New York University
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February 4, 2013

Faculty Search Committee
Physics Department, MR 419
City College of New York
160 Convent Avenue, New York, NY 10031

Dear Search Committee,

I am writing to apply for the tenure-track position in the Physics Department in theoretical condensed matter physics. I am currently a Faculty Fellow/Postdoctoral Fellow at New York University in the Center for Soft Matter Research in the Physics Department. This is an independent position with a research budget and teaching responsibilities intended to promote diversity in the university. Previously, I was a graduate student with David Chandler at the University of California, Berkeley, receiving my Ph. D. in Physical Chemistry in August 2011. I graduated from New York University in 2006 with a B.S. in Chemistry with minors in Mathematics and Computer Science. My main academic background is in the field of computational and theoretical statistical mechanics and thermodynamics with an emphasis on slow (supercooled, dynamically heterogeneous) systems and rare events.

My research focus is two pronged: I am interested in slow out-of-equilibrium systems with a main focus on glassy dynamics as well as developing new computational methods to study such out-of-equilibrium systems eventually hoping to apply those methods towards engineering new materials. My expertise is in glassy dynamics and I remain involved in understanding the role of dynamic facilitation in supercooled liquids and granular material. I am further interested in the way scientists measure glassy dynamics – specifically related to the role of probe particles as molecular thermometers. Do these probes alter the dynamics of the host material? Can their use be extended to measurements at different length scales? Beyond this, I am interested in developing new computational methods to study rare events in such glassy (and other dynamically interesting) systems. Through this development, I hope to be able to make recommendations for designing new materials that have certain desirable dynamical phenomena by exploring model parameter space.

I am also interested in harnessing the power of new computational tools available to computational scientists. I am interested in using new hardware advances –

such as running simulations on graphics card processors rather than conventional CPUs. To that end, I believe it is important to incorporate the latest available hardware and algorithms into scientific research to make the most of our current tools.

I believe my research would be a good fit for the CCNY Physics department. As a chemical physicist, I believe I would be thrilled to work closely with the researchers in the Levich institute, as my research interests span from physics to chemistry and from biophysics to material science.

Sincerely,

Yael Elmatad

encl: Research Statement, Teaching Statement, CV - 13 pages total

Statement of Research Interests:
Out of equilibrium dynamical systems, the path from A to B.

Yael S. Elmatad

Summary

Increasingly, statistical physics has had to grapple with scientific questions in which techniques of classical, equilibrium thermodynamics have to be expanded in order to apply to inherently slow and often driven systems. As these systems are out-of-equilibrium, it does not suffice to simply study ensembles of configurations. Instead, we are forced to examine dynamical ensembles of trajectories. One such problem is the glass transition. Reconciling the apparent disparity between the microscopic, disordered nature of glass and its macroscopic rigidity has confounded physicists for years. However, we have recently shown how studying a simple model in trajectory space can shed light on the true nature and universality of molecular glassformers. While these simple models have given us new insights into glasses, they are not the complete picture. I am particularly interested in investigating the effects of probe particles on supercooled liquids. Specifically, I seek to understand to what extent probe particles are recorders of the dynamics of the host. Using techniques developed to study dynamical systems (eg. transition path sampling), which I have already applied to simple models, I believe it would be instructive to study other out of equilibrium processes such as motion in a crowded intracellular environment and clot formation in sickle-cell anemia. Beyond these applications, I am intrigued by the development of new dynamical sampling methods. One such example would be investigating new ways to perform parallel tempering in trajectory space which could help improve sampling efficiency in path ensembles. Moreover, I am fascinated by protocols for designing novel materials by optimizing model parameters to create an ideal process for observing a desired effect (say, self assembly). In effect, such a method would shift the focus from studying a set of trajectories given particular parameters, to studying a model with adjustable nobs which could be tuned to obtain a desired effect. Inverting the question would allow us to not only learn more about the physical world we live in but also to gain new ways to engineer models and novel materials to perform desired behaviors.

