

Einstein, for Experts and Beginners

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AAPF Symposium

Merging BH-NS binaries

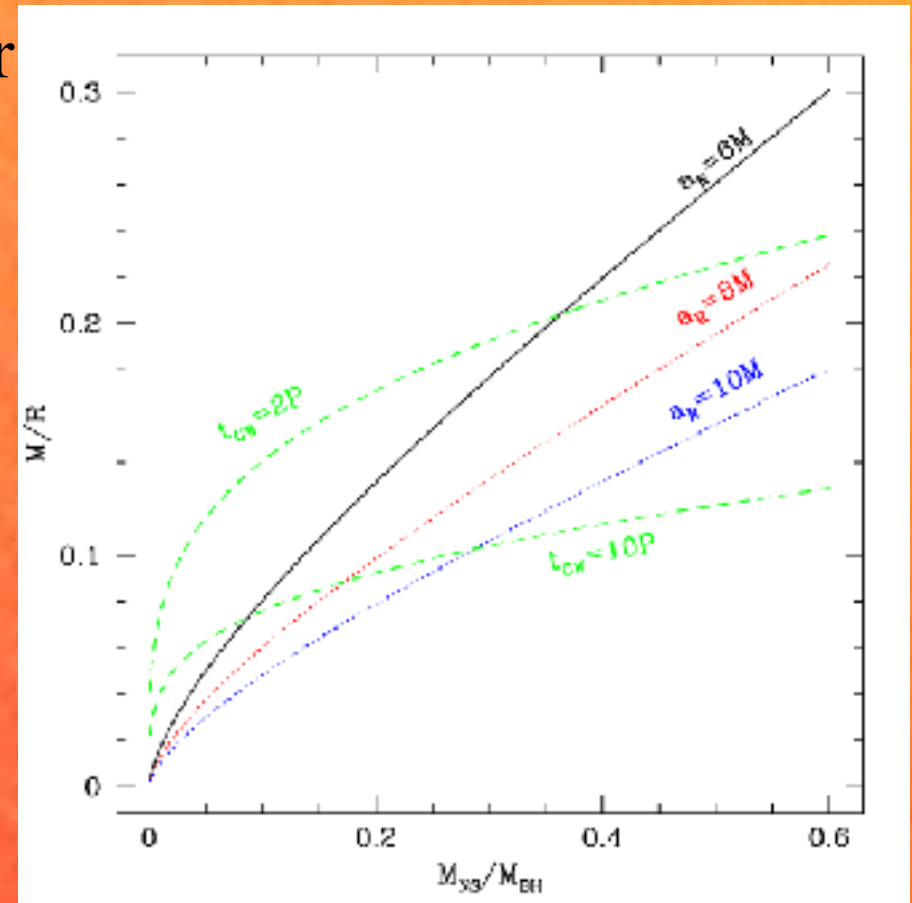
- Relativistic binaries projected to be a primary source of GW detections
- GRB050509b may be located 35kpc from center of elliptical with low SFR -> binary compact object merger
 - 3 other mergers in galaxies with low SFR
- More massive than NS-NS-> seen at greater distance (10-100/yr for LIGO II; Belczynski et al. 2002, Voss +Tauris 2003)
- May shed light on internal structure of NS, behavior of matter at high density
 - Violent disruption process exposes interior of NS for study

Description of method

- We assume an extreme mass ratio (Baumgarte et al.)
 - $M_{\text{BH}} \gg M_{\text{NS}}$ \rightarrow BH is fixed in place
 - BH is more than a background: spacetime around NS is dynamical and self-consistent field solution
- Conformally Flat gravity (Isenberg; Wilson+Mathews):
 - Exact for spherically symmetric systems (Schwarzschild)
 - Einstein's Equations reduce to 5 linked non-linear elliptic eqs.
 - Time-symmetric scheme: gravitational waves by hand

