Thursday 4/16/09

GW

Agenda

- Schedule Projects for Next week
- Observation Tuesday
- Gravitational Wave Astronomy
- Einstein's Messengers
- GW Lab

Schedule for Next Week

- **Tuesday:**
  - **Alicia** versus **Lucille:** Global Warming Caused by Mankind
  - **Melissa:** Won't be visiting/colonizing other planets
  - **Meagan:** Extraterrestrial Life Exists
  - **Krissy:** Creationism versus Evolution
- **Thursday:**
  - **Caitlin:** Stop Animal Testing
  - **William:** We should build on the moon
  - **Nick:** No Nuclear Power
  - **Jennifer:** Against Missile Defense

Gravitational Wave Astronomy

- Einstein's Theory surpassed Newton's
- Introduced time to gravity \(\rightarrow\) gravity waves
- GW unlike X-rays, Gamma rays
  - Electromagnetic radiation (light) has various bands
  - GW is entirely separate spectrum

Information Carried

- Large masses moving fast...strongest sources
- Once produced, GW hard to disturb...important for clear “pictures”
- Unlike EM, GW arise from central regions of astrophysical systems
- Very weak signals!

Effect of Passive GW

- Alternating stretching/pulling of space
- Like a wave on a pond...get weaker as they spread out
- Rulers change length...change in length proportional to total length
- Small changes...less than diameter of an atom for a meter stick!
- Because of this, detectors designed BIG!
Hope to learn…

• Periodic sources…compact binaries
  – Compact objects: neutron stars, white dwarfs, black holes
• Burst sources
  – Merging binaries
  – Supernovae
  – AGN, GRB, etc…BH engines
• Totally unexpected stuff…like Galileo pointing the telescope up!

Attempts to Measure

• Indirect:
  – Hulse & Taylor—energy loss from GW; Nobel Prize
• Direct:
  – Resonant Bar—somewhat controversial
  – Interferometers
    • LIGO and ilk on Earth
    • LISA (proposed): space based