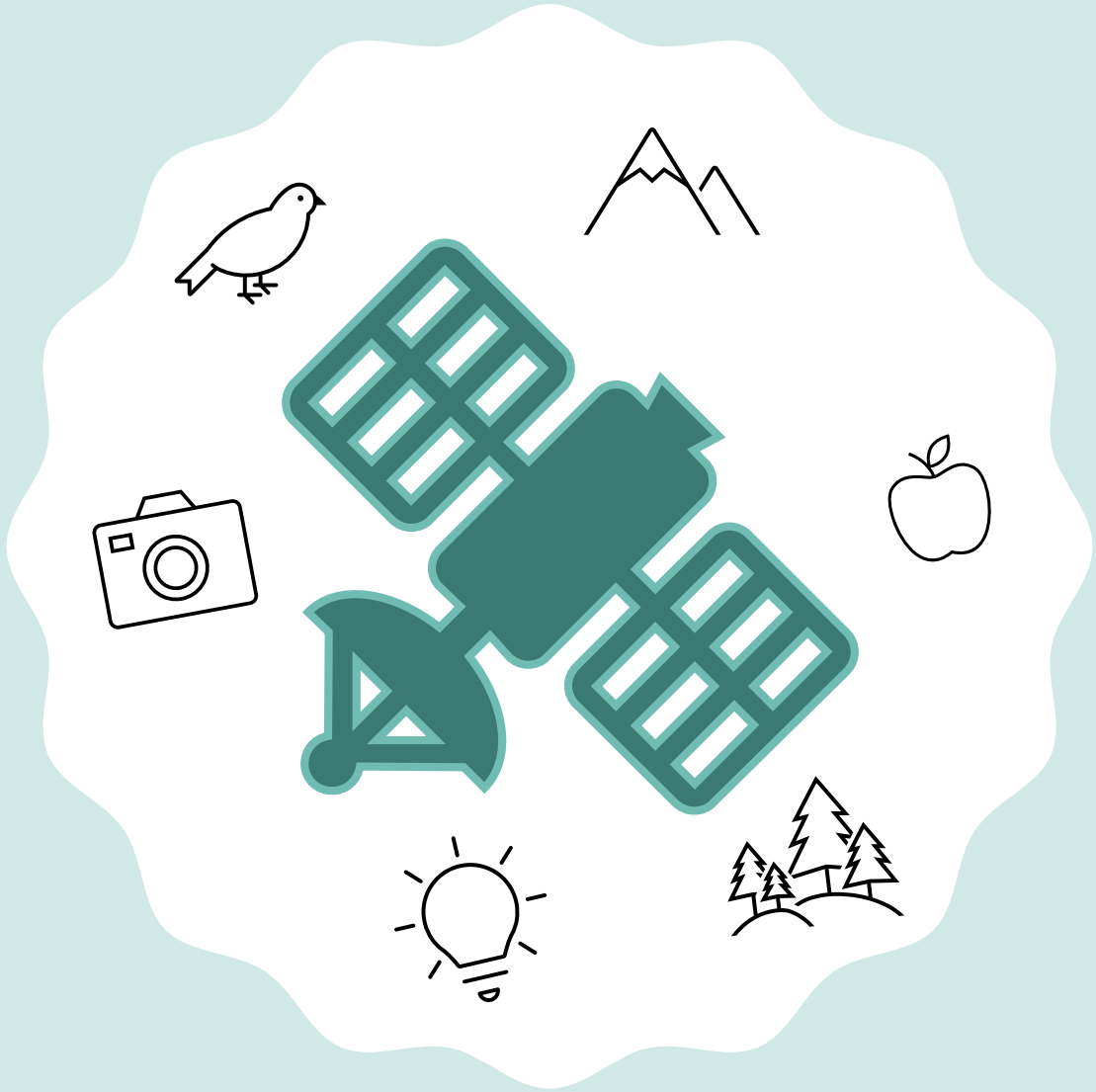
Our World in Images: Using Satellite Data in Science

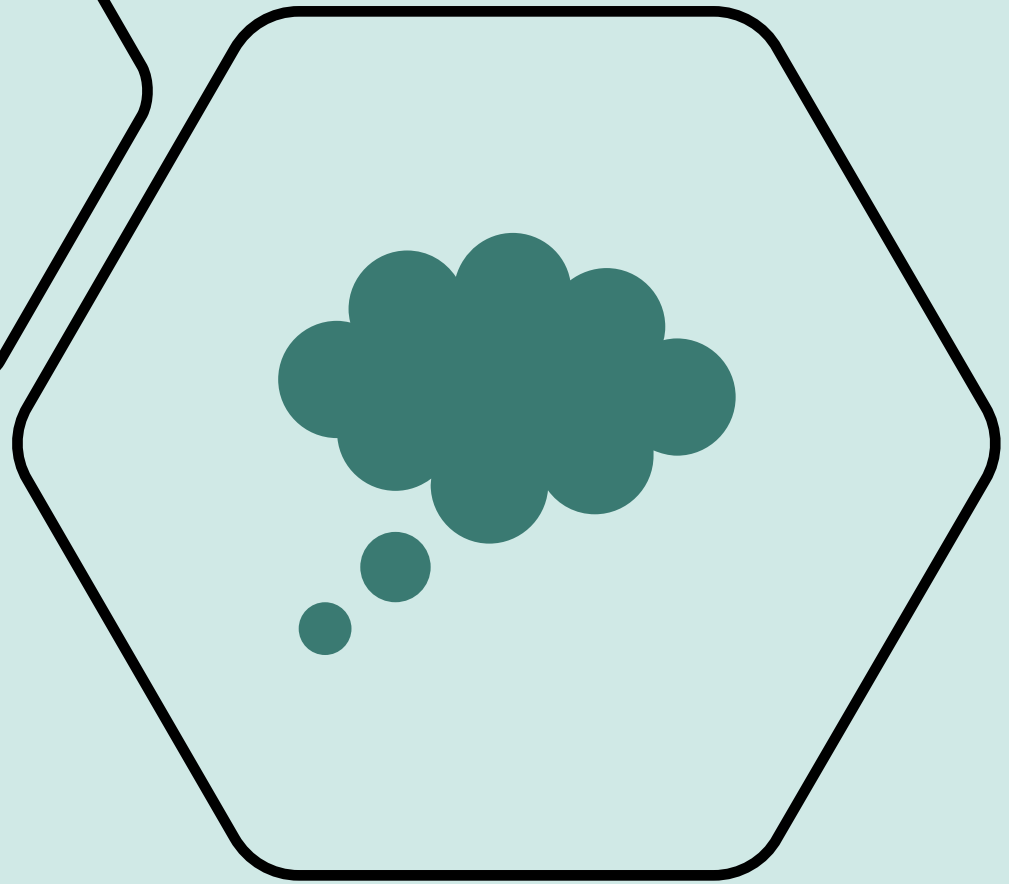


Nick Manning

Graduate Student

Michigan State University

Fisheries & Wildlife Dept.



