Leonardo Martín Alarcón

Curriculum Vitæ – April 16, 2019

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Current Research Interests

My current research focuses on the cartilage boundary biolubricant called lubricin, specifically on the role it has in altering the viscoelastic properties of synovial fluid in the joints. My goal is to uncover and characterize its dynamic interactions with other biomolecules by using diverse biochemical, macro- and micro-rheological tools. This research could potentially provide insight into the physiological role of lubricin and how it can be used in a clinical context.

Education

University of Calgary, Calgary, CA — 2015–present
Ph.D. in Biomedical Engineering
- GPA: 4.0/4.0
- Thesis: *Role of Lubricin on the Rheology of Synovial Fluid*
- Advisors: Dr. Tannin A. Schmidt & Dr. Milana Trifkovic

University of Groningen, Groningen, NL — 2013–2014
M.Sc. in Biomedical Engineering[1]
- Dutch grade: 7.8/10.0 (A-)
- Prostheses & Implant Interface Technology Specialization
- Thesis: *Fluid Shear Stress and the Endothelium*
- Advisors: Dr. Jan-Renier Moonen & Dr. Martin C. Harmsen

Trinity College Dublin, Dublin, IE — 2012–2013
M.Sc. in Bioengineering[1]
- Thesis: *Design & Optimization of a Focal Brain Cooling Device for Chronic Neural Application*
- Advisor: Dr. Kevin O'Kelly

New Mexico State University, Las Cruces, US — 2007–2011
B.Sc. in Mechanical Engineering
- GPA: 3.8/4.0
- Minor in Mathematics
- Honors Thesis: *Experimental Study of Flapping-wing Aerodynamics*
- Advisor: Dr. Fangjun Shu

Research Experience

Graduate Student Researcher – Ph.D. Work — Jan/2018–present

Chemical & Petroleum Eng, University of Calgary, CA
Trifkovic Research Group
- Adapted optical tweezers-based microrheology and dynamic light scattering techniques to examine the linear viscoelastic spectrum of hyaluronan and lubricin solutions.
- Advisor: Dr. Milana Trifkovic

Graduate Student Researcher – Ph.D. Work — Sep/2015–present

Kinesiology, Univeristy of Calgary, CA
Schmidt Lab
- Employed rheological & tribological techniques to examine the macromolecular interactions in synovial fluid.
- Advisor: Dr. Tannin A. Schmidt

Visiting Research Scholar – Ph.D.Work — Sep/2017–Dec/2017

Mechanical Eng, University of Illinois at Champaign-Urbana, US

[1] Part of a joint degree organized by the Erasmus Mundus Masters Course in Biomedical Engineering (CEMACUBE).

Ewoldt Research Group

- Spent 4 months characterizing the interfacial and bulk rheological properties of hyaluronan and lubricin solutions.
- This work was sponsored by the Biomedical Engineering Graduate Program at the University of Calgary.
- Advisor: Dr. Randy Ewoldt

Graduate Student Researcher – M.Sc. Work Feb/2014–Aug/2014

Medical Sciences, University Medical Center Groningen, NL
Cardiovascular Regenerative Medicine Group

- Used computer modeling & simulation to develop a parallel-plate flow chamber in which to examine the effects of disturbed flows on adverse EC plasticity.
- Advisors: Dr. Jan-Renier Moonen & Dr. Martin C. Harmsen

Graduate Student Researcher – M.Sc. Work Feb/2013–Aug/2013

Trinity Centre for Bioengineering, Trinity College Dublin, IE
O'Kelly Lab

- Designed a focal brain-cooling device for chronic neural use and optimized its dimensions, cooling performance, and thickness of heat-insulating biomaterial coating.
- Advisors: Dr. Kevin O'Kelly

Undergraduate Student Researcher – B.Sc. Work Sep/2010–May/2011

Mechanical & Aerospace Eng, New Mexico State University, US
Shu Lab

- Developed an experimental setup to control the flapping motion of a flexible silicon hydrofoil and employed 2-D particle image velocimetry (PIV) to examine the flow field generated.
- Advisors: Dr. Fangjun Shu

Undergraduate Research Assistant – B.Sc. Work Feb/2010–May/2011

Mechanical & Aerospace Eng, New Mexico State University, US
Mechatronics Lab

- Collaborated in the design and development of a flight experiment system designed to validate a spacecraft inertia identification method in microgravity [PDF].
- Led the team that developed a capture mechanism for the instrumented satellite.
- Project Leader: Gerardo Martinez, M.Sc.

