Dr. Andrew J. Lew ▪ lewan@mit.edu ▪ (424) 257-7169

Education --

Massachusetts Institute of Technology (MIT)   Sep 2017 – Dec 2022
PhD, Physical Materials Chemistry
NSF Graduate Research Fellowship (16% of nationwide applicants)
Thesis Title: Elucidating Structure-Property Relationships for Targeted Materials Mechanical Design

University of California, Los Angeles (UCLA)   Sep 2013 – Jun 2017
BS, Materials Science and Engineering – GPA 3.9/4.0
UCLA Engineering Achievement Award for Student Welfare (1% of department)

Research Experience ---

MIT - NSF Graduate Research Fellow, PhD Candidate   Dec 2019 – Dec 2022
• Leverage AI, atomistic simulations, and domain knowledge to guide novel materials development
• Develop computational models to understand properties of natural biomaterials
• Devise workflows for inverse design of new materials with specified target properties/behavior

MIT - Graduate Student Researcher   Dec 2017 – Dec 2019
• Synthesis of amphiphilic molecules and assembly into robust nanomaterials
• Molecular and nanoscale characterization techniques, wet lab organic chemistry work

UCLA - Undergraduate Student Researcher   Jan 2016 – Jun 2017
• Synthesis of iron oxide nanoparticles for application in magnetic hyperthermia drug delivery
• Nanoparticle characterization and incorporation into drug delivery system

Strategic Experience --

C3 AI – Senior Director, Strategic Solutions   Jan 2023 – Present
• Interface with external clients including at C-suite level to identify AI-addressable problems and scope solution approaches
• Coordinate internal solutions, sales, and legal teams to demonstrate Enterprise-level AI applications

Boston Consulting Group – Bridge Program Member   Mar 2022 – Apr 2022
• Think strategically while solving a case in a realistic BCG case team simulation
• Team with Bridge participants and consultants to understand the why and how behind case work
• Network and connect with BCG consulting staff and fellow Bridge participants

Patagonia – Case Competition Consultant   Jan 2020 – Jul 2020
• Won 1st place of 130+ teams, awarded $15,000 and discussions with Patagonia for plans on implementing our solution
• Collaborate in multidisciplinary team of 6 engineering, business, and science students to reduce Patagonia's textile waste
• Develop and present solution to a worldwide audience of Patagonia staff, C-suite, and invited guests

Engineering Experience ---

Northrop Grumman – Technical Engineer Intern   Jun 2016 – Sep 2016
• Support government DARPA "DAHI" program, "NGnext" nanoparticle research, and polymer coating R&D
• Steward of newly obtained Laser Scanning Confocal Microscope – setup tool, point of contact with vendor, train other engineers
• Hold Department of Defense Secret-level Security Clearance for trusted projects

Northrop Grumman – Process Integration Intern   Jun 2015 – Sep 2015
• Create Excel VBA tools for metric tracking and process flow management
• Investigate correlations between physical properties, processing conditions, and final yields of semiconductor boules
• Evaluate and streamline inspection steps for better process flow

Northrop Grumman – Process Engineer Intern   Jun 2014 – Sep 2014
• Optimization study for development of new GaN dicing processes
• Qualify new automatic tools for more efficient InP dicing processes, saving $50,000/year
• Identify and analyze defects for hundreds of semiconductor chips

Leadership Experience --

CEE GradCom – Student Leader   Jan 2022 – Dec 2022
• Organize department-wide events to reforge student culture after pandemic isolation
• Inform and interact with newly admitted students at department open houses
• Host town halls to gauge student sentiment of the graduate program

ChemREFS – Peer Mentor   Mar 2019 – Dec 2022

- Hold confidential 1-on-1 meetings with students to work through interpersonal conflicts and graduate school stresses
- Advocate for chemistry graduate students through annual Department Chair meetings
- Collaborate with student groups to host events at program milestones

MIT Student Leadership – Assorted Positions   July 2018 – May 2021
- *Ashdown House Executive Committee, Internal Affairs Chair*: Advocate student concerns for COVID-era policies
- *Chemistry Outreach Mentor*: Visit local high schools to present chemistry demos and inspire students to pursue STEM
- *Graduate Student Council, Orientation Events Coordinator*: Collaborate to host incoming student welcome events