1 The Glass Transition

Supercooled liquids and the glass transition are a much debated, poorly understood physical phenomenon. The nature of supercooled liquids is inherently out of equilibrium as the equilibrium state (crystal) is avoided by a cooling protocol that frustrates the previously in-equilibrium liquid. In recent work, we have shown how to take a wide range of experimental data for molecular glassformer transport properties and collapse them onto a single curve. Much of the data taken on supercooled liquids originates from measurements that involve probe particles – guest particles that are used as 'thermometers' for their host material, acting as recorders of transport properties. To what extent these probes can record useful information about the material in which they are embedded is unknown. Probe particles are generally designed to be as "inconspicuous" as possible to best mimic the behavior of the host. However, this passivity is often taken *a priori* and unverified. I believe this unverified claim to be of utmost importance to our understanding of glassy measurements. For example, would swelling the probe size tell us something about inherent length scales? Once the probe size is of the order of the typical distance between dynamic heterogeneities (a hallmark of 'glassy' dynamics), would the mean field behavior of an average liquid be recovered? In this regime, would the diffusion constant and the relaxation time be coupled as per the Stokes-Einstein equation, even while the host supercooled liquid exhibits decoupling? I believe that Monte-Carlo and molecular dynamics simulations would be excellent tools for studying the effects of probe particles on host liquids. Through these studies, it would be understood to what extent the probe particle can be used as a molecular thermometer for the host and, moreover, to what extent and in what regime does the probe disturb the normal dynamics of the host liquid. These insights would be useful to experimentalists who often assume that the probe acts only as an ideal 'passive' recorder. As these ideas are a logical next step

of work I have already begun pursuing, it would make an ideal project for a beginning graduate student seeking to learn glassy phenomenology and simulation techniques.

2 Crowded Environments

Recently, many have touted the analogy between crowded cellular environments and the colloidal glass transition. By changing the osmotic pressure, experimenters were able to 'jam' the interior environment, just as they would a dense colloidal or granular material. While this pressure was applied in a laboratory, this change in pressure is similar to the pressure change during tumor formation as cells become more and more densely packed due to rapidly dividing cells. Since cells are crowded, out of equilibrium environments they share many features with supercooled liquids – also dense packings of molecules – only on a different scale. Recent numerical and simulation technique advances have been used to shed light on motion in such supercooled environments. By exploiting the similarity, large molecular simulations of a dense cellular system coupled with new techniques can be used to study basic motion of small proteins as they diffuse in such a crowded environment. These simulations could use techniques of transition path sampling, which I am familiar with based on my studies of glassformers, to characterize the ensemble of possible moves as a protein escapes its environment by exiting its macromolecular cage. I would be especially interested in discussing these topics with biologists and biophysicists. I believe that their biological expertise coupled with my familiarity with work in dense, glassy systems would help shed new insights into crowded cellular environments. Moreover, I believe that through collaboration we would be better poised to answer questions about motion within a cell. We can also compare these motions to the facilitated motions in granular and colloidal materials. This information would lead to a better physical understanding of such a complex, crowded environment.

Beyond intracellular material, analogies with jammed materials are also observed when examining *extra*-cellular materials. Recent work in microfluidic devices have shown how sickle-cell anemia manifests itself when cells change their shape and form clots is narrow veins. The geometry of the cells as they "sickle" has been shown to play an important role in the disease. Understanding elementary processes about how clots form and dissolve can be of use to create new treatments for the disease. It has already been shown that a (toxic) chemical inhibitor that binds to red blood cells can alleviate clot formation. Alternatively, another treatment might be to add an intruder that frustrates the formation of such clots geometrically, rather than chemically. The elementary steps of formation and destruction of such clots can be studied using techniques of transition path sampling. These simulations would add insights about this physical phenomenon that has devastating medical consequences. Moreover, this knowledge might inform what size and shape molecules would be best for treatment, perhaps offering a non-toxic alternative to chemical binding. Again, here I would seek collaborations with biologists to combine my physical understanding of glasses with their biological knowledge. Such a project would be well suited for a more advanced graduate student as it requires a deeper understanding of simulation techniques and the ability to assimilate new, biological information. Plus, it would allow for the possibility of collaborative, interdisciplinary work ideal for students near the end of their degree.

