CURRICULUM VITAE

Lara A. Estroff

Department of Materials Science and Engineering; Cornell University
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Education and Research Experience

7/15 -	**Director of Graduate Studies**, Department of Materials Science and Engineering, Cornell University, Ithaca, NY
7/12 -	**Associate Professor**, Department of Materials Science and Engineering, Cornell University, Ithaca, NY
7/12 -	**Adjunct Associate Scientist**, Hospital for Special Surgery, New York, NY
1/08 – 6/12	**Adjunct Assistant Scientist**, Hospital for Special Surgery, New York, NY
8/05 – 6/12	**Assistant Professor**, Department of Materials Science and Engineering, Cornell University, Ithaca, NY
8/03 – 7/05	**Post-doctoral Researcher**, Chemistry Department, Harvard University, Cambridge, MA. Advisor: Professor George M. Whitesides.
8/98 – 7/03	**Doctor of Philosophy**, Chemistry, Yale University, New Haven, CT, Dec. 2003. Advisor: Professor Andrew D. Hamilton.
8/97 – 8/98	**Visiting Researcher**, Weizmann Institute of Science, Rehovot, Israel. Advisor: Professor Steve Weiner.
8/93 –5/97	**Bachelor of Arts**, Swarthmore College, Swarthmore, PA, graduated with Honors, Chemistry major, Anthropology minor. May 1997.

Honors

Lawrence Berkeley National Lab Affiliate, Spring 2013

Keynote Speaker, 2012 Gordon Research Seminar on Biomineralization

Faculty Early CAREER Award, National Science Foundation, 2009

Marilyn Emmons Williams Award for "significant contributions to promoting undergraduate research at Cornell", Cornell Undergraduate Research Board, 2009

Fiona Ip Li '78 and Donald Li '75 Excellence in Teaching Award, College of Engineering, Cornell University, 2007

James D. Watson Investigator Award, NYSTAR (New York State), 2006

Ruth L. Kirschstein National Research Service Award (NIH Post-Doctoral Fellowship), 2003-2005

Graduate Student Silver Award, Materials Research Society (MRS), Spring 2002

American Chemical Society (ACS) Division of Organic Chemistry Graduate Fellowship, 2000-2001

Professional Service

Chair, Gordon Research Conference (GRC) on "Crystal Growth and Assembly", Summer 2015 (*Vice Chair* for Summer 2013 conference on "Thin Film and Crystal Growth Mechanisms")

Editorial Advisory Board Member of "Chemistry of Materials" (1/2013-12/2015)

Editorial Advisory Board Member of "Advanced Functional Materials" (2012 – present)

Scientific Advisory Board Member, 11th International Conference on the Chemistry and Biology of Mineralized Tissues (ICCBMT), Oct. 2013

External Advisory Board, NYU MRSEC, April 2013

Steering Committee Member, NSF Biomaterials Workshop, June 2012

Conference Chair, MRS Spring Meeting, Apr. 2012

Guest Editor, Chemical Reviews, "Biomineralization" thematic issue, Nov. 2008

Organizer, Cornell Center for Materials Research (CCMR) Industrial Outreach Symposium, "The Future of Biologically-Inspired Materials: Fundamentals to Applications", Ithaca, NY, May 2011

Symposium Organizer, "Structure-Function Relationships in Biomaterials/Biominerals and Bio-mimetic Systems", Spring MRS Meeting, Apr. 2009.

NIH ad hoc reviewer, Skeletal Biology Development and Disease Study Section, 2011, 2010.

NSF Review Panels.

Symposium Organizer, "Ronald Breslow Award for Achievement in Biomimetic Chemistry: Symposium in Honor of Joanna Aizenberg", Spring ACS Meeting, Apr. 2008.

Discussion Leader, "Thin Films and Crystal Growth Mechanisms" GRC, 2007, 2005.

