



The MRSEC-Chile Exchange Program

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Special Thanks to Professor
Witten and Melva Smith



Brief program outline

- Choose a group to work with from the links on Prof. Witten's webpage:
 - <http://jfi.uchicago.edu/~tten/Chile/>
- Talk to professor Witten.
- Go to Chile.
- Do physics.
- Have fun.

Why you should go:

Partial list of interesting
research fields in Chile:

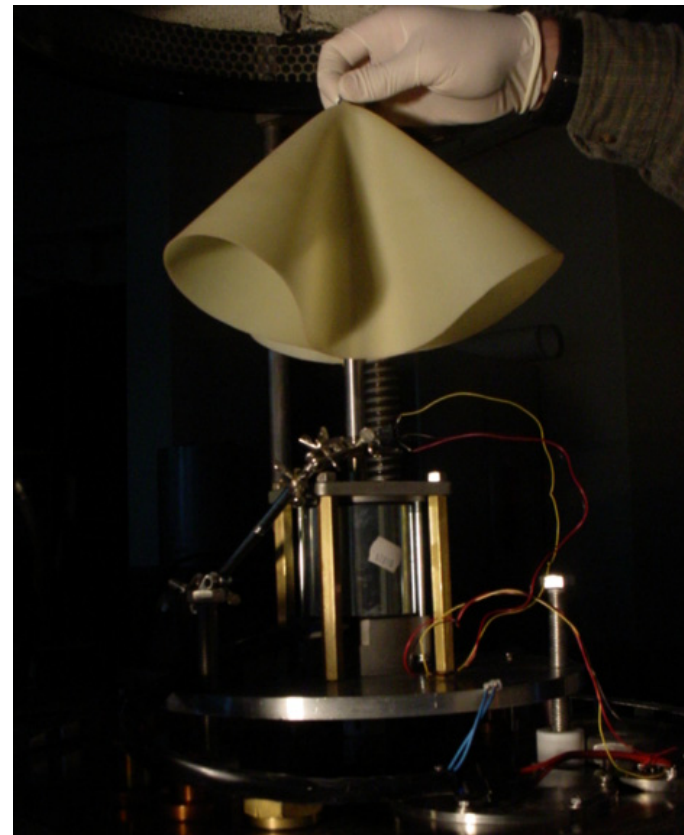
- Non-linear phenomena
- Continuum mechanics
- Granular flow
- Stochastic processes
- Surface physics

You DO, in fact, like to
have fun/cultural
experiences.



My project: Elastic sheets under gravity

- We sought to test a scaling law for the number of folds in a circular elastic sheet under the influence of gravity.
- Our scaling law came from energy considerations in the bending curvature, gravitational potential and [eventually] kinetic energies.



The Model

Considering only gravity (or $g \gg R\omega^2$):

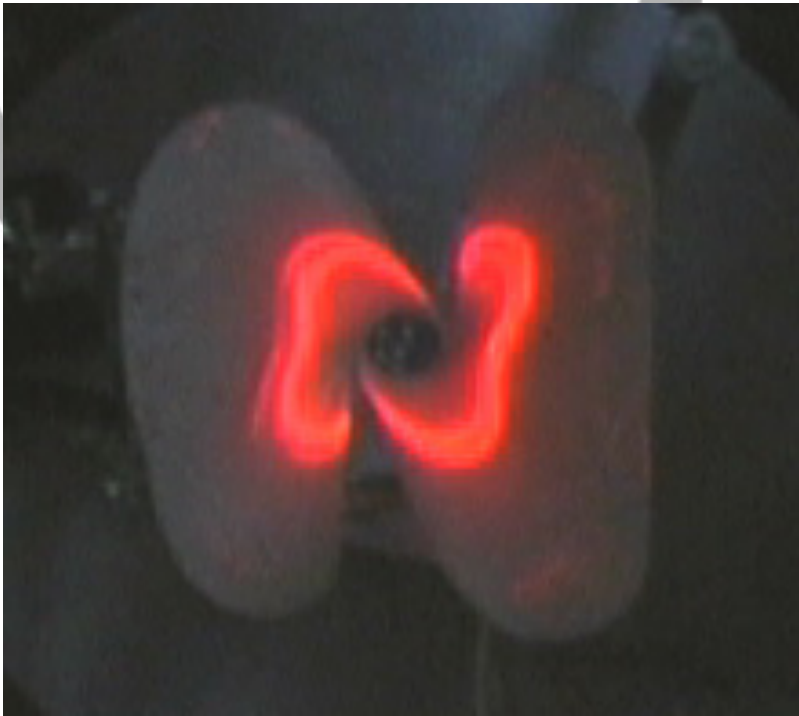
- Number of folds $\sim R^{3/4}(t\rho g/B)^{1/4}$

Rotating case ($g \ll R\omega^2$):

- Number of folds $\sim R\omega^{1/2}(t\rho/B)^{1/4}$

Where g =acceleration due to gravity, t =thickness, R =radius of sheet, ρ =density, B =bulk modulus, and ω =angular velocity.

