Introduction to the Sloan Digital Sky Surveys
https://www.youtube.com/watch?v=9vfOqVHyohw

The Sloan Digital Sky Survey or SDSS is a major multi-spectral imaging and spectroscopic redshift survey using a dedicated 2.5-m wide-angle optical telescope at Apache Point Observatory in New Mexico, United States. The project was named after the Alfred P. Sloan Foundation, which contributed significant funding. *(Wikipedia)*

Brief Details of each observation:

ra (right ascension) and dec (declination) are the coordinates on the sky that correspond to longitude and latitude on Earth. RA measures east and west on the celestial sphere and is like longitude on the Earth. Dec measures north and south on the celestial sphere and is like latitude on the Earth.

- objid = Object Identifier
- ra = J2000 Right Ascension (r-band)-
- dec = J2000 Declination (r-band)

Knowing that the color of a star is related to the wavelength of light it gives off, lets you understand the meaning of the SDSS's color filters. Each filter is designed to let in light around a specific wavelength. The filters work by blocking out light at all wavelengths except those around the wavelength they are designed to see.

- u (ultraviolet)
- g (green)
- r (red)
- i (Near infrared)
- z (Infrared)
- run = Run Number
- rereun = Rerun Number
- camcol = Camera column
- field = Field number
- specobjid = Object Identifier
- class = object class (galaxy, star or quasar object)
- redshift = Final Redshift
- plate = plate number
- mjd = MJD of observation
- fiberid = fiber ID

(The definitions below are excerpted from Wikipedia.)

Galaxy -- A galaxy is a gravitationally bound system of stars, stellar remnants, interstellar gas, dust, and dark matter.

Galaxies are categorized according to their visual morphology as elliptical,[4] spiral, or irregular.[5] Many galaxies are thought to have supermassive black holes at their active centers.

Recent estimates of the number of galaxies in the observable universe range from 200 billion to 2 trillion or more. Most of the galaxies are 1,000 to 100,000 parsecs in diameter (approximately 3000 to 300,000 light years) and separated by distances on the order of millions of parsecs (or megaparsecs). For comparison, the Milky Way has a diameter of at least 30,000 parsecs (100,000 LY) and is separated from the Andromeda Galaxy, its nearest large neighbor, by 780,000 parsecs (2.5 million LY).

The space between galaxies is filled with a tenuous gas (the intergalactic medium) having an average density of less than one atom per cubic meter. The majority of galaxies are gravitationally organized into groups, clusters, and superclusters.

Star -- A star is type of astronomical object consisting of a luminous spheroid of plasma held together by its own gravity. The nearest star to Earth is the Sun. Many other stars are visible to the naked eye from Earth during the night, appearing as a multitude of fixed luminous points in the sky due to their immense distance from Earth. Historically, the most prominent stars were grouped into constellations and asterisms, the brightest of which gained proper names. However, most of the stars in the Universe, including all stars outside our galaxy, the Milky Way, are invisible to the naked eye from Earth. Indeed, most are invisible from Earth even through the most powerful telescopes.

For at least a portion of its life, a star shines due to thermonuclear fusion of hydrogen into helium in its core, releasing energy that traverses the star's interior and then radiates into outer space. Almost all naturally occurring elements heavier than helium are created by stellar nucleosynthesis during the star's lifetime, and for some stars by supernova nucleosynthesis when it explodes. Near the end of its life, a star can also contain degenerate matter. Astronomers can determine the mass, age, metallicity (chemical composition), and many other properties of a star by observing its motion through space, its luminosity, and spectrum respectively.

Quasar -- A quasar is an extremely luminous active galactic nucleus (AGN). It has been theorized that most large galaxies contain a supermassive central black hole with mass ranging from millions to billions of solar masses. In quasars and other types of AGN, the black hole is surrounded by a gaseous accretion disk. As gas in the accretion disk falls toward the black hole, energy is released in the form of electromagnetic radiation. This radiation can be observed across the electromagnetic spectrum at radio, infrared, visible, ultraviolet, and X-ray, and gamma wavelengths. The power radiated by quasars is enormous: the most powerful quasars have luminosities exceeding 10^{41} watts, thousands of times greater than an ordinary large galaxy such as the Milky Way.

Quasars are found over a very broad range of distances (corresponding to redshifts ranging from $z < 0.1$ for the nearest quasars to $z > 7$ for the most distant known quasars), and quasar discovery surveys have demonstrated that quasar activity was more common in the distant past. The peak epoch of quasar activity in the Universe corresponds to redshifts around 2, or approximately 10 billion years ago.