

“We all know that the real reason universities have students is to educate the professors. But, in order to be educated by the students, one has to put good questions to them. You try out your questions on the students. If there are questions that the students get interested in, then they start to tell you new things and keep you asking more new questions. Pretty soon you have learned a great deal.”

-- John Archibald Wheeler (Physicist)

## Theorem: To Really Understand Something, Explain It To Somebody Else

- Corollary 1: Teaching is the biggest swindle there is: the “teacher” always learns more than the “students”
- Corollary 2: When you understand some topic better than a classmate, explain it to them
  - Your classmate will learn
  - You will learn even more! **In-Class discussions**  
**Tutorial activities**  
**Study groups**

## 2006 Nobel Prize in Physics

John C. Mather and George F. Smoot (USA)

Experimental (laboratory) work observing the cosmic microwave background (CMB) radiation

CMB is a remnant of the Big Bang. The Big Bang occurred ~15 Giga-Years ago

Their observations looked back to when the universe was ~380,000 years old

## Drop-In Centre

- A place where you can ask any question about Physics
- McLennan MP202
  - 2<sup>nd</sup> Floor just over the coffee stand on the 1<sup>st</sup> floor
- Open most days 10 AM – 2 PM
  - Hours increased before Tests
  - Schedule via the PHY138 home page
- Begins Tuesday October 10

## Reminders

- No class Monday October 9 – Thanksgiving
- Pre-Class Quiz on Chapter 9 due **Wednesday** October 11 by 10 AM
- Labs begin on Tuesday October 10 with P0202
- My office hour today is cancelled

## Last Time

- Finished projectile motion
- Uniform circular motion
  - Angular displacement  $\Delta\theta$
  - Angular velocity  $\omega = \Delta\theta/\Delta t$
  - RTZ coordinate system
  - $v_r = 0$ ;  $v_t = \text{constant} \neq 0$
  - $a_r = v_t^2/r \neq 0$ ;  $a_t = 0$
  - Circular orbits

## Today

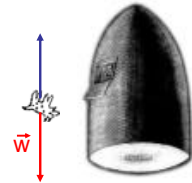
- Finish Chapter 7: Circular Motion
  - §7.5 – Fictitious Forces
  - §7.6 – Nonuniform Circular Motion
- Chapter 8 – Newton's Third Law

## Jules Verne, "From the Earth to the Moon" (1865)

Inertial Reference Frame:

$$y_{\text{dog}} = v_i t + \frac{1}{2} a_y t^2$$

$$a_y = -w / m$$



### Linear Motion

$a = \text{constant}$

$$s_f = s_i + v_i t + \frac{1}{2} a t^2$$

$$v_f = v_i + a t$$

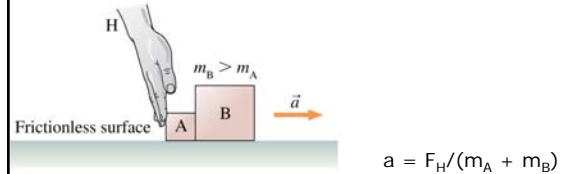
### Rotational Motion

$\alpha \equiv \frac{a_t}{r} = \text{constant}$

$$\theta_f = \theta_i + \omega_i t + \frac{1}{2} \alpha t^2$$

$$\omega_f = \omega_i + \alpha t$$

### Figure 8.13



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$$F_{A \text{ on } B} = m_B F_H / (m_A + m_B), \text{ to right}$$

$$F_{B \text{ on } A} = m_B F_H / (m_A + m_B), \text{ to left}$$