

Research Interests

- Chemical Physics, Theoretical Chemistry, Photochemistry, Organic Optoelectronics, Excitonic Physics, Open Quantum Systems, Spectroscopy

Education

Massachusetts Institute of Technology (MIT), Cambridge, MA Ph.D. in Chemistry	09/2011–10/2017
National Taiwan University (NTU), Taiwan M.S. in Chemistry	09/2007–06/2009
National Taiwan University (NTU), Taiwan B.S. in Chemistry	09/2003–06/2007

Professional Experience

Assistant Professor at Dept. of Chemistry and Biochemistry, University of Nevada, Las Vegas	01/2023–present
Research Associate at Dept. of Chemistry, University of Toronto (University Professor Paul Brumer) Parametric Sensitivity of Excited State Processes in Condensed Phase Chemistry	10/2021–12/2022
Postdoctoral Fellow at Dept. of Chemistry, University of Toronto (University Professor Paul Brumer) Theoretical Investigation of Light-Induced Biological Processes Including Light-Harvesting and Dim-Light Vision	01/2018–09/2021
Graduate student visitor, Theoretical division, Los Alamos National Lab (Professor Sergei Tretiak) Charge Transport in Bacterial Pili Biofilm	06/2014–08/2014
Graduate Student in Dept. of Chemistry, MIT (Professor Jianshu Cao) Spectroscopy, Relaxation, and Transport of Molecular Excitons in Noisy and Disordered Environments	11/2011–10/2017
Research Assistant in Dept. of Chemistry, NTU (Professor Bih-Yaw Jin) Theoretical Characterization of Graphene Grain Boundary, Geometric Solitons in Extended Metal Atom Chains	09/2010–07/2011
Graduate Research in Dept. of Chemistry, NTU (Professor Bih-Yaw Jin)	09/2010–07/2011

Theoretical Studies of Complex Graphitic Structures

Undergraduate Research in Dept. of Chemistry, NTU
(Professor Bih-Yaw Jin)

09/2010–07/2011

Magnetic Response of Defective Toroidal Carbon Nanotubes

Teaching Experience

- Teaching Assistant of Undergraduate Course: Statistical Mechanics (MIT) 02/2014–05/2014
- Teaching Assistant of Undergraduate Course: Statistical Mechanics (MIT) 02/2012–05/2012
- Teaching Assistant of Undergraduate General Chemistry Lab (MIT) 09/2011–12/2011
- Teaching Assistant of Analytical and Physical Chemistry Lab (NTU) 09/2007–06/2008

Honors and Scholarships

- Best Poster Award, Quantum Effects in Biological Systems Workshop 12/2014
- Wellington and Irene Loh Fund Fellowship, MIT 09/2014
- Robert T Haslam (1911) Presidential Fellowship, MIT 09/2011
- Best Poster Award, Cross-Strait Theoretical and Computational Chemistry Conference 02/2011
- Poster Award, Dept. of Chemistry, NTU) 07/2009
- Dr. Yen Distinguished Thesis Award (Best thesis award in Department of Chemistry, NTU) 07/2009
- Dean's Award for Graduates in College of Science, NTU (For graduates ranked within top 10%) 06/2009
- Member of the Phi Tau Phi Scholastic Honor Society, Taiwan 06/2009
- Dean's Award for Undergraduates in College of Science, NTU (For undergraduates with outstanding performance in College of Science ranked within top 10%) 06/2007

Manuscripts in preparation

1. Chuang, C., Ogilvie, J. and Brumer, P., "Parametric sensitivity of excited state processes in biology and condensed phase"
2. Chuang, C. and Cao, J., "A unified theoretical framework for understanding multiple timescales of carrier relaxation in organic systems: Hot exciton relaxation in conjugated polymers."

