November 17, 2010 Physics 121 Prof. E. F. Redish

- **Theme Music:** Blood, Sweat, and Tears
  Spinning Wheel
- **Cartoon:** Bill Watterson
  Calvin & Hobbes

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ILD 6: Rotational Kinetic Energy

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Rotational Energy

- When an object is moving, it has kinetic energy. When an object is rotating, each part of it is moving so it has kinetic energy.
- For each piece of the object rotating about an axis with an angular velocity ω

$$v_i = r_i\omega$$

$$\tfrac{1}{2}m_i v_i^2 = \tfrac{1}{2}m_i\left(r_i\omega\right)^2 = \tfrac{1}{2}(m_i r_i^2)\omega^2$$

$$KE_{rot} = \sum_i \tfrac{1}{2}(m_i r_i^2)\omega^2 = \tfrac{1}{2}\left(\sum_i m_i r_i^2\right)\omega^2 = \tfrac{1}{2}I\omega^2$$

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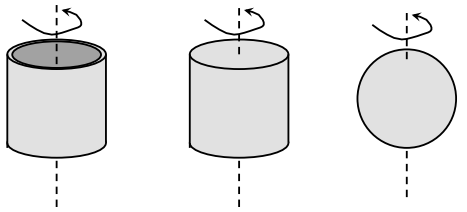
Moments of Inertia



$I = MR^2$ $I = \frac{1}{2}MR^2$ $I = \frac{2}{5}MR^2$