

Introduction

Newton on his bitter rival Hooke:

"This carriage towards me is very strange & undeserved, so that I cannot forbear in stating that point of justice to tell you further ... he should rather have excused himself by reason of his inability. For tis plain by his words he knew not how to go about it."

Syllabus Change

- Drop §13.8 – *Rolling Motion*
 - Include the *Angular Velocity Vector* sub-section of §13.9.
 - The rest of this section continues to be dropped
 - Mechanics Home Page and Syllabus pdf have been updated
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Coming Up

- This week: finish Chapt. 11 *Work* and discuss Chapt. 13 *Rotation of a Rigid Body*
 - Monday October 31: review for the test
 - The pdf of the PowerPoint will be released this Wednesday
 - Tuesday November 1, 6 – 7:30PM: Test
 - Wednesday November 2: Dr. Harlow & I will discuss a laboratory topic: *Error Analysis*
 - Monday November 7: Waves Section with Dr. Harlow begins
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Test #1

- Reminder: if you have a conflict with Tuesday November 1, 6:00 – 7:30 PM today is the last day to see Dr. Savaria or Ms. Seeley in MP129
 - Format set:
 - 8 Multiple-Choice questions worth 8 marks each
 - 1 Long Answer with 6 Parts (36 marks total)
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Last Time 1/2

- Work $w = \int_{s_1}^{s_2} \vec{F} \cdot d\vec{s}$
 - Dot Product
 - $W_{\text{net}} = \Delta K$ always
 - Springs
 - $F_s = -ks$
 - $U_s = \frac{1}{2} ks^2$
-

Last Time 2/2

- Conservative Forces (gravity, springs):
 - W independent of path
 - Potential for work to be done: potential energy U
 - $W = -\Delta U$
 - $E_{\text{mech}} = K + U$ conserved
 - $F_x = -dU/dx$
 - Non-Conservative Forces (friction):
 - W depends on path
 - U can not be defined
 - Isolated System: E_{tot} always conserved
 - Heat is a form of energy (Mayer, 1842): observed the color of blood of people in Europe and Indonesia
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How Strong Is My Belief in Conservation of Energy?



Today

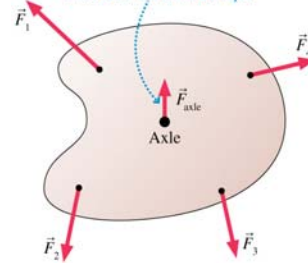
- Power
 - Basal Metabolism
 - Rotational Kinematics
 - Centre of Mass
 - Torque
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Metabolism

- Basal (Resting) Metabolic Rate (bmr)
 - Body radiates energy at a rate: dE/dt
 - At equilibrium: $bmr = dE/dt$
 - Surface area A : $dE/dt = kA$
 - Dimensional analysis for mass m :
 $bmr = c m^{2/3}$
 - Experimentally: $bmr = c m^{3/4}$
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Figure 13.18

The axle exerts a force on the object to keep $\vec{F}_{net} = 0$. This force does not exert a torque.



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