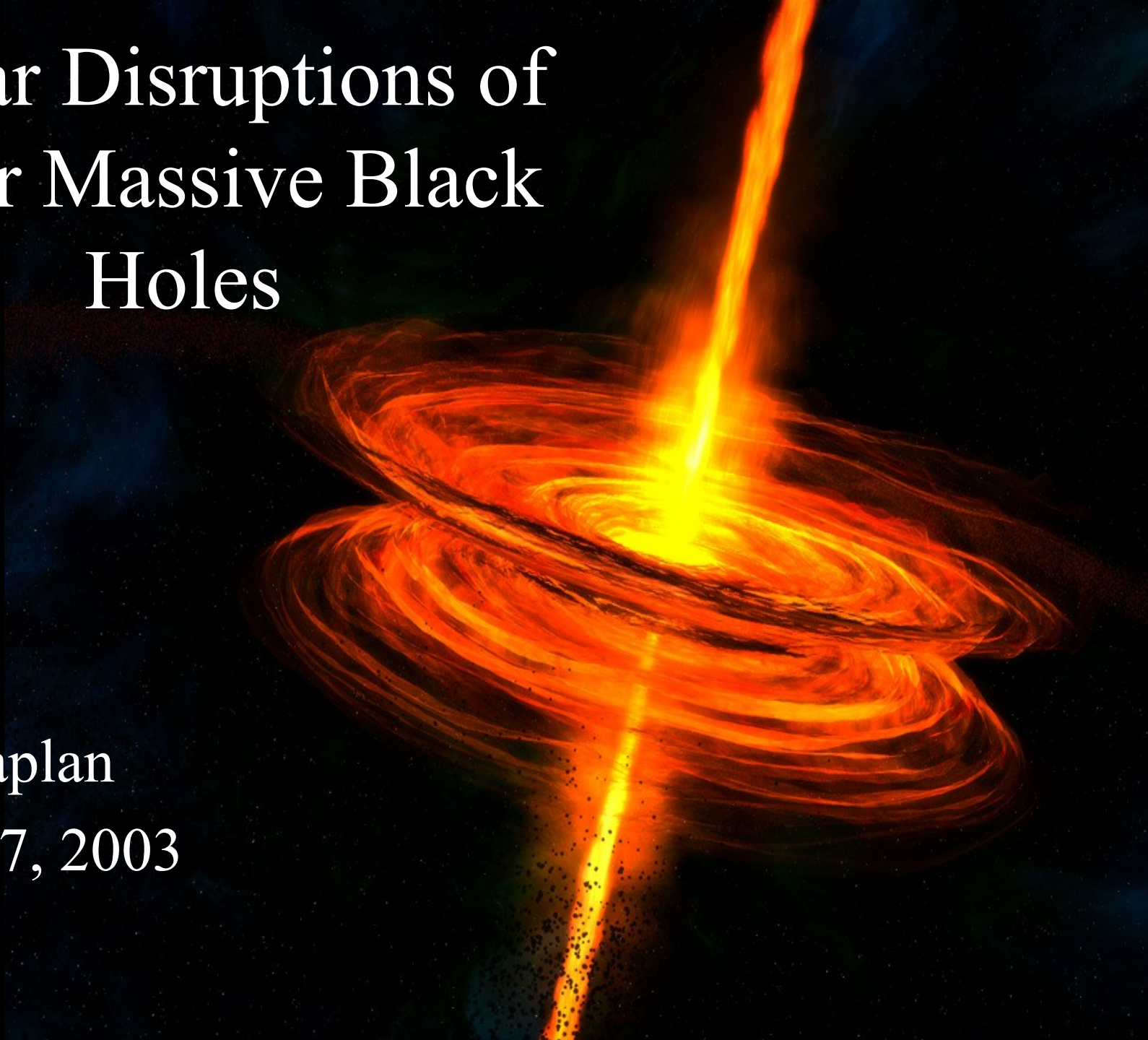
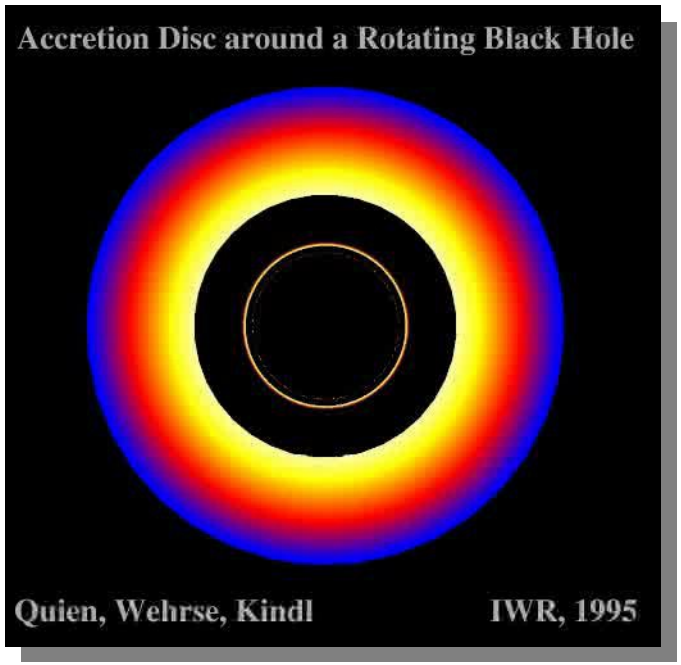
Stellar Disruptions of Super Massive Black Holes