ACTIVITY:

Think of the TALLEST building you've ever seen

Image Source: https://newatlas.com/one-world-trade-center-tallest-building-us/29762/

One World Trade Center
1776 ft (~ 1/3 mile)

Image Source: https://newatlas.com/one-world-trade-center-tallest-building-us/29762/

Image Source: https://www.reportdoor.com/mount-everest-is-now-officially-nearly-30-feet-taller/

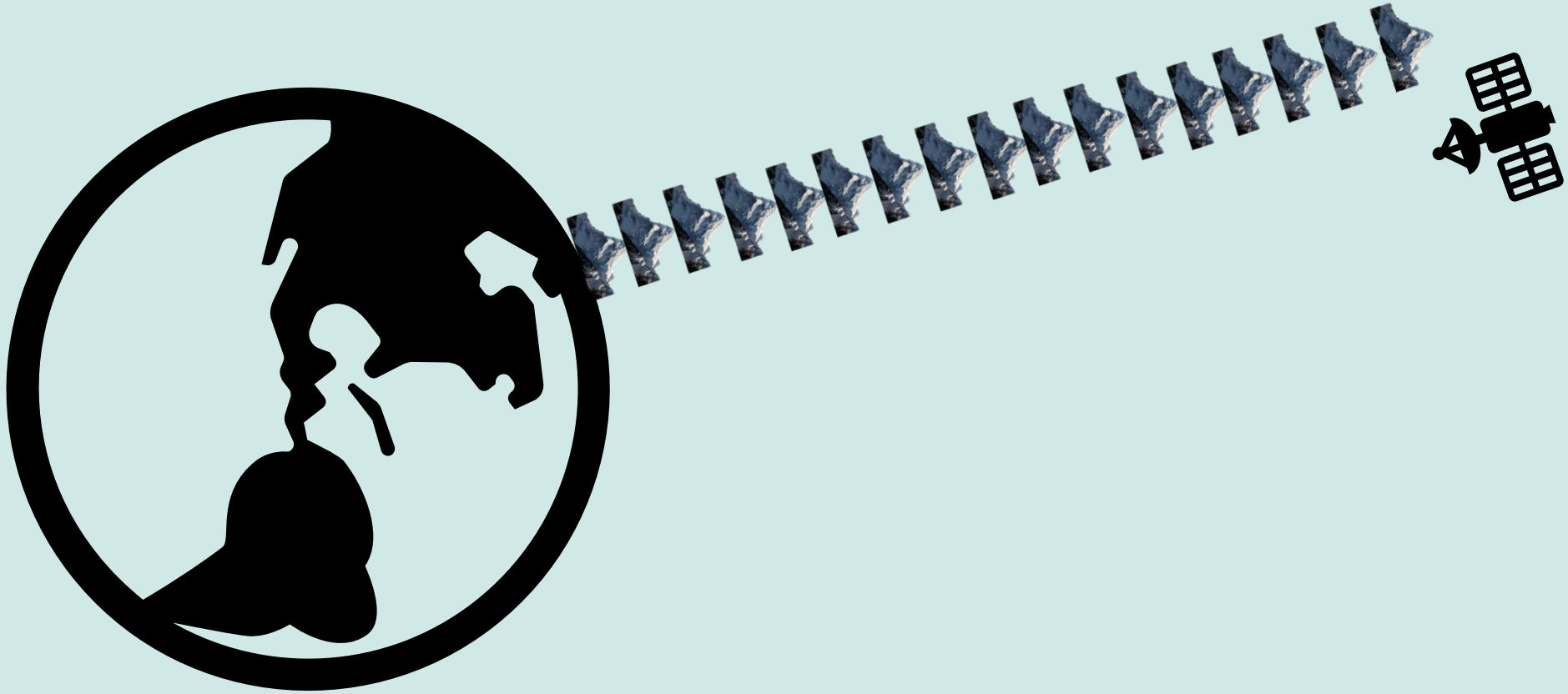
Mt. Everest,
Nepal/Tibet/China
5.5 miles (~29,000 ft)

Image Source: https://www.reportdoor.com/mount-everest-is-now-officially-nearly-30-feet-taller/


Mount Everest
5.5 miles = 16 buildings tall!

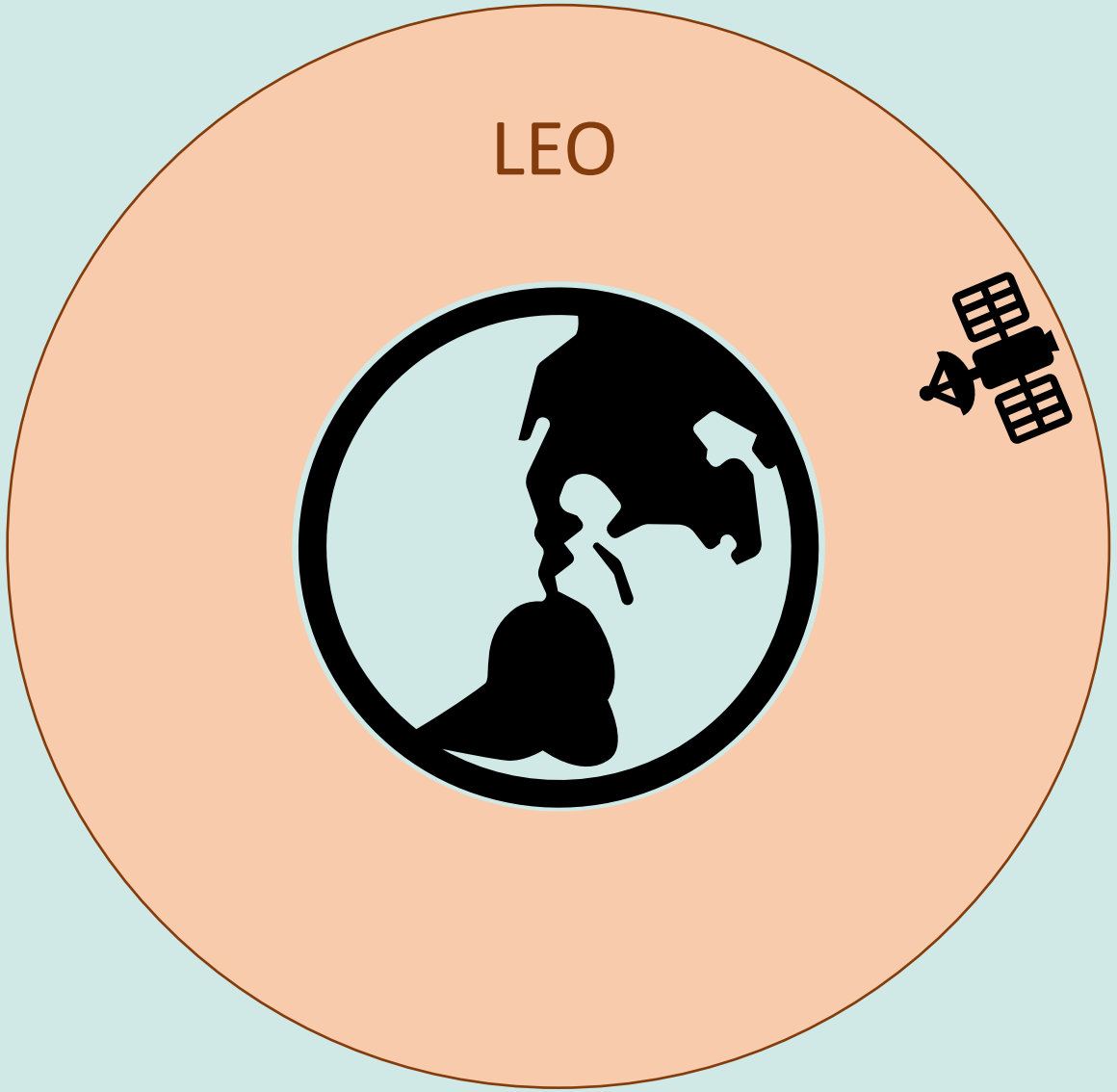
Closest satellite to Earth is 90 miles

- **17** Mt. Everest's away!!
- **276** buildings away!!!!!



