



The Universe and You

• An astronomy primer

with

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What is Astronomy?

astronomy noun

 Save Word

as·tron·o·my | \ ə-ˈsträ-nə-mē  \

plural **astronomies**

Definition of *astronomy*

: the study of objects and matter outside the earth's atmosphere and of their physical and chemical properties

Credit: [Merriam-Webster](#)



What's interesting in space?



Image Credit: Wikipedia

Saturn from Cassini

Sun from SDO Solar Dynamics Observatory

Andromeda (and M110 below, M32 above center), in h-Alpha

Pleiades, taken with an 8" Newtonian telescope

Vesta, Ceres, and Eros - V+C from Dawn, Eros from NEAR Shoemaker

All of these objects are things that can be observed with the naked eye or a pair of binoculars EXCEPT the Sun.

Do not stare directly into the sun. <https://skyandtelescope.org/observing/observing-the-sun/>

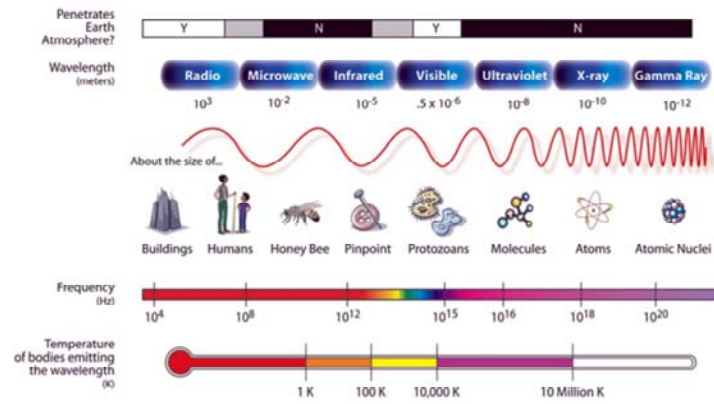


A little history

- ★ 1609: Galileo builds his telescope, era of modern astronomy begins
 - Later confirms heliocentric Solar System
- ★ 1668: Newton creates the first reflecting telescope
 - His observations lead to the theory of gravitation
- ★ 1781: William Herschel discover Uranus
- ★ Late 1800s: Astronomers begin using photography and spectroscopy
- ★ 1924: Edwin Hubble confirms existence of other galaxies
 - Prior to this, they were thought to be “spiral nebulae”
- ★ 1970s: Vera Rubin confirms that dark matter must exist
- ★ 1988: First exoplanet is discovered
- ★ 2019: The shadow of a black hole’s event horizon is imaged

A little science

THE ELECTROMAGNETIC SPECTRUM



Credit: [NASA via Wikipedia](#)

A little more science



Credit: [NASA](#)

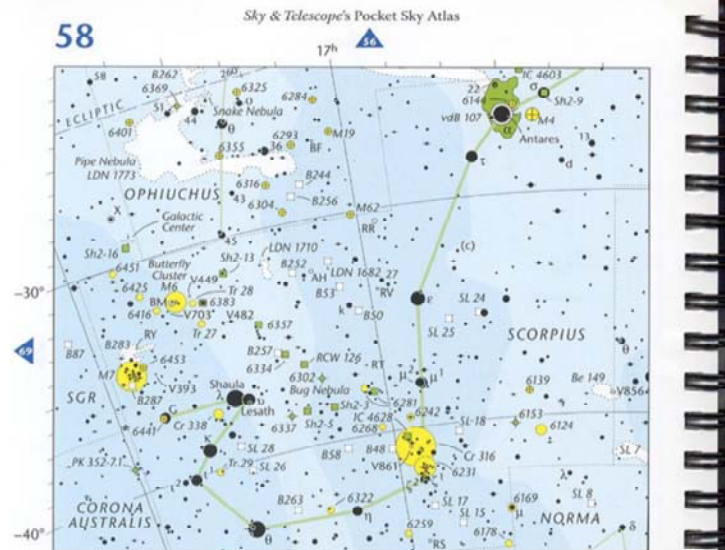
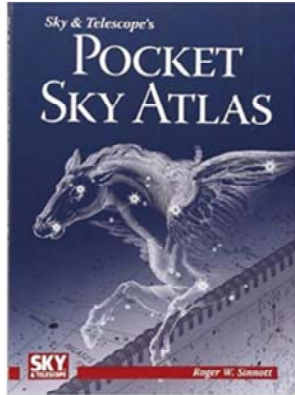
The represented observatories are: HESS, [Fermi](#) and [Swift](#) for [gamma-ray](#), NuSTAR and [Chandra](#) for [X-ray](#), GALEX for [ultraviolet](#), Kepler, [Hubble](#), Keck (I and II), SALT, and Gemini (South) for [visible](#), Spitzer, Herschel, and Sofia for [infrared](#), Planck and CARMA for [microwave](#), Spektr-R, Greenbank, and VLA for [radio](#).

