

# Lyle M. Gordon

Department of Materials Science and Engineering  
Northwestern University  
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## Areas of Specialization

Atom probe tomography • Organic-inorganic interfaces • Biomineralization

## Education

- 2008- **PhD Candidate in Materials Science and Engineering**  
*Northwestern University*. Evanston, IL. Expected 2013  
THESIS : Buried Organic-Inorganic Interfaces in Biological Minerals  
ADVISOR : Dr. Derk Joester
- 2008 **BASc with Honours in Materials Science and Engineering**  
*University of Toronto*, Toronto, ON.

## Research Experience

- 2008- **Biomineral Engineering Group**, Materials Science and Engineering, Northwestern University.  
ADVISOR : Dr. Derk Joester  
Characterization of nanoscale buried organic-inorganic interfaces in biological minerals with atom-probe tomography.
- 2007-2008 **Hybrid Materials Group**, Materials Science and Engineering, University of Toronto.  
ADVISOR : Dr. Glenn D. Hibbard  
Developed and characterized a sub-millimetre scale periodic cellular material fabricated using rapid-prototyping and electrodeposition of high-strength nanocrystalline nickel.
- 2004-2008 **Concrete Canoe Team**, Civil Engineering, University of Toronto.  
ADVISOR : Dr. Kim D. Pressnail  
Coordinated the development, testing and implementation of a carbon fiber reinforced polymer modified lightweight aggregate concrete composite for use in the construction of a racing canoe.
- 2007 **Orthopaedic Biomechanics Lab**, Sunnybrook Health Sciences Centre.  
ADVISOR : Dr. Cari M. Whyne.  
Characterized the mechanical and biological properties of a elastin-hyaluronan composite hydrogel for tissue engineering of the nucleus pulposus.
- 2006 **Orthopaedic Biomechanics Lab**, Sunnybrook Health Sciences Centre.  
ADVISOR : Dr. Cari M. Whyne.  
Developed and validated a finite element model of pelvic lateral compression fracture stability.
- 2005 **Orthopaedic Biomechanics Lab**, Sunnybrook Health Sciences Centre.  
ADVISOR : Dr. Cari M. Whyne.  
Developed a 3D atlas-based method to automate segmentation of metastatic vertebrae on X-ray computed tomography scans.

## Professional Experience

- 2012 **PreScouter**, Evanston, IL.  
TECHNOLOGY CONSULTANT  
Technology scouter connecting corporate innovators to new technologies.

## Teaching

- 2012 **Biomaterials: Hierarchical Architecture and Function**, Northwestern University.  
Lecture on the structure and function of the chiton tooth.
- 2011 **Introduction to Materials Science**, Northwestern University.  
Laboratory assistant.
- 2009 **Introduction to Materials Science**, Northwestern University.  
Teaching and laboratory assistant.
- 2009 **Introduction to Materials Science**, Northwestern University.  
Teaching and laboratory assistant.

## Grants, Honours & Fellowships

- 2012-2013 **Terminal Year Fellowship**. McCormick School of Engineering, Northwestern University.
- 2010-2012 **Postgraduate Scholarship, Doctorate**. National Science and Engineering Research Council of Canada.
- 2009-2010 **Postgraduate Scholarship Extension, Masters**. National Science and Engineering Research Council of Canada.
- 2008-2009 **Appointed University Scholar**. The Graduate School, Northwestern University.
- 2008 **Walter P. Murphy Fellowship**. Department of Materials Science and Engineering, Northwestern University.
- 2008-2009 **Postgraduate Scholarship, Masters**. National Science and Engineering Research Council of Canada.
- 2008 **Alexander Graham Bell Canada Graduate Scholarship, Masters**. National Science and Engineering Research Council of Canada, *declined*.
- 2008 **Ontario Graduate Scholarship, Masters**. Ontario Graduate Scholarship Program, *declined*.
- 2008 **Stanford Graduate Fellowship**. Stanford University, *declined*.
- 2004-2008 **Dean's Honour List**. Faculty of Applied Science and Engineering, University of Toronto. (4 years)
- 2007-2008 **Stelco Scholarship**. Department of Materials Science and Engineering, University of Toronto.
- 2007 **Undergraduate Student Research Award**. National Science and Engineering Research Council of Canada.
- 2005-2007 **Scholarship**. Department of Materials Science and Engineering, University of Toronto. (2 years)
- 2006 **Undergraduate Student Research Award**. National Science and Engineering Research Council of Canada.
- 2005 **Research Summer Studentship Award**. Sunnybrook Health Science Centre.
- 2004 **Entrance Scholarship**. Department of Materials Science and Engineering, University of Toronto.