Ron Caplan

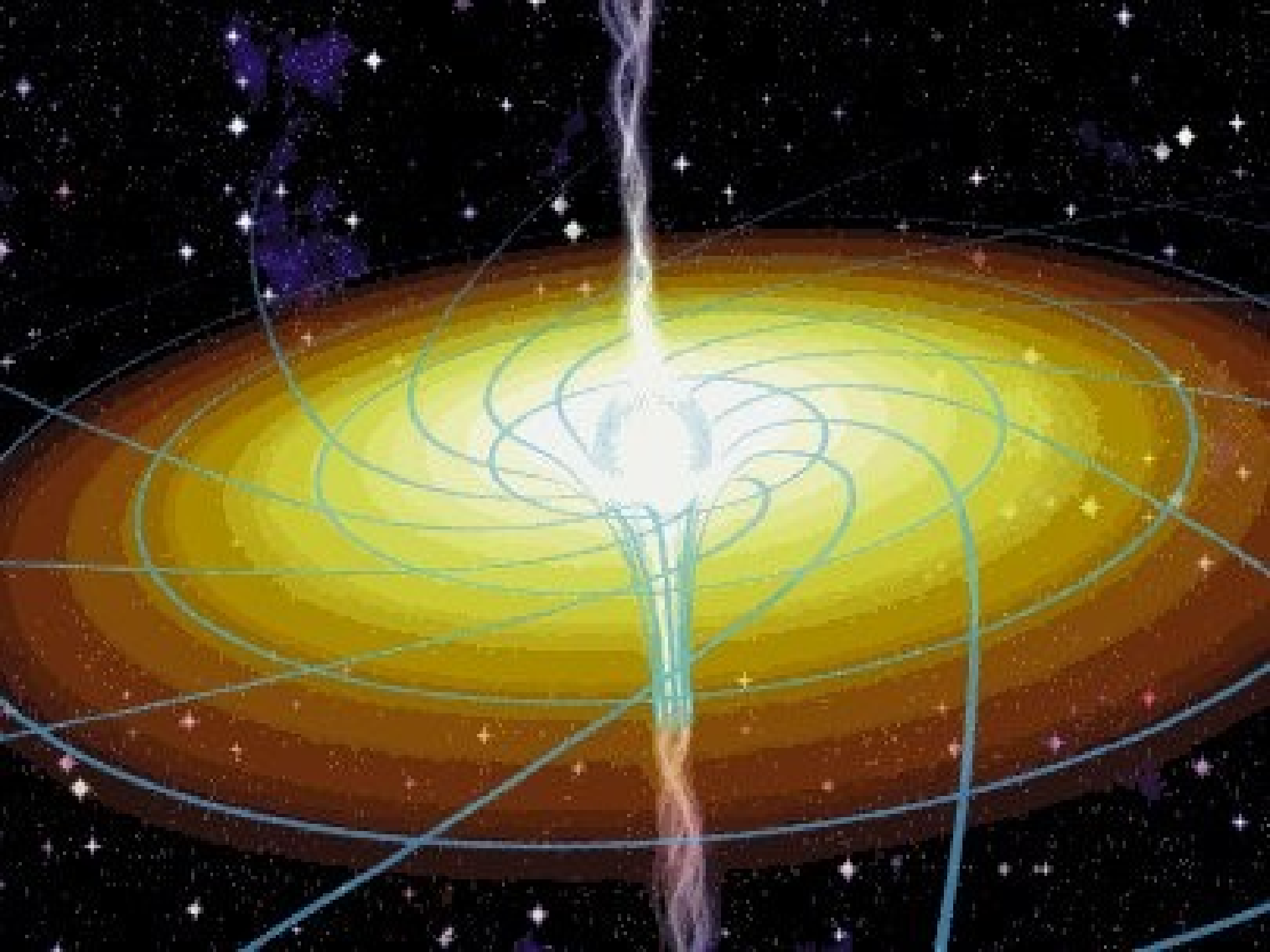
March 7, 2003

Outline

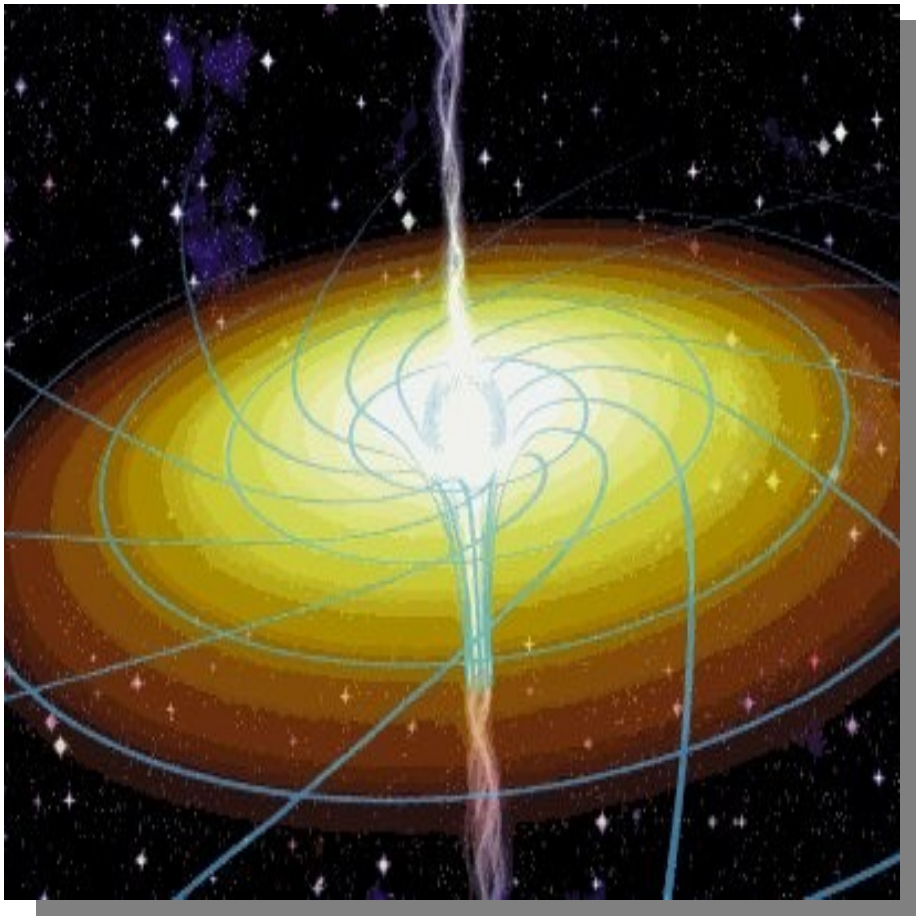


- Overview of Black Holes
- The Stellar Disruption Event
  - The Flare
  - The Stellar Wind
  - Core Remnants
- Observations

When a star gets too close to a super massive black hole, it becomes disrupted causing a flare. Detecting these flares is a way to find such holes, as well as learn about them. The study of super massive black holes is important for galaxy evolution studies.

