

## Accretion

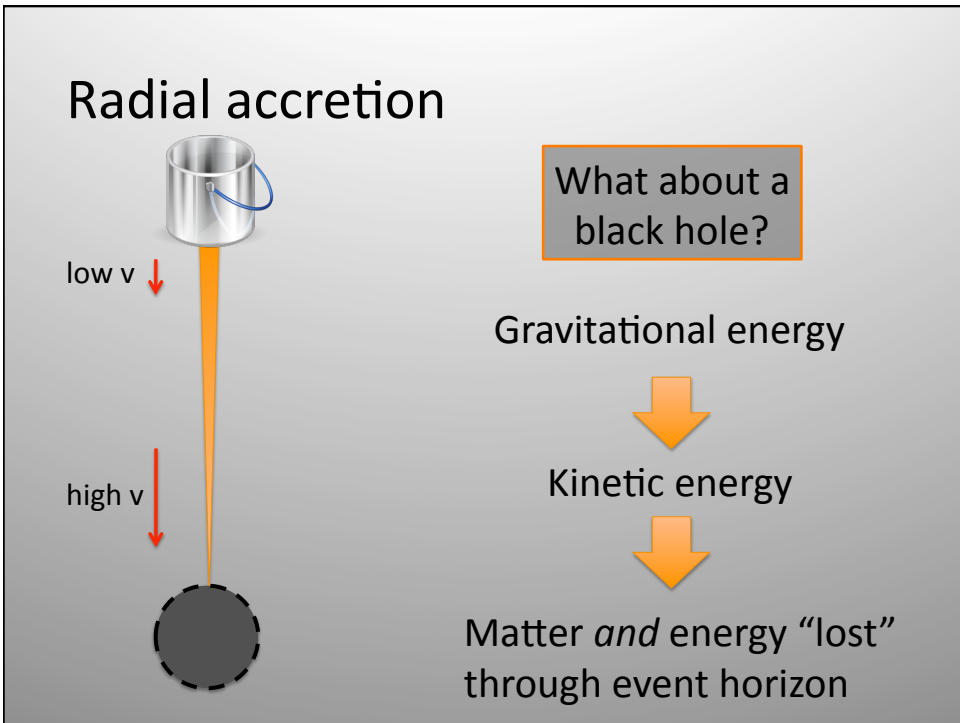
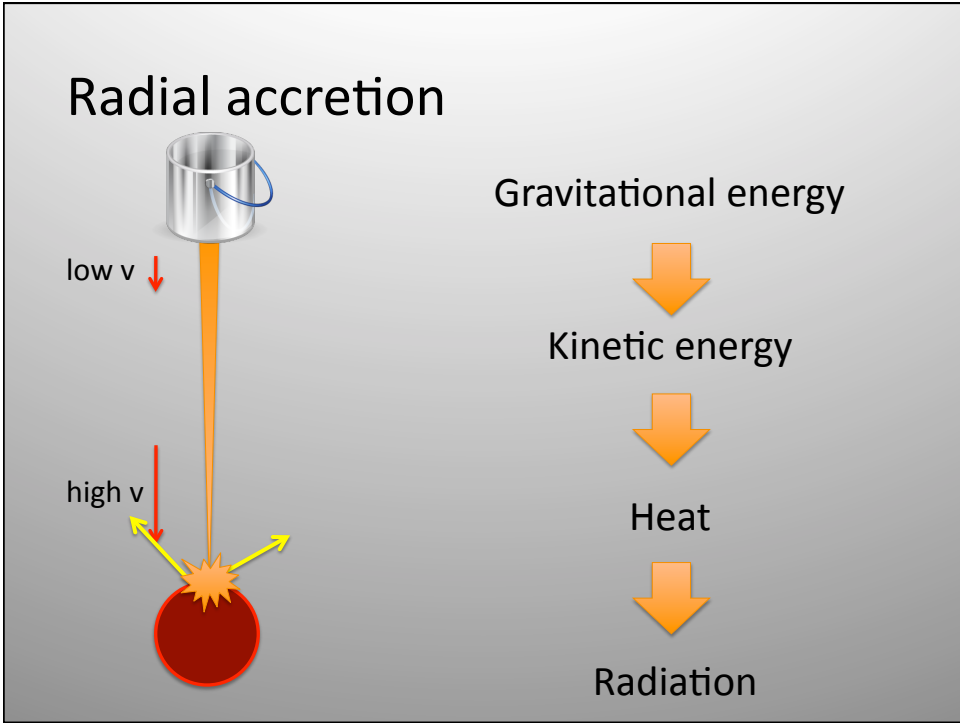
X-ray binaries: gas flowing from a “normal” star onto / into a neutron star or black hole