3 Sampling Methods

The problem of efficient and accurate sampling methods for complex systems is one that continues to challenge researchers even in the face of great technological and algorithmic gains. To that end, in the future it will be necessary to expand methods to improve sampling and design in materials. For example, the development of a new parameter space sampling technique to investigate ensembles of trajectories with increased computational efficiency for dynamical problems will be useful. On the other hand, scientists and engineers are seeking methods which would optimize parameters to select for certain dynamical behaviors. The creation of such methods would allow us to engineer models which strike a balance between thermodynamics and kinetics. Both methods would have applications for studying glassformers, biophysics, and designing novel materials.

To investigate behaviors of rare events, we have used advanced sampling methods developed to study ensembles of trajectories. One of the most significant of these is transition path sampling. This method has allowed people to probe a diverse set of dynamical problems from supercooled liquid dynamics to biological self-

assembly. While current methods can investigate trajectory space for fixed parameters very well, few techniques exist which allow for crossing large barriers in parameter space. Traversing dynamical barriers in trajectory space suffers the same pitfalls as traversing barriers in configuration space: barriers in space-time can prove too high to climb in a given parameter set, meaning that important regions of trajectory space may go unexplored. If this is the case, the transition path ensemble will be poorly converged and may not reflect the true nature of the underlying dynamical free energy landscape. In fact, even with our simple models, straightforward sampling leads to a large number of rejected trajectories.

Parameter space methods for parallel tempering have been mostly limited to swapping static configurations with different parameters by taking into account the relative probabilities of these states. However, recent works have shown that it is possible to extend these methods to include other parameters. I believe it will be possible to extend these methods to mix both dynamical order parameters (which characterize a trajectory) as well as thermodynamic parameters (such as the temperature). In order to make such a trajectory space parallel tempering method fully functional, the path probability for the entire trajectory must be calculated - requiring storing every step of the simulation. This computational demand has only recently become tractable with advances in computing – both in hardware as well as architecture designed to take advantage of the parallel nature of supercomputers. Using such a technique, the path probability could be reconstituted for any arbitrary set of parameters and thus parallel tempering-like swaps could be attempted between two trajectories run with different thermodynamic and dynamical parameters. This work could potentially be expanded to swapping between "protocols" (eg. cooling a liquid toward its glass transition). Take, for example, a trajectory whose temperature changes as a function of time. As long as the path probability of that trajectory can be computed for any arbitrary protocol, swaps can be attempted between these protocols. Such methods would be easily verified on lattice models such as kinetically constrained glassy models (which I have studied extensively) and lattice protein models – both known to exhibit rich dynamic phenomena.

4 Material Design

In the last twenty years, nanoparticles and their applications have come to the forefront of scientific consciousness. Certain nanoparticles can be used for self-assembly, spontaneously forming complex aggregated structures. The future will hold a variety of uses for particles that can self-assemble such as for targeted drug delivery, in optics, and as surfactants. The final, assembled, structure depends on the interactions between the nanoparticles and how those interactions dictate kinetic pathways to assembly. It has been noted that interactions should be strong but *not too strong*, so that an unassembled system has enough time and energy to bind but also to anneal out defects. Many have tried to design methods to optimize specified assembly pathways (and final structures) at viable conditions. However, a reliable method remains elusive.

Tuning interactions until they produce a desirable effect involves developing a method to allow trajectories to explore parameter space. For specific parameters of interest, one can gain insight into dynamics by sampling this space. This allows us to sample the extreme values of our ensemble distribution along with the average. This information can be used to optimize parameters that select for a particular behavior in a system with two basins, say A and B. For example, in a self-assembly process A could be an unassembled state and B an assembled state. Ideally, we could optimize the probability of seeing a trajectory that goes from A to B given that the trajectory starts in A; that is, optimize, relative to the thermodynamic parameters, the probability of ending in state B given that the system started in state A.

