

Dissipative Rheology of Foams

CECAM workshop January 9-12, 2012, School of
Physics, Trinity College Dublin

Opening Remarks - S. Hutzler, TCD

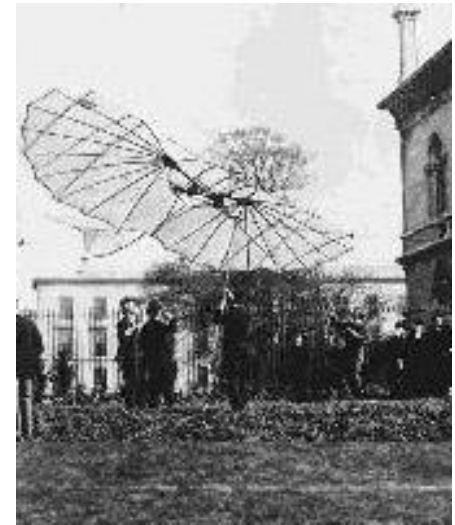
- some historical figures in Physics, TCD
- dissipative foam rheology
- organisational matters

George Francis FitzGerald 1851-1901

Erasmus Smith's Professor of Natural and Experimental Philosophy
Fellow of the Royal Society



Fitzgerald-Lorentz contraction



Flying a Lilienthal glider from the Pavillion bar!

Clock in the library: wedding present by Physics graduates

Fitzgerald's night-time thoughts

enacted by Denis Weaire,
Erasmus Smith's Professor of
Natural and Experimental
Philosophy
Fellow of the Royal Society

Queen's University Belfast, 1999



Erwin Schrödinger

1887-1961

one of the fathers of quantum mechanics

Research in Dublin 1940-56

Founder of Dublin Institute of Advanced Studies

Series of lectures 'What is Life',
delivered in TCD 1943

(aperiodic crystal containing genetic information)