MIT Chemistry Department – Teaching Assistant   Aug 2017 – Dec 2018
- Teach two hour-long sections and hold two+ sessions of office hours per week for Course 5.111: Principles of Chemical Science
- Create homework questions, maintain code for online "MITx" portion of the class, provide tech support for in-person lectures
- Administrative grading and solution key write-up for Course 5.73: Intro to Quantum Mechanics I

Materials Research Society @ UCLA – President   May 2016 – Jun 2017
- Lead student board of 14 to restructure MRS@UCLA as a consistently active, officially registered student organization
- Organize regular events including professional workshops, industry info sessions, and mixers between grad/undergrad students
- Collate student feedback on program in department-wide Town Hall meeting, and advocate results to the Department Head

SAMPE Bridge Competition Team – Co-Founder, Team Lead, and Mentor   Dec 2015 – May 2017
- Restart UCLA involvement in SAMPE competition with a team of 4 others, petition department for lab space and resources
- Lead student teams in the design, fabrication, and 3-pt bend testing of glass fiber composite beams
- Develop and teach composite processing workshops to facilitate wider participation in SAMPE Bridge Competition.

Publications --

- Lew, A.J., *et al.* Deep learning virtual indenter maps nanoscale hardness rapidly and non-destructively, revealing mechanism and enhancing bioinspired design. *Matter* (2023). https://doi.org/10.1016/j.matt.2023.03.031
- Lew, A.J., *et al.* A Molecular Scale Understanding of Misorientation Toughening in Corals and Seashells. *Advanced Materials* (2023). https://doi.org/10.1002/adma.202300373 – **University of Liège News Feature**
- Lew, A.J., Buehler, M.J. Single-shot forward and inverse hierarchical architected materials design for nonlinear mechanical properties using an attention-diffusion model. *Materials Today* (2023). https://doi.org/10.1016/j.mattod.2023.03.007
- Lew, A.J., Jin, K., Buehler, M.J. Architected Materials for Mechanical Compression: Design via Simulation, Deep Learning, and Experimentation. *arXiv [cond-mat.mtrl-sci]* (2022). arXiv:2212.02643v2
- Ni, B., *et al.* Fracture at the Two-Dimensional Limit. *Materials Research Society Bulletin.* 47 (2022). https://doi.org/10.1557/s43577-022-00385-4
- Lew, A.J., Beniash, E., Gilbert, P.U.P.A. *et al.* Role of the Mineral in the Self-Healing of Cracks in Human Enamel. *ACS Nano.* (2022). https://doi.org/10.1021/acsnano.1c10407
- Lew, A.J., Buehler, M.J. DeepBuckle: Extracting physical behavior directly from empirical observation for a material agnostic approach to analyze and predict buckling. *Journal of the Mechanics and Physics of Solids.* 164, 104909 (2022). https://doi.org/10.1016/j.jmps.2022.104909
- Lew, A.J., Buehler, M.J. A deep learning augmented genetic algorithm approach to polycrystalline 2D material fracture discovery and design. *Applied Physics Reviews.* 8, 041414 (2021). https://doi.org/10.1063/5.0057162 – **Featured Article**
- Lew, A.J., Buehler, M.J. Encoding and exploring latent design space of optimal material structures via a VAE-LSTM Model. *Forces in Mechanics.* 5, 100054 (2021). https://doi.org/10.1016/j.finmec.2021.100054
- Lew, A.J., Yu, CH., Hsu, YC. *et al.* Deep learning model to predict fracture mechanisms of graphene. *Nature Partner Journal 2D Materials Applications.* 5, 48 (2021). https://doi.org/10.1038/s41699-021-00228-x – **MIT News Feature**
- Lew, A.J., Kaser, S.J., Kim, DY, *et al.* Effects of molecular flexibility and head group repulsion on aramid amphiphile self-assembly. *Molecular Systems Design & Engineering.* 6, 1016-1024 (2021). https://doi.org/10.1039/D1ME00120E
- Christoff-Tempesta, T., Cho, Y., Kim, DY. *et al.* Self-assembly of aramid amphiphiles into ultra-stable nanoribbons and aligned nanoribbon threads. *Nature Nanotechnology.* 16, 447–454 (2021). https://doi.org/10.1038/s41565-020-00840-w
- Lew, A.J., Christoff-Tempesta, T., Ortony, J.H. Beyond Covalent Crosslinks: Applications of Supramolecular Gels. *Gels.* 4, 40 (2018). https://doi.org/10.3390/gels4020040

Patents ---

- Lew, A.J., Buehler, M.J. A Method to Extract Physical Behavior Directly from Simple Visual Empirical Observation Via a Deep Learning Model. *U.S. Provisional Patent Application No. 63/333493.* Filed April 21, 2022.
- Ortony, J., Jia, T., Kim, D. Y., Lindemann, W., Christoff-Tempesta, T., Lew, A.J., & Cho, Y. Aramid amphiphile self-assembled nanostructures. *U.S. Patent Application No. 16/825724.* Filed September 24, 2020.

