

# The daily motion of the sky

Astronomy 101  
Syracuse University, Fall 2019  
Walter Freeman

September 3, 2019

# Some announcements

- People just now joining the class: everything you need is on the course website, [walterfreeman.github.io/ast101/](https://walterfreeman.github.io/ast101/)
- Labs start this week
- First quiz today:
  - We'll distribute it during class
  - We'll collect it when you leave; drop your completed quiz in the boxes by the doors
- Submit your “ask the physicist” questions by Slack message or email
- If you have a Monday lab, you'll do Lab 1 next week

- AST101 help sessions: Wednesday 3-5PM, or Friday 9:30-11:30AM, in my office or the Physics Clinic if we run out of room

# Opportunities for help

- AST101 help sessions: Wednesday 3-5PM, or Friday 9:30-11:30AM, in my office or the Physics Clinic if we run out of room
- Other times in the Clinic during business hours (8AM-9PM, except Thurs 3-5PM)

# Opportunities for help

- AST101 help sessions: Wednesday 3-5PM, or Friday 9:30-11:30AM, in my office or the Physics Clinic if we run out of room
- Other times in the Clinic during business hours (8AM-9PM, except Thurs 3-5PM)
- Appointments with me by request

# Opportunities for help

- AST101 help sessions: Wednesday 3-5PM, or Friday 9:30-11:30AM, in my office or the Physics Clinic if we run out of room
- Other times in the Clinic during business hours (8AM-9PM, except Thurs 3-5PM)
- Appointments with me by request
- By email: most of you have cellphone cameras...

# The lecture tutorials

We won't be “going over” them in class – this deprives you of an opportunity.

# The lecture tutorials

We won't be “going over” them in class – this deprives you of an opportunity.

Remember, the goal of the tutorials isn't for you to learn *those* things – it's to give you practice in reasoning so you can figure out *other* things.



# The lecture tutorials

We won't be “going over” them in class – this deprives you of an opportunity.

Remember, the goal of the tutorials isn't for you to learn *those* things – it's to give you practice in reasoning so you can figure out *other* things.

So I am eager to discuss them with you in the help sessions, and your TA's can help you as well. Or you can take a cellphone picture and post your question to Slack.

# The lecture tutorials

We won't be “going over” them in class – this deprives you of an opportunity.

Remember, the goal of the tutorials isn't for you to learn *those* things – it's to give you practice in reasoning so you can figure out *other* things.

So I am eager to discuss them with you in the help sessions, and your TA's can help you as well. Or you can take a cellphone picture and post your question to Slack.

If you're not sure about the reasoning involved, *ask us in class*. We won't tell you the answers but we'll make sure you know how to get there on your own! (That's the point...)

# This week we will...

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

- Review the celestial-sphere model from last time
- Look in more detail at its consequences
- Complete the first *Lecture Tutorial* that we started last time

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

- What about the Sun?
- What causes the seasons?
- What does the Sun do to the Earth?

# The celestial sphere model: summary

This is what we see when we look at the night sky:

<https://youtu.be/meo9aBB9RvA>

# The celestial sphere model: summary

This is what we see when we look at the night sky:

<https://youtu.be/meo9aBB9RvA>

But the camera in all these pictures is really moving! What happens if we hold the camera still?

<https://www.facebook.com/studiosplatter/videos/10218013642265393/>

# The celestial sphere model: summary

This is what we see when we look at the night sky:

<https://youtu.be/meo9aBB9RvA>

But the camera in all these pictures is really moving! What happens if we hold the camera still?

<https://www.facebook.com/studiosplatter/videos/10218013642265393/>

The sky is really holding still, and *we* are turning!

# The celestial sphere model: summary

- We can pretend that everything on the sky is attached to a sphere that rotates around us.
- The axis of the sphere runs from the North Celestial Pole to the South Celestial Pole.
- This is the same as the rotation axis of the Earth:
  - The NCP and North Star are above the North Pole
  - The SCP and South Star (if there was one) would be “below“ the South Pole
- The sphere rotates counterclockwise, while looking at the NCP

# Which are true in Syracuse?

- I: Some stars are always visible (at night)
- II: Some stars are only visible sometimes; they rise and set during the night
- III: Some stars are never visible