## Publications & Presentations

### JOURNAL ARTICLES

**Gordon, L.M., Joester, D.** "Grain Boundary Chemistry Controls the Properties of Tooth Enamel." *in preparation*.

**Gordon, L.M.,** Cohen, M.J. Joester, D. “Polymorph Selectivity and Stabilization in Chiton Tooth Ferrihydrite Biomineralization.” *in preparation*.

Suram, S.K., Kaluskar, K., **Gordon, L.M.,** Joester, D., Rajan, K. “Extracting Crystallographic Information from Atom Probe Tomography of a Biomineral.” *in preparation*.

2013 Marquis, E.A., Bachhav, M., Chen, Y., Dong, Y., **Gordon, L.M.,** McFauland, A. “On the current role of atom probe tomography in materials characterization and materials science.” *Current Opinion in Solid State & Materials Science*. *in press*.

2012 **Gordon, L.M.,** Tran, L., Joester, D. “Atom Probe Tomography of Apatites and Bone-Type Mineralized Tissues.” *ACS nano* 6, 10667-10675 (2012). [DOI]

2011 **Gordon, L.M.,** Joester, D. “Nano-Scale Chemical Tomography of Buried Organic-Inorganic Interfaces in the Chiton Tooth.” *Nature* 469, 194-197 (2011). [DOI] Featured in *Nature Methods* 8, 199 (2011). [DOI]

2011 Moss, I., **Gordon, L.M.,** Woodhouse, K.A., Whyne, C.M., Yee, A.J.M. “A Novel Thiol-Modified-Hyaluronan and Elastin-Like Polypeptide Composite Material for Tissue Engineering of the Nucleus Pulposus of the Intervertebral Disc.” *Spine* 36, 1022-1029 (2011). [DOI]

2009 **Gordon, L.M.,** Bouwhuis, B.A., Suralvo, M., McCrea, J.L., Palumbo, G., Hibbard, G.D. “Micro-Truss Nanocrystalline Ni Hybrids.” *Acta Materialia* 57, 932-939 (2009). [DOI]

2009 Leung, A., **Gordon, L.M.,** Skrinkas, T., Szwedowski, T., Whyne, C.M. “Effects of bone density alterations on strain patterns in the pelvis: application of a finite element model.” *Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine* 223, 965-979 (2009). [DOI]

2007 Hardisty, M., **Gordon, L.M.,** Agarwal, P., Skrinkas, T., Whyne, C.M. “Quantitative characterization of metastatic disease in the spine. Part I. Semiautomated segmentation using atlas-based deformable registration and the level set method.” *Medical Physics* 34, 3127 (2007). [DOI]

2007 Whyne, C.M., Hardisty, M., Wu, F., Skrinkas, T., **Gordon, L.M.,** Clemons, M., Basran, P.S. “Quantitative characterization of metastatic disease in the spine. Part II. Histogram-based analyses.” *Medical Physics* 34, 3279 (2007). [DOI]

#### INVITED TALKS

2013 **Gordon, L.M.** “Rock munching mollusks: understanding biomineralization of ultrahard iron-oxide teeth.” Harvard University Applied Physics Colloquium. *Cambridge, MA*.