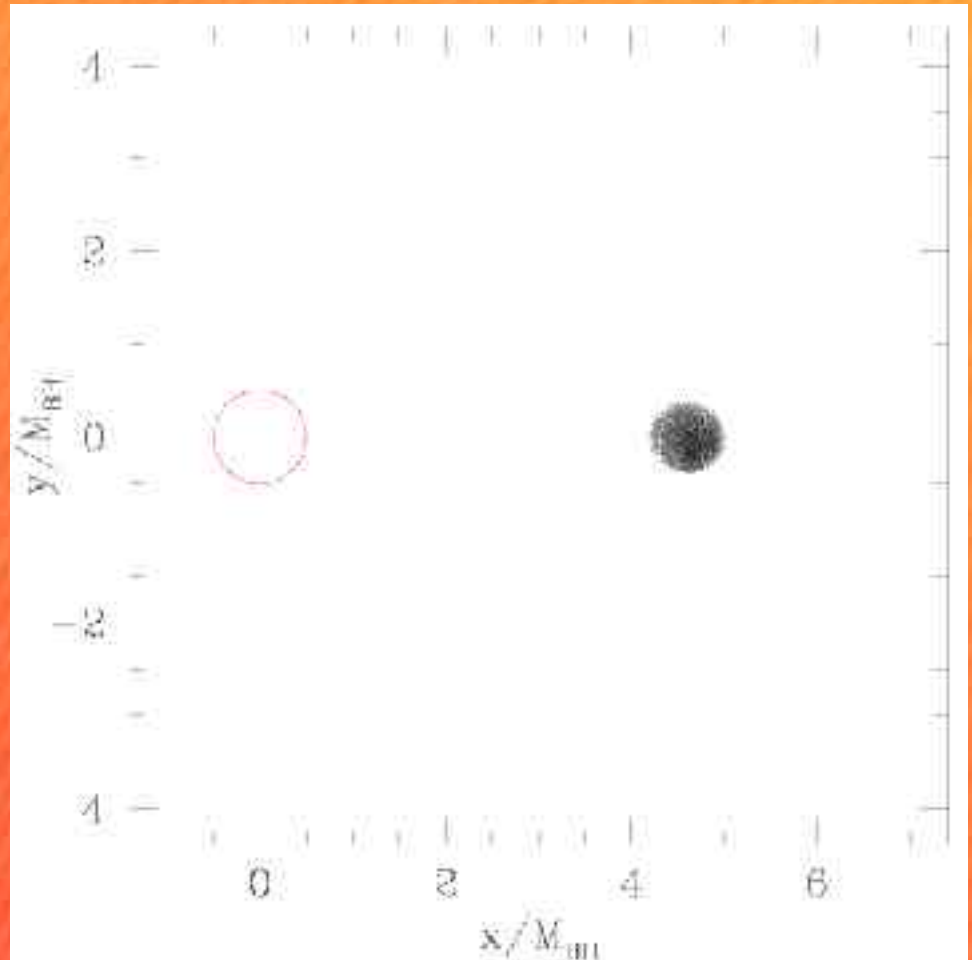
Disruption at the ISCO

- Tidal disruption and mass transfer vs. gravitational radiation
- Tidal gravity at ISCO is *weaker* for more massive BH
- For physical value of $M/R=0.15$, disruption at ISCO for $M_{\text{BH}} \sim 3M_{\text{NS}}$
- Disruption near ISCO does not necessarily imply NS gets swallowed whole...
...just mostly whole.



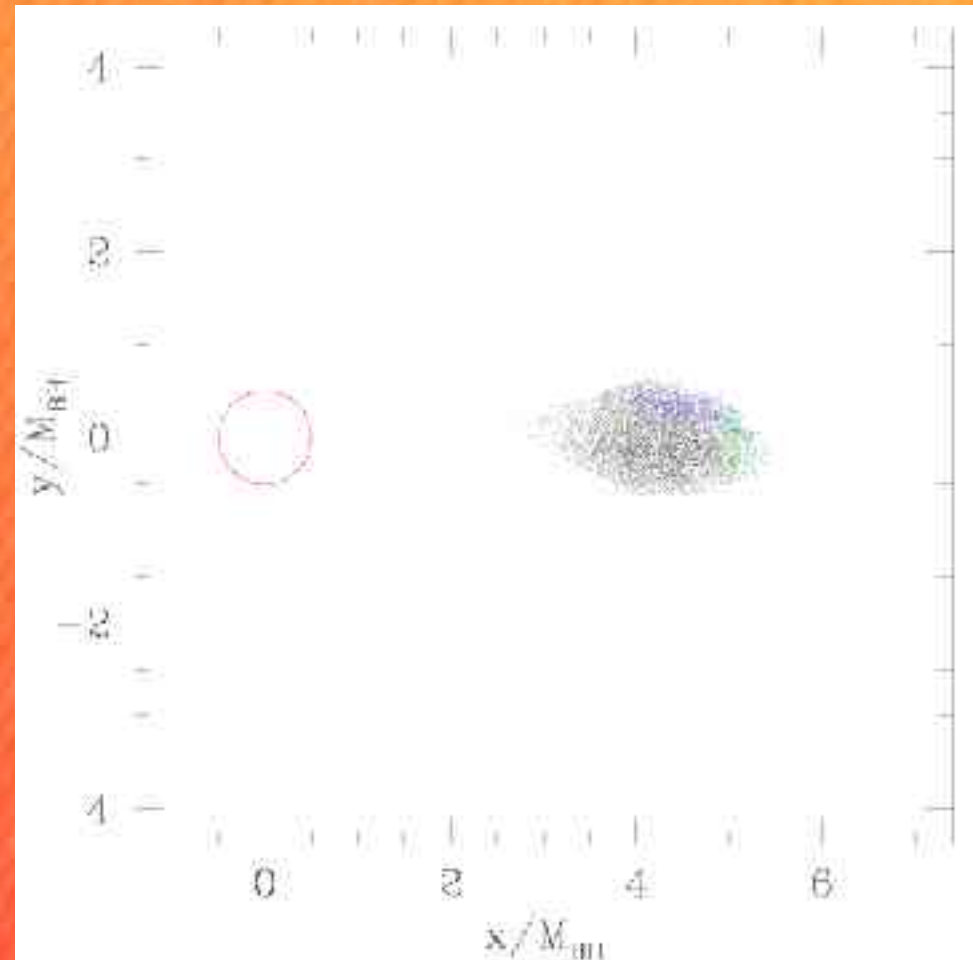
Compact NS models: $M/R=0.15$

- NS intact within ISCO
- Very little matter into an accretion disk
 - Poor GRB candidate
- Upper limit on BH mass for disk formation