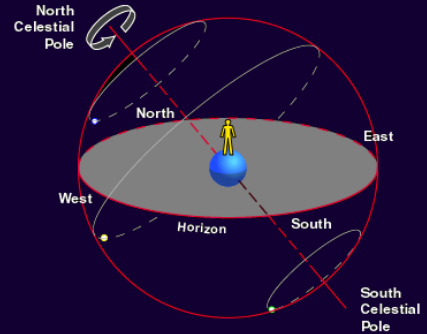
A: I only

B: II only

C: III only

D: I and II

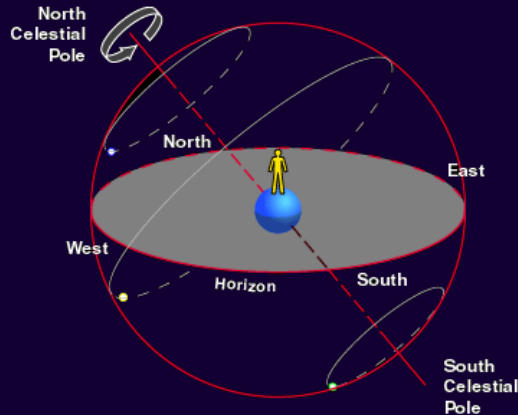
E: I, II, and III





# Summary

- We can treat the stars as all rotating together, on an invisible sphere far away
- The axis of rotation is the same as the Earth's, and it rotates once per day
- Only half of the sphere is visible, because the Earth is in the way



This picture was taken in Australia. Which way is the photographer looking?

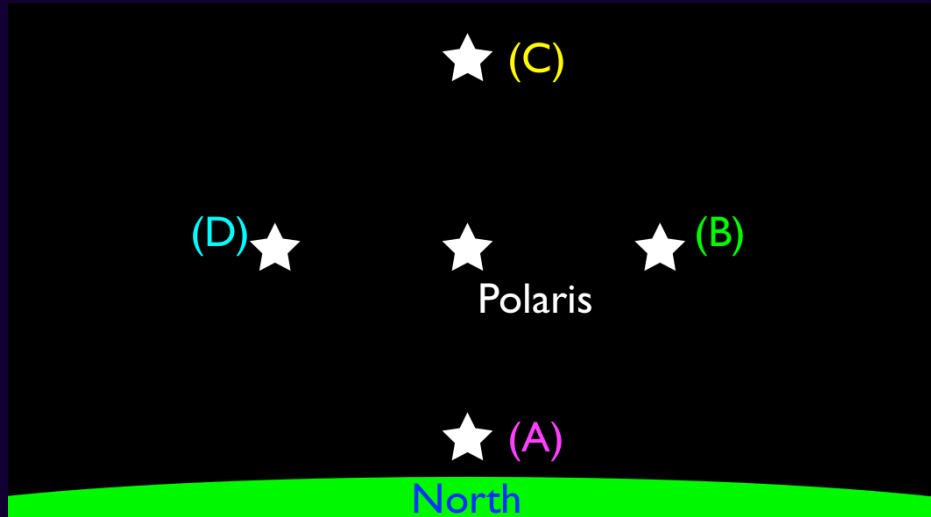
- A: North
- B: South
- C: East
- D: West



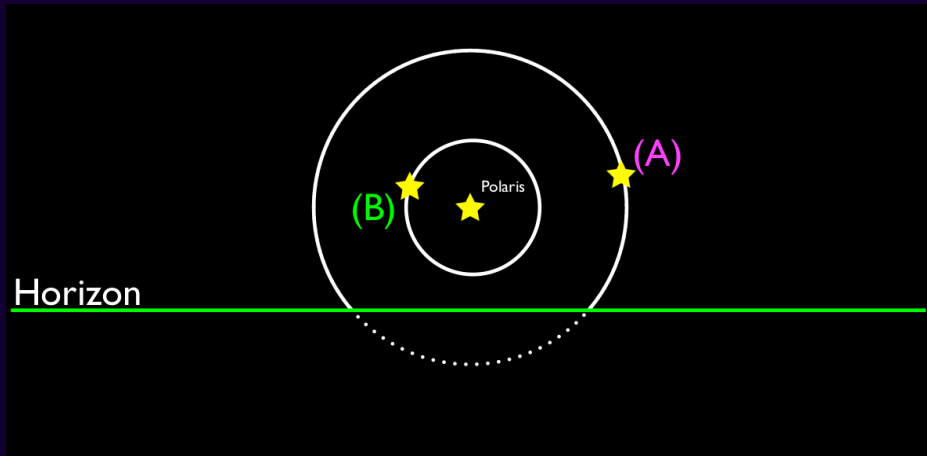
Complete pages 1-6.

