Welcome to Maryland!
Why UMD? (Location, Location, Location)

- **Eastern Seaboard:** Washington DC, Baltimore, Philadelphia, New York, Boston

- **Washington DC: the Nation’s Capital**
  - Policy makers (Government, USPTO)
  - Funding agencies (NSF, DOE)
  - Defense contractors (DoD)

- Much of the chemical industry in the US is concentrated close by in DE-PA-NJ-NY

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California
San Francisco, Los Angeles

- Washington DC: the Nation’s Capital
  - Policy makers (Government, USPTO)
  - Funding agencies (NSF, DOE)
  - Defense contractors (DoD)

- Much of the chemical industry in the US is concentrated close by in DE-PA-NJ-NY

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- Why UMD? (Location, Location, Location)
Location: Quality of Life

Seasonal but comfortable climate year-round

<table>
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<tr>
<th>Monuments</th>
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Many cultural events, attractions in the Washington DC area

Beaches (MD/DE), mountains (VA) are just 2-3 hours away by car

Shenandoah Valley, VA

**Temperatures (°F)**

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<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
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<tbody>
<tr>
<td>46°</td>
<td>46°</td>
<td>58°</td>
<td>61°</td>
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<td>69°</td>
<td>62°</td>
<td>59°</td>
<td>49°</td>
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**Rainfall (inches)**

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<th>Jan</th>
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<td>2.5</td>
<td>3.4</td>
<td>4.6</td>
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<td>3.9</td>
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<td>3.3</td>
<td>3.3</td>
<td>2.8</td>
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Monuments

Museums (free!)

Beaches (MD/DE), mountains (VA) are just 2-3 hours away by car
Ph.D. Program in Biophysics

Total Time to Degree is roughly 4.5-5 Years

• Year 1 (Fall/Spring): Take courses, TA, and Lab rotations

• Year 1 (Summer): Full time focus on research (work hard and make initial progress) & Qualifying exam (August)

• Year 2 (Fall/Spring): Continued focus on research

• Year 2 (Summer): Make significant headway on research

• Year 3 (end of semester 5): Defend Ph.D. proposal

• Year 3: Submit manuscripts and go to conferences

• Year 4-5: Finalize research, write dissertation, find a job and defend your dissertation
Lab Rotations: Overview

Format

- Three lab rotations in the Fall and Spring semester of the first year (with BIPH faculty)
- Research presentations at the end of each rotation

Why?

- Will allow you hands-on experience working in a potential advisor’s lab and better understand their research and lab culture
- Faculty will get to know you better
- Help you decide between experimental versus computational research and find a thesis advisor
Research in Biophysics at UMD

Faculty in our Program come from different Departments

A. James Clark School of Engineering
Departments: Bioengineering and Chemical and Biomolecular Engineering

College of Computer, Mathematical, and Natural Sciences
Departments: Biology, Cell Biology, Chemistry/Biochemistry, Mathematics, Physics

Research areas span a broad range of topics
Computational Research

High Resolution: Quantum, atomic detail and molecular levels

Jeff Klauda
Pratyush Tiwary
Silvina Matysiak

Coarse Resolution & Theoretical: cell mechanics, systems-level biology and developing theories across levels

Garegin Papoian

Biophysics out of equilibrium

Chris Jarzynski
Molecular Modeling: Cell Membranes and Associated Proteins

- Modeling of organism and organelle membranes at physiological concentrations\(^1,2\)
- Dimerization of proteins involved in neuronal, bone and cancer growth\(^3\)
- COVID-19 Research on Spike Protein\(^4\)
- Activation of the Serotonin Receptor\(^5\)
- Peptide-membrane interactions with applications to anti-microbial peptides (AMPs)\(^6\)

Cell Membranes
- Outer Membrane of E. Coli\(^1\)
- Plasma Membrane of Yeast
- Stratum Corneum Layer of Skin\(^2\)

Membrane-Associated Proteins
- PlexinA3 homodimerization\(^3\)
- COVID-19 Spike\(^4\)
- Serotonin Receptor\(^5\)
- Peptide-membrane Binding\(^6\) and AMPs

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Experimental Research

**Biophysics research at the interface: across multiple scales**

**Colenso Speer**
- Molecular and structural basis of developing neural circuits
- Super-resolution imaging of synaptic connectivity and function in neurons

**Sergei Sukharev**
- Biophysics of mechano-sensation and osmoregulation
- Structure function relationships in mechanosensitive channels

**Wolfgang Losert**
- Dynamics of complex biological systems
- How topography and electric fields modulate cell migration

**Gregg Duncan**
- Lung airway microphysiology
- Nanomaterials and soft matter approaches for interfacial interactions in lung airway surfaces

**Kimberley Stroka**
- Cellular microenvironment engineering
- Interplay of chemical and mechanical cues in disease
How do cells sense and respond to physical cues?

- Stiffness
- Topography
- Mobility

Techniques:
- Single molecule imaging
- Traction force microscopy
- Super-resolution microscopy
- Computational image analysis

Biophys J. 2012, Nature Comm., 2020

Mol. Biol. Cell 2015
PNAS, 2018

Molecular Cell, 2019

http://www2.physics.umd.edu/~arpitau/
Weekly Biophysics Seminars

- **Biophysics Seminars** on cutting edge research from top scientists in the field
- Student lunch with speaker on the day of the seminar
- Opportunity for students to interact with national and international scientists from many institutes
Where Biophysics students have gone after graduation

Hongdian Yang – Faculty member at University of California, Riverside
Ruillang Bai – Faculty position at Zhejiang University, China
Shaon Chakraborty – Faculty position at National Center for Biological Sciences, India
Kyemyung Park – Faculty member at Yonsei University, Korea
Xue Fei – Postdoctoral Fellow at MIT
Eleanor Ory – Postdoctoral Fellow at University of Maryland School of Medicine
Huong Vu – Postdoctoral Associate at University of Texas, Austin
Jonathan Cwik - Postdoctoral Associate at MRC Laboratory of Molecular Biology, UK
Haiqing Zhao – Postdoctoral Associate at Columbia University
Alison Leonard – Postdoctoral Associate at University of Delaware
Hongcheng Xu – Software Engineer at Google
Hao Wu – Postdoctoral Position at Cornell Medical School
Stephanie Miller – Postdoctoral Researcher at University of California San Francisco
Simona Patange – Postdoctoral Research Associate at NIST
Deborah Hemingway – CEO at Leon Scientific
John Giannini – Postdoctoral fellow at National Eye Institute
Biophysics opportunities and communities in and around UMD

NCI-UMD PARTNERSHIP FOR INTEGRATIVE CANCER RESEARCH

Small-angle neutron scattering (SANS) at NIST

COMBINE
Computation and Mathematics for Biological Networks
Contact Info

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