40. Deshmukh, A.; Zheng, W.; [Chuang, C.](#); Bailey, A.; Williams, J.; Sletten, E. ; Egelman, E. ; Caram, J., “Near-atomic resolution structure of J-aggregated helical light harvesting nanotubes,” submitted, (), ,
39. [Chuang, C.](#), Kapulkin, A.; Pattanayak, A.; Brumer, P., “Extreme parametric sensitivity in bath-mediated transport due to avoided level crossings in the dissipative Quantum Rabi model,” submitted, (), ,
38. Blach, D. D.; Lumsargis, V. A.; Clark, D. E.; [Chuang, C.](#); Wang, K.; Dou, L.; Schaller, R. D.; Cao, J.; Li, C. W.; Huang, L., “Superradiance and exciton delocalization in perovskite quantum dot superlattices,” *Nano Lett.*, (2022), 22, 7811
37. Calderon, L. F.; [Chuang, C.](#); Brumer, P., “Electronic-vibrational resonance does not alter steady-state transport in natural light-harvesting systems,” *J. Phys. Chem. Lett.*, (2023), 14, 1436
36. [Chuang, C.](#) and Brumer, P., “Steady state photoisomerization quantum yield of model rhodopsin: Insights from wavepacket dynamics?,” *J. Phys. Chem. Lett.*, (2022), 13, 4963
35. Deshmukh, A.; Geue, N.; Bradbury, N.; Atallah, T.; [Chuang, C.](#); Pengshung, M.; Cao, J.; Sletten, E.; Neuhauser, D.; Caram, J., “Bridging the gap between H- and J-aggregates: Classification and supramolecular tunability for excitonic band structures in 2-dimensional molecular aggregates,” *Chem. Phys. Rev.*, (2022), 3, 021401
34. Vargas-Hernandez, R. A.; [Chuang, C.](#); Brumer, P., “Multi-objective optimization for photoisomerization models with respect to experimental observables,” *J. Chem. Phys.*, (2021), 155, 234109
33. Ho, H.-H.; [Chuang, C.](#); Jin, B. Y., “Constructing bead models of smoothly varying carbon nanotori with constant radii and related intersecting structures,” *Proceedings of Bridges: Mathematics, Music, Art, Architecture, Culture*, (2021), , 331-334.
32. [Chuang, C.](#) and Cao, J., “Universal scalings in two-dimensional anisotropic dipolar excitonic systems,” *Phys. Rev. Lett.*, (2021), 127, 047402
31. [Chuang, C.](#) and Brumer, P., “Extreme parametric sensitivity in the steady-state photoisomerization of two-dimensional model rhodopsin,” *J. Phys. Chem. Lett.*, (2021), 12, 3618
30. Bradbury, N. C.; [Chuang, C.](#); Deshmukh, A. P.; Rabani, E; Baer, R.; Caram, J. R.; Neuhauser, D., “Stochastically realized observables for excitonic molecular aggregates,” *J. Phys. Chem. A*, (2020), 124, 10111
29. [Chuang, C.](#) and Brumer. P., “LH1-RC light-harvesting photocycle under realistic light-matter conditions,” *J. Chem. Phys.*, (2020), 152, 154101 (Featured on the AIP website and AIP Scilight: 10.1063/10.0001137).
28. [Chuang, C.](#); Bennett, D. I. G.; Caram, J. R.; Aspuru-Guzik, A.; Bawendi, M. G.; Cao, J., “Generalized Kasha’s model: T-dependent spectroscopy reveals short-range structures of 2D excitonic systems,” *Chem*, (2019), 5, 1.