Optimization methods for these kinds of problems have been recently promoted and are known as *maximum likelihood estimators*. These methods can be then used iteratively until an ideal set of parameters is found that increases the probability of going from A to B. This method would act as a maximization method for path probability in parameter space. These results can be informed by real thermodynamic control parameters that experimentalists can tune – such as the interaction strength between particles (say, by changing the host material) or by tuning an external field.

These sampling ideas could form the basis for a graduate thesis or, equally for a postdoctoral project. Moreover, these ideas would be especially well suited for collaborations with material scientists.

Teaching Statement

Yael S. Elmatad

1 Teaching Background

One of the selling points of my current position as an NYU Diversity Faculty Fellow/Postdoctoral Fellow was the ability to combine my love of independent research with my sense of teaching responsibility. Over the past few semesters, I have enjoyed my time as the instructor of two required upper level courses: Thermal Physics and Quantum Mechanics I. Throughout my time, I have had to grapple with the pitfalls that often face new faculty such as writing fair examinations and explaining material in a novel way – not to mention dealing with a wide variety of student concerns ranging from questions regarding difficult material to issues concerning personal matters. Designing these courses myself has been challenging but rewarding. In spite of these challenges, I was pleased that 11 out 12 students said they would recommend me as an instructor to a friend.

Up until my postdoctoral work, my education and teaching experience has been mostly in chemistry departments. However, my education has always been on the very physical side of chemistry – opting for extra physics, mathematics, and computer science coursework rather than pure chemistry. As a sophomore undergraduate I was already leading general chemistry clinic sections. By my junior year I was one of the two Physical Chemistry teaching assistants, teaching both semesters (quantum mechanics, statistical mechanics, thermodynamics, gas kinetics, etc...) while still enrolled in a variety of upper level coursework.

In graduate school at UC Berkeley, I was a teaching assistant for three semesters. My first semester, I was selected out of all the incoming graduate students to teach the laboratory portion of the General Chemistry for majors (rather than non-majors). I then went on to teach the upper level Physical Chemistry Thermodynamics/Statistical Mechanics course. For my work as a teaching assistant in that course, I received a Graduate Student Instructor Teaching Award from the university and received reviews stating that I was the best teaching assistant my students encountered during their studies. In my fourth year, I was selected to be the teaching assistant for the graduate level statistical mechanics course in the chemistry department.

2 Teaching Tools and Philosophy

Throughout my teaching work, I have endeavored to make the material both accessible and relatable. One strategy that I have used is to include modern research into my teaching assignments. In statistical physics, I must go through all the different kinds of engines – something that seems archaic to most students (and instructors!). However, a recent article in Nature Physics about a one-particle Stirling engine shows how even this mundane topic can be made interesting and is on the cutting edge of scientific discovery. In my Quantum I class I introduced the Einstein-Rosen-Podolsky paradox, Bell's inequality, and highlighted several papers (all within the past year) on quantum entanglement and quantum communication.

Moreover, as a computational chemical physicist, I know the power of computing in modern science. Students who can harness computational tools have an advantage over those who shy away from it – whether they choose to go into theory *or* experiment. As a graduate teaching assistant at Berkeley, I was charged with introducing my students to the basics of programming (in C++) so they could learn to run simple Monte Carlo simulations. This spring, I intend to do the same with my undergraduate physics students only this time I will teach them Python, a more modern language.

I believe integrating modern research and techniques (such as computer simulation) makes my courses more enriching to students who realize that what I am teaching them allows them access to some of the most current ways of looking at the world, and not only material stuck in the past.

Furthermore, as a woman in science, I believe that it is deeply important to have female role models. As a high school student, my first chemistry teacher was a woman and I believe that had an important impact on my future trajectory. At NYU and UC Berkeley, however, I did not have a single female professor in any of my chemistry, physics, mathematics, or computer science courses. Fortunately, I did have a female academic undergraduate advisor who pushed me and believed in my success. In graduate school, I became a member of the women in chemistry organization (Iota Sigma Pi) – a group dedicated to shrinking the gender gap in science. As a postdoctoral fellow, I have been volunteering with the undergraduate Women in Science group, acting as an an additional mentor for next batch of budding scientists. I am keenly aware that my ability to express confidence and competence as an instructor and mentor has a lasting impact on future generations of scientists. To some, it expresses that they too can be in my shoes, while to others it highlights that people from varied backgrounds are just as capable as anyone else.

