

Victor Lefèvre

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EDUCATION

Ph.D. in Civil Engineering (GPA 4.00/4.00), August 2017

University of Illinois at Urbana-Champaign, USA

- Dissertation: *Dielectric Elastomer Composites: Analytical and Numerical Non-Convex Homogenization Methods and Applications*

M.S. in Mechanical Engineering (GPA 4.00/4.00 with Distinction), September 2013

Imperial College London, United Kingdom

- Thesis: *Crack Growth Modelling in Advanced Alloys for High Temperature Applications*

École Polytechnique Diploma, April 2014

Engineering Degree of École Polytechnique (GPA 3.80/4.00), September 2012

École Polytechnique, France

POSITIONS HELD

Assistant Professor, Northwestern University, Department of Mechanical Engineering, USA, September 2018–July 2022

Hibbitt Engineering Postdoctoral Research Associate in Engineering, Brown University, School of Engineering, USA, October 2017–August 2018

VISITING POSITIONS

Visiting Researcher, École Polytechnique, Laboratoire de Mécanique des Solides, France, June–July 2014; June–July 2015

Visiting Researcher, University of Illinois at Urbana-Champaign, Civil and Environmental Engineering Department, USA, April–July 2012

HONORS AND AWARDS

- ▷ **Cole-Higgins Award for Excellence in Teaching**, McCormick School of Engineering, Northwestern University, 2021
- ▷ **NSF Presenter Fellowship**, USNCTAM, ICTAM 2020+1, 2021
- ▷ **Haythornthwaite Research Initiation Award**, ASME AMD, ASME IMECE 2018
- ▷ **Hibbitt Engineering Fellowship**, School of Engineering, Brown University, 2017
- ▷ **Best Student Paper award**, ASME AMD, ASME IMECE 2015
- ▷ **ASME IMECE 2015 Student Travel award**, Haythornthwaite Foundation, ASME IMECE 2015
- ▷ **Prix de la Chaire André Citroën**, Laboratoire de Mécanique des Solides, École Polytechnique, 2012
- ▷ **“Outstanding Leadership” award**, École Polytechnique, 2012
- ▷ **“Outstanding Investment” award**, École Polytechnique, 2012

PUBLICATIONS

Publications in Refereed Journals

- J18. **Ghosh, K., Lefèvre, V., Lopez-Pamies, O.** 2023. The effective shear modulus of a random isotropic suspension of monodisperse liquid n-spheres: From the dilute limit to the percolation threshold. *Soft Matter* 19, 208–224.
- J17. **Ghosh, K., Lefèvre, V., Lopez-Pamies, O.** 2023. Homogenization of elastomers filled with liquid inclusions: The small-deformation limit. The Special Issue in Recognition of the 85th Birthday of Roger Fosdick. *Journal of Elasticity. In Press.*
- J16. **Lefèvre, V., Francfort, G., Lopez-Pamies, O.** 2022. The curious case of 2D isotropic incompressible Neo-Hookean composites. The Special Issue in Recognition of the 90th Birthday of Millard Beatty. *Journal of Elasticity.* 151, 177–186.
- J15. **Lefèvre, V., Lopez-Pamies, O.** 2022. The effective shear modulus of a random isotropic suspension of monodisperse rigid n-spheres: From the dilute limit to the percolation threshold. *Extreme Mechanics Letters* 55, 101818.
- J14. **Lefèvre, V.** 2020. Electroelastic response of isotropic dielectric elastomer composites with deformation-dependent apparent-permittivity matrix. *Journal of Applied Mechanics* 87(9), 091006.
- J13. **Lefèvre, V., Danas, K., Lopez-Pamies, O.** 2020. Two families of explicit models constructed from a homogenization solution for the magnetoelastic response of MREs containing iron and ferrofluid particles. *International Journal of Non-Linear Mechanics* 119, 103362.
- J12. **Lefèvre, V., Garnica, A., Lopez-Pamies, O.** 2019. A WENO finite-difference scheme for a new class of Hamilton-Jacobi equations in nonlinear solid mechanics. *Computer Methods in Applied Mechanics and Engineering* 349, 17–44.
- J11. **Kothari, M., Cha, M.-H., Lefèvre, V., Kim, K.-S.** 2019. Critical curvature localization in graphene. II. Nonlocal flexoelectricity-dielectricity coupling. *Proceedings of the Royal Society A* 475, 20180671.
- J10. **Shrimali, B., Lefèvre, V., Lopez-Pamies, O.** 2019. A simple explicit homogenization solution for the macroscopic elastic response of isotropic porous elastomers. *Journal of the Mechanics and Physics of Solids* 122, 364–380.
- J9. **Lefèvre, V., Danas, K., Lopez-Pamies, O.** 2017. A general result for the magnetoelastic response of isotropic suspensions of iron and ferrofluid particles in rubber, with applications to spherical and cylindrical specimens. *Journal of the Mechanics and Physics of Solids* 107, 343–364.