2013 **Gordon, L.M.,** Cohen, M.J., Joester, D. “New applications: grain boundary and triple junction chemistry in nanocrystalline tooth enamel.” Cameca Atom Probe Tomography User Meeting. *Madison, WI*.

2012 **Gordon, L.M.** “Defining Interfaces and Interphases.” Tomographers Anonymous, Northwestern University. *Evanston, IL*.

#### TALKS

2013 Cohen, M.J., **Gordon, L.M.,** Joester, D. “Correlative Microscopy and Spectroscopy of Buried Interfaces in Tooth Enamel.” International Conference on the Chemistry and Biology of Mineralized Tissues. *Lake Geneva, WI*.

2013 **Gordon, L.M.,** Cohen, M.J., Joester, D. “Grain Boundary Chemistry Controls the Properties of Tooth Enamel.” XXII International Materials Research Congress. *Cancun, Mexico*.

2013 **Gordon, L.M.,** Joester, D. “Polymorph Selectivity in Chiton Tooth Biomineralization.” XXII International Materials Research Congress. *Cancun, Mexico*.

- 2013 Brooker, L. **Gordon, L.M.**, Joester, D. "Characterisation of the microstructure of the aragonite lens of shell eyes in the chiton." XXII International Materials Research Congress. *Cancun, Mexico*.
- 2013 **Gordon, L.M.**, Cohen, M.J., Joester, D. "Correlative Microscopy and Spectroscopy of Buried Interfaces in Tooth Enamel." Microscopy & Microanalysis Meeting. *Indianapolis, IN*.
- 2013 **Gordon, L.M.**, Cohen, M.J., Joester, D. "Towards Atom Probe Tomography of Hybrid Organic-Inorganic Nanoparticles." Microscopy & Microanalysis Meeting. *Indianapolis, IN*.
- 2013 **Gordon, L.M.**, Cohen, M.J., Joester, D. "Correlative Microscopy and Spectroscopy of Tooth Enamel." Cameca Atom Probe Tomography User Meeting. *Madison, WI*.
- 2013 Cohen, M.J., **Gordon, L.M.**, Suram, S.K., Kaluskar, K., Rajan, K., Valley, J.W., Joester, D. "Atom Probe Tomography Reconstruction of Single Crystalline Metal Oxides." Cameca Atom Probe Tomography User Meeting. *Madison, WI*.
- 2013 **Gordon, L.M.**, "Nanoscale Chemical Tomography of Buried Organic-Inorganic Interfaces" McMaster University, Materials Science and Engineering Department Seminar. *Hamilton, ON*.
- 2013 **Gordon, L.M.**, Joester, D. "Understanding the biological stabilization of ferrihydrite and its transformation to magnetite." American Physical Society Meeting. *Baltimore, MD*.
- 2012 **Gordon, L.M.**, Joester, D. "Buried Interfaces in Mouse Incisor Enamel." Spring Meeting of the Materials Research Society. *San Francisco, CA*.
- 2011 **Gordon, L.M.**, Joester, D. "Atom Probe Tomography of Buried Organic-Inorganic Interfaces in Biological Minerals." Society of Engineering Science Meeting. *Evanston, IL*.
- 2011 **Gordon, L.M.**, Joester, D. "Buried Organic-Inorganic Interfaces in Mineralized Biological Tissues." 11<sup>th</sup> International Symposium on Biomineralization. *Noosa, Queensland, Australia*.
- 2011 **Gordon, L.M.**, Joester, D. "Buried Organic-Inorganic Interfaces in Biological Minerals." Cameca Atom Probe Tomography User Meeting. *Madison, WI*.
- 2009 **Gordon, L.M.**, Joester, D. "Atom Probe Tomography of Buried Organic in the Chiton Tooth." Fall Meeting of the Materials Research Society. *Boston, MA*.
- 2006 **Gordon, L.M.**, Hardisty, M., Skrinkas, T., Wu, F., Whyne, C.M. "Automated Atlas-based 3D segmentation of the Metastatic Spine." 40<sup>th</sup> Annual Canadian Orthopaedic Research Society Meeting. *Toronto, ON*.

