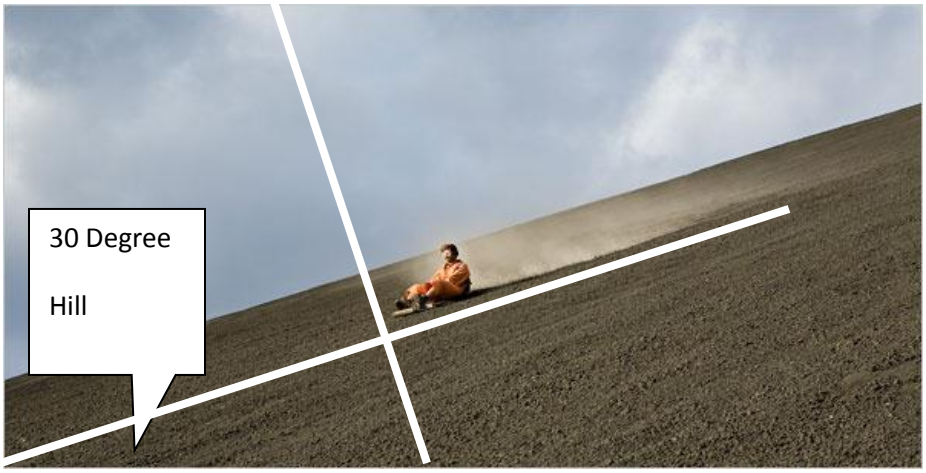
NEWTON'S 2ND LAW

Unit 6,7 & 8 John P. Cise , Professor Of Physics,

Austin Com. College, Austin Tx. 78701 & New York Times, April 19, 2009 by Laura Siciliano-Rosen

HEADS UP

A Sport Erupts on a Live Volcano in Nicaragua



Scott B. Rosen for The New York Times

THERE'S nothing quite like the sudden silence one experiences midway through the descent down a roughly ***1,600-foot volcanic slope***, having just somersaulted out of the pebble-scraping, air-rushing trajectory previously occupied by you and your volcano board. Boarders hurtle down the active volcano's bald, steep slope atop a sled like piece of plywood, at speeds of up to 50 miles per hour. It's hot, dusty, a little scary — and crazy enough to be fun.

Cerro Negro is accessible from León, a colonial city historically known as a center of left-wing intellectualism that is about 15 miles southwest of the ***roughly 2,388-foot mountain (the height can vary from eruption to eruption, experts say).*** In February, my husband, Scott, and I decided it was too unusual to pass up. Climbing a volcano was one thing, but sledding down its slope? That's a story for the grandkids. Cerro Negro is the youngest volcano in Central America, and like a rambunctious youth, it's active. Born in 1850, it has erupted over 20 times. At the volcano's base, we were handed boards and a cloth bag containing a jumpsuit and goggles. The steep 45-minute climb up the cone's rocky backside, for which we All too soon it was go time. We clumsily pulled on the oversize orange jumpsuits and gathered for Ms. Cope's brief, cheeky lesson on boarding techniques — how to balance, steer and control speed on the ***slope, which is 41 degrees at its steepest***, she said. Unlike a smooth, soft sandboarding descent, the ride was bumpy, the noise deafening. I hunkered down and began tapping my feet in the slope along the board's sides — a technique to slow speed — but I evidently dug in too hard. The result was like braking too suddenly on a bicycle: crash and burn.

At the bottom, Bigfoot's radar gun registered my end speed at a respectable 46 kilometers an hour — over 28 miles per hour. The whole run had taken just a few minutes, even with my fall. I stumbled over to the group, suddenly aware of a scratched hand and aching knee. Everyone was dazed but grinning, faces blackened by dust. Some of us bore scrapes on skin left exposed by the suits; volcanic pebbles aren't as forgiving as sand. Volcano boarding, it was agreed, isn't easy to master, but you can't help but want to try.

Introduction: Assume this 160 lb slider in the above picture slides down the slope at constant velocity. Assume the hill is a 30 degree slope. Questions: (a) Sketch the three forces acting on the slider? (b) Find the magnitude of the component of the weight down the hill in the negative X direction? (c) Find the magnitude of the frictional force acting on the slider and sled? (d) Find the magnitude of the normal force acting on the slider and sled? (e) Find the coefficient of friction between the slider board(the slider sits on this board) and the volcanic ash? Answers: (a) _____

(b) 80 lbs. (c) 80 lbs (d) 138.6 lbs (e) ~ 0.58 (no units)