3 Future

My diverse educational background in physical sciences makes me suitable for teaching a wide variety of courses across several departments. My favorite courses are those close to my research background such as those that deal with Thermodynamics, Statistical Mechanics, and Mathematical Methods. However, my experience and teaching also makes me suitable for other courses such as General Chemistry and Physics, Quantum Mechanics, Biophysics, Condensed Matter, and Classical Mechanics.

Moreover, I would love the opportunity to design new courses. For example, one idea I have been considering is a course on non-equilibrium statistical mechanics and simulation methods that includes current work on out-of-equilibrium and dynamical systems such as the Jarzynski inequality and Crooks fluctuation theorems as well as rare event path sampling methods developed to study dynamical processes and slow systems. Additionally, I believe it is important for undergraduates to be exposed to state of the art research and I believe a course that focuses on reading modern and current literature analytically – that is understanding the material, critiquing it, as well as suggesting future steps in that line of work – would highlight another facet of being a scientist normally excluded from undergraduate education.

I also look forward to mentoring graduate and undergraduate students in my new position as a research group leader. I was fortunate enough to have an excellent graduate advisor at UC Berkeley who was able to manage his group effectively without micromanaging us – thus allowing us the ability to discover things independently, though still under his guidance. I hope to bring this balance to my own group, knowing when to push and be assertive, but also knowing when to back off and allow for individual discovery.

4 At CUNY

At an undergraduate level, I could teach the majority of physics courses for both majors and non-majors such as Ideas in Physics, General Physics, Elementary Physics, any of the Honors courses, any of the Quantum Mechanics courses (such as the QM for Applied Engineers), Biophysics, Mechanics I & II, Thermodynamics and Statistical Physics, Kinetic Theory and Statistical Mechanics, The Physics and Chemistry of Materials, The Physical Universe, Science I & II, Development and Analysis of Ideas in Classical Science, as well as Development and Analysis of Ideas in Contemporary Science.

At the graduate level, I would be more than comfortable teaching any level of Statistical Mechanics, Quantum Mechanics I, Mathematical Methods in Physics, Computational Methods in Physics, and Biophysics.

Yael S. Elmatad

Contact Information

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Citizenship USA

Education

University of California, Berkeley, Berkeley, CA USA

Ph.D., Physical Chemistry, August 2011

- Thesis Title: *Analysis & Simulation of Dynamics in Supercooled Liquids*
- Research Adviser: Professor David Chandler
- Research: Statistical physics of supercooled liquids from analysis of experimental data to simulations and analytics of kinetically constrained lattice models of glassformers.

New York University, *College of Arts & Science*, New York, NY USA

B.S., Chemistry, May 2006

- College of Arts & Science Valedictorian
- *Summa cum Laude*, with University and Departmental Honors
- Minor in Computer Science
- Minor in Mathematics
- Minor in Hebrew Language & Literature
- Research Adviser: Professor Zlatko Bačić
- Research: Equilibrium and vibrationally-averaged structure of small molecular clusters as well as clusters of H_2 in water clathrates for potential use for hydrogen storage.

Appointments

New York University, *College of Arts & Science*, New York, NY USA

- NYU Postdoctoral and Transition Program for Academic Diversity Fellowship
  Center for Soft Matter Research, Physics Department, Fall 2011-

International Experience

Visiting Research Scholar

- Juan Garrahan's Research Group
- March-April 2010
- School of Physics & Astronomy, University of Nottingham, Nottingham, UK

Publications

Elmatad, Y. S and R. L. Jack. Space-time Phase Transitions in the East Model with a Softened Kinetic Constraint. *J. Chem. Phys.*, **138**, 12A531, 2013.