Low-Earth Orbit (LEO)

- 4,000 satellites here
- 84% of satellites
- Up to 1,200 miles
  (218 Mt. Everests)



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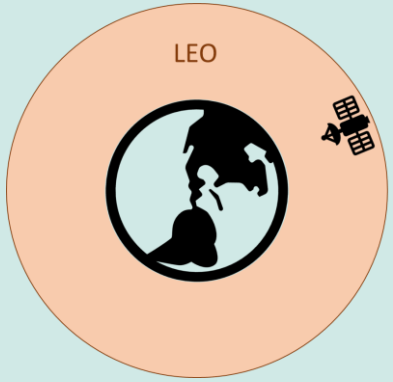
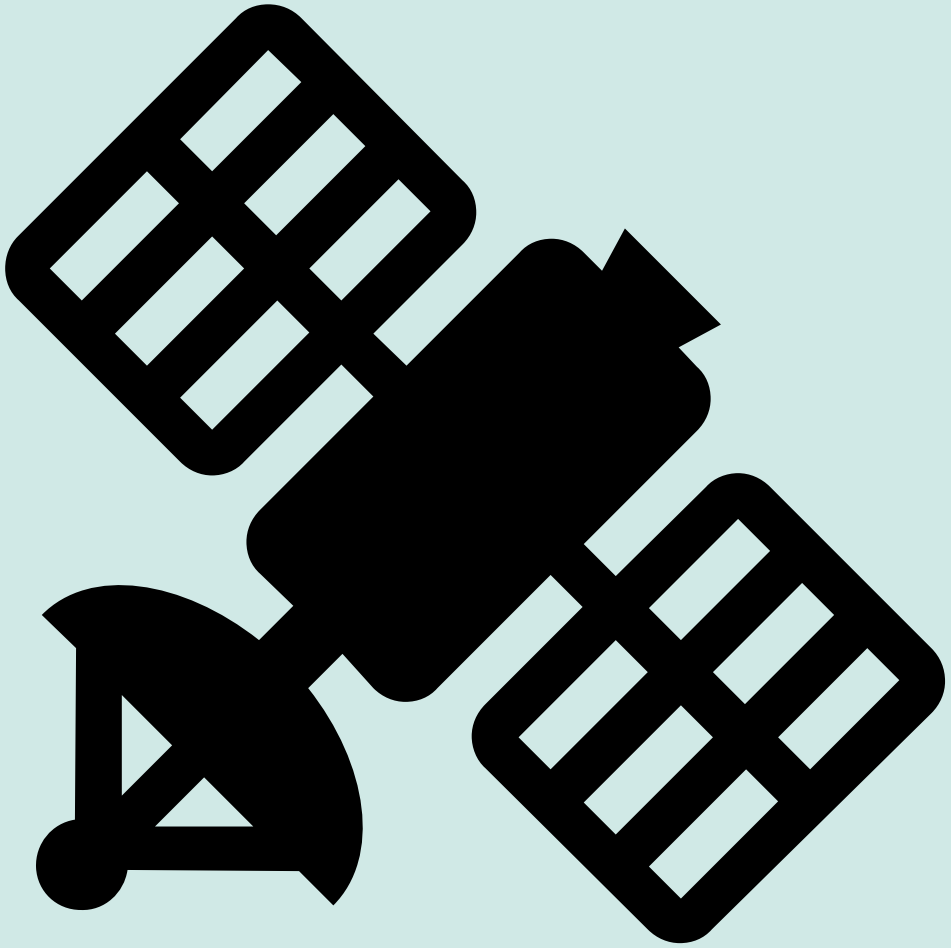


https://www.colorado.edu/today/2020/05/26/solving-space-junk-problem

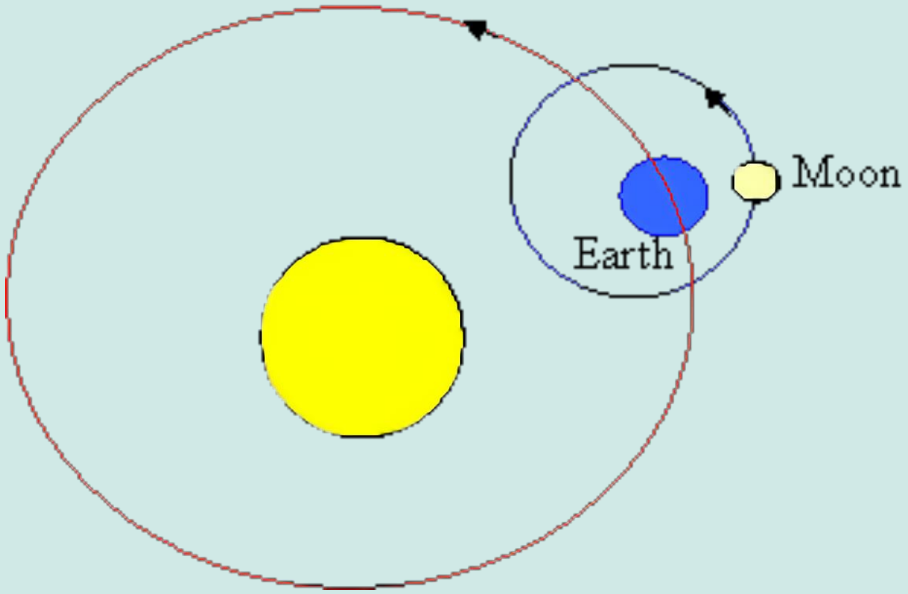


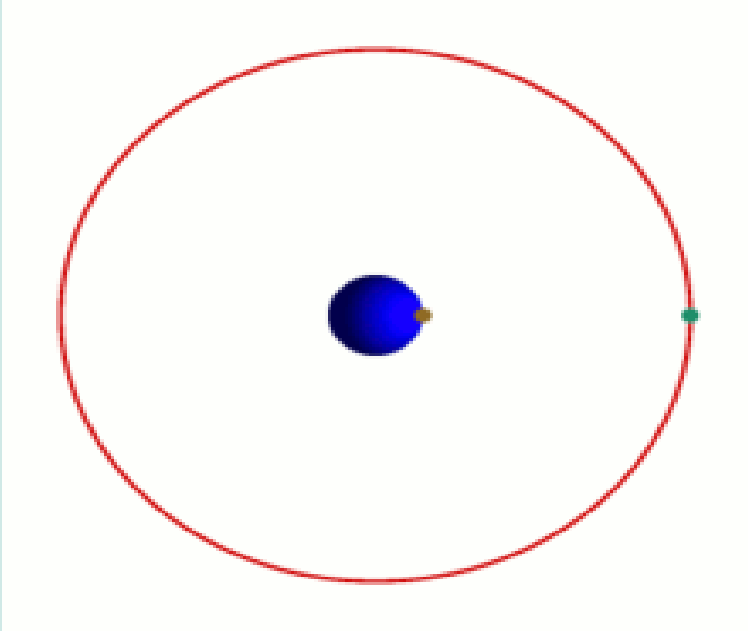
?

- What is a satellite?
- How do we take pictures using satellites?
- How do scientists use these pictures?
- Demo!!!

SATELLITE:

Anything that **orbits** a planet or star





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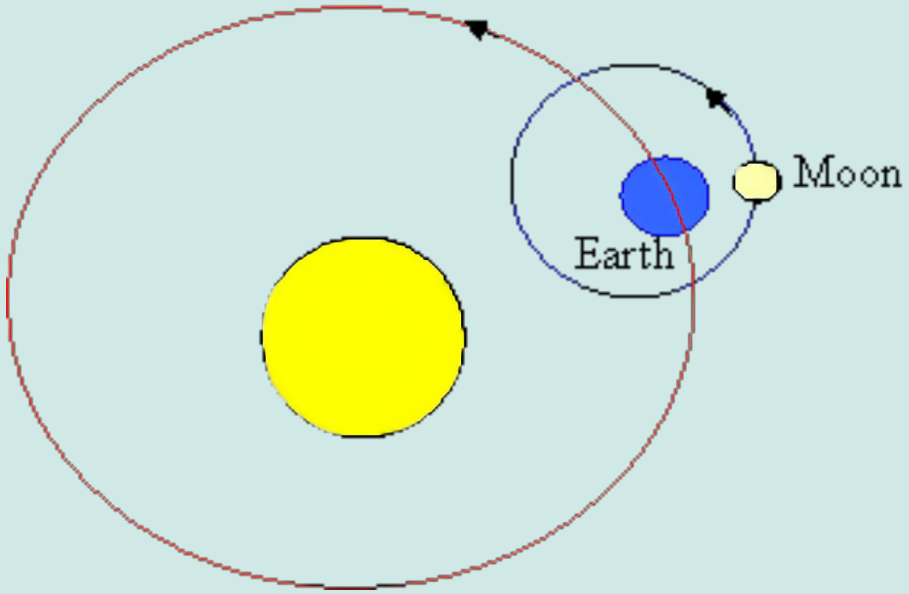
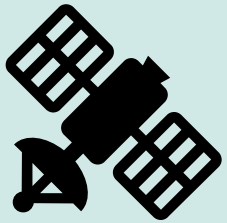


