

Curriculum vitae

José Alvarado

Education & research

2019–present Assistant Professor in Physics, University of Texas at Austin, USA.

2013–2018 Postdoc in Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, USA. Advisor: Anette (Peko) Hosoi

2009–2013 PhD in Physics, AMOLF & VU Amsterdam, Netherlands. Thesis: Biological Polymers: Confined, Bent & Driven. Advisor: Gijsje Koenderink

2003–2008 MSc in Physics, minor in Classical Sanskrit, Universität Leipzig, Germany. Thesis: Biomechanics on Actin Bundles. Advisor: Josef Käs

2002 Mechanical Engineering student, University of Miami, USA.

1997–2001 German Studies Diploma, Coral Reef Senior High School, Miami, USA.

Research interests

“Biological Systems Mechanics”: biomimetics, cell biology, soft condensed matter physics, mechanical engineering, geometric nonlinearity, emergent response, fluid-structure interaction, biological fluid flows, symmetry-breaking, hydraulic components, fluid mixing, actuator design, nonlinear force generation, optimization, energetic versatility, active gels, nonequilibrium physics, percolation theory, protein hydrogel actuators, nematic order, stimulus-responsive biomaterials, biohybrid robotics

Technical experience

Experimental: imaging, fluorescence microscopy, polarization microscopy, polymers, liquid crystals, rheology, microfluidics, light scattering, x-ray scattering, protein purification, biochemical preparation, genetic engineering, optical tweezers, machine shop, laser cutter, 3D printers, microfabrication, microcontroller-based prototyping.

Computational: image analysis, feedback control, data analysis, statistical analysis, Monte-Carlo simulation, ODE solvers, Mathematica, MATLAB, Python, HTML, CSS, JavaScript, SQL, functional programming, object-oriented programming, graphic design.

Theoretical: analysis (real, complex, functional), group theory, variational calculus, quantum mechanics, statistical mechanics, percolation theory, polymer physics, soft condensed matter physics, continuum mechanics, thermodynamics, dynamics, controls (state-space).

Publications

Links to profiles on [Google Scholar](#), [ResearchGate](#), [ORCID](#)

Citations across research articles: 578 (Google Scholar)

h-index: 10 (Google Scholar)

Research articles

- IC Gârlea, O Dammone, J Alvarado, V Notenboom, Y Jia, GH Koenderink, DGAL Aarts, MP Lettinga, BM Mulder. Colloidal Liquid Crystals Confined to Synthetic Tactoids. **Scientific Reports**, 9, 20391 (2019) (doi.org/10.1038/s41598-019-56729-9)
- J Alvarado, L Cipelletti, G Koenderink. Uncovering the dynamic precursors to motor-driven contraction of active gels. **Soft Matter**, 15, 8552-8565 (2019) ([doi:10.1039/C9SM01172B](https://doi.org/10.1039/C9SM01172B)) ([Preprint on arXiv](#))
- Y Liang, J Alvarado, K Iagnemma, AE Hosoi. Dynamic sealing using magneto-rheological fluids. **Physical Review Applied**, 10, 064049 (2018) ([doi:10.1103/PhysRevApplied.10.064049](https://doi.org/10.1103/PhysRevApplied.10.064049)) ([Preprint on arXiv](#)).
- J Alvarado, J Comtet, E de Langre, AE Hosoi. Nonlinear flow response of soft hair beds. **Nature Physics**, 13: 1014–1019 (2017) ([doi:10.1038/nphys4225](https://doi.org/10.1038/nphys4225)) *Featured on [Nature Physics News & Views](#), [MIT News](#), [FYFD](#) and the [Naked Scientists](#).*
- I Garlea, P Mulder, J Alvarado, O Dammone, G Koenderink, P Lettinga, D Aarts, B Mulder. Topology meets finite particle size: defect-mediated domain structures in strongly confined colloidal liquid crystals. **Nature Communications**, 7: 12112 (2016) ([doi:10.1038/ncomms12112](https://doi.org/10.1038/ncomms12112)).
- A Nasto, M Regli, PT Brun, J Alvarado, C Clanet, AE Hosoi. Air entrainment in hairy surfaces. **Physical Review Fluids**, 1: 033905 (2016) ([doi:10.1103/PhysRevFluids.1.033905](https://doi.org/10.1103/PhysRevFluids.1.033905)).
- M Sheinman, A Sharma, J Alvarado, G Koenderink, FC MacKintosh. Inherently unstable networks collapse to a critical point. **Physical Review E**, 92: 012710 (2015) ([doi:10.1103/PhysRevE.92.012710](https://doi.org/10.1103/PhysRevE.92.012710)).
- M Sheinman, A Sharma, J Alvarado, G Koenderink, FC MacKintosh. Anomalous discontinuity at the percolation critical point of active gels. **Physical Review Letters**, 114: 098104 (2015) ([doi:10.1103/PhysRevLett.114.098104](https://doi.org/10.1103/PhysRevLett.114.098104)). *Featured on the issue cover.*
- A Lewis, I Garlea, J Alvarado, O Dammone, P Howell, A Majumdar, B Mulder, MP Lettinga, G Koenderink, D Aarts. Colloidal liquid crystals