Semi-compact NS models: $M/R=0.10$

- NS disrupts just within ISCO
- Some matter into accretion disk
 - $0.01 M_{\text{NS}}$ (?)
- GRB formation for low-mass BHs?



Einstein for Beginners

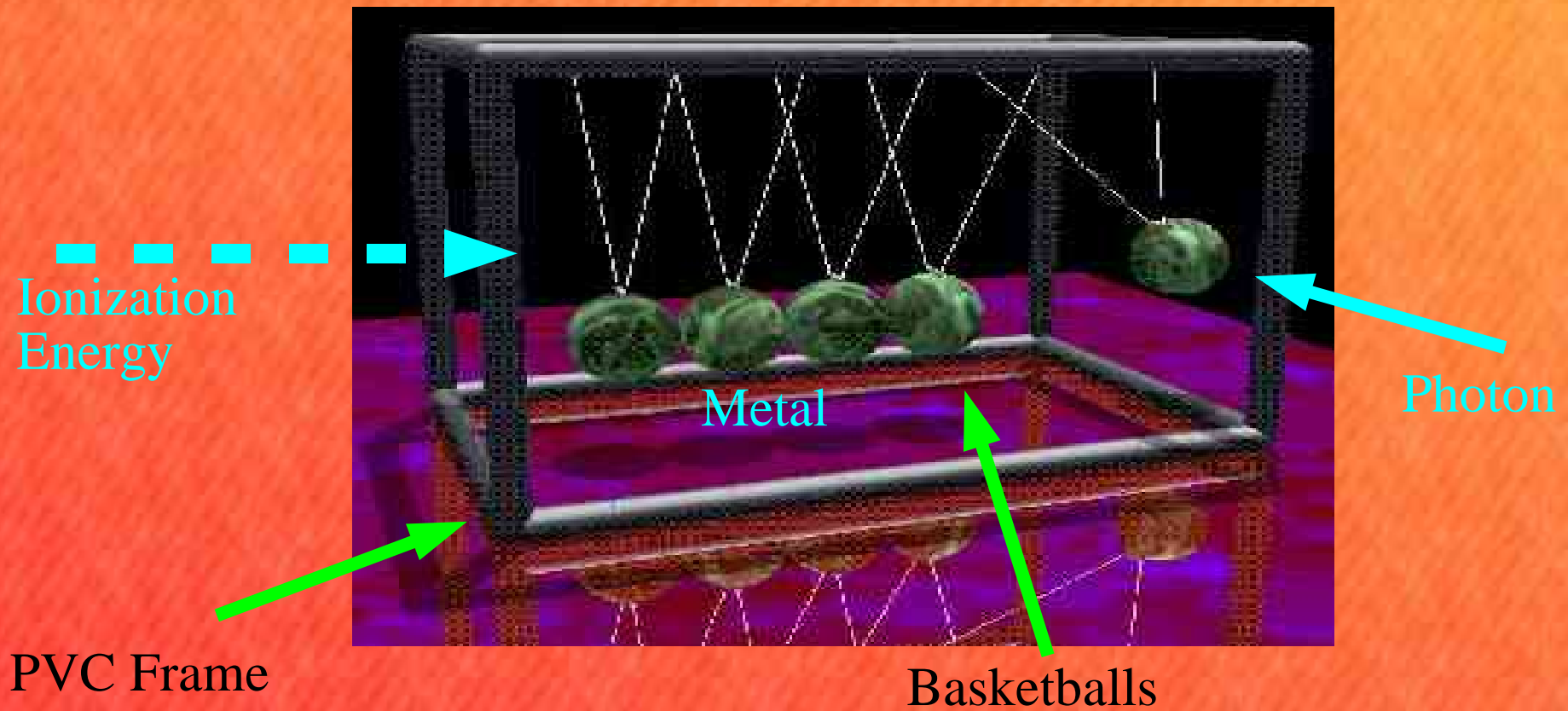
- Einstein day at the Orpheum Children's Science Museum
- Relativity by extremely crude, but correct, analogies
- Needs to include balloons



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The Photoelectric effect, with a little help from my friends

- Thanks to the UIUC Physics Van



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Public Service Announcements

- Estimated taxes for 4th quarter due Jan 17
- E-mail jfaber@uiuc.edu to
 - get on the AAPF mailing list
 - have something posted to the NSF AAPF website