



# GFD 2011



The group photo, Fabian Waleffe, and Rich Kerswell

## An outline of the Summer 2011

The principal lecturers for this year's theme, *Shear Turbulence: onset and structure*, were Fabian Waleffe (University of Wisconsin) and Rich Kerswell (University of Bristol). They skillfully led us from classical notions of fluid stability to their role in initiating and sustaining turbulence in shear flows, and then on to current pictures and current issues in shear turbulence.

The 2011 Public Sears Lecture was given by L. Mahadevan (Harvard) on the subject *On growth and form: geometry, physics and biology*, convincingly blending the first and second of these disciplines to arrive at conclusions for the third.

Norm Lebovitz and Phil Morrison codirected, with able and generous assistance from other members of the staff and the usual, smooth administrative assistance of Jeanne Fleming and Janet Fields.

There were eleven fellows, shown with their project descriptions on the next page.

## The schedule of principal lectures

### Fabian Waleffe

Monday, June 20: *General introduction and overview.*

Tuesday, June 21: *Viscous derivation of classical inviscid stability results. Viscous instability.*

Wednesday, June 22: *Diffusion and damping in shear flows: a truly singular limit. Critical layers.*

Thursday, June 23: *Origin and survival of 3d-ality.*

Friday, June 24: *Instability of streaky flows. Asymptotics of self-sustaining process.*

Monday, June 27: *Spatio-temporal complexity. Spots, puffs and slugs, snakes and spirals.*

### Rich Kerswell

Tuesday, June 28: *Transition scenarios: normality vs. non-normality.*

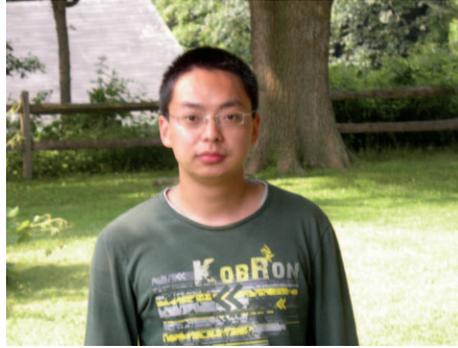
Wednesday, June 29: *Edge-tracking: walking the tightrope.*

Thursday, June 30: *Triggering transition efficiently.*

Friday, July 1: *Turbulence: transient or sustained?*



*Matthew Chantry (Bristol): Traversing the edge: how turbulence decays*



*Chao Ma (Colorado): On Brownian motion in a fluid with a plane boundary.*



*Samuel Potter (Princeton): Islands in locally forced basin circulations.*



*Andrew Crosby (Cambridge): Chaotic interaction of vortex patches with boundaries.*



*Giulio Mariotti (Boston U): A low dimensional model for shear turbulence: an example to understand the edge.*



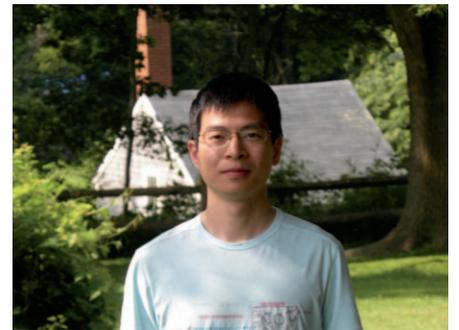
*Lindsey Ritchie (Strathclyde): Ascending the ridge: maximizing the heat flux in steady porous medium convection.*



*Martin Hoecker-Martinez (Oregon State): Constraints on low-order models: the cost of simplicity.*



*Adele Morrison (ANU): Upstream basin circulation of rotating hydraulically controlled flows.*



*Zhan Wang (Wisconsin): Two-layer viscous fluid in an inclined closed tube: Kelvin-Helmholtz instability.*



*Keiji Kimura (Kyoto): A one-fluid MHD model with electron inertia.*



*John Platt (Harvard): Localized solutions in plane Couette flow: continuation methods.*



*No! YES!! Our PLs are former fellows & both did PhDs under founder Willem Malkus, who leads them still in this photo.*



The fellows are at bat as the ancients win the day in the staff-fellows game.

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## EXTRACURRICULARS

### Softball

It hasn't happened for a while, but this year's athletic fellows, combined with seasoned veterans from the staff, pulled off a successful season, winning five while losing three.

Keiji had played in Japan and added batting punch and fielding grace, the Commonwealth contingent caught on quickly, and Greg Chini and Phil Morrison contributed occasional heroics.

In the annual staff-fellows 'exhibition' game, the aged staff staggered to a win. Even diehard refuseniks like Norm Lebovitz and Tobias Schneider put in appearances.

