

# Illinois Biophysics

## 2019 Newsletter

### OPTICAL TRAPS

The 2018 Nobel Prize in Physics was awarded in part to Arthur Ashkin from Bell Laboratories, Holmdel, USA “for the optical tweezers and their application to biological systems.” We met with Dr. Yann Chemla (YC), Physics Professor and Center for Biophysics and Quantitative Biology Affiliate, and his students—Alice Troitskaia, Monika Makurath, Roshni Bano, Steve Yao, Sean Carney and Yuchen Wu—to get their views on the subject.

#### What is an optical tweezer?

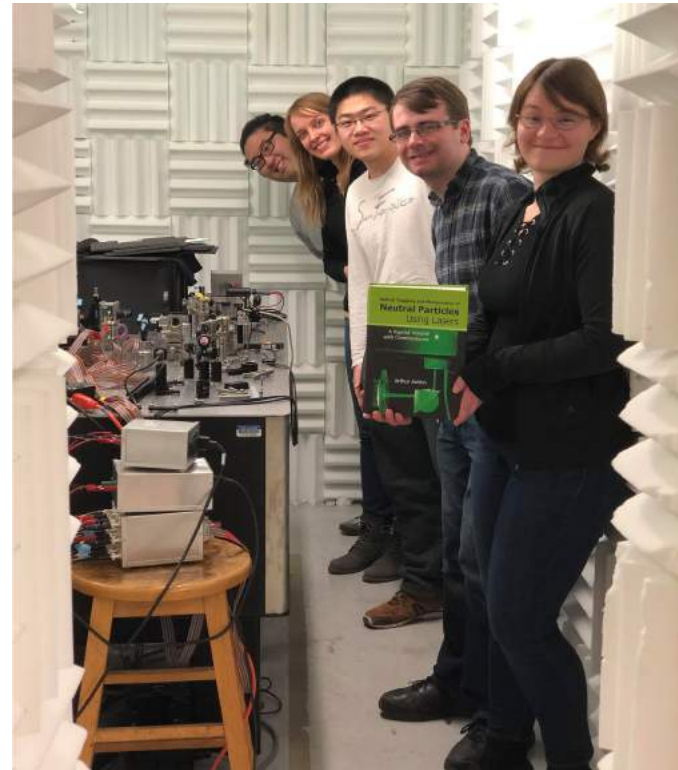
**YC** – It’s a technique that uses light to manipulate molecules. Basically, photons carry momentum and when photons impact objects they transfer that momentum. There are two forces at play here – scattering force and gradient force. The gradient force is the key to holding dielectric particles in place and actually trapping them. It’s similar to how a magnet experiences force in a magnetic field.

**Students** - In an experiment an optical trap setup can be imagined as two spheres joined by a spring. You can’t see the spring, but you

can detect how hard the spheres are pulling on the spring. We measure displacement of the spheres by using a very sensitive detector. Using our setups, we can study objects ranging from single molecules (DNA helicases) to single cells (*E. Coli* chemotaxis).

#### How does it feel that your field got a Nobel prize?

**YC** – The prize for Arthur Ashkin was long overdue. His work formed the basis of the 1997 Nobel Prize in Physics and it was great to see his work finally recognized! At 96 years of age he is the oldest Nobel prize winner and since prizes aren’t awarded posthumously, it was good that it happened. It was also good to see that he got a Physics prize since he is a physicist. Even though the technique is widely used by biochemists, it remains a biophysical technique. And while the award doesn’t change much for us, it was awesome to see one of our lab papers referenced in the official (Nobel Prize) announcement.



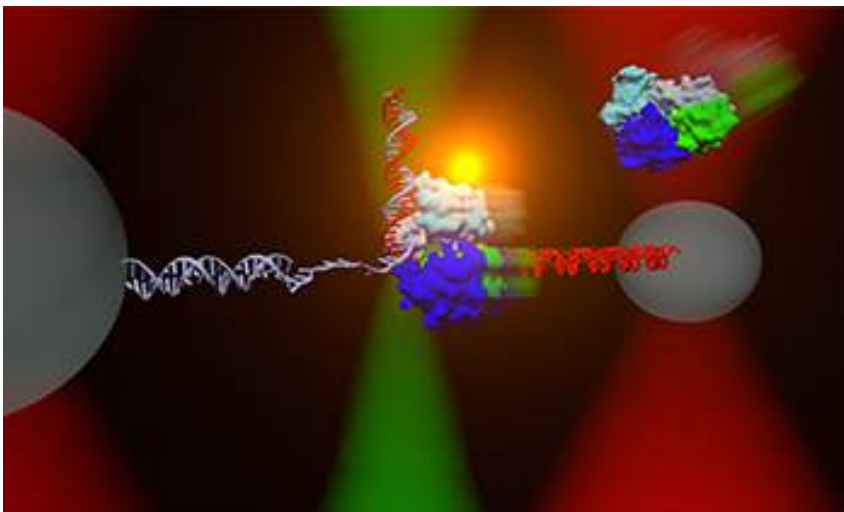
**Students** – It was definitely motivating to see someone get Nobel prize in our field. All of us have come from different backgrounds and what we like about optical traps and single molecule techniques in general is similar. It allows us to probe a particular question about a molecule or cell, and answer it specifically based on the signal we get.