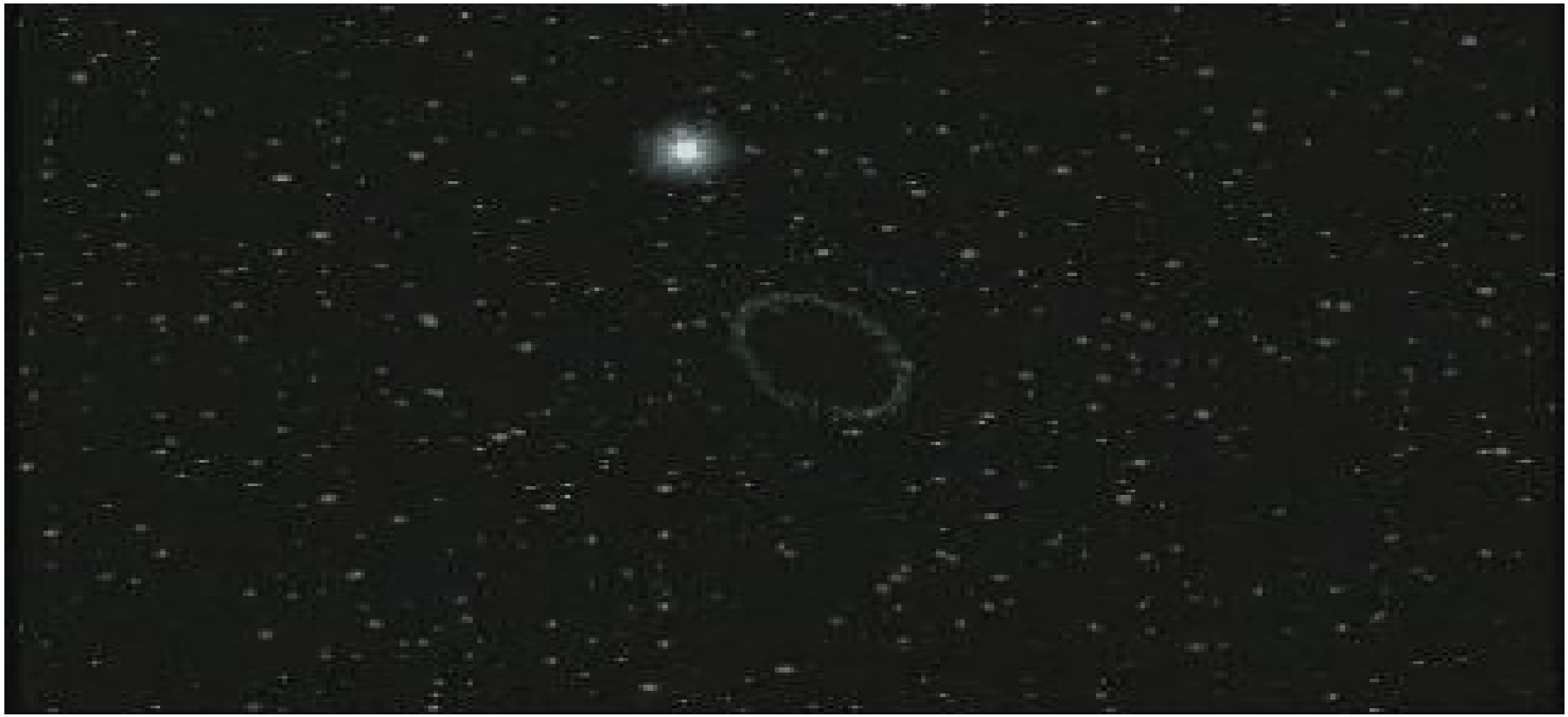


Black Hole Structure



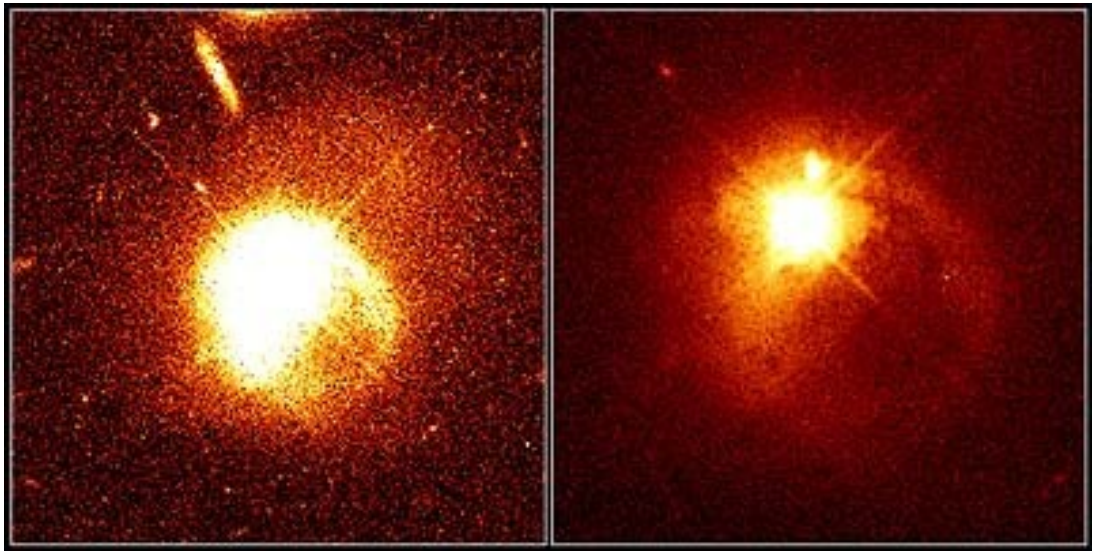
- Space-Time Geometry
- How to Make a BH
- Event Horizon
- Singularity
- Tidal Forces
