Colm P. Kelleher

Department of Physics, New York University
Meyer Hall Rm 424, 4 Washington Pl, New York NY 10003
Phone: 646-226-6305 · · · Email: cpk235@nyu.edu

Education

Ph.D. (Physics), New York University 2017
M.Sc. (Physics), New York University 2014
B.Sc. (Mathematics & Physics), University College Cork, Ireland 2008

Research interests

My research focuses on the rich and industrially relevant physics that occurs when colloidal particles bind to fluid interfaces. I am particularly interested in using colloids as a model system to explore the interplay of order, curvature and topology in two dimensional systems.

Research experience

Graduate student researcher New York University 2011-2017
Advisor: Paul Chaikin, Ph.D.
Topic: Physics of colloids and interfaces, classical 2D condensed matter physics.

Research assistant University College Cork, Ireland 2008-2009
Advisor: Michel Van Dyck, Ph.D.
Topic: Theory of differentiation on manifolds.

Undergrad. research assistant Tyndall Institute, Cork, Ireland 2007-2008
Advisors: Síle Nic Chormaic, Ph.D. and Thomas Busch, Ph.D.
Topic: Quantum computing with ultra-cold atoms, experiment and theory.

Undergrad. research assistant University College Cork, Ireland Summer 2006
Advisor: Paul Callanan, Ph.D.
Topic: Physics of X-ray binary star systems.

Academic publications

Melting on spheres
CP Kelleher, RE Guerra and PM Chaikin
Manuscript in preparation (2017)

Phase behavior of charged colloids at a fluid interface
CP Kelleher, RE Guerra, AD Hollingsworth and PM Chaikin
Physical Review E (Manuscript in press Jan. 2017)

Phase behavior of charged hydrophobic colloids on flat and spherical surfaces (Ph.D. Thesis)
October 2016

Long Wavelength Fluctuations and the Glass Transition in 2D and 3D
S Vivek, CP Kelleher, PM Chaikin and ER Weeks
Proceedings of the National Academy of Science (Jan. 2017)

Charged hydrophobic colloids at an oil-aqueous phase interface
CP Kelleher, A Wang, GI Guerrero-García, AD Hollingsworth, RE Guerra, BJ Krishnatreya, DG Grier, VN Manoharan, PM Chaikin
Physical Review E 92 (6), 062306 (2015)

Academic honors & awards

- Kessler Fellowship - New York University (2012-present)
- McCracken Fellowship - New York University (2009-2014)
- First-class honors degree - University College Cork (2008)
- William T. Markey Scholarship - University College Cork & UMass Amherst (2006)
- Membership of Irish Team at International Physics Olympiad, Pohang, Korea (2004)

Teaching

College level

Lab Assistant, Introductory Physics I — Fall 2014
Dept. of Physics, New York University

Teaching Assistant, Dynamics — Fall 2011
Dept. of Physics, New York University

Teaching Assistant, Classical and Quantum Waves — Spring 2011
Dept. of Physics, New York University

Lab Assistant, Physics I — Fall 2009
Dept. of Physics, New York University

Multivariable Calculus — Spring 2009
Dept. of Mathematics, University College Cork

Grading Coordinator, Introductory Physics — Fall 2008 & Spring 2009
Dept. of Physics, University College Cork

Teaching Assistant, Introductory Calculus — Fall 2008
Dept. of Mathematics, University College Cork

Other

Course facilitator, Physics and biology of light and color — Fall 2015
Math for America Mini-Course

- Designed and taught six hour course for high-school science teachers, with an emphasis on accessible, engaging, and pedagogically valuable demonstrations.

Volunteer Educator — Spring 2011 - present
Biobus Mobile Microscope Lab

- Volunteering in the Biobus mobile science lab, helping adults and children of all ages to explore the microscopic world. Working with visitors in both traditional classroom settings and non-traditional environments, such as the Baltimore Artscape art festival (2015) and the Gathering of the Vibes music festival (2013).

Academic talks

Dynamics of particles and defects on spherical crystals 2016
March Meeting 2016, Baltimore, MD

Interactions and phase behavior of charged interfacial colloids 2016
Max Planck Institute for Dynamics and Self-Organization, Göttingen, Germany

Pair interactions of superhydrophobic colloids at an oil-aqueous phase interface 2015
March Meeting 2015, San Antonio, TX

Dynamics of 2D colloidal crystals under microscopic shear 2014
March Meeting 2014, Denver, CO

Curvature-induced potential for colloids at an oil-water interface 2013
March Meeting 2013, Baltimore, MD

Wetting colloidal particles at a curved interface 2012
March Meeting 2012, Boston, MA

Internal talks at NYU CSMR 2011-present
Roughly once-a-semester presentations for faculty, postdocs and students at the NYU Center for Soft Matter Research.

Computer skills and programming languages

- Image analysis and feature identification in 2D and 3D.
- 2D and 3D data visualization and representation.
- Simulations of fluid interfaces, basic molecular dynamics (Langevin) simulations of interacting particles.
- Programming languages and software packages: Mathematica, Matlab, IDL, C, Python, Surface Evolver, ImageJ, COMSOL.

Experimental skills and techniques

- Quantitative microscopy (bright-field and confocal) of colloidal particles and fluid interfaces.
- Optical trapping.
- Preparation and observation of 2D colloidal crystals and glasses.
- Interface and surface physics techniques, including surface functionalization to control wetting properties.
- Two-particle and ensemble methods of measuring interaction potentials for colloidal particles.

Science communication and outreach

Math for America 2015-present
Working with MfA to identify, consolidate and strengthen excellent science teaching in public schools in New York City. Roles include interviewing and selecting candidate master teachers, and organizing professional development classes. (More details in "Teaching" section.)

TED-Ed 2012-2014
In collaboration with professional animators, designed, wrote and recorded a series of online video lessons, covering various topics in math and physics, which have been viewed over 2 million times on YouTube. (To view these, Google "Colm Kelleher TED-Ed YouTube.")

Biobus 2010-present
Volunteering with Biobus, a mobile science lab that aims to introduce kids of all ages to the idea of science as a process of discovery, invention and creation. Roles have included teaching on the bus (see "Teaching" section for details), and working with Biobus staff to develop curricula on colloidal physics, the physics of light, and science podcasting.

Other 2009-present
Exploring non-traditional ways of communicating research-level science to the public, including contributing to NYU's science radio show, *The Doppler Effect,* online writing for *Scientific American* and *Nautilus* magazines, and showing confocal microscope images in a public art exhibition in *The Burger Joint*, a pub/restaurant in Greenwich Village.

References

Paul M. Chaikin
Silver Professor of Physics,
Department of Physics,
New York University,
4 Washington Place,
New York, NY 10003
Phone: 212-998-7694
Email: chaikin@nyu.edu

David G. Grier
Professor of Physics & Director of
the Center for Soft Matter Research,
Department of Physics,
New York University,
4 Washington Place,
New York, NY 10003
Phone: 212-998-3713
Email: david.grier@nyu.edu

Eric R. Weeks
Samuel Candler Dobbs Professor of
Physics & Department Chair,
Department of Physics,
Emory University,
400 Dowman Dr
Atlanta, GA 30322
Phone: 404-727-4479
Email: erweeks@emory.edu