#### Going forward, where do you think the technique and your lab are going?

**YC** – As with most technique development labs, we go through cycles where we develop a new technique and apply it to a few different systems,

before tweaking it or developing it further. It ultimately depends on whether my students want to approach the problem from a physics perspective to develop it further or a biological perspective to answer a particular question.

**Students** – Currently we are working on applying available techniques in our lab to answer specific questions. We study different helicases to understand how they unwind DNA and flagellar motion of *E. Coli*. We are excited to see what our techniques continue to show us about these tiny machines!





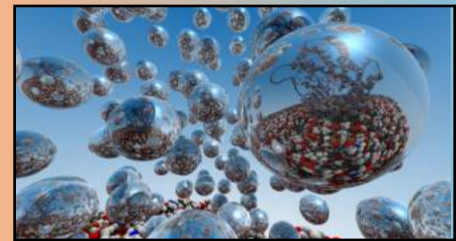
# ILLINOIS BIOPHYSICS SYMPOSIUM

The annual Illinois Biophysics Graduate Research and Networking Symposium brought together graduate students, post-docs, and professors to share and discuss advancements in biophysics research. Participants enjoyed an engaging and welcoming environment in which they presented their work and learned about the cutting-edge research conducted at the University of Illinois. A wide range of techniques and methodologies were presented, both computational and experimental. The event, which was held at the Illini Union, on October 30th, included a poster presentation session, wherein posters were judged by rising star post-doctoral researchers from labs affiliated with the Center for Biophysics and Quantitative Biology (CBQB). The judges agreed that all the posters reflected the premium quality research expected from U of I graduate students, but ultimately selected Shashank Pant, Chuankai Zhao, and Zahra Shamsi as winners for Best Poster awards.

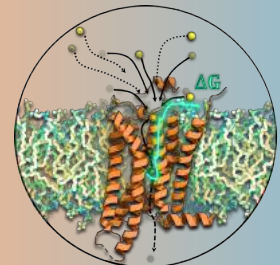
The 2018 Illinois Biophysics symposium aimed to showcase quality

science and creative means of communicating it. The symposium succeeded in bridging art and science via the first IB image contest. Contestants submitted inventive imagery, which were displayed throughout the symposium with the participants voting for their favorites (SEE RIGHT).

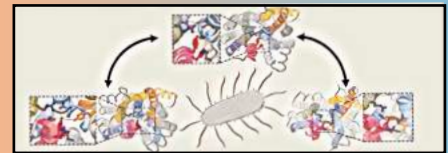
The symposium came to a close with two faculty speakers, professors Stephen Sligar and Emad Tajkhorshid. Dr. Sligar shared his background and history, starting with how he started his career at the University of Illinois. He also discussed how he progressed in academia and shared his journey as a student, advisor, professor, and as an entrepreneur. Dr. Tajkhorshid shared his journey as a PhD student in Iran to a PhD student in Germany. He went on to mention how he chased his future postdoctoral advisor, Klaus Schulten in France, which eventually led to him joining the University of Illinois. Both speakers answered audience questions and gave advice on how to succeed in the world of science.



