The active Sun

The magnetic Sun

White light
Magnetic field

Solar magnetic fields reach far out into space

Solar magnetic fields reach out into the outermost layer of the Sun's atmosphere...the corona

Temperatures in the corona are 1 - 2 million degrees Kelvin

Your chance to see the solar corona

Total eclipse of the Sun...August 21, 2017

The 11 Year Solar Cycle

The Sun has a "heartbeat"; its properties change on a period of 11 years
Latest data on this sunspot cycle

An indication that our knowledge of the solar cycle is far from perfect

Predictions in 2007

Sunspots are the sites of big explosions (solar flares and coronal mass ejections)

The Sunspot Cycle has been going on for a long time

The Solar Wind

- A wind past the Earth at 400 km/sec
- The Sun is “melting away”
- Density 19 orders of magnitude less than atmosphere
- A medium for solar events
- May have "sandedblasted" the early atmosphere of Mars
The Lesson for Other Stars

- Do they also have sunspots, sunspot cycles, etc?
- How does all this (magnetic fields, solar wind, rotation) relate to the age of a star?

More about telescopes

- What you will be looking through later in the semester
- Progress in astronomy would have been impossible without them

Telescopes do two things:

- Collect “Big Piles” of light
- Magnify object (it looks a lot closer than it is)

Types of Telescopes

- Refractors
- Reflectors
- Radio telescopes
- None of the above
Reflectors and Refractors

Newtonian Cassegrain

Demo

Reflectors: more details from the book

Formation of an image

Modern astronomy: instead of an eyepiece, a Charge-Coupled Device (CCD)

Demo

Magnification of a telescope

The longer the focal length, the higher the magnification
Keck Telescopes (Reflectors): 10 meter diameter

Resolution: How small detail can you see with a telescope?

Resolution: smallest angle measurable

\[
\text{Angle} = \frac{\text{wavelength}}{\text{diameter (telescope)}} \quad \text{(radians)}
\]

Radio Telescopes

Wavelength large (1cm – 1 meter typically) so D has to be \textit{HUGE}

Radio Interferometers:

The ultimate in angular resolution

Final topic: the disappearing night sky:
The US by night; where is it dark?