What do we use?



Credit: SkyWatcher USA, meteorwatch.org, Canon USA, QHYCCD, Wikipedia

How do we find things?



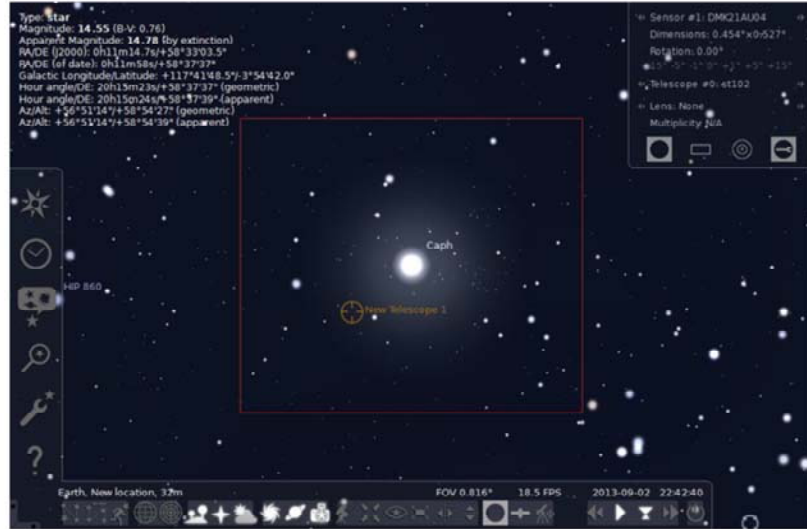
Books, charts, software. Learning the night sky.

How do we find things?



Also

- ★ SkySafari
- ★ StarWalk
- ★ Others





What can you see in the sky?

- ★ Planets
- ★ Stars
- ★ Meteors
- ★ Aurorae

Naked eye

- ★ Comets
- ★ Asteroids
- ★ Galaxies
- ★ Star Clusters (open, globular)
- ★ Nebulae (emission, reflection)

Can be
found with
binoculars!

There's some overlap here, too.

List of cool stuff, esp. upcoming events like the two penumbral eclipses, meteor showers (with caveats), planets, ATLAS.



Getting involved

- ★ Start simple: binoculars, a sky chart, and a lawn chair

- ★ [Find a local astronomy club](#)
 - Scientific talks
 - Observing events
 - Knowledgeable members

- ★ Start a club at school



Credit: [National Park Service](#)

Start simple - pair of binoculars and a lawn chair kind of deal. Local clubs - mostly adults and deep technical topics, but we all started there - and observing events. School clubs.



Modern astronomy: NASA

Current missions

- ★ SDO
- ★ New Horizons
- ★ Curiosity
- ★ LRO
- ★ OSIRIS-REx
- ★ Parker Solar Probe
- ★ Juno
- ★ International Space Station

Famous old stuff

- ★ Voyager 1 and 2
- ★ Hubble

Future missions

- ★ James Webb Space Telescope
- ★ Europa Clipper
- ★ WFIRST
- ★ Perseverance

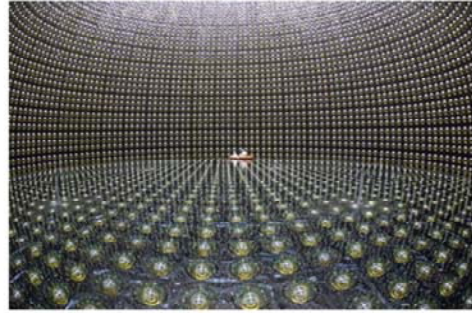
Upcoming and current space missions to follow - NASA, ESA, Roscosmos, SpaceX, LIGO, etc.

Famous old stuff: Voyagers, Hubble

Current missions: SDO, New Horizons, Curiosity, LRO, OSIRIS-REx, Parker Solar Probe, Juno

Future missions: JWST, Europa Clipper, WFIRST

More modern astronomy





More things to check out

- ★ [NASA Astronomy Picture of the Day](#)
- ★ [Hubble Space Telescope](#)
- ★ [European Space Agency](#)
- ★ [NASA](#)
- ★ [SkyMap, monthly](#)
- ★ [Clear Outside, observing weather charts](#)
- ★ [Astronomy Calendar, celestial events until 2030](#)
- ★ [StarTalk Radio, NdT's podcast](#)
- ★ [List of NY astronomy clubs](#)
- ★ [Spot the Station](#)



Q&A

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