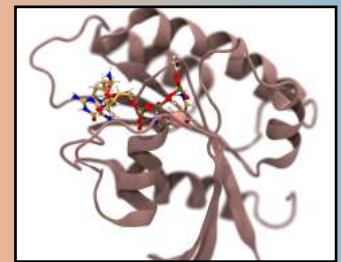
ANDRES ARANGO- WINNER  
TAJKHORSHID LAB



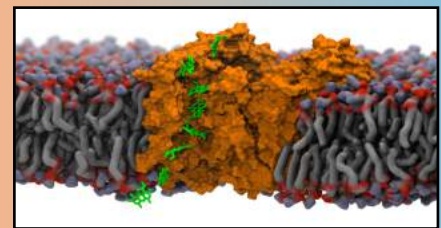
ZAHRA SHAMSI  
SHUKLA LAB



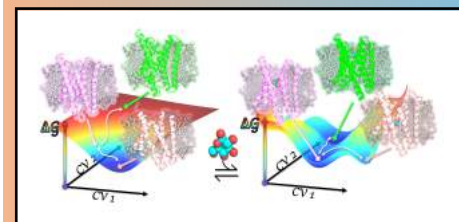
SHRIYAA MITTAL, BALAJI SELVAM  
SHUKLA LAB



ANDA TRIFAN  
TAJKHORSHID LAB



NANDAN HALOI  
TAJKHORSHID LAB



KEVIN J CHENG  
SHUKLA LAB

# A PERSPECTIVE ON ILLINOIS BIOPHYSICS

Two things that made me feel as belonging to a program in my first semester were Prof. Paul Selvin's class BIOP 401 and seeing Cindy Dodds in room 176@Loomis. Unfortunately, this class was not offered last fall and I pity the new cohorts who will never get to know Cindy. Clearly, it is hard to develop a sense of community in this program. Out of six students in my Biophysics cohort, two live at Beckman institute, two at Loomis, another at Siebel and I am at Roger Adams Lab. Well, by live obviously I mean, work in these buildings, but then for graduate students what's the difference, right? The diversity in the buildings we are spread across is akin to the variety in our undergrad majors, research interests, coursework and countries of origin. Hence, I believe Illinois Biophysics (IB) has an important role in the biophysics program: to increase communication within biophysics and

so many other units on campus which have students dabbling in biophysics research.

Even though IB had been active in the past, the Society has not seen much activity since I joined the program. In summer 2017, about seven volunteer students planned the first IB symposium with financial support from the Biophysical Society. The Society's networking grants have since then allowed us to host our second IB symposium and Trivia night! Organizing symposiums, happy hours and trivia night required considerable efforts from those involved including our program coordinator, Waad Ayoub. We have been fortunate to have volunteers and always welcome more. In my stint as the former president of IB, I found it to be time well-spent in the presence of like-minded people. At the end of

most IB meetings, I was filled with gratitude towards everyone willing to take responsibility in ensuring biophysics become a close-knit program.

For the upcoming years of IB, I hope that we can keep up the momentum and be mindful that all future events include everyone, remembering that a significant number of us are international students. It is also essential to connect with alumni and tap into the many advocacy efforts that scientists everywhere are beginning to become vocal about.

But, for now I am certain that Illinois Biophysics is in great hands. Especially since the current team's first order of business was to change our name from Illinois Biophysics Society (IBS) to Illinois Biophysics.

## GRADUATE STUDENT ACHIEVEMENTS



**Anda Trifan** (Tajkhorshid) has been awarded a DOE Computational Science Graduate Fellowship to support her research in theoretical and computational biophysics. Fewer than 6 percent of applicants for the

DOE fellowship are chosen each year. The program grants fellowships to support doctoral students whose education and research focus on using high-performance computers to solve complex science and engineering problems of national importance. Anda was also awarded the Biochemistry Travel Award Spring (2019).

**Kevin Cheng** (Pogorelov) has been awarded the NSF Graduate Research Fellowship. The program recognizes and supports outstanding graduate students in NSF-supported science, technology, engineering, and



mathematics disciplines. The reputation of the GRFP follows recipients and often helps them become life-long leaders that contribute significantly to both scientific innovation and teaching.

**Andres Arango** (Tajkhorshid) was awarded a UIUC Biophysics/MCB Fellowship. This fellowship was established by an anonymous donor to support research for an outstanding candidate in Biophysics. Andres was selected out of a pool of strong candidates based on his research accomplishments and publication track. This fellowship ensures funding for a year. Andres was also awarded the Biochemistry Travel Award Spring (2019).



We would also like to congratulate **Shashank Pant** for receiving the Biochemistry Travel Award 2018 (Fall) & 2019 (Winter). He was also awarded Illinois Biophysics Graduate Research and Networking Symposium 2018 - Best

Poster Award. Shanshank was also Discussion leader - Gordon Research Seminar (GRS): Molecular Mechanisms of Transporters Session.

**Noah Trebesch** received a Biophysical Society 63rd Annual Meeting Travel Award and was named Beckman Institute for Advanced Science and Technology Student Researcher of the Week.

**Brittany Gorman** won a Student Poster Award for her poster presented at American Vacuum Society (AVS) Prarie Chapter Symposium. She also earned Honorable Mentions from the NSF Graduate Research Fellowship.

