21. Galaxy Evolution
Quasar 3C 273
An Active Galactic Nucleus (AGN) emits non-stellar radiation.

Quasars are the most extreme examples.
The diagram illustrates the spectrum of a galaxy and an AGN (Active Galactic Nucleus) across different frequency bands. The x-axis represents the log of the frequency (in Hz), and the y-axis represents the log of the flux density (in erg s^{-1}).

- **Radio** range is indicated on the far left, followed by the **IR** range, then the **opt. + UV** range, and finally the **X-ray** range on the far right.

The diagram shows:
- **AGN** with a distinct peak near the center of the X-ray range.
- **Galaxy** with a less pronounced peak in the IR range.

A question mark is labeled near the accretion disk in the AGN region.
Radio emission from center

Swirling gas near center
Swirling gas near center

Orbiting stars near center
Stellar Orbits in the Central Parsec

Keck/UCLA Galactic Center Group

Stellar Orbits in the Central Parsec
Supermassive Black Hole in M87

\[ M_{BH} = (3.5 \pm 0.8) \times 10^9 \, M_\odot \]