### Cookouts

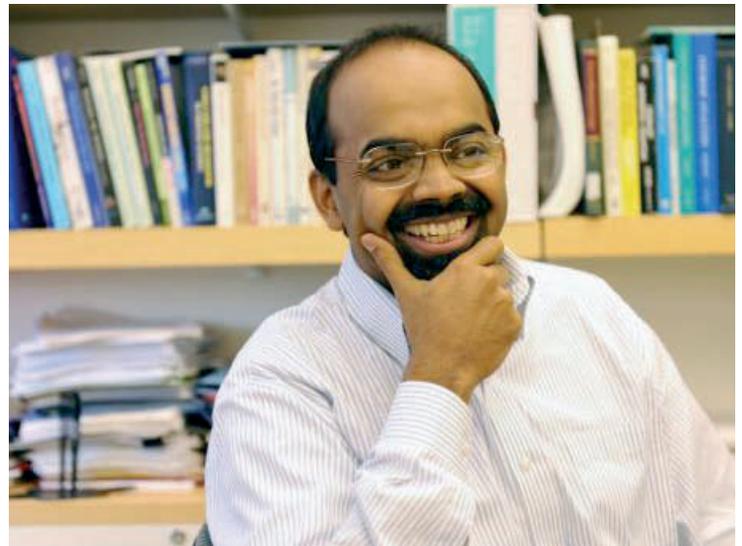
The usual Sunday cookout on the 19th of June, just before the first day of the program, helped the fellows to get acquainted with the staff, and the new staff visitors to get acquainted with one another. The fellows organized a Fourth of July picnic with an admirable variety of offerings.



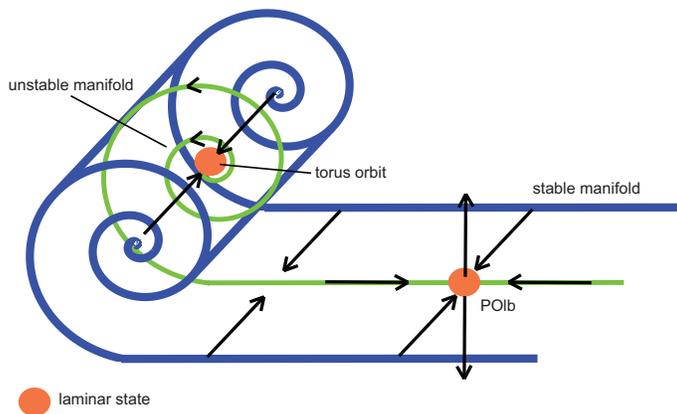
George Hagstrom comes to bat in the bottom of the first, Adele guards the plate and Joe looks on.

Some of the fellows also provided surprise offerings of homemade brownies and cookies through the summer.

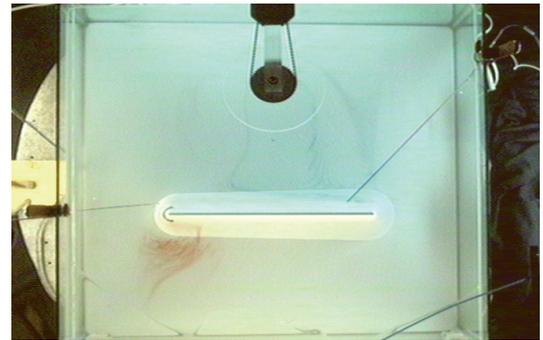
### The Sears Public Lecture



This year's speaker, L. Mahadevan, gave an excellent lecture, enthusiastically received by a large audience in Redfield auditorium, applying methods of mathematics and physics to achieve an understanding of biological development. The lecture, on the afternoon of August 4, was followed by an outdoor reception.



Several projects had a dynamical-systems flavor: from Giulio's project



Some were experimental: the tank in Karl's lab, from Samuel's project

### GFD FACULTY

Neil Balmorth, *University of British Columbia*  
 Oliver Buhler, *New York University*  
 Colm-Cille Caulfield, *Cambridge University*  
 Claudia Cenedese, *WHOI*  
 Eric Chassignet, *Florida State University*  
 Steve Childress, *New York University*  
 Charles Doering, *University of Michigan*  
 Glenn Flierl, *MIT*  
 Pascale Garaud, *University of California at Santa Cruz*  
 Karl Helfrich, *WHOI*  
 Louis Howard, *MIT and Duke University*  
 Joseph B. Keller, *Stanford University*  
 Norman Lebovitz, *University of Chicago*  
 Stefan Llewellyn Smith, *University of California at San Diego*  
 Willem Malkus, *MIT*  
 Philip Morrison, *University of Texas at Austin*  
 Antonello Provenzale, *Istituto di Scienze dell' Atmosfera e del Clima, CNR*  
 Edward Spiegel, *Columbia University*  
 Jean-Luc Thiffeault, *University of Wisconsin*  
 George Veronis, *Yale University*  
 John Wettlaufer, *Yale University*  
 Jack Whitehead, *WHOI*  
 William Young, *Scripps Institution of Oceanography*

### GFD WEBSITE

Lecture notes and fellows' reports are archived on the website: [gfd.whoi.edu](http://gfd.whoi.edu). Much other useful information is there as well, including lists of alumni and visitors and application materials. Lecture notes and fellows' reports for this year's program should be posted by December 1, 2011.

### ACKNOWLEDGEMENTS

The GFD program has an endowment fund to help support its activities and in particular to support the visit of a key participant, like a Principal Lecturer. The fund is administered by WHOI under the guidance of George Veronis. If you wish to contribute you may send a check payable to WHOI to:

Woods Hole Oceanographic Institution  
 GFD Fund, MS 40  
 Woods Hole, MA 02543

alternatively by credit card by calling the Development Office: 508-289-4895.

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