Professional Societies

Member of Sigma Xi, Phi Beta Kappa, ACS, MRS, American Crystallographic Association

Academic Service

Departmental

Curriculum Committee (Summer 2015 – present)

Faculty Search Committee (Fall 2006 – Fall 2008; Fall 2011; Summer 2014 - present)

Graduate Admissions Committee (Spring 2009; Spring 2012; Spring 2016)

Undergraduate Advising Committee (Spring 2010 – present)

Faculty Advisor, Women in Materials Science and Engineering (WIMSE) (Fall 2007 - present)

Seminar organizer (Fall 2006 – Spring 2009)

Engineering College

Chem/Bio Liaison Subcommittee of CCGB (Fall 2013 – present)

Undergraduate Research Grants Review Committee (Fall 2013-Summer 2015)

Ph.D. Program Committee for Strategic Planning, College of Engineering (Winter 2011 – present)

Faculty Advisory Committee, Teaching Excellence Institute (Winter 2008- present)

Teaching Awards Committee, College of Engineering (Summer 2009 – Summer 2011)

Faculty Search Committee, Outside member, Mechanical and Aerospace Engineering (Fall 2010)

Faculty Search Committee, Outside member, Applied and Engineering Physics (Fall 2008)

Traveled with group of faculty members to China to participate in Cornell-China workshops at Tsinghua and Jiao-Tong Universities (Oct. 2006)

University

CCMR Executive Committee, At-large Representative for College of Engineering, (Summer 2015 – present)

Faculty advisor, CCMR's Materials Characterization Facility (Fall 2009 – present)

Integrated Research Group (IRG) co-leader on CCMR's MRSEC renewal proposal (2011)

Journal Publications

Cornell Independent Career (underlined: Cornell Ph.D. student or post-doc in my lab; *italics*: Cornell undergraduate; [*]: corresponding author)

50) Hovden, R.; Wolf, S.E.; Holtz, M.E.; Marin, F.; Muller, D.A.; Estroff, L.A.* Nanoscale Assembly Processes for Nacre Formation in Mollusk Shells (*Pinna nobilis*): From Disorder to Order, *Nature Commun.*, **2015**, under review.

49) Asenath-Smith, E.; Estroff, L.A.* Role of Akaganeite (beta-FeOOH) in the Growth of Hematite (alpha-Fe_2O_3) in an Inorganic Silica Hydrogel, *Cryst. Grow. Des.*, **2015**, *15*, 3388-3398. 10.1021/acs.cgd.5b00475

48) Choi, S.; Coonrod, S.; Estroff, L.A.*; Fischbach, C.* Chemical and physical properties of carbonated HA affect breast cancer cell behavior, *Acta Biomater.* **2015**, *in press*. http://dx.doi.org/10.1016/j.actbio.2015.06.001

47) Hendley, C.T.; Tao, J.; Kunitake, J.A.M.R.; de Yoreo, J.J.*; Estroff, L.A.* Microscopy techniques for investigating the control of organic constituents on biomineralization, *MRS Bulletin*, **2015**, *40*, 480-489. 10.1557/mrs.2015.98

46) Wu, F.; Lin, D.D.W.; Chang, J.H.; Fiscbach, C.; Estroff, L.A.; Gourdon, D.* "Effect of the Materials Properties of Hydroxyapatite Nanoparticles on Fibronectin Dposition and Conformation." *Cryst. Grow. Des.*, **2015**, *15*, 2452-2460. 10.1021/acs.cgd.5b00231

45) Moore, D.T.; Tan, K.W.; Sai, H.; Wiesner, U.*; Estroff, L.A.* "Direct crystallization route to methylammonium lead iodide perovskite from an ionic liquid." *Chem. Mater.*, **2015**, *27*, 3197-3199.

44) Asenath-Smith, E.; Hovden, R.; Kourkoutis, L.F.; Estroff, L.A.* "Hierarchically-Structured Hematite Architectures Achieved by Growth in a Silica Hydrogel." *J. Am. Chem. Soc.*, **2015**, *137*, 5184-5192. 10.1021/jacs.5b01697

43) Moore, D.T.; Sai, H.; Tan, K.W.; Smilgies, D.M.; Zhang, W.; Snaith, H.J.; Wiesner, U.*; Estroff, L.A.* "Crystallization kinetics of organic-inorgnaic trihalide perovskites and the role of the lead anion in crystal growth." *J. Am. Chem. Soc.*, **2015**, *137*, 2350-2358. doi: 10.1021/ja512117e.

