PERSONAL INFORMATION

Name Eli Il-Hyung Lee
Rank Assistant Professor
Professional Address 357 Richardson Hall, 1 Normal Ave., Montclair, NJ 07043
e-mail leei@montclair.edu

EDUCATION

B.S., Major Chemistry and Minor Mathematical sciences, 2008, KAIST, Daejeon, South Korea (Military service, Korean augmentation to the United States army, 2003-2005)
Ph.D., Chemistry, 2012, University of California Berkeley, Berkeley, CA

PROFESSIONAL EXPERIENCE

2019-	Assistant Professor, Department of Chemistry and Biochemistry, Montclair State University, Montclair, NJ
2017-2019	Visiting Assistant Professor, Department of Chemistry, University of Puget Sound, Tacoma, WA
2013-2017	Postdoc, Department of Molecular and Cell biology, UC Berkeley, CA
2013	Postdoc, Howard Hugh Medical Institute, UC Berkeley, CA

GRANTS AWARDED

2022	Oracle for Research Award, Oracle, Austin, TX
2022	NSF MRI grant, co-PI of five, NSF, Alexandra, VA
2022	Separately Budgeted Research Award, Montclair State University, Montclair, NJ
2022	GS-LSAMP Post-Bac Research Experience for LSAMP Students (PRELS) program
2022	CSAM Summer Research Award, Montclair State University, Montclair, NJ
2021	Student Faculty Research Award, Montclair State University, Montclair, NJ
2021	CSAM Summer Research Award, Montclair State University, Montclair, NJ
2020	The Margaret and Herman Sokol Faculty/Student Research Grant, Montclair State University, Montclair, NJ
2019	Start-up fund, Montclair State University, Montclair, NJ
2018	Summer research grant, University of Puget Sound, Tacoma, WA (from NASA)

TEACHING EXPERIENCE

General Chemistry II (Chem121, Lecture and lab)	2021-2022
Selected topics in chemistry / Lipid Biochemistry (CHEM490/576)	2020
General Chemistry I (Chem120, Lecture and lab sections)	2020-2022
Biochemistry I (CHEM370)	2019
Experimental Biochemistry (CHEM372)	2019-2022

Analytical Chemistry (CHEM310)	2022
Analytical Methods (CHEM231, Univ. Puget Sound)	2018
Analytical Methods Laboratory (CHEM231, Univ. Puget Sound)	2018
Analytical Chemistry (CHEM230, Univ. Puget Sound)	2018
Analytical Chemistry Laboratory (CHEM230, Univ. Puget Sound)	2018
Physical Biochemistry (CHEM460, Univ. Puget Sound)	2017
Physical Biochemistry Laboratory (CHEM460, Univ. Puget Sound)	2017
Physical Chemistry Laboratory (CHEM125, UC Berkeley), Graduate student instructor	2011
General Biochemistry & Molecular Biology Laboratory (MCB110L, UC Berkeley), Graduate student instructor	2010
General Chemistry (CHEM1A, UC Berkeley), Graduate student instructor	2009

REFEREED PUBLISHED ARTICLES

1. Juan Ureña, Ashlynn Knight, Il-Hyung Lee, "Membrane Cargo Density-Dependent Interaction between Protein and Lipid Domains on the Giant Unilamellar Vesicles", Langmuir 38 (15), (2022): 4702-4712.
   [Density dependence of interaction between protein and lipid domains on the lipid membrane was discovered. Featured as a supplementing cover of the issue. Cited by 1]

2. Il-Hyung Lee, Sam Passaro, Selin Ozturk, Juan Ureña, Weitian Wang, "Intelligent fluorescence image analysis of giant unilamellar vesicles using convolutional neural network", BMC Bioinformatics, 23 (1), (2022): 1-22.
   [First development of the vesicle analysis software using the deep learning classification, Cited by 1]

3. Il-Hyung Lee, Matthew Y. Imanaka, Emmi H. Modahl, Ana P. Torres-Ocampo. "Lipid raft phase modulation by membrane-anchored proteins with inherent phase separation properties", *ACS Omega*, 4, no. 4 (2019): 6551-6559.
   [This research pointed out the importance of protein domain forming interaction of the membrane-anchored proteins on the lipid membrane in context of the widely recognized membrane heterogeneity, lipid raft model. Cited by 28]

4. Johannes Schöneberg, Mark Remec Pavlin, Maurizio Righini, Il-Hyung Lee, Lars-Anders Carlson, Amir Houshang Bahrami, Daniel H. Goldman, Xuefeng Ren, Gerhard Hummer, Carlos Bustamante and James H. Hurley. "ATP-dependent force generation and membrane scission by ESCRT-III and Vps4", *Science* 362, no. 6421 (2018): pp. 1423-1428.
   [I designed and built a high resolution confocal fluorescence microscopy system coupled with a high IR laser optical trap to measure molecular forces. Cited by 118]

5. Johannes Schöneberg*, Il-Hyung Lee*, Janet H. Iwasa and James H. Hurley. "Reverse-topology membrane scission by the ESCRT complexes", *Nature Reviews Molecular Cell Biology* 18, no. 1 (2017): 5-17. (* equally contributed)
   [A comprehensive review on current models for the reverse topology membrane remodeling mechanism of ESCRT. Molecular animations were introduced to help readers to understand various models intuitively. Cited by 303]