27. Deshmukh, A. P.; Koppel, D.; Chuang, C.; Cadena, D. M.; Cao, J.; Caram, J. R., "Design principles for two-dimensional molecular aggregates using Kasha's model: Tunable photophysics in near and short-wave infrared," *J. Phys. Chem. C*, (2019), 123, 18702.
26. Doria, S.; Sinclair, T. S.; Klein, N. D.; Bennett, D. I. G.; Chuang, C.; Freyria, F. S.; Steiner, C. P.; Foggi, P.; Nelson, K. A.; Cao, J.; Aspuru-Guzik, A.; Lloyd, S.; Caram, J. R.; Bawendi, M. G., "Photochemical control of exciton superradiance in light-harvesting nanotubes," *ACS Nano*, (2018), 12, 4556.
25. Chuang, C.; Lee, C. K.; Moix, J. M.; Knoester, J.; Cao, J., "Quantum diffusion on molecular tubes: Universal scaling of the 1D to 2D transition," *Phys. Rev. Lett.* , (2016), 116, 196803.
24. Manzano, D.; Chuang, C.; Cao, J., "Quantum transport in d-dimensional lattices," *New J. Phys.*, (2016), 18, 043044.
23. Yan, H.; Chuang, C.; Zhugayevych, A.; Tretiak, S.; Dahlquist, F. W.; Bazan, G. C., "Inter-aromatic distances in *Geobacter Sulfurreducens* pili relevant to biofilm charge transport," *Adv. Mater.*, (2015), 27, 1908-1911.
22. Chuang, C.; Guan, J.; Witalka, D.; Zhu, Z.; Jin, B. Y.; Tomanek, D., "Relative stability and local curvature analysis in carbon nanotori," *Phys. Rev. B*, (2015), 91, 165433.
21. Guan, J.; Jin, Z.; Zhu, Z.; Chuang, C.; Jin, B. Y.; Tomanek, D., "Local curvature and stability of two-dimensional systems," *Phys. Rev. B*, (2014), 90, 245403.
20. Chen, C.-T.; Chuang, C.; Cao, J.; Ball, V.; Ruch, D.; Buehler, M. J., "Excitonic effects from geometric order and disorder explain broadband optical absorption in eumelanin," *Nature Comm.*, (2014), 5, 3859.
19. Chuang, C.; Jin, B. Y., "Torus knots with polygonal faces," *Proceedings of Bridges: Mathematics, Music, Art, Architecture, Culture*, (2014), , 59-64.
18. Chuang, C.; Knoester, J.; Cao, J., "Scaling relations and optimization of excitonic energy transfer rates between one-dimensional molecular aggregates," *J. Phys. Chem. B*, (2013), 118, 7827-7834.
17. Chuang, C.; Fan, Y.-C.; Jin, B.-Y., "Comments on structural types of toroidal carbon nanotubes," *J. Chin. Chem. Soc.*, (2013), 60, 949-954.
16. Cleary, L.; Chen, H.; Chuang, C.; Silbey, R. J.; Cao, J., "Optimal fold symmetry of LH2 rings on a photosynthetic membrane," *Proc. Nat. Acad. Sci.*, (2013), 110, 8537-8542.
15. Tsou, C.-C.; Chuang, C.; Jin, B.-Y., "Mathematical beading as molecular analog computation: An example from beaded Sierpinski buckyball," *Proceedings of Bridges: Mathematics, Music, Art, Architecture, Culture*, (2013), , 487-490.
14. Chuang, C.; Jin, B.-Y., "Construction of Sierpinski superfullerenes with the aid of zome geometry: Application to beaded molecules," *Proceedings of Bridges: Mathematics, Music, Art, Architecture, Culture*, (2013), , 495-498.