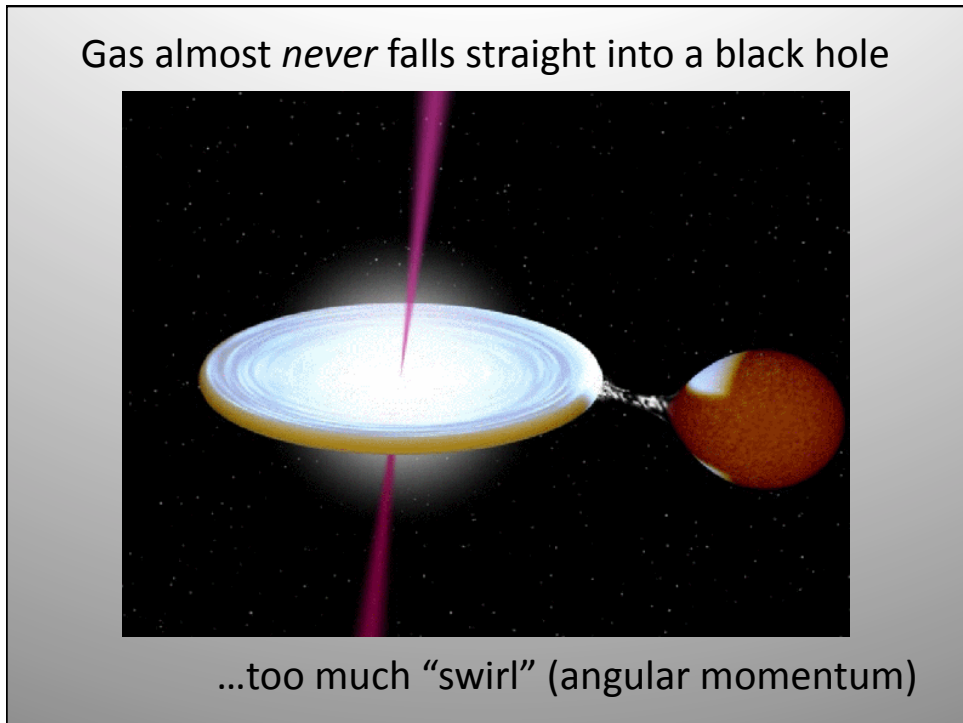
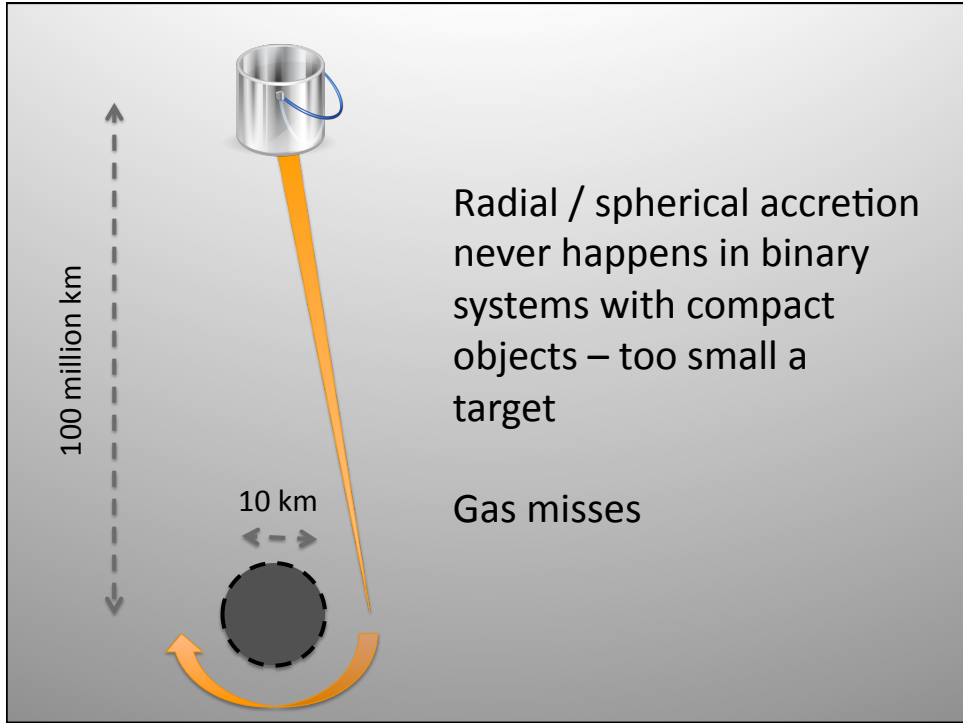
- how does this happen?
- why does it produce X-rays?