#### PUBLISHED PROCEEDINGS

- 2013 **Gordon, L.M.**, Joester, D. "Understanding the biological stabilization of ferrihydrite and its transformation to magnetite" *Bulletin of the American Physical Society*. (2013)
- 2012 Suram, S.K., Kaluskar, K., **Gordon, L.M.**, Joester, D., Rajan, K. "Atom Probe Tomography of Organic/Inorganic Interfaces in Biominerals." *Microscopy & Microanalysis*. 18, Supplement S2, 1608-1609 (2012)
- 2012 Larson, D.J., Smentkowski, V.S., **Gordon, L.M.**, Joester, D., Inoue, K., Reinhard, D.A., Prosa, T.J., Olson, D., Lawrence, D., Clifton, P.H., Ulfig, R.M., Martin, I., Snoeyenbos, D., Kelly, T.F. "New Applications in Atom Probe Tomography." *Microscopy & Microanalysis*. 18, Supplement S2, 926-927 (2012)
- 2008 **Gordon, L.M.**, Hardisty, M., Skrinkas, T., Wu, F., Whyne, C.M. "Automated Atlas-based 3D segmentation of the Metastatic Spine." *Journal of Bone and Joint Surgery, British Volume* 90 Supplement 1, 128 (2008)
- 2008 Wu, F., Burnes, D., **Gordon, L.M.**, Hardisty, M., Skrinkas, T., Basran, P., Whyne, C.M. "Quantitative Characterization of Metastatic Disease in the Spine and Development of an Automated Tracking Tool." *Journal of Bone and Joint Surgery, British Volume* 90 Supplement 1, 129 (2008)

- 2008 Whyne, C.N., Skrinskas, T., Yee, A., **Gordon, L.M.**, Akens, M., Hardisty, M., Burch, S., Wilson, B., Bisland, S., "Does Photodynamic Therapy Affect the Structural Integrity of Vertebral Bone." *Journal of Bone and Joint Surgery, British Volume* 90 Supplement 1, 135 (2008)

