Physics 121 – October 28, 2009

This Week:

- Finish reading Chapter 11 – Angular Momentum
- Homework problems due **Friday, Oct 30**
  Chap 11, # 23, 27, 28, 46, 47, 51
- MP Assignment #9 (more rotation) to be completed by **Sunday, Nov 1** at 11 pm.

Angular Momentum

L = **r** x **p** (single mass)

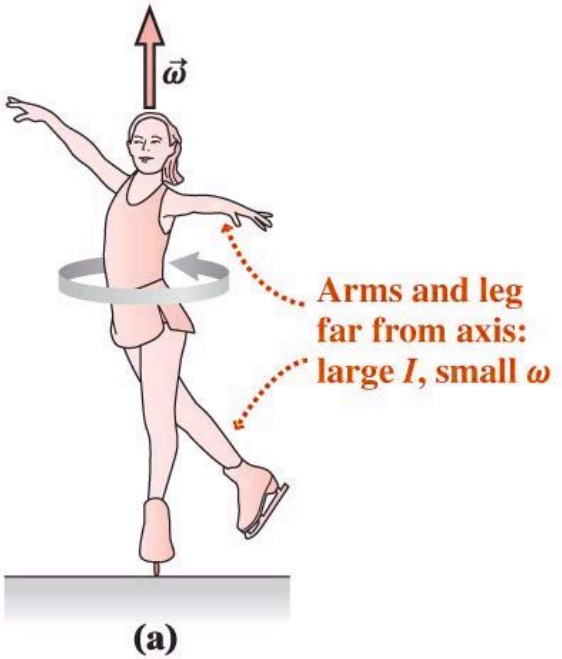
L = Iω (rotating solid)

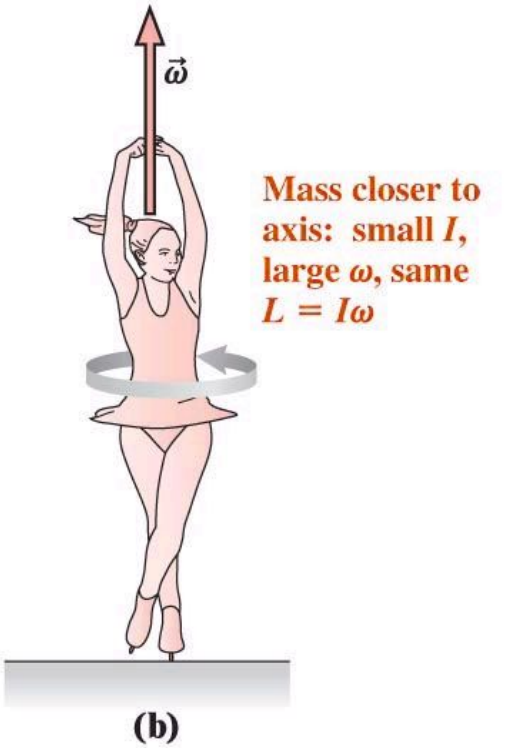
$$\frac{d\vec{L}}{dt} = \vec{\tau}$$ (rotational analog, Newton's 2nd law)

Special cases:

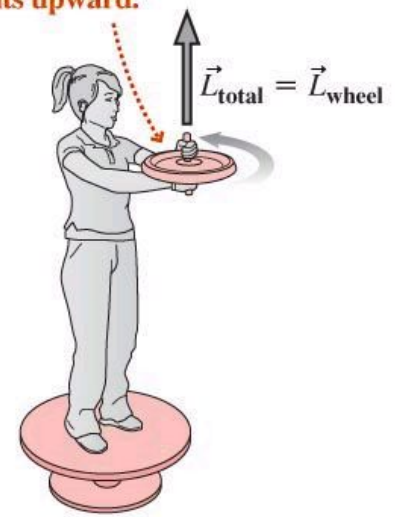
• If τ = 0, then **L** = constant
(see skater at right, turntable demonstration)

• If τ is always perpendicular to **L**, then the *magnitude* of **L**=constant, but *direction* of **L** changes with time (gyroscope)



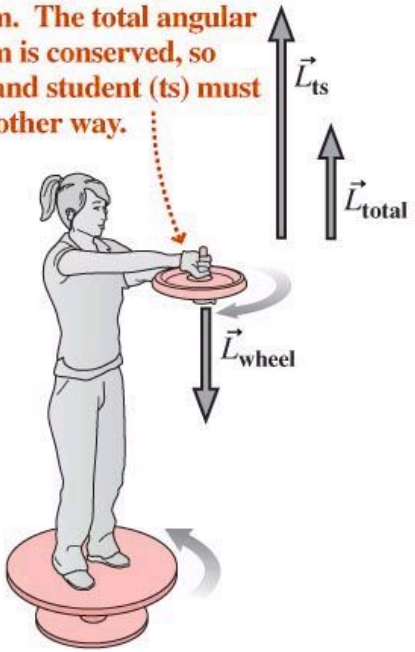


The student stands on a stationary turntable holding a wheel that spins counterclockwise; the wheel's angular momentum points upward.



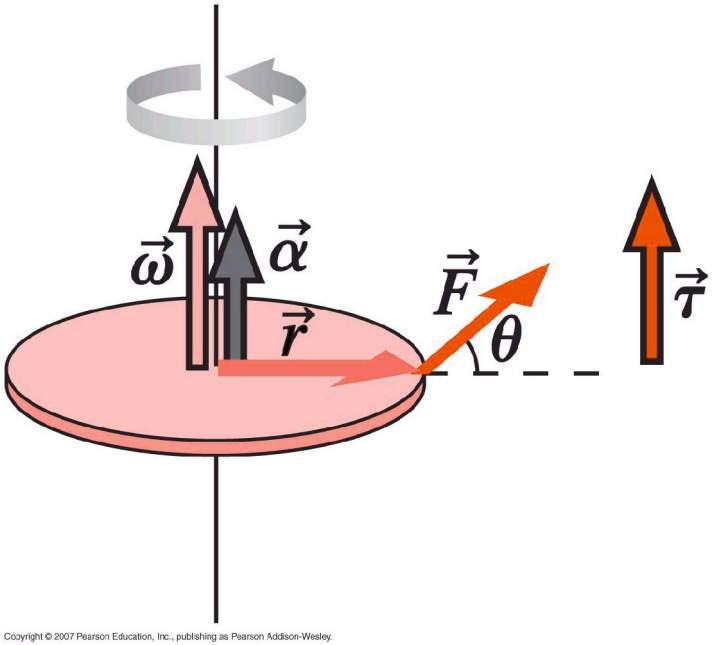
(a)

She flips the moving wheel, reversing its angular momentum. The total angular momentum is conserved, so turntable and student (ts) must rotate the other way.



(b)

Iclicker: A flywheel is rotating with angular velocity ω on a frictionless shaft of negligible mass. A force is applied to the rim of the flywheel in the direction shown in the figure. What is the effect of this force?



A. Nothing – **L** is constant, the wheel continues to rotate at ω

B. The wheel rotates at ω but the axis of rotation tilts into the page

C. The wheel must have decreasing **L**, hence decreasing ω

D. The wheel must have increasing **L**, hence increasing ω