42) Zhang, W.; Saliba, M.; Moore, D. T.; Pathak, S.; Horantner, M.; Stergiopoulos, T.; Stranks, S. D.; Eperon, G. E.; Alexander-Webber, J. A.; Abate, A.; Sadhanala, A.; Yao, S.; Chen, Y.; Friend, R. H.; Estroff, L. A.; Wiesner, U.; Snaith, H. J.* "Ultra-smooth organic-inorganic perovskite thin-film formation and crystallization for efficient planar heterojunction solar cells." *Nat. Commun.* **2015**, *6*, 6142. doi: 10.1038/ncomms7142

41) Chang, E.P.; Russ, J.A.; Verch, A.; Kroger, R.; **Estroff, L.A.**; Evans, J.S.* "Engineering of crystal surfaces and subsurfaces by framework biomineralization protein phases" *CrystEngComm*, **2014**, *16*, 7406-7409.

40) Chang, E.P.; Russ, J.A.; Verch, A.; Kroger, R.; **Estroff, L.A.**; Evans, J.S.* "The Intrinsically Disordered C-RING Biomineralization Protein, AP7, Creates Protein Phases That Introduce Nanopatterning and Nanoporosities into Mineral Crystals." *Biochemistry*, **2014**, *53*, 4317-4319

39) Moore, D.T.; Sai, H.; Tan, K.W.; **Estroff, L.A.**; Wiesner, U.* "Impact of the Organic Halide Salt on Final Perovskite Composition for Photovoltaic Applications" *Appl. Phys. Lett. Mater.*, **2014**, *2*, 081802. http://dx.doi.org/10.1063/1.4886275

38) Tan, K.W.; Moore, D.T.; Saliba, M.; Sai, H.; **Estroff, L.A.**; Hanrath, T.; Snaith, H.J.; and Wiesner, U.* "Thermally induced structural evolution and performance of mesoporous block copolymer-directed alumina perovskite solar cells", *ACS Nano*, **2014**, *8*, 4730-4739.

37) Saliba, M.; Tan, K.W.; Sai, H.; Moore, D.T.; *Scott, T.;* Zhang, W.; **Estroff, L.A.**; Wiesner, U.*; and Snaith, H.J.* "The Influence of Thermal Processing Protocol Upon the Crystallization and Photovoltaic Performance of Organometal Trihalide Perovskites." *J. Phys Chem. C.*, **2014**, *118*,

17171-17177. 10.1021/jp500717w.

36) Song, R.Q.; Hoheisel, T.N.; Sai, H.; Li, Z; Carloni, J.D.; Wang, S.; Youngman, R.E.; Baker, S.P.; Gruner, S.M.; Wiesner, U.*; **Estroff, L.A.*** "Morphology and Property Control of Periodically-Ordered Calcium Phosphate Nanostructures by Block Copolymer-Directed Self-Assembly." submitted.

35) Asenath-Smith, E.; **Estroff, L.A.*** "Sectioning of Individual Hematite Pseudocubes with Focused Ion Beam Enables Quantitative Structural Characterization at Nanometer Length Scales." *Microscopy and Microanalysis*, **2014**, *20*, 635-644. http://dx.doi.org/10.1017/S143192761400004X.

34) Sai, H.; Tan, K.W.; Hur, K.; Asenath-Smith, E.; Hovden, R.; Jiang, Y.; Riccio, M.; Muller, D.A.; Elser, V.; **Estroff, L.A.**; Gruner, S.M.; Wiesner, U.* "Hierarchical Porous Polymer Scaffolds from Block Copolymers." *Science*, **2013**, *341*, 530-534. 10.1126/science.1238159

33) Kunitake, M.E.; *Mangano, L.M.; Peloquin, J.M.;* Baker, S.P.*; **Estroff, L.A.*** "Evaluation of Strengthening Mechanisms in Calcite Single Crystals from Mollusk Shells." *Acta Biomaterialia,* **2013**, *9*, 5353-5359. http://dx.doi.org/10.1016/j.actbio.2012.09.030