Elmatad, Y. S and A. S. Keys. Manifestations of Dynamical Facilitation in Glassy Materials. *Phys.. Rev. E* **85,** 061502, 2012.

Elmatad, Y. S. Fragile-to-Strong Crossover in Supercooled Liquids Remains Elusive. *Proc. Natl. Acad. Sci.* **108,** E230, 2011.

Elmatad, Y. S., D. Chandler, and J. P. Garrahan. Corresponding States of Structural Glass Formers II. *J. Phys. Chem. B* **114,** 17113-17119, 2010.

Elmatad, Y. S., R. L. Jack, D. Chandler, and J. P. Garrahan. Finite-temperature Critical Point of a Glass Transition. *Proc. Natl. Acad. Sci.* **107,** 12793-12798, 2010.

Elmatad, Y. S., D. Chandler, and J. P. Garrahan. Corresponding States of Structural Glass Formers. *J. Phys. Chem. B* **113,** 5563-5567, 2009.

Elmatad, Y. S., M. Zitolo, D. Fera, and A. Jerschow. Examining Gas Kinetics in MATLAB. *Chem. Educator* **12,** 89-93, 2007.

Sebastianelli, F., M. Xu, Y. S. Elmatad, J. W. Moskowitz and Z. Bačić. Hydrogen Molecules in the Small Dodecahedral Cage of a Clathrate Hydrate: Quantum Translation-Rotation Dynamics of the Confined Molecules. *J. Phys. Chem. C* **111,** 2497-2504, 2007.

Xu, M., Y. S. Elmatad, F. Sebastianelli, J. W. Moskowitz and Z. Bačić. Hydrogen Molecules in the Small Dodecahedral Cage of a Clathrate Hydrate: Quantum Five-dimensional Calculations of the Coupled Translation-rotation Eigenstates. *J. Phys. Chem. B* **110,** 24806-24811, 2006.

Sebastianelli, F. Y. S. Elmatad, H. Jiang, and Z. Bačić. HF in Clusters of Molecular Hydrogen: II. Quantum solvation by H_2 Isotopomers, Cluster Rigidity, and Comparison with CO-doped Parahydrogen Clusters. *J. Chem. Phys* **125,** 164313, 2006.

Presentations

"Amorphous Glassy Materials: Solids or Liquids?"
- *Invited*, NYU, College of Arts and Science Scholars Lecture, March 2013.
- New York, NY

"The Glass Transition: A Facilitation Perspective"
- *Invited*, Columbia University, Physical Chemistry Seminar Series, October 2012.
- New York, NY

"Manifestations of dynamical facilitation in glassy materials "
- Presentation at American Physical Society Meeting, March 2012
- Boston, MA

"Finite-temperature critical point of a glass transition"
- Presentation at American Physical Society Meeting, March 2011
- Dallas, TX

"Jamming and the glass transition''
- Presentation for Youth Radio
- Oakland, CA

"Letting go of the reins: A finite temperature critical point in a glass-former model"
- Presentation to Itamar Procaccia Research Group, April 2010
- Weizmann Institute Rehovot, Israel

Mini Statistical Mechanics Meeting
- Poster Presenter, January 2007, 2008, 2009, 2010, 2011
- UC Berkeley Berkeley, CA

"Dynamic phase transitions in glass former models"
- Graduate Research Conference
- Presentation to College of Chemistry, April 2008

- UC Berkeley Berkeley, CA

Workshop on Metastability and Rare Events in Complex Systems
- Poster Presenter, February 2008
- The Erwin Schrödinger Institute, Vienna, Austria

National Awards

Office of Naval Research
- NDSEG, Graduate Fellowship, 2007-2010

Department of Energy
- Computational Science Graduate Fellowship, 2007 (Declined)

National Science Foundation
- Graduate Research Fellowship, 2006-2011

The Bill & Melinda Gates Foundation
- Gates Cambridge Scholarship, 2006 (Declined)

Iota Sigma Pi: National Honor Society for Women in Chemistry
- Undergraduate Award for Excellence in Chemistry, 2006
- Awarded to one graduating female chemistry undergraduate in the United States per year.