Presentations --

- Lew, A.J., Buehler, M.J. Talk #2011619: "Leveraging Deep Learning Models to Expedite and Expand the Exploration of Material Structures for Mechanical Design". *10th International Conference on Multiscale Materials Modeling, Baltimore* (2022)
- Lew, A.J., Gilbert, P.U.P.A., Buehler, M.J. Poster #SF12.11.06: "Non-destructive Hardness Prediction via Deep Learning Image Regression Models". *MRS Spring Meeting and Exhibit, Virtual* (2022) – **Outstanding Contribution**
- Lew, A.J., Buehler, M.J. Talk #DS03.03.04: "A Deep Learning Augmented Genetic Algorithm Approach for 2D Fracture Discovery and Design". *MRS Fall Meeting and Exhibit, Boston* (2021)
- Lew, A.J., Buehler, M.J. Talk: "Cutting Through Failure by Traversing Across Disciplines: Leveraging Traditional Mechanics, Deep Learning, and Genetic Algorithms to Predict Fracture and Design Material Structure". *MIT Chemistry Student Seminar* (2021)
- Lew, A.J., Buehler, M.J. Talk #21721056: "Using Deep Learning to Predict Fracture: Analysis, Design, and Additive Manufacturing". *16th US National Congress on Computational Mechanics* (2021) – **Keynote Address**
- Lew, A.J., Kim, DY, Ortony, J.H. Poster: "From Molecules to Macroscale: Self-assembly of Robust Hierarchically Ordered Materials". *MIT WIC/CADI Poster Symposium* (2019)
- Lew, A.J., Machness, A., Goorsky, M. Poster #557: "Synthesis and Characterization of Superparamagnetic Iron Oxide Nanoparticles for Magnetic Hyperthermia Applications". *UCLA Undergraduate Research Week* (2017) – **Vice Provost's Poster Recognition Award**
- Lew, A.J., Lieng, J., Tran, V., *et al.* Poster Category D: "I Beam Glass Fiber". *SAMPE Conference and Exhibition, Seattle* (2017)
- Lang, A. *et al.* Poster: "Microelectronics: Micro-design, Mega-impact". *Northrop Grumman Intern Showcase: Explore Space* (2016) – **Best Overall Presentation Award**
- Lew, A.J., Timmons, J., Lieng, J., Figueroa, J., Chu, K. Poster Category E: "Square Beam Glass Fiber", *SAMPE Conference and Exhibition, Long Beach* (2016)
- Lew, A.J., Machness, A., Goorsky, M. Poster #42: "Synthesis and Characterization of Superparamagnetic Iron Oxide Nanoparticles with Varying Precursor Addition Rate". *ACS Southern California Undergraduate Research Conference* (2016) – **Outstanding Poster Award**

Skills --

Computational Modeling

- *General Tools* – Python, MATLAB, Excel, PowerPoint, Linux, Windows
- *Classical Simulation* – Large-scale Atomic/Molecular Massively Parallel Simulator (LAMMPS), Open Visualization Tool (OVITO)
- *Artificial Intelligence* – Convolutional Neural Networks, Variational Autoencoders, Genetic Algorithms, TensorFlow

Laboratory Techniques

- *Organic Synthesis* – Peptide Coupling, BOC-protection/deprotection, Column Chromatography
- *Characterization* – Nuclear Magnetic Resonance (H^1NMR & C^{13}NMR), Thin Layer Chromatography (TLC), Mass Spectrometry (MS), UV-Visible Spectrophotometry (UV-Vis), Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM), X-Ray Diffraction (XRD), Förster Resonance Energy Transfer (FRET)
- *Composite Processing* – Wet Layup, Vacuum Bagging, Curing

Interpersonal Qualifications

- *Discretion* – Held Department of Defense Secret-level Security Clearance, Confidential Conflict Resolution Training Certification
- *Mentorship* – Classroom Teaching, 1-on-1 Tutoring, Hands-on Workshops, Teaching Assistant
- *Business* – Miller Heiman Strategic and Conceptual Sales Certification, C3 AI Application Development Methodology Certification