate train schedules. They were internationally recognized soon afterward in an international conference and were adopted by countries in the 1920s.
    - A standard time zone is 15° of longitude wide: divide the 360° equator by 24 hours in the day = 15 segments. Clocks within each time zone are set when Noon occurs at the zone's central meridian.
    - There are 24 standard zones, each 15 degrees of longitude wide and each representing one hour. They extend from the North Pole to the South Pole. In reality, there are over 30 irregular-shaped zones *(see Slide 20).*
    - The International Date Line (IDL) roughly follows the 180-degree meridian, but the IDL bends to keep political units within the same day, just as time zone boundaries bend to keep units within the same hour.
    - Both Time Zone designations and the placement of the IDL are artificial and can be changed by countries.
    - **Slide 20 is the Time Zone Map.** The colors correspond to one-hour time zones and the numerals indicate the number of hours a zone is different from Greenwich Mean Time (GMT), the world's standard time zone. *NOTE: This map illustrates world time when it is Noon at GMT. You need 24 maps to show all varieties of standard time.* Follow the "LATER" and "EARLIER" arrows to determine time difference. For example, if it is 11 AM in NY (+5 time zone) it would be 8 AM in California (+8 time zone) because California is 3 zones away or 3 hours earlier than NY. Going eastward, it would be 5 PM in Algeria (-1 time zone) which is 6 hours later than (or 6 zones away from) NY time.

- **Slides 21-26: GPS: Global Positional System.** GPS: Global Positional System was developed by the military to pinpoint location. It came into the public domain and is now indispensable by all of us even if you didn't realize you are using it. The more satellites you connect with, the more accurate is your data.
    - **Slide 23 illustrates various types of usage.** It is not just giving you directs to get from Point A to Point B. *View the 2 min. GPS video ad.*
    - **Slides 23-26.** These are example from a NYTimes report and people-tracking by GPS enabled devices like your cell phone. With the GPS feature turned on, you are constantly being tracked. This includes movements with buildings and supposedly safe areas. *Read the article. Look at the illustrations.*

- **Slide 27: Next lecture topic: Maps and their Parts**