Horizons in the Universe

- The horizon divides all events in the spacetime diagram into two regions.
- Two horizons
  - Particle horizon
    - The horizon at the epoch of observation.
    - Divides into visible and invisible events.
    - The particle horizon exists when there is the beginning.
    - The particle horizon grows in time.
    - Causality
  - Event horizon
    - The ultimate horizon throughout the entire spacetime.
    - Divides into events that are visible at some time or other and those that are never visible.
    - The event horizon exists when there is an end.
    - The event horizon does not change over time.

The Horizon Problem

- Why do galaxies look alike?
- Why is the cosmic microwave background so isotropic?
- Because the particle horizon grows in time, the particle horizon was smaller in the past.
  - The galaxies we see today did not have a chance to communicate in the past.
    - How come they look so similar?
  - When the cosmic microwave background radiation was emitted, there was no chance for photons in one place to propagate to the other at more than 1 million light years away.
    - How the CMB is so isotropic?