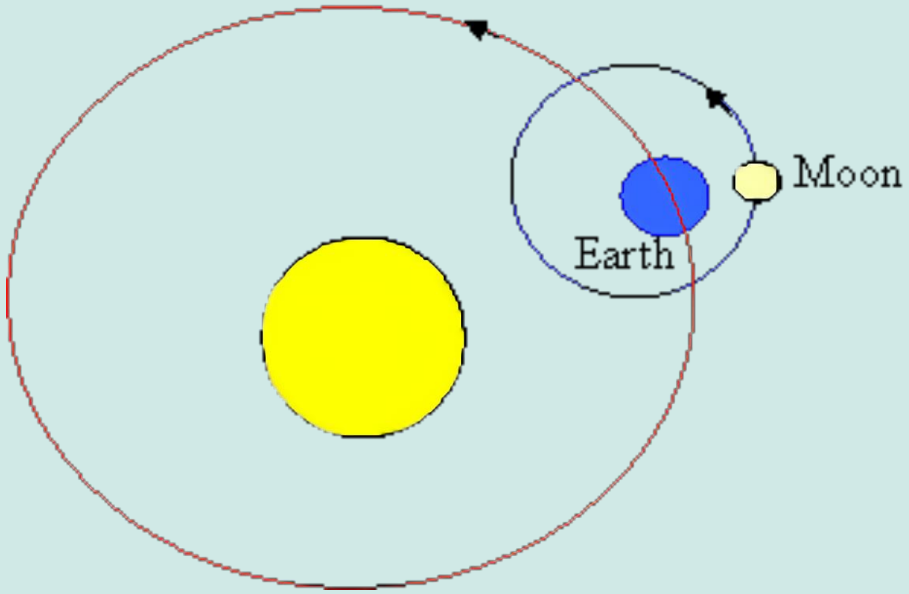
NATURAL

HUMAN-MADE (Artificial)



SATELLITE:

Anything that orbits a planet or star



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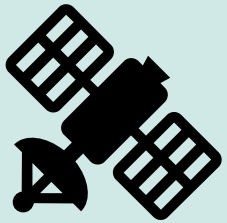
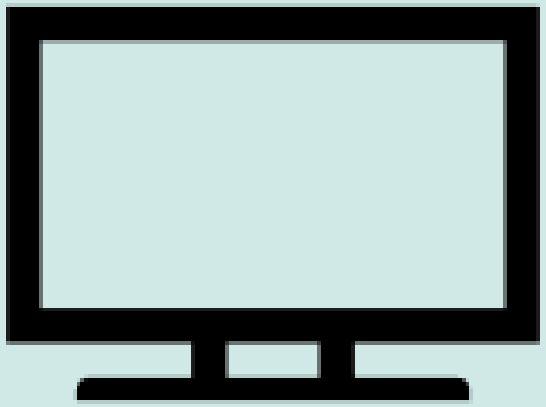


GPS

TV



PHONES

EARTH-OBSERVING

Artificial Satellites

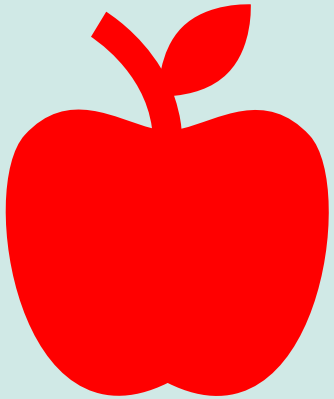
WAIT

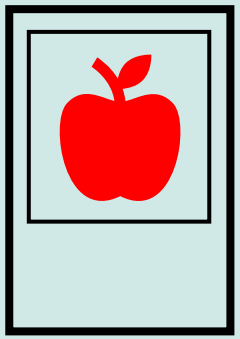
What do you like taking pictures of?

Can anyone tell me how they think a camera works?

Camera Icon:
http://www.clker.com/clipart-camera-11.html

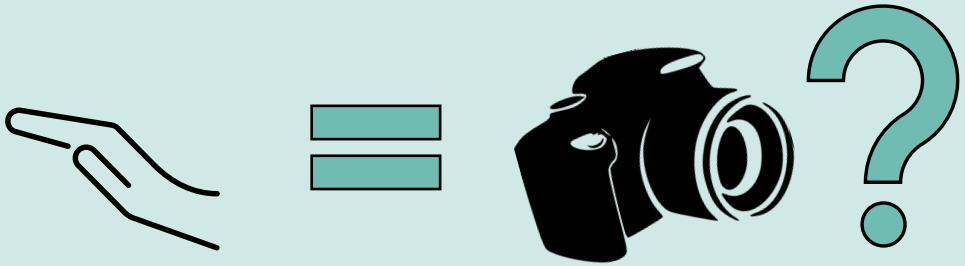
LIGHT





Your hands SENSE and feel heat, just like a camera can SENSE and pick up light

Your hands SENSE and feel heat, just like a camera can SENSE and pick up light



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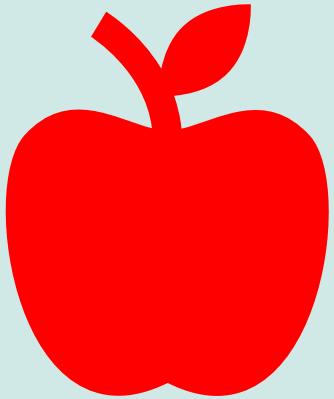
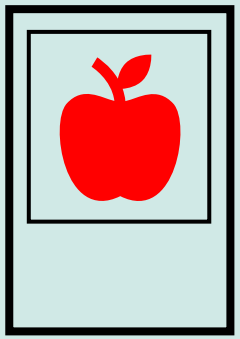
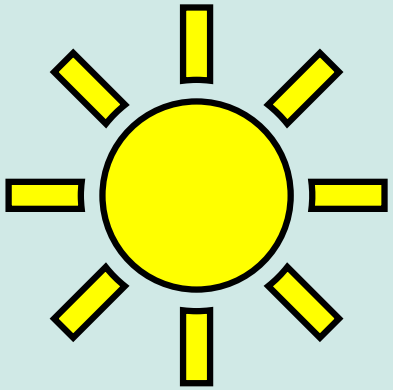
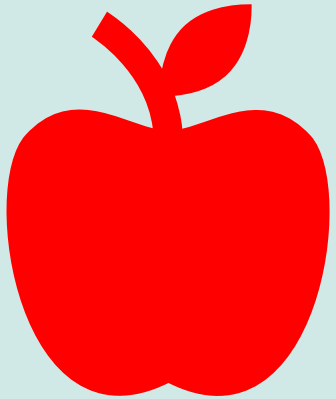
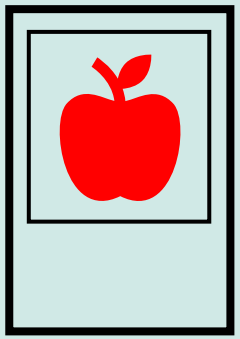




LIGHT







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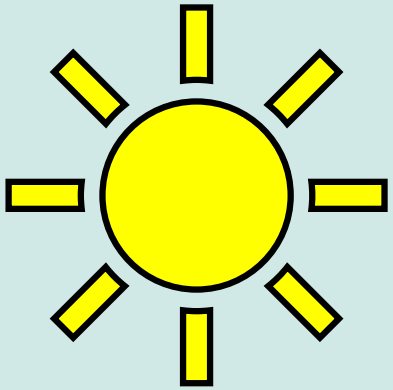
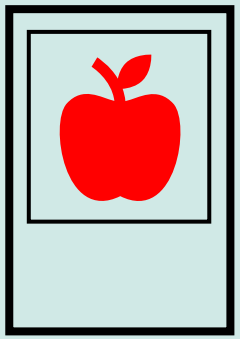
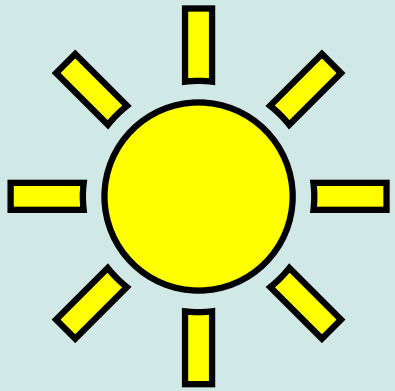
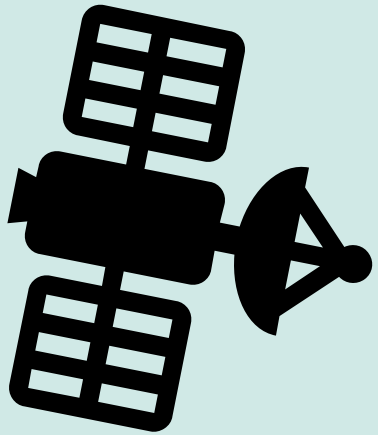
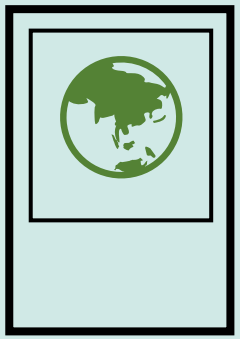