32) Kunitake, M.E., Baker, S.P.*, **Estroff, L.A.*** "The Effect of Magnesium Substitution on the Hardness of Synthetic and Biogenic Calcite", *MRS Communications*, **2012**, *2,* 113-116. doi:10.1557/mrc.2012.20

31) Suteewong, T.; Sai, H.; Bradbury, M.; **Estroff, L.A.**; Gruner, S.M.; Wiesner, U.* "Synthesis and Formation Mechanism of Aminated Mesoporous Silica Nanoparticles." *Chem. Mater.,* **2012**, *24*, 3895-3905.

30) Dorvee, J.R.; Boskey, A.L.; **Estroff, L.A.*** "Rediscovering Hydrogel-Based Double-Diffusion Systems for Studying Biomineralization." (Invited Highlight article), *CrystEngComm*, **2012**, *14,* 5681-5700. 10.1039/C2CE25289A.

29) Asenath-Smith, E.; Li, H.Y.; Keene, E.C.; *Seh, Z.W.*; and **Estroff, L.A.*** "Crystal Growth of Calcium Carbonate in Hydrogels as a Model of Biomineralization" (Invited Feature article), *Adv. Funct. Mater.*, **2012**, *22*, 2891-2914.

28) **Estroff, L.A.***; Cohen, I. "Biomineralization: Micelles in a crystal." *Nature Materials*, **2011***, 10,* 810-811.

27) Wu, C.H.; Li, H.Y.; Fong, H.H.; Pozdin, V.A.; **Estroff, L.A.**; Malliaras, G.G.* "Room-temperature preparation of crystalline TiO_2 thin films and their applications in polymer/TiO_2 hybrid optoelectronic devices." *Organic Electronics*, **2011**, *12*, 1073-1079.

26) Pathi, S.P.; Lin, D.D.W.; Dorvee, J.R.; **Estroff, L.A.***; Fischbach, C.* "Hydroxyapatite Nanoparticle-containing scaffolds for study of breast cancer bone metastasis." *Biomaterials*, **2011**, *32*, 5112-5122.

25) Li, H.Y.; Xin, H.L.; Kunitake, M.E.; Keene, E.C.; Muller, D.A.; **Estroff, L.A.***, "Calcite prims from mollusk shells (*Atrina rigida*): swiss-cheese-like organic-inorganic single-crystal composites." *Adv. Funct. Mater.*, **2011**, *21*, 2028-2034.

24) Li, H.Y.; Fujiki, Y.; Sada, K.; **Estroff, L.A.*** "Gel incorporation inside of organic single crystals grown in agarose hydrogels." *CrystEngComm*, **2011**, *13*, 1060-1062.

23) Keene, E.C.; Evans, J.S.; **Estroff, L.A.*** "Silk fibroin hydrogels coupled with the n16N – β-chitin complex: An *in vitro* organic matrix for controlling calcium carbonate mineralization." *Crystal Growth & Design* **2010**, *10*, 5169-5175.

22) Ndao, M; Keene, E.; Amos, F.F.; Rewari, G.; Ponce, C.B.; **Estroff, L.**, Evans, J.S.* "An intrinsically disordered mollusk shell prismatic protein that modulates calcium carbonate crystal growth." *Biomacromolecules*, **2010**, *11*, 2539-2544.

21) Keene, E.C.; Evans, J.S.; **Estroff, L.A.*** "Matrix Interactions in Biomineralization: Aragonite

nucleation by an intrinsically disordered nacre polypeptide, n16N, associated with a β-chitin substrate." *Crystal Growth & Design* **2010**, *10*, 1383-1389.

20) Li, H.Y.; Xin, H.L.; Muller, D.A.; **Estroff, L.A.*** "Visualizing the 3D internal structure of calcite single crystals grown in agarose hydrogels." *Science* **2009**, *326*, 1244-1247.

19) Li, H.Y. and **Estroff, L.A.*** "Calcite growth in hydrogels: Assessing the mechanism of polymer network incorporation into single crystals." *Adv. Mater.,* **2009,** *21*, 470-473.