- Stellar vs. Super Massive

Black Hole Accretion Disks



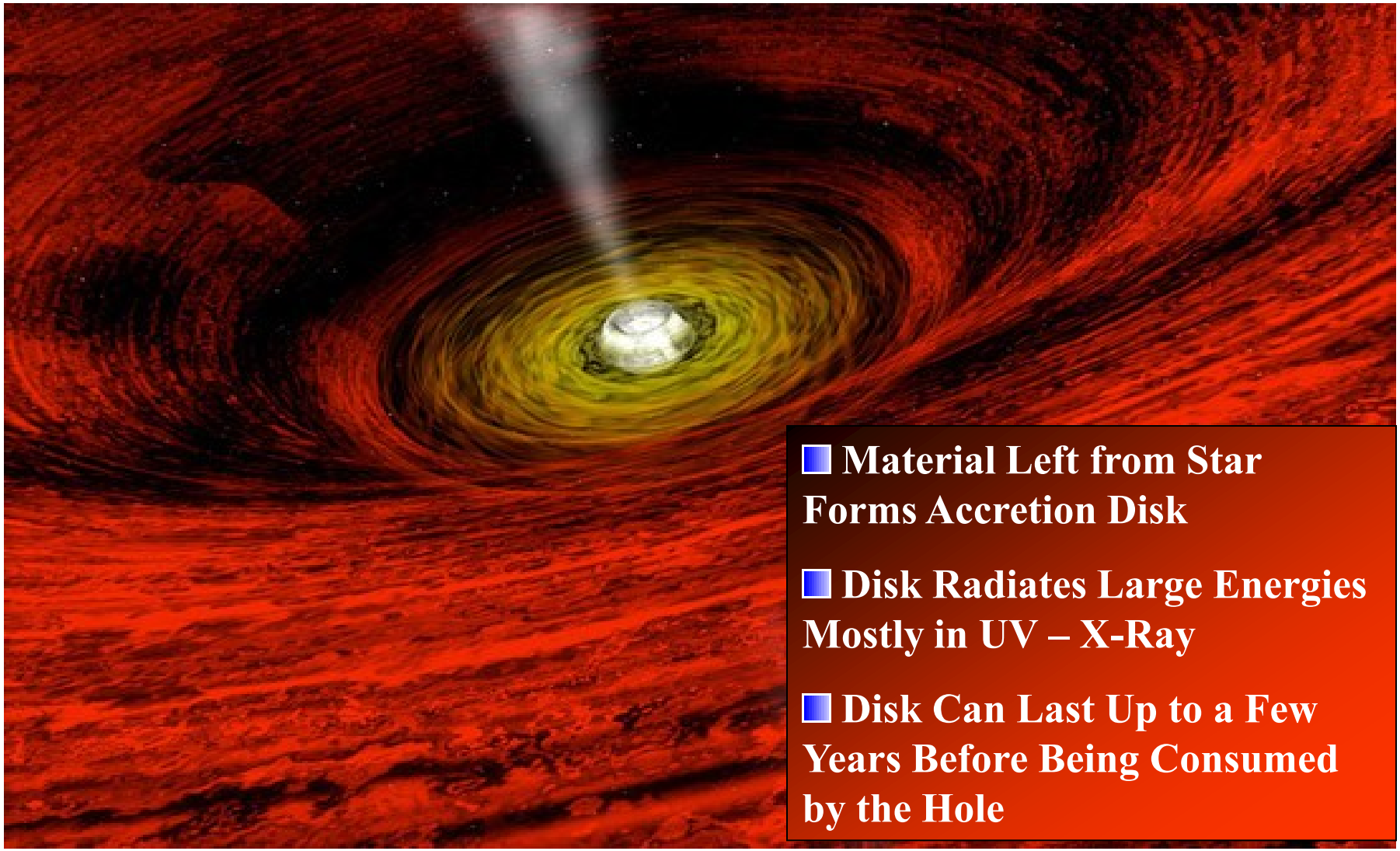
- Friction and Heat
- Active Galactic Nuclei
- Thermal Radiation
- Gamma-Ray Bursts