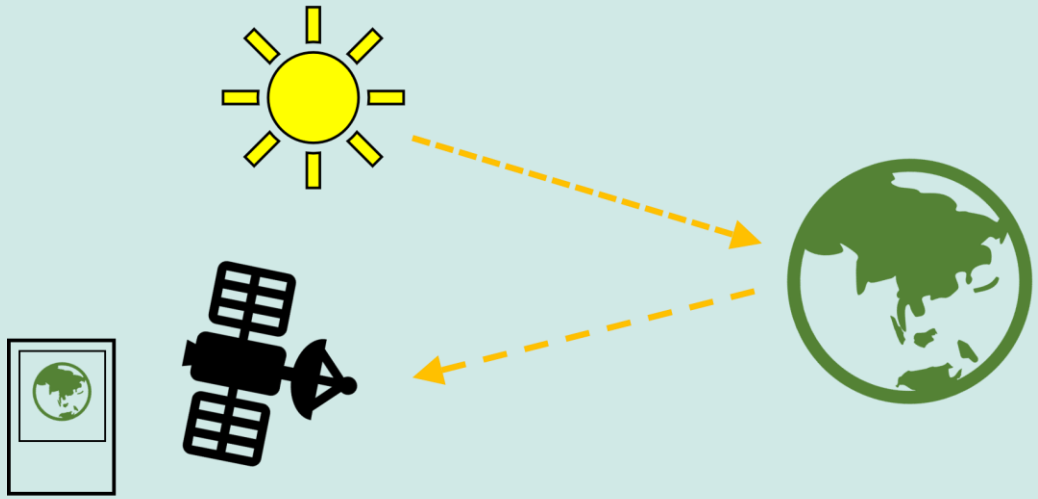


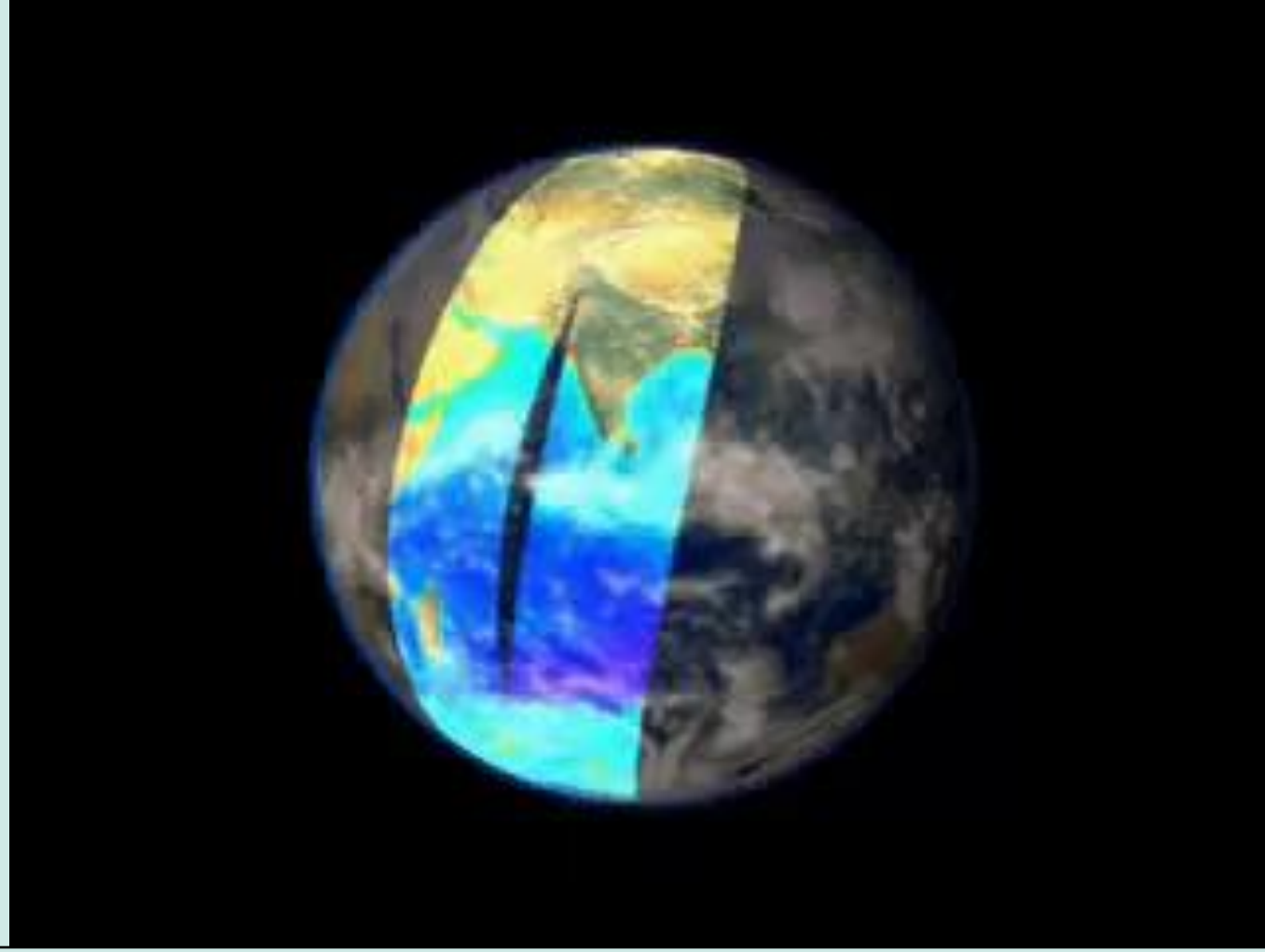
LIGHT





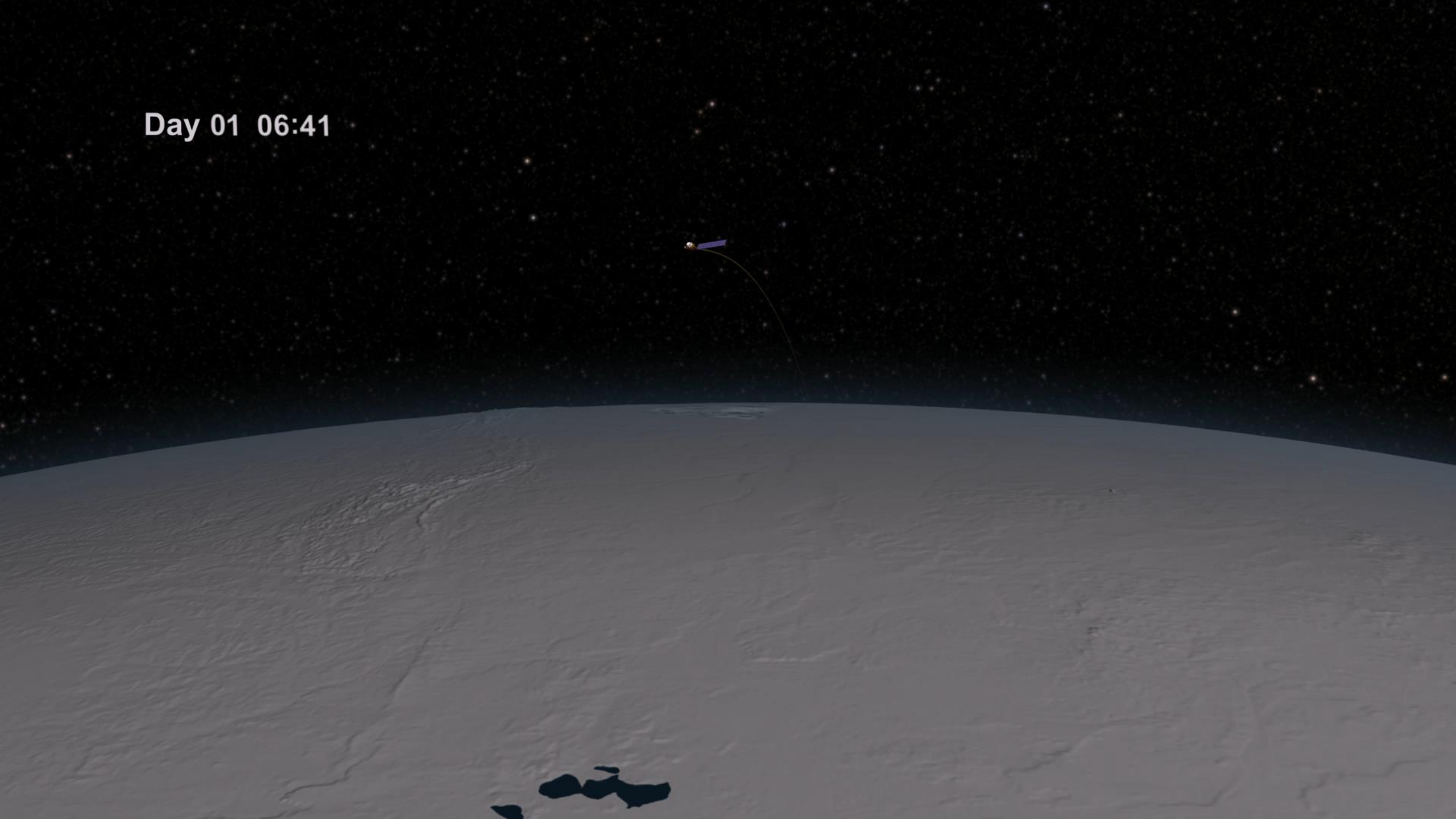






Remember, satellites ORBIT things.

As the satellite orbits, it SENSES the reflected light from the Earth


Day 01 06:41

Short Question Break:

Any questions so far?

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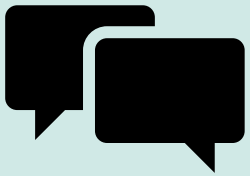

How are we feeling?
Close / cover your eyes!

Q for You:

Why would scientists need to use satellites to take pictures of Earth?

Can’t they just have someone take a picture from the ground? Or use a drone? Or go up in a plane?

Reasons for Satellite Images:

1) Pictures over long time periods

2) Photos of entire landscapes

3) Things not visible to humans

4) Hard-to-Reach Places

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1. Pictures over long time periods

Ucayali River (Rio Ucayali), Peru – Landsat Images from 1985-2013

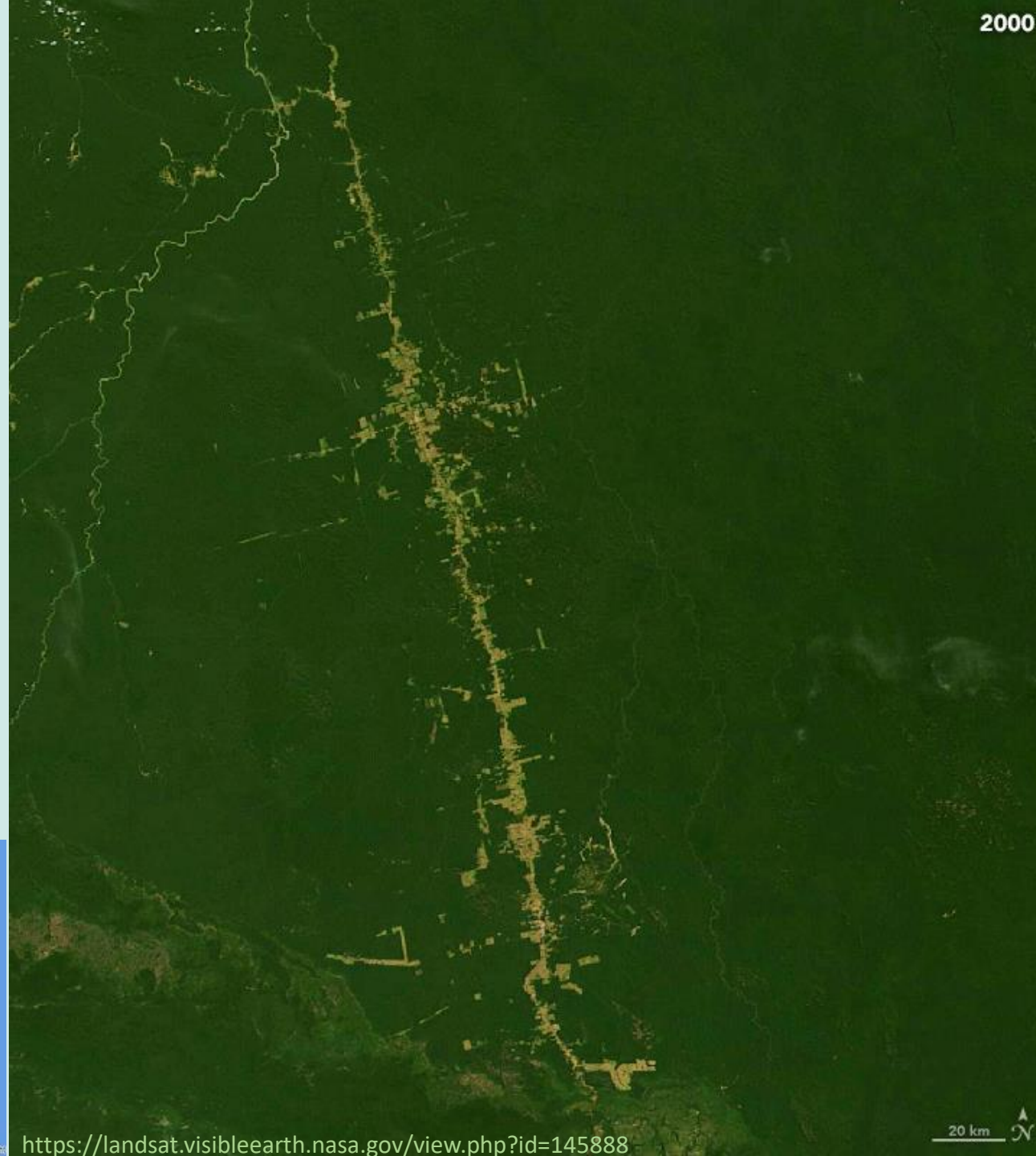
https://hinderedsettling.com/2014/03/16/rivers-through-time-as-seen-in-landsat-images/

2. Photos of entire landscapes

Soybean farms in Brazilian forests 2000-2019

Other Purposes:

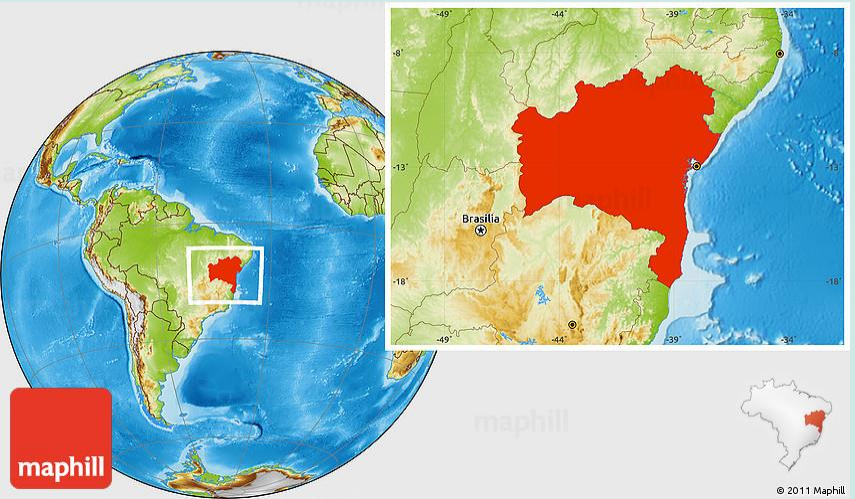
Mining
Cities Expanding
Crops Growing
Infrastructure (bridges, cities)
Glaciers changing