Barry M. Goldwater Scholarship and Excellence in Education Program
- Scholarship Recipient, 2005-2006

Arnold & Mabel Beckman Foundation
- Beckman Scholar, 2004-2005

National Science Foundation
- Research Experience for Undergraduates (REU), 2004-2005

University Awards

New York University, *Faculty of Arts & Science*, New York, NY USA
- NYU Postdoctoral and Transition Program for Academic Diversity Fellowship (Fall 2011)

University of California, Berkeley, Berkeley, CA USA
- Outstanding Graduate Student Instructor, 2008

New York University, *College of Arts & Science*, New York, NY USA
- Roland P. Beattie Memorial Award presented to class Valedictorian, 2006
- Phi Beta Kappa/Albert Borgman Prize for Best Honors Thesis in the Sciences, 2006
- Chemistry Departmental Scholar Award, 2006
- George Granger Brown Scholar in Chemistry, 2005
- Chemistry Department Research Conference Award Recipient, 2005
- Lillian Lindhardt-Solotoroff Award, 2005
- President's Service Award in Leadership (Personal), 2005
- President's Service Award in Programming (with Draper Chemical Society), 2005
- Chemistry Department Research Fellow, 2004
- New York State Applied Spectroscopy Society Undergraduate Award, 2004
- Dean's Undergraduate Research Fund Scholar, 2004
- Sokol Freshman Chemistry Scholar, 2002
- Thomas Sweeney Scholarship, 2002-2006

- Presidential Honors Scholar, 2002-2006
- Dean's List 2002-2006

Honor Societies

Iota Sigma Pi: National Honor Society for Women in Chemistry
- Inducted 2006

Phi Beta Kappa
- Inducted 2005

Phi Lambda Upsilon: National Chemistry Honor Society
- Inducted 2004

Leadership

Iota Sigma Pi (ISP), Hydrogen Chapter at UC Berkeley
- President, 2008-2009 and 2010-2011
- Vice President, 2009-2010
- ISP at UC Berkeley is a women's organization for chemists. We focus on career development events as well outreach projects to the UC community as well as the community at large. Events include women's tea hours where professors as well as women in industry come to speak to our group and brown bag lunches with female faculty members. We have worked with Girls Inc. of Alameda county to recruit volunteers for their afterschool programs for 4th grade girls. We also organize graduate-undergraduate mentorship programs at UC Berkeley.

NYU Draper Chemical Society
- President 2005-2006
- Secretary 2004-2005
- The Draper Society is the undergraduate chemistry society at NYU. I was one of the founding members of the society in 2004 and it's first secretary. I created and planned an undergraduate research fair which highlighted opportunities for research across disciplines. This event is now held yearly and for our efforts our group received a President's Service Award for programming. I created a partnership with a local high school that sent NYU students to act as classroom assistants. Additionally, we held a regular seminar where professors presented their work to our group. We also held workshops geared towards students interested in pursuing graduate studies. My work with the Draper Society earned me a President's Service Award for Leadership.

Phi Lambda Upsilon, Alpha Lambda Chapter at NYU
- Vice President 2005-2006
- Secretary 2004-2005
- Phi Lambda Upsilon is the national honor society in chemistry. Our group mostly worked with the Draper Society to put on joint programs. We also coordinated an upperclassman-freshman mentorship program.

NYU Model United Nations (MUN)
- President 2005-2006
- Treasurer 2003-2005
- As the treasurer of the MUN team I was responsible for handling all of the group's finances. This included handling the funding we received from the university to attend our two yearly national MUN conference (one at UPenn and one at Harvard). I trained members in parliamentary procedure and submitted budget proposals to ensure that our club continued to be funded. As the President, I acted as head delegate during conferences.

