The yearly motion of the sky

Astronomy 101
Syracuse University, Fall 2020
Walter Freeman

September 3, 2020

The Sun and the stars: the zodiac

This is the excellent foppery of the world, that, when we are sick in fortune, often the surfeit of our own behaviour, we make guilty of our disasters the sun, the moon, and the stars; as if we were villains on necessity; fools by heavenly compulsion... An admirable evasion of whore-master man, to lay his goatish disposition to the charge of a star!

—William Shakespeare, *King Lear*

For in that event [the stars dictated our fates], every single individual would lack the power to do anything he set his mind to, since something else draws him on – against his will – to be this and not to be that...

—Maimonides (c. 1135-1204),
Spanish / North African Sephardic scholar

Announcements: Groups

Thank you for your patience during this – we have been overwhelmed by email.

My extreme gratitude to all the people who filled out the Blackboard survey (84% of the class) – getting you set up has been easy!

I tried to delegate handling the mail for the rest of folks to Suman, but his inbox exploded. So we are now using a shared account so we can all work more efficiently.

We have processed a lot of people's requests to change groups (or be added). I have updated the webpage with people's groups on it.

If there is still something amiss with your group, email suastronomy101@gmail.com. Make sure you tell us:

- Your chosen lab time
- Whether you will be online or in person
- If there is anyone **at that time** that you want to work with

Announcements: Project 1

Your first group project is due *Tuesday*.

If you *have a group assigned*, then go to the "Group Information" page and follow the instructions. Even if your group changes in the next few days, keep these groups for Project 1.

If you *do not have a group*, then you should contact `suastronomy101@gmail.com` and we'll get that sorted out for you.

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Unfortunately, every time I update the groups, the computer program I wrote re-randomizes who does peer review for whom. Has anyone already submitted their projects to the reviewers?

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Any questions about the projects?

Announcements: Labs

We are not having labs this Saturday after all! Labs start Monday.

(The chaos getting groups together was too much.)

If your lab is in person:

- Go out front of Holden Observatory at your scheduled lab time
- Bring your laptop with you with a full battery
- Your TA and coaches will meet you there

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If your lab is online:

- Connect to Blackboard Collaborate "Course Room" at your scheduled lab time
- Someone from the teaching staff will be there to welcome you
  - If your section is purely online, then everyone will be working there
  - If your section has both online and in-person students, then one of the teaching staff will be on Collaborate to help you as you need it

Ask the Physicist: why do the stars twinkle?

Today: consequences of the Earth's **revolution**:

- How is the Sun different from the other stars?
- What's this zodiac business?
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- How is the Sun different from the other stars?
- What's this zodiac business?
- What does it mean for the Sun to be "in Aries"?
- We will see how this is only complicated because of **how we keep time**

Last time: the celestial sphere model

All the stars in the sky rotate together.

The orientation of the celestial sphere depends on where you are on Earth (your latitude).

You can figure all this out with a diagram.

Today: what about the Sun?

How accurate is the celestial sphere model for the Sun?

Type in Zoom or Twitch chat.

Today: How do the stars change during the year?

What do you know about how the stars in the sky change over the course of a year?

Type in Zoom or Twitch chat.

A demonstration

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... What's wrong?

... isn't the celestial sphere supposed to rotate once per day?
... Why are the stars moving?
... What's wrong?

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- The Sun just moves up and down a little bit, and the stars spin!
- ... why is this?

Let's draw some diagrams and try to understand this.

Two kinds of day!

Demo in *Stellarium:*

In one solar day...

- The stars move a lot
- ...since the Earth isn't pointed in the same direction
- The Sun moves higher or lower in the sky a little bit
- Exactly 24h

In one sidereal day...

- The stars don't move at all
- ... since the Earth is pointed in the same direction
- The Sun moves a lot, since the Earth has moved
- A little bit less than 24h