2. Photos of entire landscapes

Soybean farm, Bahia, Brazil,
April 2022

@geosteinmetz



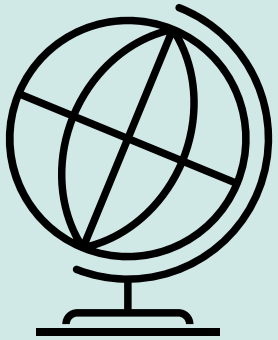
3. Information not visible to humans

NDVI = Greenness = How Healthy the Plants Are

Other Purposes:

Tracking Malaria Risk Areas
Habitat Montoring / Modeling

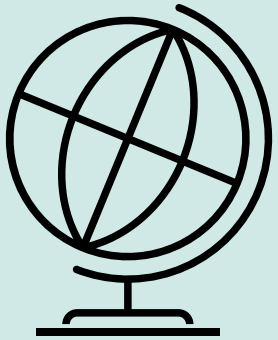
https://developers.google.com/earth-engine/tutorials/community/modis-ndvi-time-series-animation



4. Hard-to-Reach Places

We can’t travel everywhere all the time, and we can’t go back in time (yet?)

- Landsat goes back to 1985



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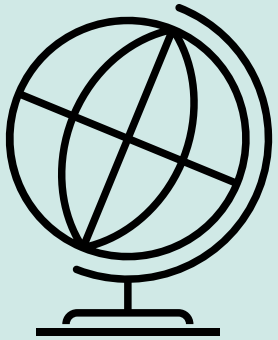
- Aerial photos before that



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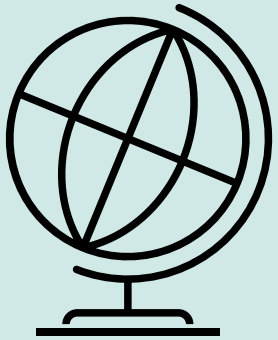
- Aerial photos before that
- Pigeon photos before that?



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We can’t travel everywhere all the time, and
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- Landsat goes back to 1985
- Aerial photos before that

- Pigeon photos before that?

https://www.geographyrealm.com/before-there-were-drones-using-pigeons-for-aerial-photography/

Quiz Time

What did we learn??

- What does a satellite do?
- How do we take pictures using satellites?
- How do scientists use these pictures?

What did we learn??

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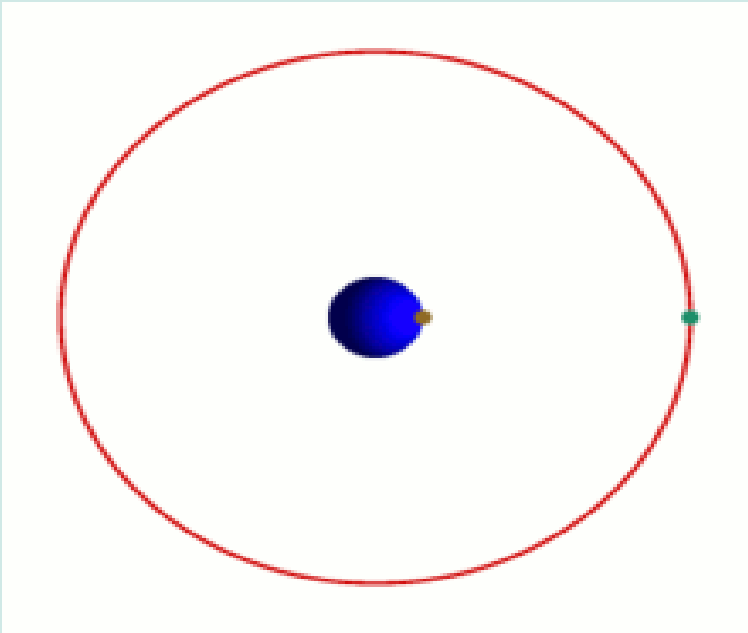

What did we learn??

- What does a satellite do?
    - A satellite is an object that ORBITS a planet or star
- How do we take pictures using satellites?
- How do scientists use these pictures?

What did we learn??

- What does a satellite do?
    - A satellite is an (artificial or natural) object that orbits a planet or star
- How do we take pictures using satellites?
- How do scientists use these pictures?

What did we learn??

- What does a satellite do?
    - A satellite is an (artificial or natural) object that orbits a planet or star

- How do we take pictures using satellites?
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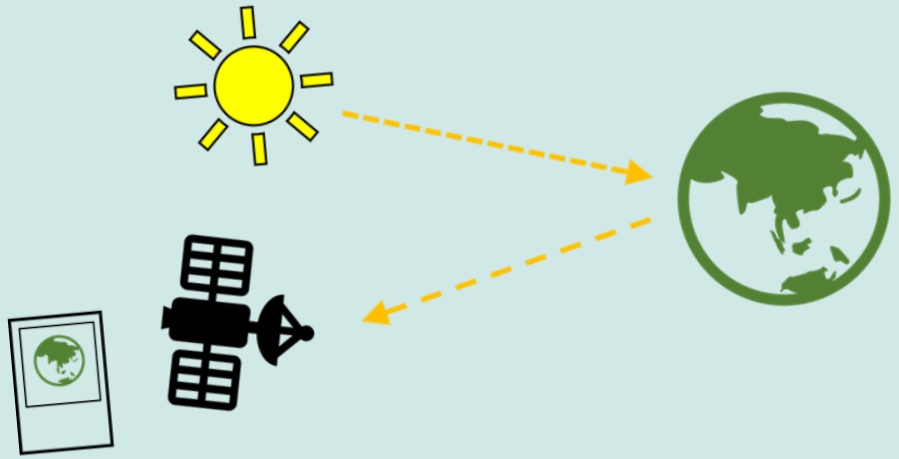
What did we learn??

- What does a satellite do?
- How do we take pictures using satellites?
    - Satellites pass over and collect reflected light to capture images
- How do scientists use these pictures?



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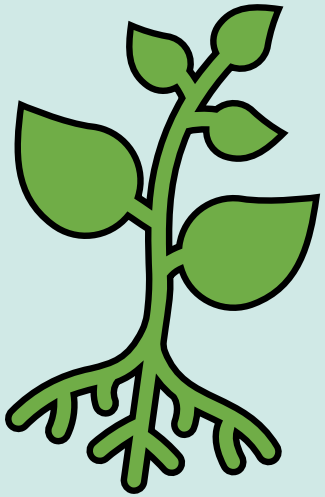
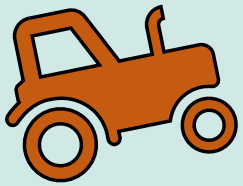
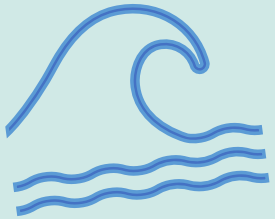
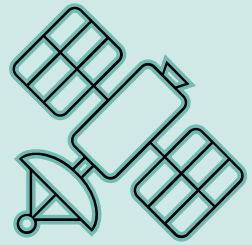
What did we learn??



