# Severine Atis

Harvard University
Department of Physics
17 Oxford Street
Cambridge, MA 02138

phone number: +1 (857) 991-7366
web page: http://scholar.harvard.edu/atis
email: atis@fas.harvard.edu


| | |
|---|---|
| Research Interests | Dynamical Systems, Out-of-Equilibrium Phenomena, Soft Matter, Condensed Matter<br>Biophysics, Hydrodynamics, Instabilities, Experimental Methods |

## Education

| | |
|---|---|
| 2010 - 2013 | **PhD in Physics, FAST Laboratory - Sorbonne Université**<br>Reaction wave front propagation in disordered flow<br>supervisors: Dr. Laurent Talon and Professor Dominique Salin |
| 2007 - 2009 | **Master degree in Condensed Matter**<br>Doctoral School: Ecole Normale Supérieure Paris - **Université Paris-Saclay** |
| 2004 - 2007 | **License degree in Fundamental Physics**<br>Magistère d'Orsay - **Université Paris-Saclay** |

## Research Appointments

| | |
|---|---|
| 2019 - 2021 | **Grainger Postdoctoral Fellow, James Franck Institute, University of Chicago**<br>Non-equilibrium many body physics, colloidal particles, turbulent flows<br>Principal investigator: Professor William Irvine |
| 2015 - 2019 | **Postdoctoral Associate, Department of Physics, Harvard University**<br>Hydrodynamic instabilities in cell assemblies, Evolutionary dynamics coupled with flows<br>Principal investigators: Professor David Nelson and Professor Andrew Murray |

## Other Research Experiences

| | |
|---|---|
| 2014 | **Visiting Postdoctoral Fellow, Department of Mechanical Engineering, MIT**<br>**END Lab** / FAST Laboratory<br>Inertial particles dispersion in chaotic flow / internal waves in periodic stratification<br>Principal investigator: Professor Thomas Peacock |
| 2009 | **Research Student at ESPCI-ParisTech, Paris, France**<br>Quantum limit under high magnetic field and low temperature in graphite<br>Principal investigators: Dr. Benoit Fauqué and Dr. Kamran Behnia |
| Jan-April 2009 | **Research Student at CEA, Saclay, France**<br>Bifurcation in turbulent von Karman flow<br>with Dr. Pierre-Philippe Cortet, Dr. Arnaud Chiffaudel, Professor François Daviaud, and Professor Bérengère Dubrulle |

## Honors and Awards

| | |
|---|---|
| 2019 - 2021 | Grainger Postdoctoral Fellowship in Experimental Physics - University of Chicago |
| 2014 - 2015 | CNRS Fellowship one year postdoctoral grant |
| 2010 - 2013 | CNRS Doctoral grant |

## Publications

JOURNAL PUBLICATION

1. **Microbial Range Expansions on Liquid Substrates**
*under review* **[arXiv]**
S. Atis, B. T Weinstein, A. W. Murray, and D. R. Nelson

2. **Avalanches Dynamics in Reaction Fronts in Disordered Flows**
T. Chevalier, A. K. Dubey, S. Atis, A. Rosso, D. Salin and L. Talon
PRE **95** 042210 (2017) **[Publisher version]**

3. **Experimental Evidence for Three Universality Classes for Reaction Fronts in Disordered Flows**
S. Atis, A. K. Dubey, D. Salin, L. Talon, P. Le Doussal, and K. Wiese
PRL **114** 234502 (2015) **[arXiv]**

4. **Autocatalytic Reaction Fronts Inside a Porous Medium of Glass Spheres**
S. Atis, S. Saha, H. Auradou, L. Talon and D. Salin,
PRL **110** 148301 (2013) **[arXiv]**

5. **Phase Diagram of Sustained Wave Fronts Opposing the Flow in Disordered Porous Media**
S. Saha, S. Atis, D. Salin and L. Talon,
EPL **101** 38003 (2013) **[PDF]**

6. **Chemo-hydrodynamic Coupling Between Forced Advection in Porous Media and Self-sustained Chemical Waves**
S. Atis, S. Saha, H. Auradou, J. Martin, N. Rakotomalala, L. Talon, D. Salin,
Chaos **22** 037108 (2012) **[PDF]**

IN PREPARATION

**Bloch Internal Waves in Periodically Stratified Fluids [link]**
S. Atis and S. J. Ghaemsaidi

**Anisotropic Particles Focusing Effect in Chaotic Flows [link]**
S. Atis, M. Leclair, T. Sapsis, and T. Peacock

**Laboratory Investigations of a Chaotic Flow Using Braid Theory**
M. Filippi, M. Budisic, S. Atis, M. Allshouse, J.-L.Thiffeault and T. Peacock

PROCEEDINGS

**A phase transition in a closed turbulent flow**
E. Herbert, S. Atis, A. Chiffaudel, P.-P. Cortet, F. Daviaud, L. Divaret, B. Dubrulle,
Journal of Physics: Conference Series **318** 032003 (2011) **[PDF]**

**Experimental study of the von Karman flow from Re = $10^2$ to $10^6$: spontaneous symmetry breaking and turbulent bifurcations**
P.-P. Cortet, S. Atis, A. Chiffaudel, F. Daviaud, B. Dubrulle, F. Ravelet,
Advances in turbulence XII **132** 59-62 (2009)

## Teaching

FALL 2017

**Lecturer in Applied Math, John A. Paulson School of Engineering and Applied Sciences, Harvard University**
Pattern Formation in Soft Matter, graduate students course with L. Mahadevan