We will talk about something else after this.

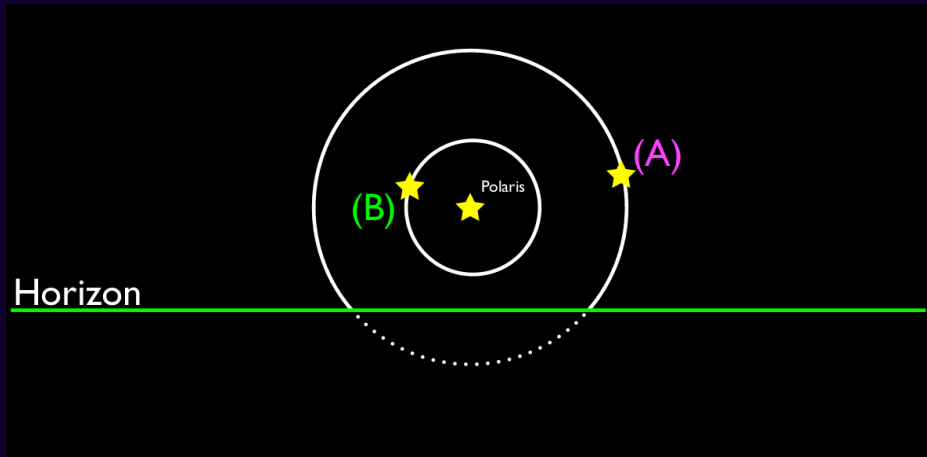
In Syracuse, you see this star at (A). Where will it be six hours later?



Which star is visible longer?



Which star is visible longer?



We call a star that is always above the horizon **circumpolar**.

Where in the sky should I look to find circumpolar stars?

A: High in the southern sky

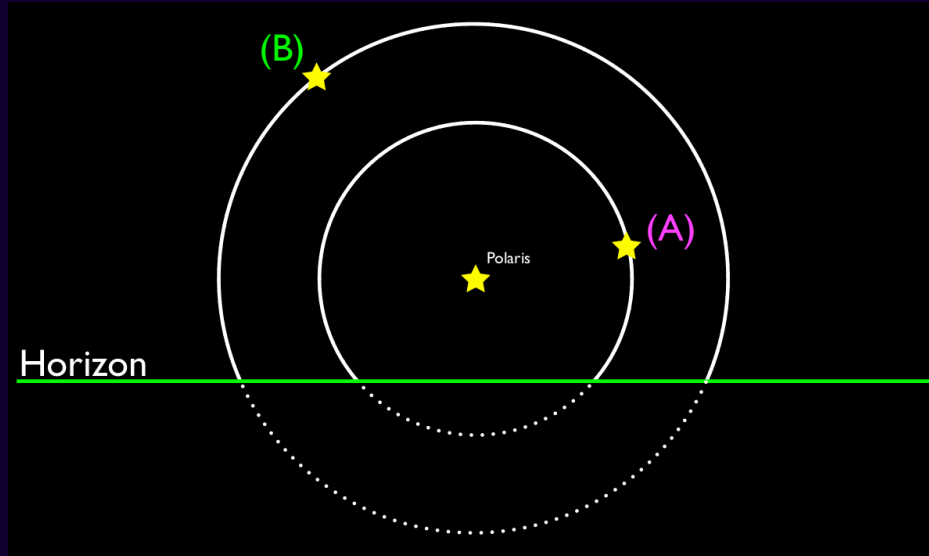
B: Low in the eastern sky

C: High in the northern sky

D: Low-ish in the northern sky

E: Low in the northern sky

What about now? Which star is visible longer?