- What does a satellite do?
- How do we take pictures using satellites?
- How do scientists use these pictures?
  - Lots of ways! We talked about plant health, tracking farms, and watching rivers move





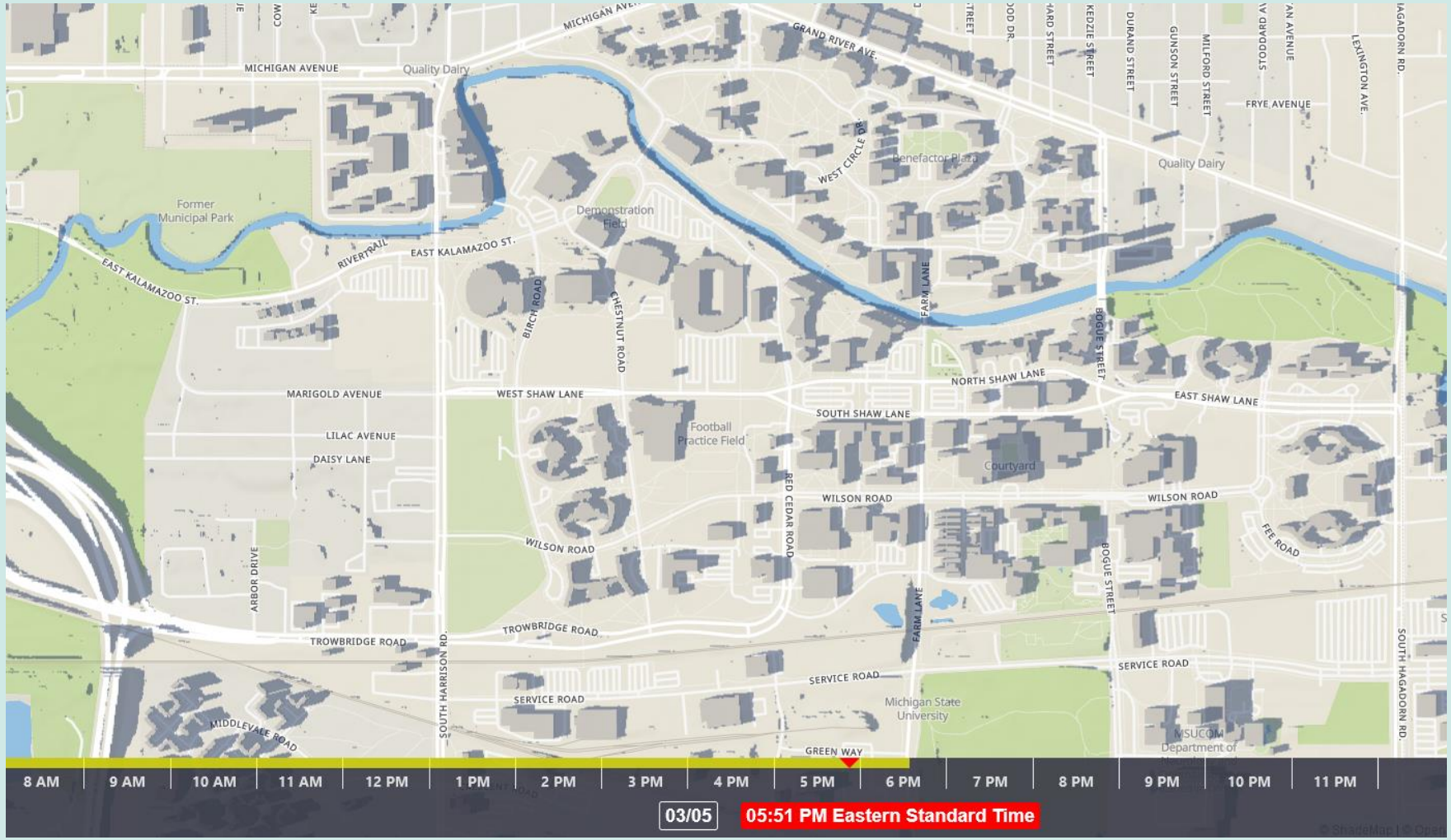


Thank you so much!!!

One word to describe your feelings about this talk

manni175@msu.edu

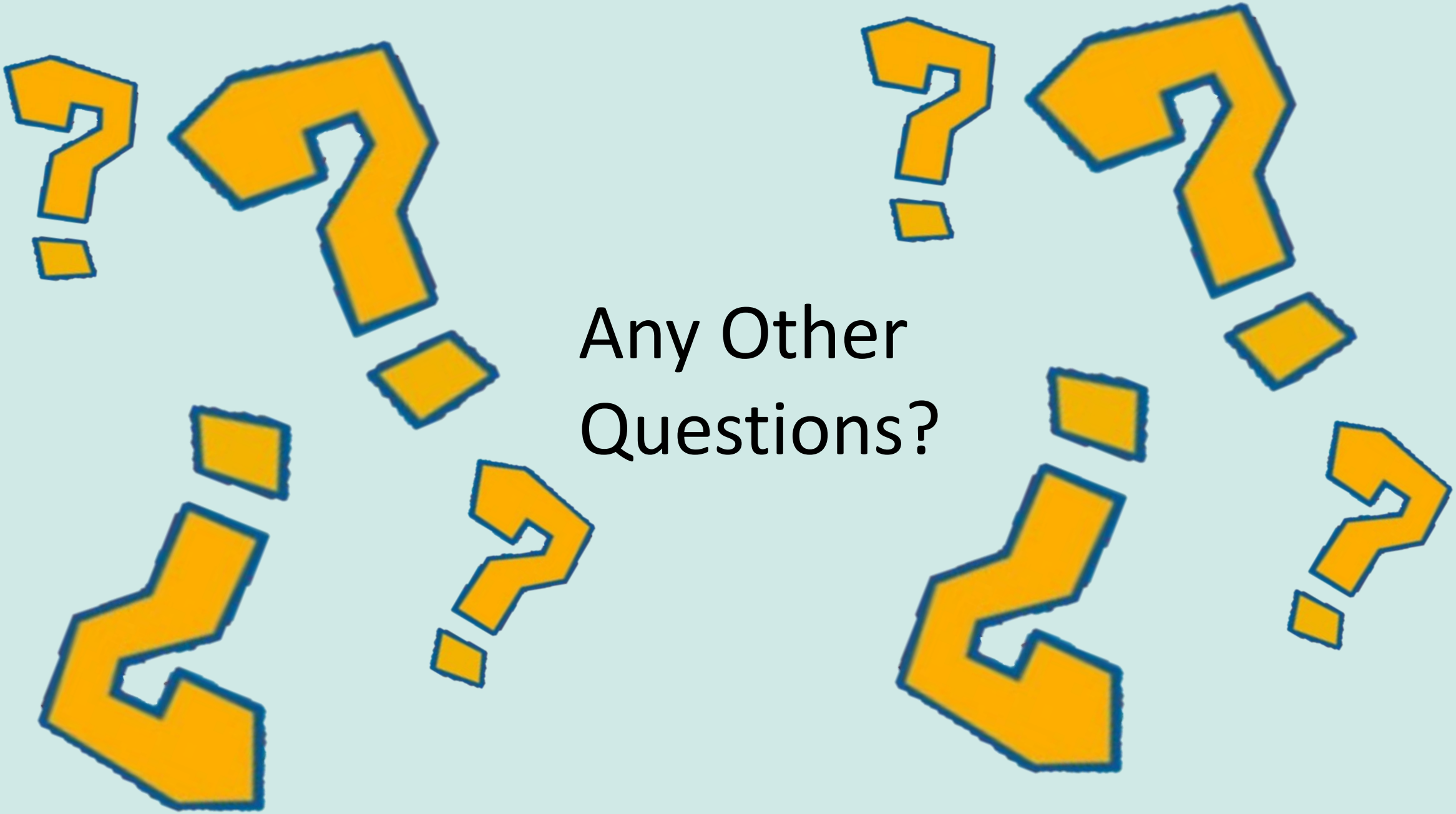
More Fun with Satellite Pictures



- Shade Map: https://shademap.app/@42.73572,-84.47619,15z,1646506147784t,0b,0p

More Fun with Satellite Pictures

https://twitter.com/i_ameztoy/status/1508146455516753924?s=20&t=_0EVGC5eaV2S4JY7pA0K4g


Any Other
Questions?

Demo

Timelapse: https://earthengine.google.com/timelapse/

*No scale bar here! We can’t tell how many Everests away something is