**Shriyaa Mittal** was awarded a Biophysical Society Travel Award.

**Alexander S. Moffett** received a Graduate College Conference Travel Award

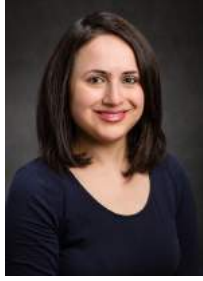
**Nandan Haloi** was awarded the Biochemistry Travel Award Spring (2019)

**Zhiyu Zhao** won a Student Research Achievement Award (SRAA) at BPS 2018



# WELCOME OUR NEW FACULTY!

**Waad Ayoub** has been our permanent Biophysics Grad Program Coordinator starting August 23rd, 2018. She comes to Biophysics after having worked with the ICT/Civil Engineering for the past 8 years as a Senior Communications Coordinator. Waad has been an excellent coordinator, and has been very involved with student activities. We are lucky to have her and welcome her



as a part of the CBQB!

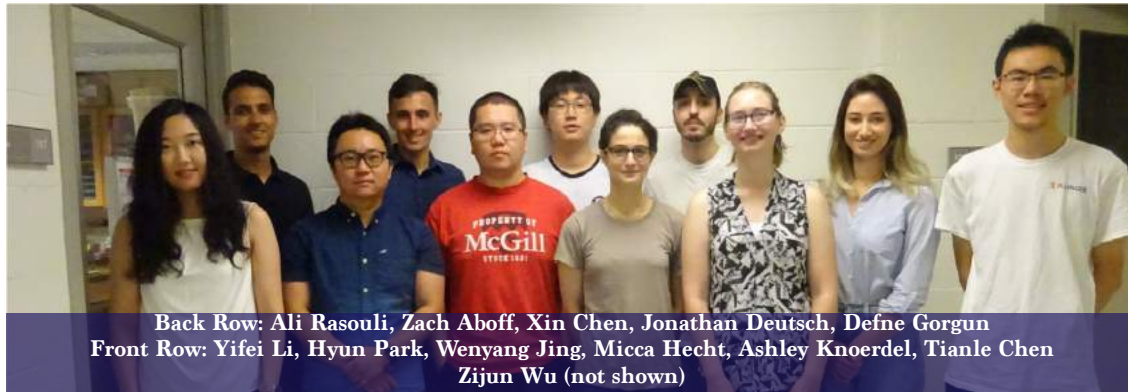
**Ido Golding's** lab focuses on examining the way living cells process information from their environment and make decisions based on that information. The aim is to form a quantitative narrative for the dynamics of cellular decision-making and unveil simple principles that underlie this process.



**Lisa Olshansky's** group works on preparing conformationally gated artificial metallo-proteins and metallofactors that mimic the way that biological systems use structural changes as a vehicle for the interconversion of different forms of energy. Exploring this mechanistic paradigm, applications include solar fuels conversion, targeted drug delivery, photocatalysis, and the generation of smart materials.



# WELCOME CLASS OF 2018!



Back Row: Ali Rasouli, Zach Aboff, Xin Chen, Jonathan Deutsch, Defne Gorgun  
Front Row: Yifei Li, Hyun Park, Wenyang Jing, Micca Hecht, Ashley Knoerdel, Tianle Chen  
Zijun Wu (not shown)

# CONGRATULATIONS GRADUATES!

**Mrinal Shekhar** (Tajkhorshid) AstraZeneca

**Chen-Yu Li** (Aksimentiev)

**Yuhang "Steven" Wang** (Tajkhorshid) Postdoc, California Institute of Technology

**Weihao Ge** (Jakobsson)

**Kim Jiah** (Belmont)

**Evan Mirts** (Lu)

**Yi Zhang** (Gruebele/Pogorelov) Quant Analyst, VP, SunTrust

# ILLINOIS BIOPHYSICS TEAM

The Illinois Biophysics (IB) is a student run organization comprised of Center for Biophysics and Quantitative Biology graduate students whose mission is to improve the lifestyle, educational experience, and future career opportunities of biophysics peers. The new Illinois Biophysics society would like introduce this year's committee members: Eric Shinn, President; Yuhan Wang, Secretary; Mayank Boob, Treasurer; Andres Arango, Communication Chair; Anda Trifan, Chief Editor.

**NEWSLETTER TEAM:** Anda Trifan, Andres Arango, Mayank Boob, Yuhan Wang, Eric Shinn, Shriyaa Mittal

