The oldest known object (as of 2016): Galaxy GN-z11, 13.4 Ga

Possible reorganization of solar system orbits, producing LHB (Late Heavy Bombardment)

**Cosmic events**

**Panel 0**

**Panel 1:** COSMOS (13.8 Ga to now)

**Panel 2**

**Metallicity**

Metallicity is defined as the ratio of the number of atoms of Fe to atoms of H in a star (determined spectroscopically) divided by the same ratio in the Sun (defined as 1). Metallicity is shown here on a log plot.

**Cosmic events**

- Oldest known object (as of 2016): Galaxy GN-z11, 13.4 Ga
- Formation maximum of quasars (supermassive black holes)
- Galactic collisions
- Fraction of spiral galaxies with central bars (like the Milky Way, unlike Andromeda) increases over the last 7 Gyr

**Dark energy and the accelerating expansion of the Universe**

- After inflation, the expansion of the Universe either...
  - first decelerated, then accelerated...
  - or has always decelerated.

**Age vs. redshift**

- The redshift of light coming from distant objects can be measured...
  - ...but the age of distant objects must be calculated from their redshift