- J8. **Lefèvre, V., Lopez-Pamies, O.** 2017. Homogenization of elastic dielectric composites with rapidly oscillating passive and active source terms. *SIAM Journal on Applied Mathematics* 77, 1962–1988.
- J7. **Poulain, X., Lefèvre, V., Lopez-Pamies, O., Ravi-Chandar, K.** 2017. Damage in elastomers: Nucleation and growth of cavities, micro-cracks, and macro-cracks. *International Journal of Fracture* 205, 1–21.
- J6. **Lefèvre, V., Lopez-Pamies, O.** 2017. Nonlinear electroelastic deformations of dielectric elastomer composites: II — Non-Gaussian elastic dielectrics. *Journal of the Mechanics and Physics of Solids* 99, 438–470.
- J5. **Lefèvre, V., Lopez-Pamies, O.** 2017. Nonlinear electroelastic deformations of dielectric elastomer composites: I — Ideal elastic dielectrics. *Journal of the Mechanics and Physics of Solids* 99, 409–437.
- J4. **Lefèvre, V., Lopez-Pamies, O.** 2015. The overall elastic dielectric properties of fiber-strengthened/weakened elastomers. *Journal of Applied Mechanics* 82(11), 111009.
- J3. **Spinelli, S.A., Lefèvre, V., Lopez-Pamies, O.** 2015. Dielectric elastomer composites: A general closed-form solution in the small-deformation limit. *Journal of the Mechanics and Physics of Solids* 83, 263–284.
- J2. **Lefèvre, V., Ravi-Chandar, K., Lopez-Pamies, O.** 2015. Cavitation in rubber: an elastic instability or a fracture phenomenon? *International Journal of Fracture* 192, 1–23.
- J1. **Lefèvre, V., Lopez-Pamies, O.** 2014. The overall elastic dielectric properties of a suspension of spherical particles in rubber: An exact explicit solution in the small-deformation limit. *Journal of Applied Physics* 116, 134106.

GRANTS

- G2. “Linking Matrix Composition with Spatially Resolved Mechanical Properties in Polymicrobial Biofilms”. PI: O. Blagoun, co-PIs: G. Wells, V. Lefèvre. Period: August 2021 – July 2024. Funded by NSF Biomechanics and Mechanobiology program of CMMI division \$450,000 (33% share).
- G1. “Semiconductor-generated Active Space Charges in Dielectric Elastomer Composites”. PI: V. Lefèvre. Period: November 2018 – November 2019. Funded by Haythornthwaite Foundation. Haythornthwaite Research Initiation Grant. \$20,000 (100% share).

COURSES TAUGHT

- ME 414 Mechanics of Composite Materials (graduate course), Northwestern University, Fall 2019 – 2021
- GE 205-3 Engineering Analysis 3 (undergraduate course), Northwestern University, Fall 2019 – 2021
- ME 495 Theory of Heterogeneous Materials (graduate course), Northwestern University, Winter 2019 – 2021
- ME 495 Constitutive Modeling of Soft Materials (graduate course), Northwestern University, Winter 2022
- ENGN2920E Theory of Heterogeneous Materials (graduate course), Brown University, Spring 2018

STUDENT ADVISING AND MENTORING

Akash Pandey, 01/2022 – 06/2022. Programming Materials with Extreme Behaviors via Source Terms

Akash Pandey and Daniel Quispe, Winter 2022. Theory of Heterogeneous Materials (ME495 taught as ME499)