Ernest Thomas Sinton Walton

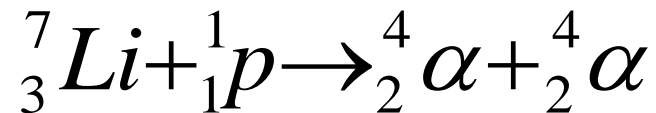
1903-1995



TCD graduate and later Head of Department

Erasmus Smith's Professor of Natural and Experimental Philosophy

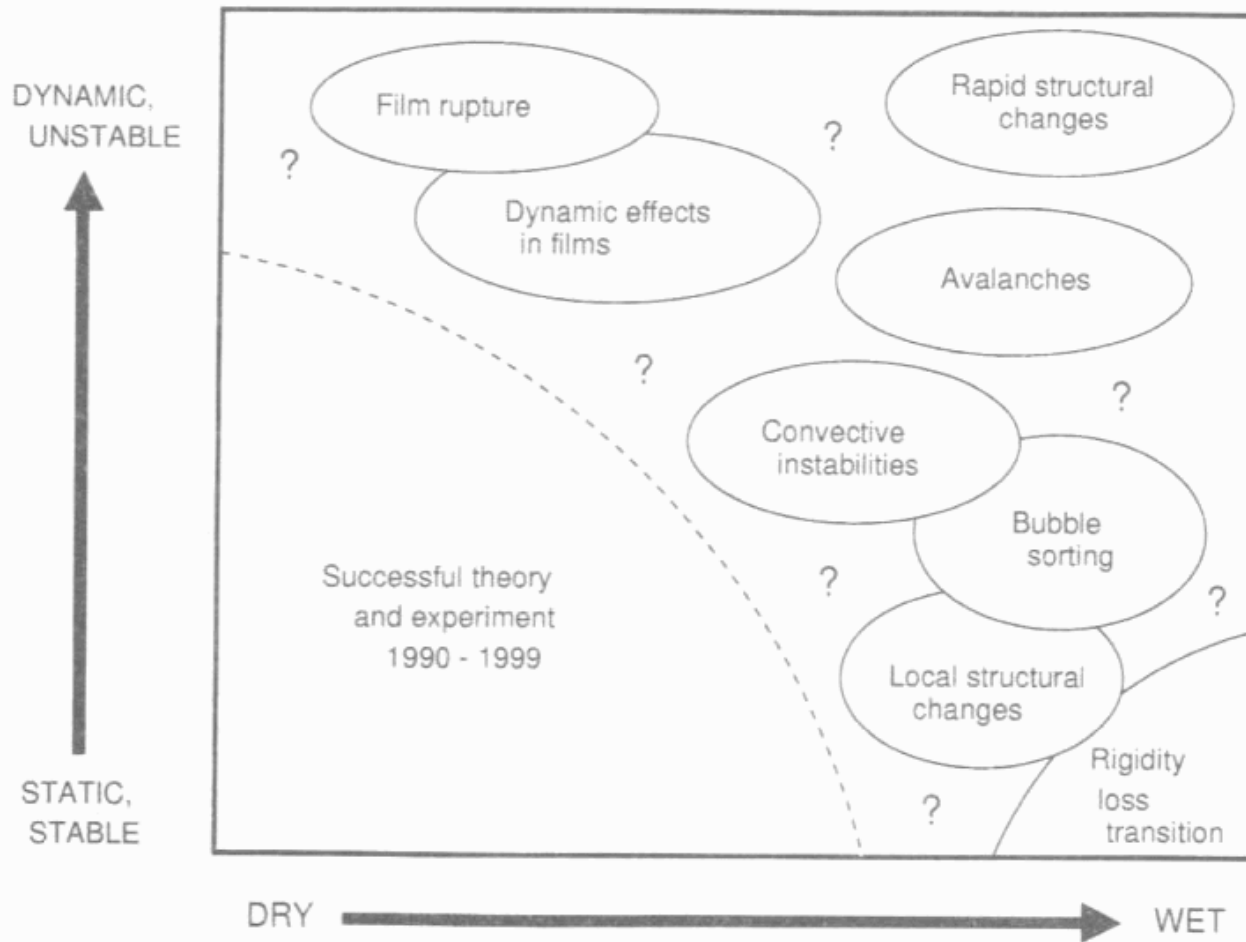
In 1932 Cockcroft and Walton performed the following experiment in Rutherford's group, Cavendish lab, Cambridge:



They found a release of energy of about 17MeV.

First nuclear confirmation of Einstein's relationship $E=mc^2$ results in Nobel Prize for Cockcroft and Walton in 1951.

Outlook Weaire and Hutzler 1999



The success of present theory is confined to one corner of the subject.

origins of dissipation – a question of scale

- Bubble scale (0.1mm to 1cm) - T1 events [Durian's bubble model, viscous froth model, hydrodynamic models]
- width of Plateau borders (0.01mm to 1mm) and films (5nm to 0.1mm)- liquid viscosity (drainage)
- interfaces; molecular level - Marangoni, molecular dynamics
- 2d-continuum model - Herschel-Bulkley relation + drag force

Length scales: Sylvie Cohen-Addad, Anne-Laure Biance

Time scales (non-equilibrium): Paul Grassia

Bubble scale: Matthias Möbius (shear induced bubble diffusion)

Disorder and liquid fraction: Marc Durand

“veteran” foam rheologist: Andy Kraynik

Key question

How does all of this determine the overall macroscopic rheological behaviour of foams/emulsions?

Important for many large-scale industrial applications, e.g. froth flotation

focus of this workshop: numerical approaches

Soft dynamics – Pierre Rognon

Lattice Boltzmann – Roberto Benzi

Bubble model – Matthias Möbius

Aim is to benefit from advances in neighbouring fields

glasses: Anaël Lemaitre, Peter Sollich

suspensions: Jean-Noel Roux

granular materials: Jean-Noel Roux, Brian Tighe (Durian),

biological tissues: François Graner, Sascha Hilgenfeldt

Organisational Matters

- 20/30 minute presentations followed by 15 minute discussions
- 10+2 minute hot topics (including our update on Weaire-Phelan structure)
- Tea/coffee-breaks in the Fitzgerald library
- Lunch: dining hall or Science Gallery (pay as you go)
- Conference dinner on Tuesday, 7pm, in Messrs. Maguire; well flowing foam guaranteed due to in-house brewing.

One possible workshop outcome: a new phase diagram?