in rectangular confinement: theory and experiment. **Soft Matter**, 10: 7865–7873 (2014) ([doi:10.1039/C4SM01123F](https://doi.org/10.1039/C4SM01123F)).

- M Mavrakakis, Y Azou-Gros, FC Tsai, J Alvarado, A Bertin, F Iv, A Kress, S Brasselet, G Koenderink, T Lecuit. Septins promote F-actin ring formation by cross-linking actin filaments into curved bundles. **Nature Cell Biology**, 16: 322–34 (2014) ([doi:10.1038/ncb2921](https://doi.org/10.1038/ncb2921)). *Rated “excellent” by F1000Prime; Featured in Curr Biol 24(11): R526 (2014).*
- J Alvarado, B Mulder, G Koenderink. Alignment of nematic and bundled semiflexible polymers in cell-sized confinement. **Soft Matter**, 10: 2354–2364 (2014) ([doi:10.1039/C3SM52421C](https://doi.org/10.1039/C3SM52421C)). *Featured on the issue cover.*
- J Alvarado, M Sheinman, A Sharma, F MacKintosh, G Koenderink. Molecular motors robustly drive active gels to a critically connected state. **Nature Physics**, 9: 591–597 (2013) ([doi:10.1038/nphys2715](https://doi.org/10.1038/nphys2715)). *Featured on the issue cover.*
- M Soares e Silva, J Alvarado, J Nguyen, N Georgoulia, B Mulder, G Koenderink. Self-organized patterns of actin filaments in cell-sized confinement. **Soft Matter**, 7: 10631–10641 (2011) ([doi:10.1039/C1SM06060K](https://doi.org/10.1039/C1SM06060K)).
- D Strehle, J Schnauss, C Heussinger, J Alvarado, M Bathe, J Käs, B Gentry. Transiently crosslinked F-actin bundles. **European Biophysical Journal**, 40: 93–101 (2011) ([doi:10.1007/s00249-010-0621-z](https://doi.org/10.1007/s00249-010-0621-z)).

Reviews & chapters

- J Alvarado, M Sheinman, A Sharma, F MacKintosh, G Koenderink. Force percolation and phase behavior of contractile active gels. **Soft Matter**, 13: 5624–5644 (2017) ([doi:10.1039/C7SM00834A](https://doi.org/10.1039/C7SM00834A)).
- B Gentry, S Swei, J Alvarado, L Kreplak, G Koenderink. Mechanical Properties of Active Biopolymer Networks. Submitted (2017).
- J Alvarado, G Koenderink. Reconstituting cytoskeletal contraction events with biomimetic actin-myosin active gels. **Methods in Cell Biology**, 128: 83–103 (2015) ([doi:10.1016/bs.mcb.2015.02.001](https://doi.org/10.1016/bs.mcb.2015.02.001)).
- J Alvarado, G Koenderink. Chapter 1: Active mechanics of the cytoskeleton. **Cell and Matrix Mechanics**, Abingdon: Taylor & Francis (2014) ([isbn:9781466553811](https://doi.org/10.1201/b17612-2)) ([doi:10.1201/b17612-2](https://doi.org/10.1201/b17612-2)).

Patents

- Y Liang, M Evzelman, MF Demers, J Alvarado, AE Hosoi, K Iagnemma, R Zane. Solid State Pump Using Electro-Rheological Fluid. US Patent App. 15/296,694 (2017).

Other publications

- J Alvarado, M Sheinman, A Sharma, F MacKintosh, G Koenderink. Actieve vezelnetwerken: van connectie tot contractie. Popular article for Nederlandse Tijdschrift voor Natuurkunde, 80 (02): 8 (2014) ([link](#)).
- J Alvarado. Biological Polymers: Confined, Bent and Driven. PhD thesis, VU University Amsterdam (2013) ([link](#)).
- J Alvarado, M Schmidt, G Rudolph. Group Theoretical Aspects of Quantum Mechanics. 80-page introductory script, freely available (2008) ([link](#)).

