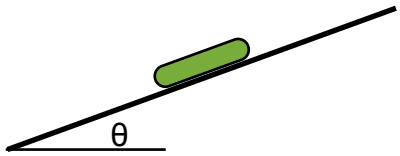
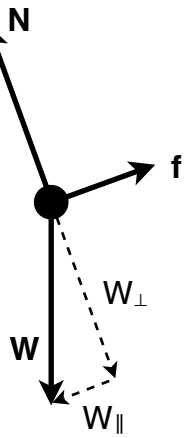
Friction problem: Egg in pan

The coefficient of static friction between teflon and scrambled eggs is about 0.04.
What is the smallest angle from the horizontal that will cause the eggs to slide across the bottom of a teflon-coated pan?

Solution: Free-body diagram when egg just starts to slip





Resolve into components:

perpendicular to pan	$W_\perp = W \cos\theta$
parallel to pan	$W_\parallel = W \sin\theta$

When the egg is just about to slip, there is no net force in either direction, so

perpendicular to pan	$N - W_\perp = 0$	(1)
parallel to pan	$f - W_\parallel = 0$	(2)

Equation (1) ⇒ $N - W\cos\theta = 0$

so $\cos\theta = N / W$

Equation (2) ⇒ $\mu_s N - W\sin\theta = 0$

so $\sin\theta = \mu_s N / W$

Now $\tan\theta = \sin\theta / \cos\theta = \mu_s N / W \times W / N$

$= \mu_s = 0.04$

so $\theta = \tan^{-1}(0.04)$

$= 2.3°$