

February 10, 2020

## **A Few Notes from the First Lecture Covering Latitude, Longitude, and Right Ascension**

*Because the OpenStax textbook does not discuss the astronomers' coordinates of right ascension and declination, I have prepared these notes and will have some more for the next lecture.*

Before we try to understand right ascension and declination, we need to review latitude and longitude.

### **Units of Latitude and Longitude**

Degrees, Minutes, Seconds

### **Facts/Examples for Latitude**

0° latitude is the equator.

38° latitude is about how far north Moraga is.

90° latitude is the north pole.

39° S latitude is about how far south Pucón, Chile is. Sometimes we write that as -39°.

90° S or -90° is the south pole.

### **Facts/Examples for Longitude, including the Special Spot of 0° Longitude**

Who got the special spot of 0° longitude? The Greenwich Royal Observatory, near London.

We number positive longitudes to the east, all the way to +180°.

We number negative longitudes to the west, all the way to -180°.

Moraga is at -122° sometimes written 122° W.

### **Time Zones**

By the way, we also count time zones from The Greenwich Royal Observatory. In winter, California is 8 hours behind Greenwich (PST). In summer we move our clocks ahead an hour and we are only 7 hours behind (PDT). That's why our time zone right now (until daylight savings time begins on Sunday, March 8th) is sometimes called GMT-8. In the summer PDT is the same as GMT-7.

### **Arc-Minutes and Arc-Seconds**

All the above examples of latitude and longitude are in degrees. In class I covered arc-minutes and arc-seconds? Usually saying "arc" is clumsy and we leave it off.

Here are more accurate coordinates for Moraga: 37° 50' 5.7" latitude, 122° 7' 46.9" W longitude. The latitude is read as "37 degrees, 50 minutes, 5.7 seconds."

### **Ecliptic**

You agree that in our summer, the Sun is high in the sky?? Ask if you don't agree!

And during our summer, the Sun is low in the sky for those that live in the southern hemisphere, say Chile?

Similarly, in our winter, the Sun is low in the sky, and during our winter, the Sun is high in the sky for those in Chile?

We will discuss the movement of the Sun much more soon, but for today, it is enough to know that the Sun goes  $23.5^\circ$  north of the equator (at the "Summer Solstice") and  $23.5^\circ$  south of the equator (on the "Winter Solstice"). On the day it crosses the equator headed north, that is the "vernal equinox" (also called "first day of spring" or "spring equinox"), and on the day it crosses the equator headed south, that is the "autumnal equinox" (also called "first day of fall" or "fall equinox").

The name "equinox" comes from the fact that night and day are each 12 hours long for everyone on earth on both the vernal and autumnal equinoxes.

*The ecliptic is the path that the Sun appears to trace through the stars, sometimes further north, sometimes further south, and it turns out always moving eastward through the stars.*

### First Point of Aries

In the year 2000, when the the Sun passed over the equator moving north (the "first day of spring" or "vernal equinox"), you agree there was a place in the stars that the Sun was when it crossed? That place is called the "First Point of Aries." We will have more to say about the first point of Aries in the next class.

It's a special spot, but only the same way that the Greenwich observatory is a special spot. It's just a spot, chosen in the sky where we measure to the east and west. We say this spot has zero "right ascension," and right ascension in the sky is analogous to longitude on the Earth.