**Teaching Assistant, Department of Molecular and Cellular Biology, Harvard University**
Integrated Science, undergraduate students course with A. Murray

SPRING 2015

**Instructor, Department of Mechanical Engineering, MIT**
Instrument and Measurement, undergraduate Laboratory course.

2010-2012

**Teaching Assistant, Department of Physics, Université Pierre et Marie Curie**
- Recitations: Electromagnetism, Astrophysics, Cosmology
- Laboratory courses: Physical optics, Fluid mechanics, Thermodynamics, Astrophysics (catadioptric telescopes and signal processing)

## Presentations

INVITED TALKS - SEMINARS

Yeast Rocket Science, or how do growing microbial colonies generate their own propelling flow
Soft Matter group seminar
**University of Chicago**, Chicago, March 2018

On Growth and Form of Range Expansions at Liquid Interfaces
Physics of Living Systems seminar
**Massachusetts Institute of Technology**, Cambridge, January 2018

On Growth and Form of Range Expansions at Liquid Interfaces
Biophysics seminar
**Boston University**, Boston, October 2017

Active Interface Propagation and Anisotropic Particles Dispersion in Complex Flows
Physics Colloquium
**University of California Merced**, Merced, January 2016

Universality Classes in Growing Interfaces: Reaction Fronts in Disordered Flow
Workshop: New approaches to non-equilibrium and random systems
**Kavli Institute for Theoretical Physics**, Santa Barbara, January 2016

Active Interface Propagation and Anisotropic Particles Dispersion in Complex Flows
Condensed Matter Theory Kid's Seminar
**Harvard University, Department of Physics**, Cambridge, March 2015

Avalanches and Dynamical Phase Transition of Reaction Waves in Adverse Flow

Workshop: Avalanches, Intermittency, and Nonlinear Response in Far-From Equilibrium Solids
**Kavli Institute for Theoretical Physics**, Santa Barbara, November 2014

Universal Growing Behavior and Pattern Formation in Disordered Reaction Front Propagation
Physical Mathematics Seminar
**Massachusetts Institute of Technology**, Cambridge, September 2014

Three Universality Classes in Reaction Fronts in Disordered Flow
Workshop: Interface Fluctuations and KPZ universality class
**Yukawa Institute for Theoretical Physics**, Kyoto, Japan, August 2014

Scaling Laws and Pinning-Depinning of Reaction Fronts in Disordered Flow
Laboratoire de Physique Statistique Seminar
**Ecole Normale Supérieure**, Paris, France, December 2013

Reaction Waves Propagation in Disordered Flow
Earth and Planetary Magnetism Group Seminar
**ETH Zurich**, Zurich, Switzerland, March 2013

OTHER PRESENTATIONS

On Growth and Form of Range Expansions at Liquid Interfaces
**APS - March Meeting**, March 2018, Los Angeles

Experimental Population Dynamics in Fluid Flows
**APS - March Meeting**, March 2017, New Orleans

Elliptical Particle Clustering in Cellular Flows
**APS - Division of Fluid Dynamics**, November 2015, Boston

Frozen Sawtooth Shapes and Universality in Reaction Fronts Coupled with Disordered Flow
**SIAM Conference - Applications of Dynamical Systems**, Mai 2015, Snowbird

Getting Things Sorted With Lagrangian Coherent Structures
**APS - Division of Fluid Dynamics**, November 2014, San-Francisco

Chemical Wave Fronts Dynamics in Disordered Flow
**APS - March Meeting**, March 2012, Boston

Self-Sustained Reaction Fronts in Disordered Flow: Power Law and Stationary States
**Journee Dynamique des Fluides du Plateau**, November 2011, Orsay

## Outreach and popularization

MARCH 2016

**Girls Day at MIT Museum**
*Mechanical Engineering Graduate Association of Women (MIT)*
Hands-on activities and demonstrations: Rube Goldberg machine

APRIL 2016

**Cambridge Science Festival**
*Outreach experiments in the street - Massachusetts Institute of Technology*

- Ferrofluids
- Marangoni Effect
- Copper Diamagnetism

2009 - 2012 **Palais de la Découverte Museum**

*Speaker and organizer of outreach experiments in the Physics Department:*

- Macroscopic quantum phenomena: *Superfluids and superconductivity*
- Electrostatic and electromagnetism experiments
- Cosmic rays: *Cloud chamber*
- Stellar nucleosynthesis and radioactivity

2011 - 2012 **October science week at University Paris Sud**

*Physics experiments presentations at Orsay Science Faculty:*

- Chaotic mixing in viscous fluids
- Turbulent transition in a model cylindrical Taylor-Couette
- Quantum mechanics and superconductivity (more information on: **Physics Reimagined**)

2010 - 2011 **Other large public events**

*Animations and experiments presentations:*

- "Entrée en Matière", Quantum Mechanics experiments, CNRS autumn science event
- "Festival Remue Méninges", Grenoble,
  science animations for junior high school students

## References


Professor David Nelson
Harvard University
Department of Physics
nelson@physics.harvard.edu
(617) 495-4331

Professor Andrew Murray
Harvard University
Department of Molecular and Cellular Biology
amurray@mcb.harvard.edu
(617) 496-1350

Professor Pierre Le Doussal
Directeur de recherche
Ecole Normale Supérieure
Laboratoire de Physique Théorique
ledou@lpt.ens.fr
+33 1 44 32 37 87

Professor Thomas Peacock
END Lab - Department of Mechanical Engineering
Massachussetts Institute of Technology
tomp@mit.edu
(617) 258-0736