#### POSTERS

- 2013 Larson, D., Ulfig, R., Valley, J., Ushikubo, T., Miller, M., Takamizawa, H., Shimizu, Y., **Gordon, L.M.**, Joester, D., Duquenne, C., Giddings, A., Reinhard, D., Lawrence, D., Clifton, P. "New Applications in Atom Probe Tomography" Microscopy & Microanalysis Meeting. *Indianapolis, IN*.
- 2013 Cohen, M.J., **Gordon, L.M.**, Suram, S.K., Kaluskar, K., Rajan, K., Valley, J.W., Joester, D. "Constraining Atom Probe Tomography Reconstructions of Crystalline Oxides." Microscopy & Microanalysis Meeting. *Indianapolis, IN*.
- 2013 Ulfig, R., Valley, J., Ushikubo, T., Miller, M., Takamizawa, H., Shimizu, Y., **Gordon, L.M.**, Joester, D., Duquenne, C., Giddings, A., Reinhard, D., Lawrence, D., Clifton, P., Larson, D. "New Applications of LEAP® Microscopy" 15th European Conference on Applications of Surface and Interface Analysis. *Forte Village Resort, Sardinia, Italy*.
- 2013 **Gordon, L.M.**, Joester, D. "Buried Organic/Inorganic Interfaces in Biological Minerals" Northwestern University John E. Hilliard Memorial Symposium. *Evanston, IL*.
- 2012 Ehrke, H.U., Smentkowski, V.S., **Gordon, L.M.**, Joester, D., Prosa, T.J., Clifton, P.H., Snoeyenbos, D., "Atom Probe Tomography - 3D Subnanometer chemical imaging extended to Photovoltaic and Geological Materials." European Mineralogical Conference . *Frankfurt, Germany*.
- 2012 Ehrke, H.U., Larson, D.J., Smentkowski, V.S., **Gordon, L.M.**, Joester, D., Prosa, T.J., Clifton, P.H., Snoeyenbos, D., "New Applications in Atom Probe Tomography." Microscopy & Microanalysis. *Phoenix, AZ*.
- 2012 **Gordon, L.M.**, Joester, D. "Model System for Biomimetic Magnetite Mineralization" Gordon Research Conference on Biomineralization. *New London, NH*.
- 2012 Larson, D.J., Smentkowski, V.S., **Gordon, L.M.**, Joester, D., Inoue, K., Reinhard, D.A., Prosa, T.J., Olson, D., Lawrence, D., Clifton, P.H., Ulfig, R.M., Martin, I., Snoeyenbos, D., Kelly, T.F. "New Applications in Atom Probe Tomography." Microscopy & Microanalysis. *Phoenix, AZ*.
- 2012 Suram, S.K., Kaluskar, K., **Gordon, L.M.**, Joester, D., Rajan, K. "Atom Probe Tomography of Organic/Inorganic Interfaces in Biominerals." Microscopy & Microanalysis. *Phoenix, AZ*.
- 2012 Larson, D.J., Smentkowski, V.S., **Gordon, L.M.**, Joester, D., Inoue, K., Reinhard, D.A., Prosa, T.J., Olson, D., Lawrence, D., Clifton, P.H., Ulfig, R.M., Martin, I., Snoeyenbos, D., Horreard, F., Kelly, T.F. "New Applications in Atom Probe Tomography." SCANDEM 2012: Annual Meeting of the Nordic Microscopy Society. *Bergen, Norway*
- 2012 Larson, D.J., Smentkowski, V.S., **Gordon, L.M.**, Joester, D., Inoue, K., Reinhard, D.A., Prosa, T.J., Olson, D., Lawrence, D., Clifton, P.H., Ulfig, R.M., Martin, I., Snoeyenbos, D., Kelly, T.F. "New Applications in Atom Probe Tomography." International Field Emission Symposium. *Tuscaloosa, AL*.
- 2010 **Gordon, L.M.**, Joester, D. "Nanoscale Chemical Tomography of Buried Organic-Inorganic Interfaces in Biominerals." Gordon Research Conference on Biomineralization. *New London, NH*.
- 2006 Hardisty, M., Skrinskas, T., **Gordon, L.M.**, Whyne, C.M. "A Repeatable Bone Quality Measurement Technique Using 3D Stereology." 40<sup>th</sup> Annual Canadian Orthopaedic Research Society Meeting. *Toronto, ON*.
- 2006 Whyne, C.M., Skrinskas, T., Yee, A., **Gordon, L.M.**, Akens, M., Hardisty, M., Burch, S., Wilson, B., Bisland, S. "Does Photodynamic Therapy Affect the Structural Integrity of Vertebral Bone?" 40<sup>th</sup> Annual Canadian Orthopaedic Research Society Meeting. *Toronto, ON*.

- 2006 Wu, F., Burnes, D., **Gordon, L.M.**, Hardisty, M., Skrinskas, T., Basran, P., Whyne, C.M. “Quantitative Characterization of Metastatic Disease in the Spine and Development of an Automated Tracking Tool.” 40<sup>th</sup> Annual Canadian Orthopaedic Research Society Meeting. *Toronto, ON*.
- 2006 **Gordon, L.M.**, Hardisty, M., Skrinskas, T., Wu, F., Whyne, C.M. “Atlas-Based Segmentation in the Metastatic Spine via 3D Deformable Registration.” 52<sup>nd</sup> Annual Meeting of the Orthopaedic Research Society. *Chicago, IL*.
- 2006 Hardisty, M., Skrinskas, T., **Gordon, L.M.**, Whyne, C.M. “A Repeatable Stereologic Method to Measure Bone Quality.” 52<sup>nd</sup> Annual Meeting of the Orthopaedic Research Society. *Chicago, IL*.
- 2006 Whyne, C.N., Skrinskas, T., Yee, A., **Gordon, L.M.**, Akens, M., Hardisty, M., Burch, S., Wilson, B., Bisland, S., “Structural Effects of Photodynamic Therapy on Vertebral Bone. 52<sup>nd</sup> Annual Meeting of the Orthopaedic Research Society.” *Chicago, IL*.
- 2006 Wu, F., Burnes, D., **Gordon, L.M.**, Hardisty, M., Skrinskas, T., Basran, P., Whyne, C.M. “Quantitative Characterization of Metastatic Disease in the Spine and Development of an Automated Tracking Tool.” 52<sup>nd</sup> Annual Meeting of the Orthopaedic Research Society. *Chicago, IL*.