18) **Estroff, L.A.*** "Introduction: Biomineralization." *Chem. Rev.*, **2008**, *108*, 4329-4331.

17) Li, H.Y. and **Estroff, L.A.*** "Porous calcite single crystals grown from a hydrogel medium." *CrystEngComm*, **2007**, *9*, 1153-1155.

16) Li, H.Y. and **Estroff, L.A.*** "Hydrogels coupled with SAMs: An *in vitro* matrix to study calcite biomineralization." *J. Am. Chem. Soc.*, **2007**, *129*, 5480-5483.

Post-doctoral Research

15) Bilgicer, B.; Thomas, S. W.; Shaw, B. F.; Kaufman, G. K.; Krishnamurthy, V. M.; **Estroff, L. A.**; Yang, J.; Whitesides, G. M.* "A non-chromatographic method for the purification of a bivalently active monoclonal IgG antibody from biological fluids." *J. Am. Chem. Soc.* **2009**, *131*, 9361-9367.

14) Krishnamurthy, V.M.; Quinton, L.J.; **Estroff, L.A.**; Metallo, S.J.; Isaacs, J.M.; Mizgerd, J.P.; Whitesides, G.M.* "A bifunctional polymer promotes the opsonization by antibodies and phagocytosis of gram-positive bacteria" *Biomaterials*, **2006**, *27*, 3663-3674.

13) Love, J.C.; **Estroff, L.A.**; Kriebel, J.K.; Nuzzo, R.G.; Whitesides, G.M.* "Self-assembled monolayers of thiolates on metals as a form of nanotechnology" *Chem. Rev.*, **2005**, *105*, 1103-1170.

Graduate Research

12) Saraogi, I.; Hebda, J.A.; Becerril, J.; **Estroff, L.A.**; Miranker, A.D.; Hamilton, A.D.* "Synthetic α-helix mimetics as agonists and antagonists of islet amyloid polypeptide aggregation" *Angew. Chem. Int. Ed.*, **2010**, *49*, 736-739.

11) **Estroff, L.A.**; Hamilton, A.D.* "Water gelation by small organic molecules" *Chem. Rev.,* **2004**, *104*, 1201-1218.

10) **Estroff, L.A.**; Addadi, L.; Weiner, S.; Hamilton, A.D.* "An organic hydrogel for the growth of calcium carbonate" *Org. & Biomol. Chem.* **2004**, 137-141.

9) **Estroff, L.A.**; Incarvito, C.D.; Hamilton, A.D.* "Design of a synthetic foldamer that modifies the growth of calcite crystals" *J. Am. Chem. Soc.* **2004**, *126*, 2-3.

8) **Estroff, L.A.**; Huang, J.S.; Hamilton, A.D.* "Fiber formation in water by a mono-urea dicarboxylic acid" *Chem. Commun.* **2003**, 2958-2959.

7) **Estroff, L.A.**; Leiserowitz, L.; Addadi, L.; Weiner, S.; and Hamilton, A.D.* "Characterization of an organic hydrogel: A cryo-TEM and x-ray diffraction study" *Adv. Mater.* **2003**, *15*, 38-42.

6) **Estroff, L. A.**; Hamilton, A. D.* "At the interface of organic and inorganic chemistry: Bio-inspired synthesis of composite materials" *Chem. Mater.* **2001**, *13*, 3227-3235.

5) **Estroff, L. A.**; Hamilton, A. D.* "Effective gelation of water using a series of bis-urea dicarboxylic acids" *Angew. Chem. Int. Ed. Engl.* **2000**, *39*, 3447-3450.

Undergraduate Research

4) Paley, R. S.*; **Estroff, L. A.**; Gauguet, J. M.; Hunt, D. K.; Newlin, R. C. "Enantiopure η^4-(1-sulfinyldiene)iron(0) tricarbonyl complexes as templates for carbocycle construction via ring-closing metathesis" *Org. Lett.* **2000**, *2*, 365-368.