13. Chuang, C.; Fan, Y.-C.; Jin, B.-Y., "On the structural rules of helically coiled carbon nanotubes," *J. Mol. Struct.*, (2012), 1008, 1-7.
12. Chuang, C.; Jin, B.-Y.; Tsou, C.-C.; Tang, N. Y. W.; Cheung, P. S. M.; Cuccia, L. A., "Molecular modelling of fullerenes with beads," *J. Chem. Edu.*, (2012), 89, 414-416.
11. Jin, B.-Y.; Chuang, C.; Tsou, C.-C., "Beaded realization of canonical P, D, and G triply periodic minimal surfaces," *Proceedings of Bridges: Mathematics, Music, Art, Architecture, Culture*, (2012), , 503-506.
10. Chuang, C.; Fan, Y.-C.; Jin, B.-Y., "Systematics of toroidal, helically-coiled carbon nanotubes, high-genus fullerenes, and other exotic graphitic materials," *Procedia Engineering (EASEC-12)*, (2011), 14, 2373-2385.
9. Chuang, C.; Jin, B.-Y.; Tsou, C.-C., "Designing sculptures inspired by symmetric high-genus fullerenes with mathematical beading," *Proceedings of Bridges: Mathematics, Music, Art, Architecture, Culture*, (2011), , 523-526.
8. Chuang, C.; Jin, B.-Y., "Classification of hypothetical doubly and triply periodic porous graphitic structures by tilings of neck-like units," *J. Math. Chem.*, (2010), 47, 1077-1084.
7. Jin, B.-Y.; Chuang, C.; Tsou, C.-C., "Constructing molecules with beads: The geometry of topologically nontrivial fullerenes," *Proceedings of Bridges: Mathematics, Music, Art, Architecture, Culture*, (2010), , 391-394.
6. Jin, B.-Y.; Chuang, C.; Tsou, C.-C., "Construction of physical models for arbitrary fullerenes with beads: Realization of tangent-sphere model," *J. Chin. Chem. Soc.*, (2010), 57, 316-324.
5. Chuang, C.; Jin, B.-Y., "Hypothetical toroidal, cylindrical, helical analogs of C_{60} ," *J. Mol. Graph. Model.*, (2009), 28, 220-225.
4. Chuang, C.; Jin, B.-Y., "Systematics of high-genus fullerenes," *J. Chem. Inf. Model.*, (2009), 49, 1664-1668. (Featured on the ACS News & Research, July 2009)
3. Chuang, C.; Fan, Y.-C.; Jin, B.-Y., "Dual space approach to the classification of toroidal carbon nanotubes," *J. Chem. Inf. Model.*, (2009), 49, 1679-1686.
2. Chuang, C.; Fan, Y.-C.; Jin, B.-Y., "Generalized classification scheme of toroidal and helical carbon nanotubes," *J. Chem. Inf. Model.*, (2009), 49, 361-368.
1. Jin, B.-Y.; Chuang, C.; Tsou, C.-C. , "The wonderful world of beaded molecules." , *Chemistry (The Chinese Chemical Society, Taipei)*, (2008), 66, 73-92. (in Chinese)

Invited Talks

1. "Exciton transport in low-dimensional systems" UMass Boston, MA, USA 2016 Nov.
2. "Generalized Kasha's model: T-dependent spectroscopy reveals short-range structures of 2D excitonic systems" IAMS, Academia Sinica, Taiwan 2017 Dec.

3. "LH1-RC light-harvesting photocycle under realistic light-matter conditions" Chemical Biophysics Symposium, Toronto, Canada, 2019 May.
4. "Universal scaling of the anisotropic dispersion in 2D excitonic systems and its spectroscopic signatures" Thano20, Tbilisi, Republic of Georgia (virtually via Zoom), 2020 Oct.

Contributed Conference Talks

1. "Numerically exact absorption, emission spectra and multi-chromophoric energy transfer rates in LH2" Quantum Effects in Biological Systems, NTU, Singapore, 2014, Feb. (On behalf of Dr. Jeremy Moix and Dr. Jian Ma.)
2. "Exciton transport in open quantum systems" Quantum Dynamics and Spectroscopy in Condensed-Phase Materials and Bio-systems, Telluride, CO, USA, 2015, Jun.
3. "Universal scaling relation of exciton diffusion in light-harvesting chromophore arrays" Quantum Effects in Biological Systems, Florence, Italy, 2015, Jun/Jul.
4. "Quantum transport in spin ladders and exciton lattices" Quantum Thermodynamics Workshop, MIT, MA, USA, 2015, Oct.
5. "Parameter sensitivity of model rhodopsin photoisomerization reaction" Virtual Symposium on Theoretical and Computational Chemistry in Canada, Virtual Conference, 2021, Jul.
6. "Parameter sensitivity of model rhodopsin photoisomerization reaction" ACS 2021 Fall Meeting: Synthesizing Quantum Coherence, Virtual Conference, 2021, Aug.
7. "Extreme parametric sensitivity of steady-state transport in quantum Rabi model" 54th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics, Orlando, FL, 2022, May
8. "Extreme parametric sensitivity in model light-induced biological processes" Quantum Effects in Biological Systems Workshop 2022, Heraklion, Greece, 2022, Jun.

Journal Reviewing

The Journal of Chemical Physics, The European Journal of Physics B, The Journal of the Chinese Chemical Society.