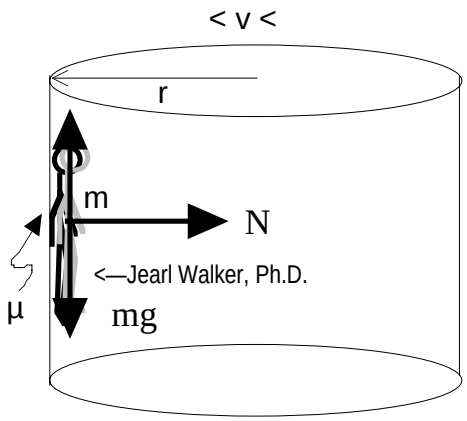
PhyzJob: The "Rotor"
a.k.a. The "Gravitron," "Vomitorium," or "I'm-Not-Getting-on-That-Thing"

FELIX



The Rotor is an amusement park ride that consists of a cylindrical chamber that can be made to spin. Riders stand with their backs against the wall as the chamber rotates faster and faster. Then the floor drops away from the riders' feet. After a brief eternity, the floor is raised and the chamber mercifully slows to a stop.

For the questions below, assume the speed of the person in the chamber is *v*, the person's mass is *m*, and the chamber's radius is *r*.

a. What force pays the centripetal force bill?

Normal

b. What force prevents the person from falling down the side of the chamber?

Friction

c. How big is the normal force (chamber wall on person)?

$N = mv^2/r$

d. How big is the friction force (chamber wall on person)? Write *two* expressions.

$f = \mu N$ (definition)
$f = mg$ (for no slipping)

e. Determine an expression for the minimum coefficient of friction μ required so that the friction force will hold riders up when their speed is *v* and the radius is *r*.

$f = \mu N = mg \qquad N = mv^2/r$
$mg = \mu mv^2/r$
$\mu = gr/v^2$

f. If r=2.0m and v=7.0m/s when the floor drops away, what is the minimum coefficient of friction μ?

$\mu = 9.8 m/s^2 \cdot 2.0m/(7.0m/s)^2$
$\mu = 0.4$

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