The Stellar Disruption Event



- Velocity Dispersion – Capture of Star Inevitable
  - Once Every 10,000 Years in an Average Galaxy
- ~Half of Star is Ejected, ~Half of Star is Accreted

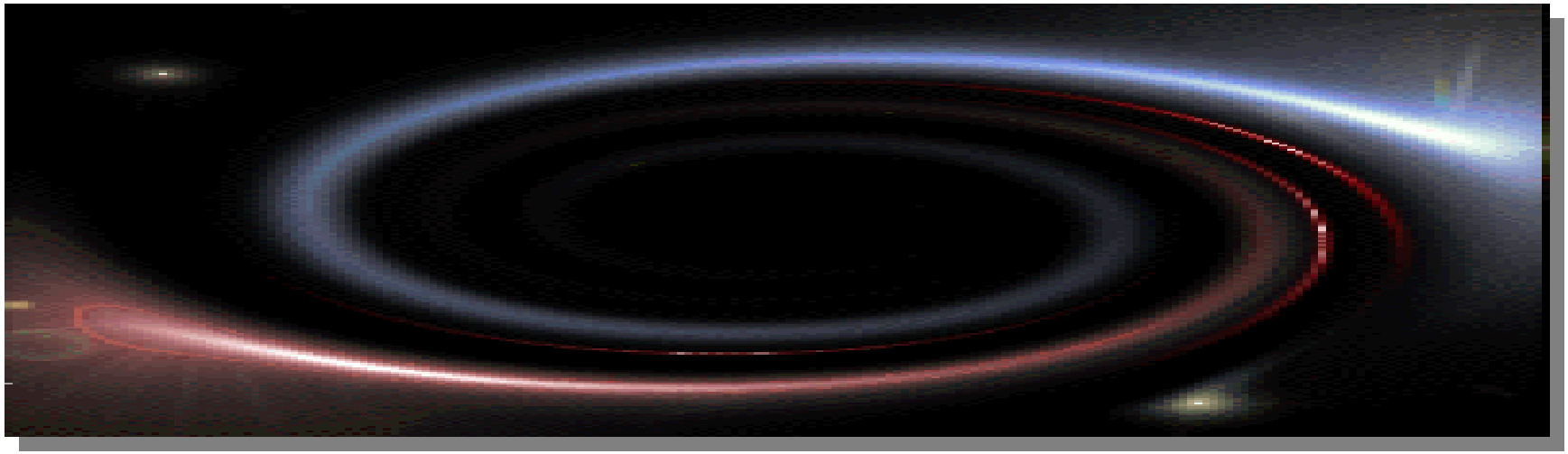
The Flare



- Material Left from Star Forms Accretion Disk
- Disk Radiates Large Energies Mostly in UV – X-Ray
- Disk Can Last Up to a Few Years Before Being Consumed by the Hole