## Radial accretion

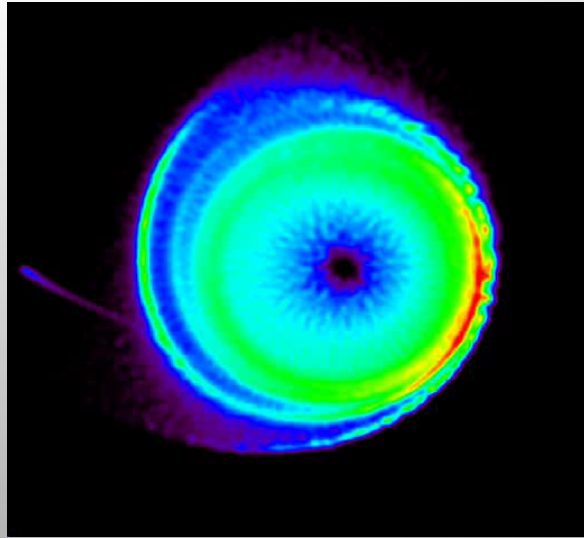


Drop gas from great distance directly onto surface of a neutron star – what happens?



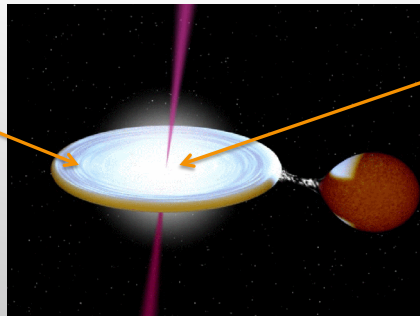


Forms an  
*accretion*  
*disk*



*Simulation: James Murray*

“low”  
velocity,  
lots of  
angular  
momentum

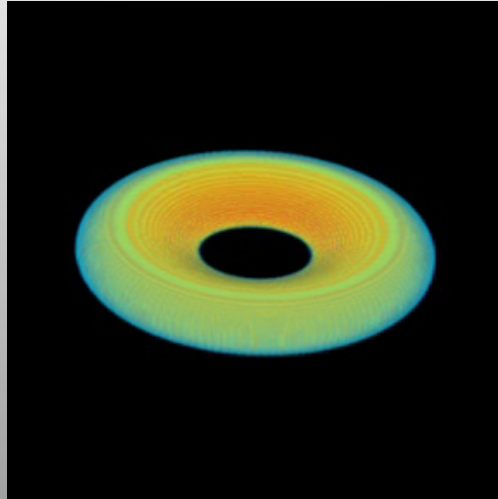


high velocity,  
less angular  
momentum

Gas must give up angular momentum to spiral  
toward the black hole

“Friction” (viscosity) between gas orbiting at  
different speeds transfers angular momentum,  
also generates *heat*

“Friction” thought to be due to tangled magnetic fields within the disk



*Simulation: John Hawley*

Flow of energy in an accretion disk