Wind Tunnel Research Lab

- Assisted in the setup and execution of 2-D PIV experiments to examine the flow field produced by flapping ornithopters. [PDF].
- Project Leader: Dr. Ramiro Chavez-Alarcon

Skills

Technical

- Rheology (rotational, microrheology with optical tweezers, and high shear microfluidics).
- Molecular characterization (DLS).
- Biochemical characterization (SDS-PAGE).
- Chemical handling, wetlab, and basic cleanroom procedures.

Software

- Matlab, NX Unigraphics, Solidworks, Comsol Multiphysics, LaTeX

Languages

- Spanish (native)
- English (native)
- French (begginer)

Refereed Journal Publications

[1] Wyma, A., **Martin-Alarcon, L.**, Walsh, T., Schmidt, T. A., Gates, I. D., & Kallos, M. S. (2018). Non-Newtonian rheology in suspension cell cultures significantly impacts bioreactor

shear stress quantification. *Biotechnology and Bioengineering*, **115(8)**, 2101–2113.

[2] **Martin-Alarcon, L.** & Schmidt, T. A. (2016) Rheological Effects of Macromolecular Interactions in Synovial Fluid. *Biorheology* **53(2)**, 49–67.

[3] Tian, R., Mitchell, R., **Martin-Alarcon, L.**, & Shu, F. (2013). Experimental Investigation of 2D Flexible Plunging Hydrofoil. *Journal of Flow Visualization and Image Processing*, **20(4)**, 243–260.

Conference Talks

[1] **Martin-Alarcon, L.**, Yang, T., Shu, F., & Wei, M. (2011). Experimental study of flow field around a plunging flexible hydrofoil. *64th Annual Meeting of the American Physical Society Division of Fluid Dynamics*. Baltimore, MD, US, November 20–22, 2011. Abstract Id. M10.002.

Conference Posters

[1] **Martin-Alarcon, L.**, Derakhshandeh, M., Jay, G. D., Trifkovic, M., Schmidt, T. A. Effect of Recombinant Human Proteoglycan 4 on the Rheology of Hyaluronan Solutions: Dose Dependency and Role of O-Linked Glycosylations. *11th International Conference on Hyaluronan*. Cleveland, OH, US, June 11–15, 2017.

Colloquia & Seminars

oral presentation *poster*

[1] The Role of Proteoglycan-4 in the Rheology of Synovial Fluid. *Human Performance Laboratory Musculoskeletal Biomechanics Seminar*. University of Calgary, Calgary, CA, May 11, 2017.

[2] Fluid Shear Stress and the Endothelium. *Biomedical Eng Summer Symposium*. University Medical Center Groningen, Groningen, NL, Jun 24, 2014.

[3] An in vitro approach to examine the effects of disturbed shear stress on adverse endothelial plasticity. *Biomedical Eng Winter Symposium*. University Medical Center Groningen, Groningen, NL, Dec 17, 2013.

[4] Optimisation of a Neural Cryo-electrode Design for Chronic Application. *M.Sc. Research Project Presentation*. Trinity Centre for Bioengineering, Dublin, IE, May 30, 2013.

[5] Inertial Property Algorithm Verification Sub-Orbital Flight Development. *New Mexico Space Grant Consortium – NASA Experimental Program to Stimulate Competitive Research*. New Mexico State University, US, May 5, 2011.

[6] Experimental Study of Flow Field around a Flexible Flapping Hydrofoil. *Undergraduate Research & Creative Arts Symposium*. New Mexico State University, Las Cruces, US, April 15, 2011.

[7] Flapping and Twisting Aeroelastic Wings for Propulsion: TA1 – Project 1-4b. *Army Research Lab – Army High Performance Computing Research Center*. New Mexico State University, Las Cruces, US, April 15, 2011.