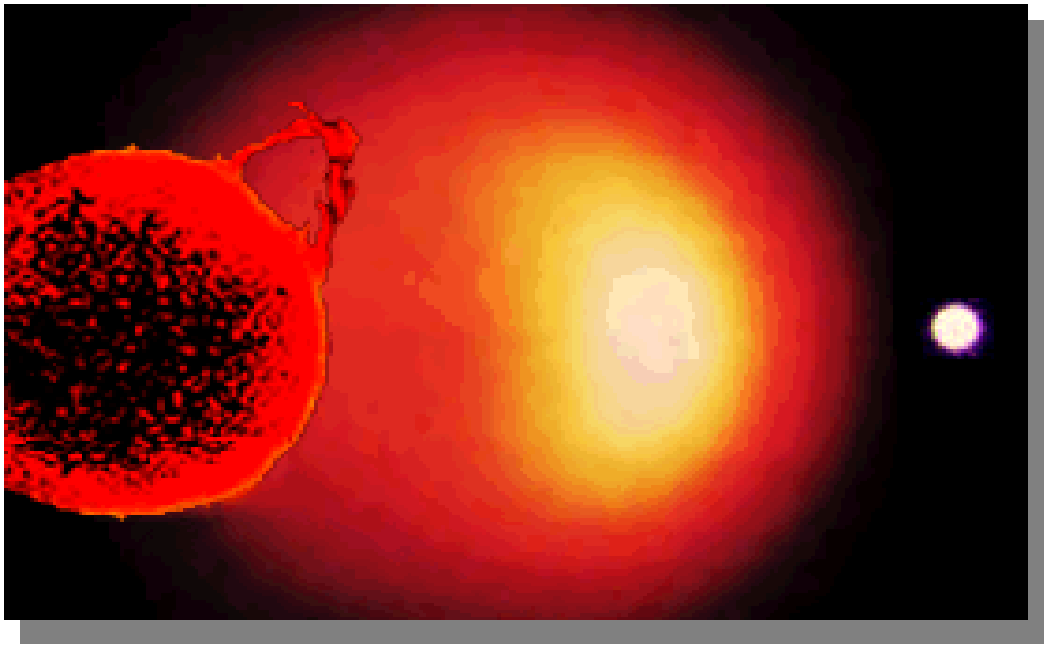
The Wind

- The material that gets blown off, does so at a very high velocity
- Energy of this stellar wind is equal to the that from a supernovae
- It can cause shockwaves in the surrounding ISM, as well as create shells



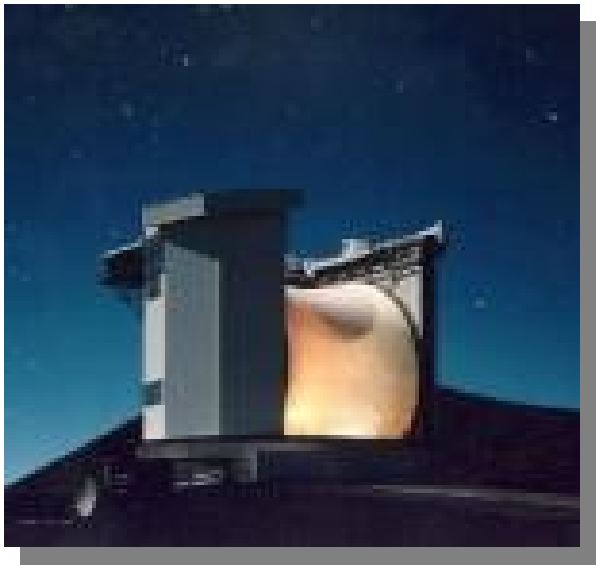
Stellar Remnants

- When a large red giant star is disrupted, there is a possibility its core survives, and is ejected very fast away from the galactic center
- This core star would be a Helium star much like a White Dwarf



Observations

- Flare
  - Light Frequency Problem?
  - Wind and Atmosphere to the Rescue
  - How many??
  - UCSB Lubin Group
- Core Remnants
  - Live Longer than Flare
  - Harder to See – HST, Keck
  - Very Similar to Standard White Dwarfs
  - Circular Patterns




The End
Any Questions?