## Media Coverage

- 2013 “Zoologger: mollusc grows hardest teeth in the world”, Alyssa Botelho, *New Scientist*. October 2013. [\[URL\]](#)
- 2013 “Tough Teeth Inspire New Bio-designs”, Susan Reiss, *Research.gov*. June 5<sup>th</sup>, 2013. [\[URL\]](#)
- 2013 “Strange Biology Inspires the Best New Materials”, Nadia Drake, *Wired*. Mar 27<sup>th</sup>, 2013. [\[URL\]](#)  
Featured on *Wired.com* front page [\[CACHE\]](#)
- 2011 “Rock-Munching Mollusks A Model For Artificial Bones”, Joe Palca, *National Public Radio*. January 13<sup>th</sup>, 2011. [\[URL\]](#) [\[MP3\]](#) [\[TRANSCRIPT\]](#)
- 2011 “Teething trouble”, Kerri Smith et al., *Nature podcast*. Jan 13<sup>th</sup>, 2011. [\[URL\]](#) [\[MP3\]](#)
- 2011 “Imaging organic-inorganic interfaces in the tooth”, *Nature Methods* 8, 199 (2011). [\[DOI\]](#)
- 2011 “Cracking a Tooth”. *US News*. Jan 13<sup>th</sup>, 2011. [\[URL\]](#)

## Awards

- 2013 **Microscopy & Microanalysis Presidential Scholar Award**, Microscopy Society of America and the Microanalysis Society.
- 2009 **Finalist**. Materials Research Society Science as Art Competition.
- 2009 **Image of Distinction**. Nikon Small World — Photomicrography Competition. [\[URL\]](#) [\[IMAGE\]](#)
- 2008 **First Place: Technical Report**. Canadian National Concrete Canoe Competition, Halifax, NS.
- 2007 **First Place: Technical Presentation**. Canadian National Concrete Canoe Competition, Kingston, ON.

## Professional Service & Extracurriculars

- 2013 Symposium Assistant, XXII International Materials Research Congress (IMRC). Cancun, Mexico.
- 2013 Session Chair, Cameca Atom Probe Tomography User Meeting. Madison, WI.
- 2012 Symposium Assistant, Materials Research Society Spring Meeting. San Francisco, CA.
- 2010 Science Fair Judge. Chicago Public Schools, Area 9.
- 2010 Science Fair Judge. Chicago Public Schools, Area 4.
- 2009 Student-Faculty Representative, Materials Science Student Association, Northwestern University.
- 2007-2008 Project manager, University of Toronto Concrete Canoe Team.

- 2007        Tutored high-school level physics and math.
- 2006-2008    Mentored first year Materials Science and Engineering students, University of Toronto.
- 2005-2007    Head of concrete mix and composite design, University of Toronto Concrete Canoe Team.
- 2006        Vice-chair coordinating orientation week and distributing financial aid for one thousand incoming University of Toronto engineering students.
- 2003        Solo Photography Exhibition, Albert White Gallery. Toronto, ON.

## Professional Societies

American Association for the Advancement of Science, American Physical Society, Materials Research Society, Microanalysis Society, Microscopy Society of America.