6. Il-Hyung Lee, Hiroyuki Kai, Lars-Anders Carlson, Jay T. Groves and James H. Hurley.

"Negative membrane curvature catalyzes nucleation of ESCRT-III assembly", Proceedings of the National Academy of Sciences 112, no. 52 (2015): 15892-15897
[Focused ion beam (FIB) nanofabrication was used to develop an in vitro lipid membrane system mimicking early budding stage of membrane remodeling with negative curvature. Quantitative TIRF experiments showed geometric preference of ESCRT proteins assembly. Cited by 99]

7. Qing-Tao Shen, Xuefeng Ren, Rui Zhang, Il-Hyung Lee, and James H. Hurley. "HIV-1 Nef hijacks clathrin coats by stabilizing AP-1: Arf1 polygons." *Science* 350, no. 6259 (2015): aac5137.
[Structural discovery of HIV protein Nef mediated AP-1:Arf1 polygon structure formation suggesting molecular mechanism of HIV subverting normal membrane trafficking. I performed Förster resonance energy transfer (FRET) experiments to detect conformational change of the AP-1 protein involved in the process. Cited by 42]

8. Suvrajit Saha, Il-Hyung Lee, Anirban Polley, Jay T. Groves, Madan Rao, and Satyajit Mayor. "Diffusion of GPI-anchored proteins is influenced by the activity of dynamic cortical actin." Molecular biology of the cell 26, no. 22 (2015): 4033-4045.
[Continuation of the collaboration in 6. We found membrane anchored proteins that do not follow smooth scaling of diffusion as a function of temperature. Unlike most other passive molecules, GPI anchored proteins were more influenced by dynamic actin cytoskeleton suggesting importance of both thermodynamics and active skeletal rearrangement as membrane organizing principles. Cited by 76]

9. Jürgen Köfinger, Michael J. Ragusa, Il-Hyung Lee, Gerhard Hummer, and James H. Hurley. "Solution Structure of the Atg1 Complex: Implications for the Architecture of the Phagophore Assembly Site." *Structure* 23, no. 5 (2015): 809-818.
[Structural study of higher-order complex of autophagy proteins involved in phagophore assembly site (PAS) formation using small angle x-ray scattering (SAXS). I performed fluorescence intensity based molecular copy number estimation in yeast cells expressing various autophagy proteins with GFP tags. Cited by 40]

10. Il-Hyung Lee, Suvrajit Saha, Anirban Polley, Hector Huang, Satyajit Mayor, Madan Rao, and Jay T. Groves. "Live Cell Plasma Membranes Do Not Exhibit a Miscibility Phase Transition over a Wide Range of Temperatures." *The Journal of Physical Chemistry B* 119, no. 12 (2015): 4450-4459.
[An intercontinental collaboration on quantitative observation of living cell membrane diffusion at a wide range of temperature. Temperature dependent phase transition has been observed in isolated cell membrane systems but not in intact cell membranes. Using fluorescence correlation spectroscopy (FCS), we found smooth change of diffusion as a function of temperature in various lipids and membrane anchored proteins suggesting non-existence of discrete phase transition in the temperature range studied. Cited by 55]

11. Margaret Stratton*, Il-Hyung Lee*, Moitrayee Bhattacharyya, Sune M. Christensen, Luke H. Chao, Howard Schulman, Jay T. Groves, and John Kuriyan. "Activation-triggered subunit exchange between CaMKII holoenzymes facilitates the spread of kinase activity." *eLife* 3 (2014): e01610. (* equally contributed)
[The very first experimental validation on phosphorylation dependent subunit exchange reaction of CaMKII. Single molecule imaging was introduced to unambiguously and quantitatively study the subunit exchange at various conditions. It implies previously unappreciated role of CaMKII as a molecular memory. Cited by 91]

12. Luke H. Chao, Margaret M. Stratton, Il-Hyung Lee, Oren S. Rosenberg, Joshua Levitz, Daniel J. Mandell, Tanja Kortemme, Jay T. Groves, Howard Schulman, and John Kuriyan. "A mechanism for tunable autoinhibition in the structure of a human Ca 2+/calmodulin-dependent kinase II holoenzyme." *Cell* 146, no. 5 (2011): 732-745.
[The very first discovery of CaMKII holoenzyme structure. I developed a hybrid (deterministic/stochastic) kinetics model to successfully explain calcium frequency dependent response of CaMKII based on its discovered structure. Cited by 231]

Citation information is from the Google Scholar as of September 16, 2022.

NOTABLE PROFESSIONAL SERVICE ACTIVITIES

1. Reviwer, Nature Chemistry, Nature Publishing Group, 2022
2. Montclair state university, Chemistry & biochemistry department committees: Undergraduate research committees, 2020-
3. Judge for the virtual New Jersey Academy of Science (NJAS) competition, 2021.

ASSOCIATION MEMBERSHIPS

2008- Member, Biophysical Society
2008- Member, American Chemical Society

COVERAGE IN THE NEWS MEDIA

"How does CaMKII sense specific calcium waves?", Cell paper flick, Cell press, 2011, Video link: https://youtu.be/nshXIgffC_Q