Stumbling blocks and solutions



Self-contact

- Rotate the sheet

Soliton formation

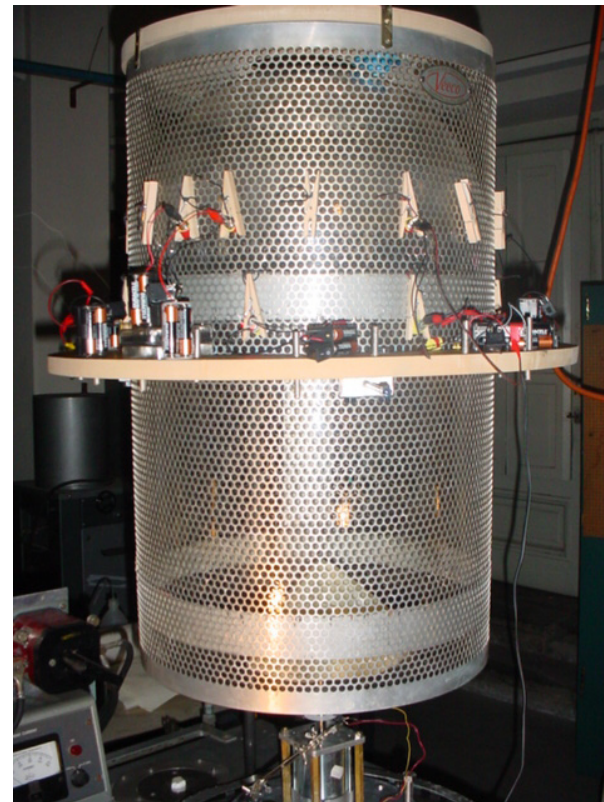
- Work in vacuum

Counting folds

- Lasers, camera

The apparatus

- Large vacuum chamber
- Variable-speed motor
- Camera, gift-shop pen lasers
- Rotational frequency meter
- And, of course, latex.



Three measurement parameters

Thickness

- Different latex sheets

Radius

- Cut different sizes

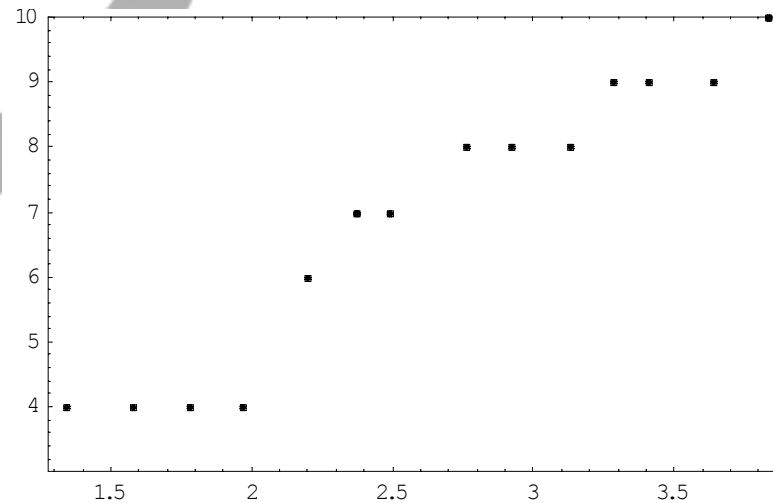
Angular velocity

- Easily variable

- After working out most of the hardware/protocol kinks, we were left with enough time to take some data!

Preliminary results

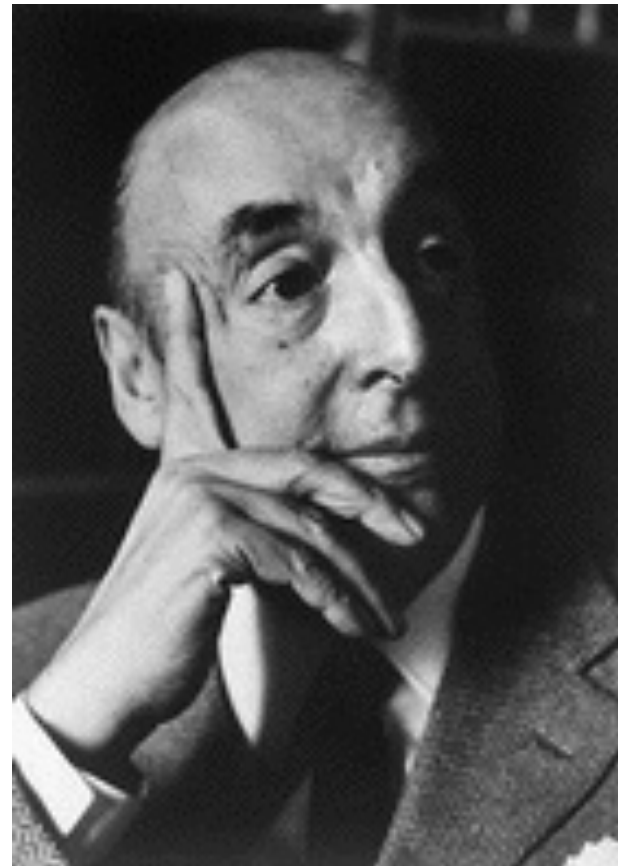
Number of Folds vs. Angular Velocity



These data are from 15 cm radius, 0.006 inch thickness sheet

Life in Chile

- Mastery of Spanish is NOT necessary, though a rudimentary knowledge is useful.
- Chile is a society very rich in culture.
 - They have vending machines that sell books in the subways.
 - Pablo Neruda is a national hero! (All three of his homes are wonderful museums.)



Attractions in Chile

In and around Santiago:

- Vineyards
- Ski slopes
- Historical sites
- A vibrant punk music scene
- The Andes

Further afield:

- Ocean
- Volcanoes
- Desert
- Fjords
- Pampas
- More Andes





Fin

Thank you all for coming. If you would like to contact me, my email address is:

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Professor Witten's webpage:

<http://jfi.uchicago.edu/~tten/Chile/>