Teaching Experience

University of Calgary, Calgary, CA 2017

Graduate Teaching Assistant, Mechanical Eng

- ENME 421: Materials I (grading, office hours, practicum 2 days/week).
- ENME 479: Mechanics of Deformable Solids II (grading, office hours, practicum 2 days/week).

University of Calgary, Calgary, CA 2016–2017

Undergraduate Student Mentor, Biomedical Eng

- Stevens, K. B.Sc. thesis: *Friction reducing properties of recombinant human proteoglycan-4 (rhPRG4) at a poly-(dimethyl siloxane) (PDMS) – glass interface.*
- Zhu, L. Summer research project: *Rheology of HA-rhPRG4 Solutions and the effect of Tween.*

New Mexico State University, Las Cruces, US 2009–2010

Undergraduate Student Tutor, Student Success Center-Zuhl

- Courses: Physics, Calculus, Pre-Calculus, Mechanical Eng, Chemistry, & Spanish.

Academic Service

Biomedical Eng Graduate Student Assoc. – VP Communications 2016–2017
University of Calgary, Calgary, CA
- Oversaw all forms of communication (e.g. emails, posters, website, newsletters) between the student association, the graduate student body, and the university's graduate student council.

Erasmus Mundus Student and Alumni Assoc. – Volunteer 2013–2014
University of Groningen, Groningen, NL
- Guided incoming M.Sc. students that joined the Biomedical Eng program.
- Helped to organize the Erasmus social & cultural events.

Editorial Committee for the 10th ICOBTE – Volunteer 2009
Advanced Materials Research Center (CIMAV), Chihuahua, MX
- Reviewed submitted abstracts and edited the proceedings for the 10th ICOBTE, a biennial international scientific conference on the biogeochemistry of trace elements and metalloids.
- Conference Organizer: Dr. Maria Teresa Alarcon Herrera.

Society of Automotive Engineers (SAE Mini Baja) – President 2008
New Mexico State University, Las Cruces, US
- Elected to lead a ten-person crew through the design and construction of an off-road vehicle for international competition.
- Duties included coordinating volunteering events, purchasing equipment, and managing the society's accounts.

Technical English Translator – Volunteer 2005–present
Advanced Materials Research Center (CIMAV), Chihuahua, MX
- Translated & edited dozens of academic papers from Spanish to English for publication in various scientific journals.
- Authors: Dr. Maria Teresa Alarcon Herrera & Dr. Ignacio Martin Dominguez.

Honors & Awards

Graduated with Honors spring 2011
New Mexico State University, Las Cruces, US
- *Honors* – GPA in top 15% of Eng College.
- *Distincion in University Honors* – Honors courses & thesis + GPA $\geq$ 3.75/4.00.
- *Crimson Scholar* – GPA $\geq$ 3.50/4.00 all semesters.

Dean's Honor List springs 2008–2012
New Mexico State University, Las Cruces, US

Funding

€ *european union award* 🏴 *federal award* 🏁 *provincial award* 🏛 *institutional award*

🏴	NSERC Alexander Graham Bell Canada Graduate Schl (1 year)	35,000 CAD	2018
🏛	BME Graduate Program Exchange Award	2,650 CAD	2017
🏛	BME Travel Award	1,000 CAD	2017
🏴	NSERC Postgraduate Schl (1 year)	24,000 CAD	2017
🏁	Queen Elizabeth II Graduate Schl	15,000 CAD	2016
€	Category-A Erasmus Mundus Schl (2 years)	68,000 CAD	2012
🏛	W.A. & Nina Greer Endowed Schl	1,600 CAD	2010
🏛	NMSU College of Engineering Schl	350 CAD	2009
🏛	GE Aircraft Engines Scholarship	700 CAD	2008
🏛	NMSU International Out-of-State Tuition Waiver (4 years)	50,000 CAD	2007

Professional Affiliations

NMSU Sociedad de Ingeniero, Member	2011
Tau Beta Pi, Member	2010
Pi Tau Sigma, Member	2009
Phi Eta Sigma, Member	2008
American Society of Mechanical Eng, Member	2007