Teaching Experience

New York University, New York, NY USA

Professor

- Phys 140: Thermodynamics & Statistical Physics (Spring 2012 & 2013)
- Phys 123: Quantum Mechanics I (Fall 2012)

University of California, Berkeley, Berkeley, CA USA

Graduate Student Instructor (GSI)

- Chem 220A: Thermodynamics and Statistical Mechanics (Graduate Level)
  - Fall 2009 with Professor Phillip Geissler
  - Was the sole teaching assistant for 50+ student graduate level course. Responsible for weekly discussion session, holding office hours, transcribing lectures to post as notes for students on the course website, grading problem sets and exams, and writing solution sets. Responsible for presenting several lectures on internal molecular partition functions when Professor Geissler was out of town. Was also responsible for introducing new graduate students to computer programming.

- Chem 120B: Physical Chemistry (Undergraduate Level Thermodynamics & Statistical Mechanics)
  - Fall 2007 with Professor David Chandler
  - Was one of two teaching assistants for a class of about 70 students. Responsibilities included: grading exams and problem sets, holding discussion session and office hours, transcribing lectures to post as notes for students on the course website, and writing solution sets.
  - Received an Outstanding Graduate Student Instructor Award from UC Berkeley for my work in this course.

- Chem 4A: General Chemistry and Quantitative Analysis (Undergraduate Level)
  - Fall 2006 with Professor Martin Head-Gordon and Professor Luciano Moretto
  - Responsibilities included: 4h/week laboratory sections, grading lab reports and exams, and holding exam reviews and office hours.

New York University, New York, NY USA

Teaching Assistant (TA)

- Chem V25.0651 & V25.0652: Physical Chemistry I & II (Undergraduate Level Quantum & Statistical Mechanics)
  - Fall 2004 & Spring 2005 with Professor Zlatko Bačić & Professor Paul Gans
  - Introductory level of quantum mechanics (Fall) and thermodynamics and statistical mechanics (Spring) for 3rd and 4th year undergraduates.
  - One of two TAs for course of about 60 students. Responsibilities included: grading exams and problem sets, holding weekly discussion session, and holding office hours.

Clinic Instructor

- Chem V25.0125 & V25.0126: General Chemistry I & II (Undergraduate Level)
  - Fall 2003 & Spring 2004 with Professor John Halpin
  - Responsibilities included: holding weekly clinic sessions where students worked collaboratively in groups to solve problem sets. Was also responsible for writing the problem sets used during these clinic sessions.

Other

Hacker School, Brooklyn, NY USA

Attendee, Summer 2012

- Three month computer science workshop ("writers' retreat for hackers"). Focused on high performance computing (parallel programming) as well as investigated data science topics.

Community Service

Women in Science (WINS), New York University , 2011-Present

- Mentor female undergraduates majoring in science and technology fields. .

Girls Inc., Girls Inc. of Alameda County, SMART Program, 2008-2009

- Volunteered biweekly with Girls Inc. working with 4th graders in an Oakland, CA public school. SMART is an afterschool program that seeks to foster an interest in science and mathematics in young girls. As a volunteer, I worked with the instructor to encouraged young girls to be interested in scientific inquiry by teaching them about our environment and performing experiments with them.
- This project was spearheaded by Iota Sigma Pi, the women honor's society in chemistry where we recruited about 15 volunteers to participate.

University Neighborhood High School, NYC 2004-2006

- Volunteered weekly as a tutor in a chemistry classroom for high school students in a low-income neighborhood. Personally initiated the program as well as organized students through the NYU Draper Chemical Society to go on various days of the week. In total, about 20 volunteers went weekly to the school to help the teacher with demonstrations, lessons, and the students with problem sets.
- Additionally, volunteered with the school's Model United Nations team along with a few other members of the NYU Model United Nations team. Helped students with their position papers for the UNA-USA Model UN conference at the UN during weekly meetings. Also, acted as a chaperone for the students when they visited the UN to participate in the conference.

The Door, NYC 2002-2004

- After school tutor for low-income students, many of whom were recent immigrants. Volunteered weekly helping students with homework, mostly in science and math.
- Placement at The Door through the NYU Dean's Service Honor Corps

References

Available upon request