TELESCOPES, ROBOTS & COMPUTERS: Using technology to see the Cosmos

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Today we’ll talk about...

- TELESCOPES
- ROBOTS
- THE EDGE OF SPACE

ASK LOTS OF QUESTIONS
Who has gone stargazing?
We see the sky with our **EYES**

Sometimes we use binoculars or telescopes
Using your eyes

Seeing Moon Shadows
Using your eyes

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Seeing Moon Shadows
Why do we use binoculars or telescopes?

How do they help us see the sky better?
Telescopes MAGNIFY what we see!

- Without a telescope, how big does Jupiter look in the sky?

  - About the size of the eyeball on a dime, held at arms length!
Telescopes GATHER LIGHT!

- Telescopes makes it seem like your pupil is as big as the mirror!
Different Kinds of Telescopes

Some telescopes have to be in SPACE.
How do we know what things in space are made of?
What are the stars made of?

- The light from every atom has its own FINGERPRINT of colors that it ABSORBS or EMITS
Spectrum of the Sun
Spectrum of Arcturus
The Planets
Robots to the Outer Planets!
Voyage to Pluto (2015)
Robots to Mars
Landing on Mars
How can robots find things out about planets?

SENSORS
Sensors at your house
The Mars Rovers carry sensors and tools with them to dig into Mars and drill into rocks.
The edge of space is above our heads...
**HARBOR**

Atmospheric Weather Balloon (Latex)

1. **LAUNCH**
   - Capsule Suspension Lines (4 “triangles”, only 2 shown)
   - Shroud Ring (Wooden Hoop)
   - Payload Capsule
   - Command Capsule

2. **ASCENT**
   - Cutdown System
   - Parachute Shroud Lines
   - Parachute Recovery System 3.5 m (12 ft) diameter

3. **BURST**

4. **DESCENT**

5. **RECOVERY**
   - Chase Team
   - Primary Antenna
Flight Day in Pictures
HAR080728 Launch Ops
On the way to space...
Infrared Imaging on HARBOR
Burst in 3 seconds
What about the future?
Future Technology: LISA

Use lasers to detect the gravity from:
- Colliding black holes
- Death spiral of stars
- The Big Bang
Future Technology: LISA