Introduction

"I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me."

-- Newton

2005 Nobel Prize in Physics

Roy Glauber (USA), John Hall (USA) and Theodore Haensch (Germany)

Quantum Optics

Quantum Optics Research Group at U of T:
Plus: 13 Research Associates and 29 Graduate Students

Announcements

☐ The PHY138 Mechanics home page neglected to list MP Problem Set #6 – Chapter 13
☐ It does now
  ■ Due Friday October 28 by 5 PM
☐ Drop-In Centre begins Tuesday next week:
  ■ MP200 (2nd floor over the coffee stand)
  ■ Monday – Thursday 10 AM – 2 PM
  ■ Week before the test: Monday – Thursday 10 AM – 5 PM

FYI

☐ Pre-Class Quiz Chapt 7 – 8
  ■ Due last Monday, October 3
  ■ The Newton’s 3rd Law Question had a missing minus sign until mid-week.
  ■ Everybody gets full credit for this question
  ■ For the remaining 3 questions:
    ■ Mean = 86.7%

Last time

☐ Galilean Relativity
☐ Tarzan
☐ Uniform Circular Motion
  ■ Angular velocity $\omega = d\theta/dt$
  ■ $r$-$t$-$z$ Coordinate System
  ■ $v$, constant; $a_\theta = 0$; $a_r = v^2/r$
☐ Fictitious forces
  ■ Arise whenever we try to analyse in a non-inertial reference frame.

Today

☐ §7.6 – Nonuniform Circular Motion
  ■ This is what Tarzan is doing
☐ Chapter 8 – Newton’s 3rd Law
  ■ A series of related examples
**Linear Motion**

\[ a = \text{constant} \]

\[ s_t = s_i + v_i t + \frac{1}{2} a t^2 \]

\[ v_t = v_i + at \]

**Rotational Motion**

\[ \alpha = \frac{\Delta \theta}{\Delta t} = \text{constant} \]

\[ \theta_t = \theta_i + \omega_i t + \frac{1}{2} \alpha t^2 \]

\[ \omega_t = \omega_i + \alpha t \]

---

**Figure 8.13**

\[ a = \frac{F}{(m_A + m_B)} \]

\[ F_{A_{on B}} = m_B F / (m_A + m_B), \text{ to right} \]

\[ F_{B_{on A}} = m_B F / (m_A + m_B), \text{ to left} \]

---

**2 Blocks Glued Together**

\[ a = \frac{F}{(m_A + m_B)} \]

\[ F_{A_{on B}} = m_A F / (m_A + m_B), \text{ to left} \]

\[ F_{B_{on A}} = m_A F / (m_A + m_B), \text{ to right} \]

---

**Massless String S**

\[ T = F_{S_{on B}} = m_A F / (m_A + m_B), \text{ left} \]

\[ T' = F_{S_{on A}} = m_A F / (m_A + m_B), \text{ right} \]

---

**Mass of String \( m_S > 0 \)**

\[ F_{B_{on S}} \neq - F_{A_{on S}} \]

\[ T = F_{S_{on B}} = (m_A + m_B)F / m_{tot}, \text{ left} \]

\[ T' = F_{S_{on A}} = m_A F / m_{tot}, \text{ right} \]

\[ T > T' \]