Ralph M. Parsons Laboratory
Environmental Sciences Seminar

Department of Mathematics
Physical Mathematics Seminar

Richard McLaughlin

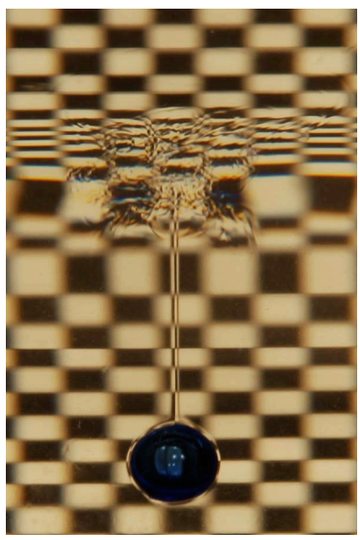
Professor and Chair, Department of Mathematics
Carolina Center for Interdisciplinary Applied Mathematics
University of North Carolina, Chapel Hill
(http://amath.unc.edu/people/richard-mclaughlin/)

"Bodies, Buoyant Jets and Vortex Rings in Stratification"

Thursday, December 11, 2014
4:00 p.m.
1-135

Abstract

We present theoretical, computational, and experimental studies of the motion of bodies and buoyant fluids moving through a stratified background density field focusing on the vertical transport. Interesting critical phenomena are observed in which bodies and buoyant fluids may either escape or be trapped as parameters (such as the propagation distance) are varied. For the case of jets, an exact solution is derived for the Morton-Taylor-Turner (MTT) closure hierarchy which yields a simple formula for this critical distance, both with and without a nonlinear "entropy" condition. These formulae will be compared directly to experimental measurements. Additionally, analysis will be shown demonstrating how the sharp two-layer background is the optimal stably stratified mixer within the MTT hierarchy. For the case of the buoyant vortex ring, full DNS simulations of the evolving ring impinging upon sharp stratification will compared directly with experimental measurements of the critical length.
This is joint work with Roberto Camassa and Chung-Nan Tzou.



Faculty Host – Lydia Bourouiba, Esther and Harold E. Edgerton Assistant Professor, Civil and Environmental Engineering, Associate Faculty, Institute for Medical Engineering and Science
For questions contact Roberta Pizzinato (robertap@mit.edu)

This seminar is jointly sponsored by MIT's Department of Civil and Environmental Engineering and Department of Mathematics