Graham Pritchard, Fall 2020. Constitutive Modeling of Soft Materials

PRESENTATIONS

Seminars and Keynote Lectures

- S10. ‘Magnetic-electric-elastic response of a general class of two-phase particulate composites’, Scale bridging in material modelling and structural optimization: A minisymposium in honor of Andrej Cherkaev’s 70th birthday. (postponed).
- S9. ‘A simple explicit homogenization solution for the macroscopic elastic response of isotropic porous elastomers’, ICTAM 2020+1, Milano, Italy, August 2021.
- S8. ‘Multiscale Computational Modeling and Design of New Classes of Electroactive and Magnetoactive Materials’, Department of Civil and Environmental Engineering, SPREE series, Northwestern University, Evanston, IL, October 2020.
- S7. ‘Multiscale Computational Modeling and Design of New Classes of Electroactive and Magnetoactive Materials’, Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, Urbana, IL, February 2020.
- S6. ‘Homogenization of Elastic Dielectric Composites with Rapidly Oscillating Passive and Active Source Terms’, Young Medalists Symposium, ASME IMECE 2019, Salt Lake City, UT, November 2019.
- S5. ‘Magnetic-electric-elastic response of a general class of two-phase particulate composites’, 55th Meeting of the Society for Natural Philosophy, Loyola University, Chicago, IL, September 2019.
- S4. ‘A general result for the magnetoelastic response of isotropic suspensions of iron and ferrofluid particles in rubber’, 6th European Conference on Computational Mechanics, Glasgow, UK, June 2018.
- S3. ‘Multiscale Computational Modeling and Design of New Classes of Electroactive and Magnetoactive Materials’, Department of Civil, Architectural and Environmental Engineering, The University of Texas at Austin, Austin, TX, March 2018.
- S2. ‘Soft Multifunctional Materials: Bottom-up Constitutive Theory and Applications’, Department of Mechanical Engineering, Northwestern University, Evanston, IL, March 2018.
- S1. ‘Analytical and numerical homogenization methods in nonlinear magnetoelastostatics and application to magnetorheological elastomers’, Laboratoire de Mécanique des Solides, École Polytechnique, Palaiseau, France, September 2017.

Conferences

- C31. ‘A WENO Finite-Difference Scheme for a New Class of Hamilton-Jacobi Equations in Nonlinear Solid Mechanics’, Virtual World Congress on Computational Mechanics, January 2021.
- C30. ‘Electroelastic response of isotropic dielectric elastomer composites with deformation-dependent apparent-permittivity matrix’, Virtual ASME IMECE 2020 conference, November 2020.
- C29. ‘Electroelastic response of isotropic dielectric elastomer composites with deformation-dependent apparent-permittivity matrix’, Virtual Technical Meeting of the Society of Engineering Science 2020, September 2020.

- C28. ‘Controlling pull-in instabilities in dielectric elastomers via the addition of filler particles’, ASME IMECE 2019, Salt Lake City, UT, November 2019.
- C27. ‘A Simple Explicit Homogenization Solution for the Macroscopic Elastic Response of Isotropic Porous Elastomers’, ASME IMECE 2019, Salt Lake City, UT, November 2019.
- C26. ‘A general result for the magnetoelastic response of isotropic suspensions of iron and ferrofluid particles in rubber’, SES 56th Annual Technical Meeting, St. Louis, MO, October 2019.
- C25. ‘A WENO Finite-Difference Scheme for a New Class of Hamilton-Jacobi Equations in Nonlinear Solid Mechanics’, SES 56th Annual Technical Meeting, St. Louis, MO, October 2019.
- C24. ‘Homogenization of Elastic Dielectric Composites with Rapidly Oscillating Passive and Active Source Terms’, SES 56th Annual Technical Meeting, St. Louis, MO, October 2019.
- C23. ‘A Simple Explicit Homogenization Solution for the Macroscopic Elastic Response of Isotropic Porous Elastomers’, ICMM6, Lund University, Sweden, June 2019.
- C22. ‘Homogenization of Elastic Dielectric Composites with Rapidly Oscillating Passive and Active Source Terms’, PACAM XVI, Ann Arbor, MI, May 2019.
- C21. ‘A Simple Explicit Homogenization Solution for the Macroscopic Elastic Response of Isotropic Porous Elastomers’, PACAM XVI, Ann Arbor, MI, May 2019.
- C20. ‘A WENO Finite-Difference Scheme for a New Class of Hamilton-Jacobi Equations in Nonlinear Solid Mechanics’, ASME IMECE 2018, Pittsburgh, PA, November 2018.
- C19. ‘Nonlinear Electroelastic Deformations of Soft Layered Composites Containing Space Charges, with Application to Electrets’, ASME IMECE 2018, Pittsburgh, PA, November 2018.
- C18. ‘A general result for the magnetoelastic response of isotropic suspensions of iron and ferrofluid particles in rubber’, SES 55th Annual Technical Meeting, Madrid, Spain, October 2018.
- C17. ‘A WENO Finite-Difference Scheme for a New Class of Hamilton-Jacobi Equations in Nonlinear Solid Mechanics’, SES 55th Annual Technical Meeting, Madrid, Spain, October 2018.
- C16. ‘Nonlinear Electroelastic Deformations of Soft Layered Composites Containing Space Charges, with Application to Electrets’, 10th European Solid Mechanics Conference, Bologna, Italy, July 2018.
- C15. ‘On two novel computational homogenization frameworks in 3D nonlinear magnetoelastostatics and application to magnetorheological elastomers’, ASME IMECE 2017, Tampa, FL, November 2017.
- C14. ‘Elastic dielectric composites with metamaterial-type properties’, ASME IMECE 2017, Tampa, FL, November 2017.
- C13. ‘A general result for the magnetoelastic response of isotropic suspensions of iron and ferrofluid particles in rubber, with applications to spherical and cylindrical specimens’, SES 54th Annual Technical Meeting, Boston, MA, July 2017.
- C12. ‘On two novel computational homogenization frameworks in 3D nonlinear electroelastostatics and application to dielectric elastomer composites’, Engineering Mechanics Institute Conference, San Diego, CA, June 2017.
- C11. ‘Homogenization of elastic dielectric composites with rapidly oscillating passive and active source terms’, 2017 MACH Conference, Annapolis, MD, April 2017.
- C10. ‘Controlling pull-in instabilities in dielectric elastomers via the addition of filler particles’, ASME IMECE 2016, Phoenix, AZ, November 2016.
- C9. ‘A 3D Hybrid Finite-Element Framework in Nonlinear Electroelastostatics and Application to Dielectric Elastomer Composites’, SES 53rd Annual Technical Meeting, College Park, MD, October 2016.
- C8. ‘Dielectric elastomer composites: A general closed-form solution and full-field simulations’, ASME IMECE 2015, Houston, TX, November 2015.
- C7. ‘The overall elastic dielectric properties of a suspension of spherical particles in rubber’, 9th European Solid Mechanics Conference, Madrid, Spain, July 2015.
- C6. ‘The overall elastic dielectric properties of a suspension of spherical particles in rubber’, Engineering Mechanics Institute Conference, Stanford University, CA, June 2015.

