**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 10: Earth – Sun Relationship

- The purpose of this lecture is to study the relationship between the earth and the sun. We know that without the heat and light from the sun, life on earth as we know it would not exist. In addition to this primary relationship, there are other relationships we need to be aware of as distance, relative movements and the receipt of various forms of radiation.

- **Slide 3: Earth-Sun Relationship - Temperature.** The heat (solar energy) generated by the sun translates into the temperatures measured on the earth's surface. We have already seen that the earth's atmosphere has different layers which retain heat to greater and lesser extents. The amount of heat on the surface is influenced by three factors: **(1)** proximity to the sun; **(2)** the angles at which the solar energy strikes the earth; and **(3)** solar activity which produces the energy that travels across space and eventually strikes the earth. We will look at all three in detail.

- **Slide 4: Earth-Sun Relationship - Proximity.** The earth's distance from the sun (proximity) determines how much solar energy (heat and other forms of radiation) it receives. The solar system diagram **(not to scale)** shows the location of earth in relation to the sun and the other planets. For life on earth as we know it, Venus is too hot and Mars too cold. In addition to placement, the earth's orbit is elliptical (not circular), so its distance from the sun varies throughout the year.

- **Slide 5: Earth-Sun Relationship – Movements and Positions.** In relationship to the sun, the earth is the moving body. There are two movements: **1. Rotation on its axis** (spin) and **2. Revolution around the sun** (path taken through space under influence of the sun's gravity). While the earth is spinning and revolving, it maintains two aspects of positioning: **1. Inclination of its axis** (tilted, not vertical); and **2. Parallelism of the axis** (to itself).

- **Slide 6: Composite of the movements and positions.**
  - Rotation is from west to east.
  - Revolution is in a counterclockwise elliptical orbit around the sun.
  - The earth's axis is presently tilted at 23½° off perpendicular.
  - The earth's axis remains parallel to itself at all points in its orbit around the sun.

- **Slide 7: Rotation.** The slide illustrates rotation with inclination. Since it takes almost 24 hours for the earth to make one rotation and since the earth's diameter is c.25,000 miles,

the earth then moves at a speed of over 1000 mph on its axis to complete one rotation. In doing so, rotation imparts the following to earth environment:

- It creates day (facing the sun) and night (away from the sun).
- Day and night help to equalize earth's surface temperatures by rotating away from the sun after the maximum heating period and rotating back to the sun following the nighttime cool down.
- Under the influence of the gravity of the sun, but especially that of the moon, oceanic tides are created.
- Since the earth is sphere spinning on an axis, the equatorial zone (25,000 mi circumference) has to move the faster to complete one rotation in 24 hours compared to the other latitudes; the spin at other latitudes is slower because they have less distance to travel (if you have access to a globe, measure the circumference at the equator, 30°N, 60°N, 80°N). The ***Coriolis Effect*** *(an apparent deflection in the path of a moving object)* is a result of this when objects no attached to the earth's surface move over long distances; it affects navigation. More in Slide 12.

- **Slides 8-10: Tides.** Rotation plays an important role with earth's ocean tides. The spin creates a centrifugal force that attempts to throw ocean water into space. However, the earth's gravity holds it back, but a bulge of water (high tide) is created as water is "stretched" or "pulled" off the surface. Tides vary each day depending on the location of the sun and the moon. **Slides 9 and 10** explain how the centrifugal and gravitational forces combine to create high and low tides. The highest tides occurs when the moon is in between the sun and the earth.

- **Slide 11: Earth-Moon Relationship.** *View the 4 min video: "What if the Moon Disappeared?"* The seven points listed summarize the video. In addition to the physical relationship, the moon has always been a part of human cultural development, including myths and psychological influences.

- **Slides 12-13: The Coriolis Effect.** Coriolis is defined as the apparent deflection of moving bodies not attached to the surface. The amount of deflection is based on the object's latitude and direction of movement. ***View the videos on Slide 13***. Remember, the moving object is **not** deflected (only appears to be) because the rotating earth has moved out from under it while the object was not attached to the earth. That is why navigators need to know their latitude and their speed of movement.

- **Slide 14: Revolution.** This diagram illustrates revolution around the sun. It is a counterclockwise movement. Since it takes over 365¼ days to complete the average 580-million-mile trip around the sun, when you do the math, it comes to about 67,000 miles an hour. So, the earth is hurdling through space at 67,000 mph while spinning on its axis at 1,000 mph – yet we feel nothing. That's because we too are moving with the earth at that speed! Should the earth slow down drastically, we would all experience quite a jolt. It is just like riding in a subway train between express stops when the engineer suddenly puts on the brakes and we all lose our balance.

- **Slide 15: Inclination.** The left diagram shows the current angle of axis inclination (23½°) in relation to an axis that is oriented perpendicular to its orbital path. The right diagram compares earth-sun relationship with and without the tilt of the axis as the sun's rays hit the earth's surface. *Notice where the sun's rays hit the surface in June and December in each example.*

- **Slide 16: Parallelism.** Parallelism means that the earth's axis is always oriented in the same direction (in relation to itself) in all points in its orbit around the sun. On the diagram, notice the tilted axis is always parallel to itself. *(Here the axis is slanted from the upper right to the lower left.)*

- **Slides 17-19: The Seasons.** The reason the earth experiences seasonal differences has to do with the variation of the solar energy received at latitudinal regions throughout the year. This variation is a result of the combination of revolution, inclination and parallelism. Notice the change of location of the shadow zones throughout the year. **Slide 19** portrays the shifting vertical rays of the sun throughout the year. Within the tropical zone (23½°N to 23½°S), vertical rays are experienced twice a year. When the vertical rays are at the Equator, the entire earth experiences 12 hours of daylight and 12 hours of darkness (the Equinox; first day of spring or autumn). *View the short video.*

- **Slides 20-22: Astronomical and Solar Aspects of Earth-Sun Relationship.**
  - **Slide 20** lists the three astronomical variables when looking at the earth in relationship to the sun *(cycle duration, precession and tilt variation)* and the three solar variables when looking at the sun's surface activity in relation to the earth *(sunspots, ultraviolet rays and solar wind).*
  - **Slide 21** defines the three astronomical factors. The earth's movements in relation to the sun change over time and will continue to do so.
    - ✓ The earth's orbital **cycles** change in path and speed.
    - ✓ The spinning earth **wobbles** on its axis like a toy top.
    - ✓ The **tilt** of the axis has varied and has been less or greater than the current 23½° off perpendicular. All of this affects the amount of solar energy hitting the earth's surface at the different latitudes.
  - **Slide 22** defines the three solar factors emanating from the sun's surface that affect the amount of energy (heat) given off by the sun. All three are short-term influencers of earth's surface temperatures.
    - ✓ **Sunspot activity** affects how hot and bright the sun is at a particular time. It has been studied for over 400 years. Variations can be associated with global warming and global cooling (see chart).
    - ✓ **Ultraviolet (UV) rays** which (gives us a sunburn) can be deadly to living things on earth in high doses. The Ozone Layer protects us front the UV rays. Absorption of UV rays and the creation of ozone plays a role in the earth's atmospheric storms.
    - ✓ **Solar wind**, which are actually the ionized particles thrown off the sun's surface, influence cloud formation and rainfall on earth. They can also interfere with electronic communications, a human geography consideration.

- **Slide 23: NEXT – The Hydrosphere: Oceans**