3) Albert, R. M.; Lavi, O.; **Estroff, L.**; Weiner, S.*; Tsatskin, A.; Ronen, A.; Lev-Yadun, S. "Mode of occupation of Tabun Cave, Mt Carmel, Israel during the Mousterian Period: A study of the sediments and phytoliths" *J. Archaeol. Sci.* **1999**, *26*, 1249-1260.

2) Paley, R. S.*; **Estroff, L. A.**; McCulley, D. J.; Martinez-Cruz, L. A.; Sanchez, A. J.; Cano, F. H. "Diastereoselective allylations of enantiopure 3- and 4- substituted η^4-(1Z)-(sulfinyldienal)iron(0) tricarbonyl complexes" *Organometallics* **1998**, *17*, 1841-1849.

1) Paley, R. S.*; deDios, A.; **Estroff, L. A.**; Lafontaine, J. A.; Montero, C.; McCulley, D. J.; Rubio, M. B.; Ventura, M. P.; Weers, H. L.; de la Pradilla, R. F.; Castro, S.; Dorado, R.; Morente, M. "Synthesis and diastereoselective complexation of enantiopure sulfinyl dienes: The preparation of sulfinyl iron(0) dienes" *J. Org. Chem.* **1997**, *62*, 6326-6343.

Book Chapters

2) Krishnamurthy, V.M.; **Estroff, L.A.**; Whitesides, G.M. "Multivalency in Ligand Design" in *Fragment-Based Approaches in Drug Discovery*; Jahnke, W and Erlanson, D, Eds; **2006**, Wiley-VCH.

1) **Estroff, L.A.**; Hamilton, A.D. "Cryo-TEM, X-Ray Diffraction and Modeling of an Organic Hydrogel" in *Molecular Gels: Materials with Self-Assembled Fibrillar Networks*; Terech, P. and Weiss, R.G., Eds.; **2005**, Springer: Dordrecht, The Netherlands.

Edited Books

1) *Structure-Property Relationships in Biomineralized and Biomimetic Composites*, Kisailus, D.; **Estroff, L.**, Landis, W., Zavattieri, P., and Gupta, H.S., Eds; **2009**, Materials Research Society: Warrendale, PA; Mater. Res. Soc. Symp. Proc. Vol. 1187

Published Extended Abstracts (underlined: Cornell Ph.D. student; *italics*: Cornell undergraduate student)

3) Lin, D.D.W.; Pathi, S.P.; Fischbach-Teschl, C.; Estroff, L.A. "The Effects of Hydroxyapatite Nanoparticles on Breast Cancer Bone Metastasis in 3-D Scaffolds." 2011, *Bone*, *48*, S253.

2) Lin, D.D.W.; Babalola, O.M.; Bodereau, A.; *Eckes, K.M.*; Boskey, A.L.; Bonassar, L.; Estroff, L.A. "Chondrocyte Viability in 1-D Diffusion Systems for Gradient Limited Studies in 3-D Cultures." *Trans. Orthop. Res. Soc.* 2010, *35*, 812.

1) Richter, A.; Dorvee, J.; Boskey, A.L.; Estroff, L.A. "Hydroxyapatite Mineralization on Porous Silicon Surfaces and in 1-D gels for Biomimetic Applications." *Trans. Soc. Biomaterials* 2010, 427.

Selected Press Coverage

7) "Spotlight: The Benefits of Biomimicry". *The Accelerator*. Published online March 25, 2014, http://blog.engineeringstudents.org/?p=3619#more-3619

6) "Tiny Insights", *Chemistry World*, Published online March 20, 2013, http://www.rsc.org/chemistryworld/2013/03/3d-imaging-tomography-microscopy

5) "Rock-Munching Mollusks: A Model for Artificial Bones" interview for "Morning Edition" NPR Broadcast, Jan. 13, 2011.

4) "Biominerals: Tomography Reveals All", *Nature Chemistry*, Published online Dec. 11, 2009, doi:10.1038/nchem.514

3) "Calcite Close-Up", *Chemical & Engineering News*, 2009, *87*, 7.

2) "Physical Forces at Work in Biocomposites", *Physics World*, Nov. 27, 2009.

1) "Calcite Biocomposites Up Close", *Science*, 2009, *326*, 1194-1195.