# What about the Sun?

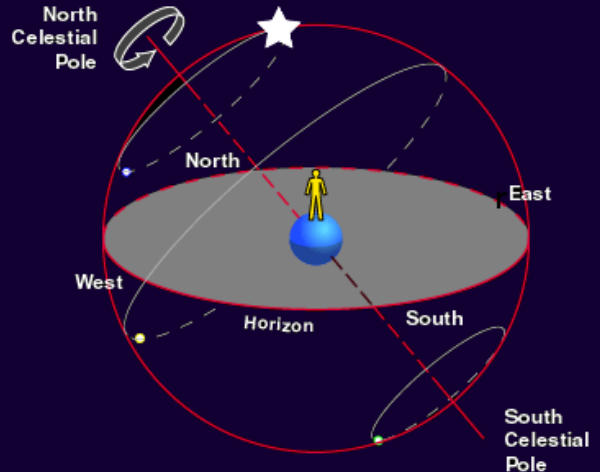
Over the course of one day, the Sun doesn't move very much.

This means the celestial sphere model can show us how the Sun moves **each day**.

It rises in the East and sets in the West, just like all the other stars.

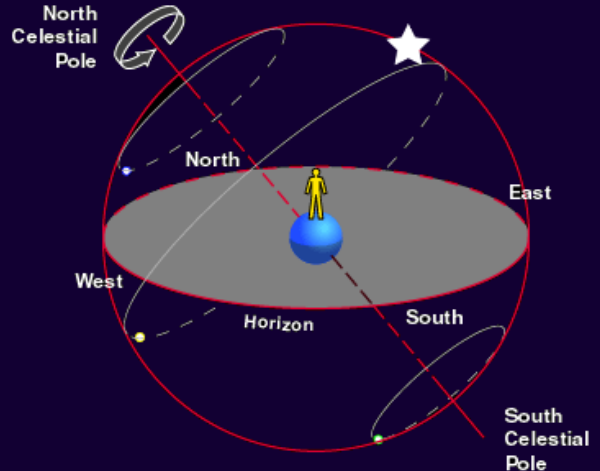
How long is this star visible in the sky each day?

- A: All the time  
B: More than 12 hours  
C: Less than 12 hours  
D: It's never visible



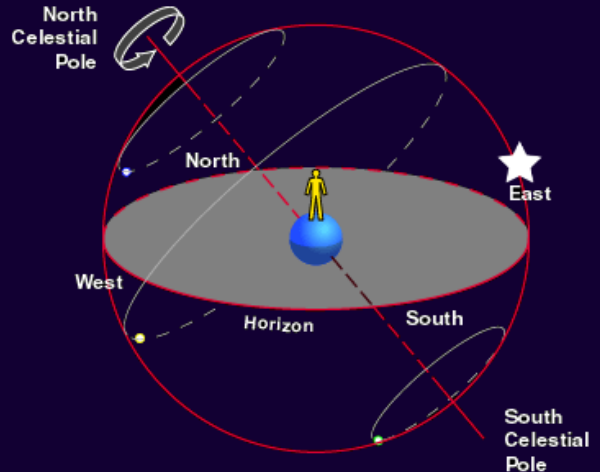
How long is this star visible in the sky each day?

- A: All the time
- B: More than 12 hours
- C: Less than 12 hours
- D: It's never visible



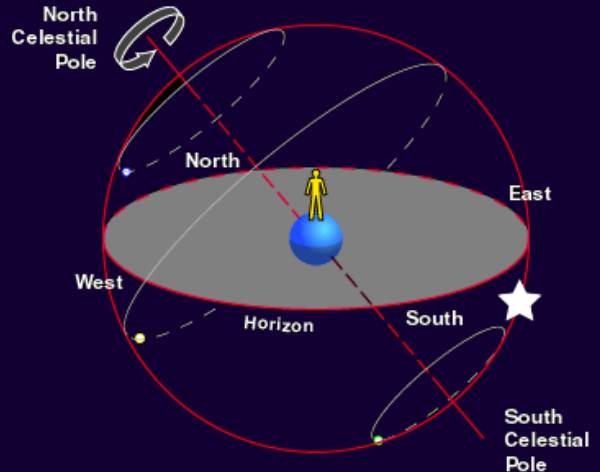
How long is this star visible in the sky each day?

- A: All the time
- B: More than 12 hours
- C: Less than 12 hours
- D: It's never visible



How long is this star visible in the sky each day?

- A: All the time
- B: More than 12 hours
- C: Less than 12 hours
- D: It's never visible



# What does one star matter?

The visibility of one star in our sky isn't that big of a deal...

# What does one star matter?

The visibility of one star in our sky isn't that big of a deal...

... unless that star is the Sun! We'll talk about this Thursday.