- C5. ‘Homogenization of coupled phenomena with oscillating source terms and application to the modeling of electrets’, PACAM XV, Champaign, IL, April 2015.
- C4. ‘The overall elastic dielectric properties of a suspension of spherical particles in rubber: An exact explicit solution in the small-deformation limit’, PACAM XV, Champaign, IL, April 2015.
- C3. ‘Cavitation in rubber: An elastic instability or a fracture phenomenon?’, SES 51st Annual Technical Meeting, West Lafayette, IN, October 2014.
- C2. ‘Cavitation in rubber: An elastic instability or a fracture phenomenon?’, World Congress of Computational Mechanics XI, Barcelona, Spain, July 2014.
- C1. ‘Cavitation in rubber: An elastic instability or a fracture phenomenon?’, European Conference of Fracture 20, Trondheim, Norway, June 2014.

PROFESSIONAL SERVICES

Professional Societies

ASME (American Society of Mechanical Engineers): Member from 2013 to present. Chair (by election) of the Technical Committee of “Mechanics of Soft Materials”, 2022.

SES (Society of Engineering Science): Member from 2014 to present.

Journal Referee

Acta Mechanica, Applied Mechanics Reviews, Cement and Concrete Composites, Composites Part B, Computational Materials Science, Engineering Fracture Mechanics, European Journal of Mechanics / A Solids, Forces in Mechanics, International Journal of Non-Linear Mechanics, International Journal of Solids and Structures, Journal of Applied Mechanics, Journal of Engineering Mechanics, Journal of the Mechanics and Physics of Solids, Meccanica, Mechanics of Material, Mechanics Research Communications, Polymer Testing, RSC Advances

Symposium Organizer

- At conferences:
 - “Mechanics of Soft Materials” in ASME IMECE 2022, November 2022 (planned)
 - “Mechanics of Soft Materials” in Virtual ASME IMECE 2021, November 2021
 - “Mechanics of Soft, Responsive Materials: Experiment, Modeling And Simulation” in 14th Virtual World Congress on Computational Mechanics, January 2021
 - “Mechanics of Soft Materials” in Virtual ASME IMECE 2020, November 2021
 - “Mechanics and Physics of Soft Materials” in Virtual Technical Meeting of the Society of Engineering Science 2020, October 2020
 - “Mechanics of Soft Materials” in ASME IMECE 2019, Salt Lake City, UT
- At Northwestern University:
 - Mechanical Engineering department graduate seminar series: Fall 2020 - Spring 2022
 - Theoretical and Applied Mechanics program seminar series: Winter 2021 - Spring 2022