Grants

- Co-PI, Multidisciplinary University Research Initiative (\$1.2M), US Army Research Office (2014–2018)

Awards

- Shapiro Teaching Fellowship (\$31k), MIT Mechanical Engineering Department (2013)
- Travel Grant (\$1k), Active Jammed Systems conference (2012)
- Travel Grant (€1k), Netherlands Society for Biochemistry and Molecular Biology (2010)
- Best idea for an interactive experiment (€1k), AMOLF 60th anniversary celebration (2009)

Teaching

- Guest Instructor, “Being Human in Physics” undergraduate course on overcoming personal challenges in physics, UT (2020)
- Guest Instructor, PHY 110C undergraduate seminar for physics majors, UT (2019)
- Lecturer, “General Physics II” (PHY 317L) undergraduate intro physics course for premedical, chemistry, and life sciences students, UT Overall rating from students: Spring 2019: 3.6/5.0 ($N = 63/130$)
- Guest Lecturer, “Mechanics of Active Matter” graduate course, Institut Fresnel (2016)
- Guest Lecturer, “Bio-inspired Robotics” graduate course, MIT (2015)
- Instructor, “Thermal Fluids Engineering II” undergraduate course, MIT Overall rating from students: Fall 2013: 6.2/7.0 ($N = 27/45$), Spring 2014: 6.9/7.0 ($N = 27/48$)
- MIT Kaufman Teaching Certificate Program (2014)

Academic service

- *Physical Review Letters*, referee
- *Physical Review Applied*, referee
- *Physical Review E*, referee
- *Physical Review X*, referee
- *Nature Communications*, referee
- *Journal of the Royal Society Interface*, referee
- *MDPI Fluids*, referee
- *Journal of Fluid Mechanics*, referee
- Dutch Foundation for Fundamental Research on Matter (FOM), Project-truimte grant scheme, referee
- National Science Foundation (NSF), panel member

Invited conference talks

- Active Matter and Liquid Crystals in Biological and Bio-Inspired Systems, American Physical Society March Meeting, Denver, USA (held online) (2020)
- Texas Soft Matter Meeting, Texas Tech U, USA (2019)
- World Congress of Biomechanics, Boston, USA (2014)

Invited institutional talks

- Symposium, AMOLF, Amsterdam, Netherlands (2020)
- Seminar, Physics Department, Trinity University, San Antonio, USA (2019)
- Colloquium, Leibniz Institute of Polymer Research, Dresden, Germany (2019)
- Solids seminar, Aerospace Engineering and Engineering Mechanics Department, UT Austin (2019)
- Seminar, Center for Nonlinear Dynamics, Physics Department, UT Austin, USA (2019)
- Seminar, Physics Department, U des Saarlandes, Saarbrücken, Germany (2018)
- Seminar, Physics Department, UC San Diego, USA (2018)
- Seminar, Physics Department, UMASS Amherst, USA (2018)
- Seminar, Physics Department, Brandeis U, USA (2018)
- Seminar, Mechanical Engineering Department, Carnegie Mellon U, USA (2018)
- Seminar, Center for Nonlinear Dynamics, Physics Department, UT Austin, USA (2018)

- Aerodynamics and Flow Control Seminar, Mechanical Engineering and Aeronautics, City University of London, UK (2018)
- Seminar, Keck Science Department, Claremont Colleges, USA (2017)
- Group Meeting, K. Brown, Mechanical Engineering, Boston University (2017)
- Seminar, Mechanical Engineering Department, UC San Diego, USA (2017)
- Group Meeting, MOSAIC, Institut Fresnel, Marseille, France (2016)
- Fluid Mechanics Seminar, Mechanical Engineering, UI Urbana-Champaign, USA (2016)
- Group Meeting, S. Nagel, Physics, U Chicago, USA (2016)
- Seminar, Army Research Lab, Aberdeen Proving Ground, USA (2016)
- Group Meeting, G. McKinley, Mechanical Engineering, MIT, USA (2015)
- Group Meeting, MOSAIC, Institut Fresnel, Marseille, France (2015)
- Group Meeting, C. Extavour, Organismic and Evolutionary Biology, Harvard U, USA (2014)
- Seminar, Concord Field Station, Organismic and Evolutionary Biology, Harvard U, USA (2014)
- Seminar, Active Matter Program, Kavli Institute for Theoretical Physics, UCSB, USA (2014)
- Short Colloquium, AMOLF, Amsterdam, Netherlands (2013)
- Group Meeting, U. Schwarz, Physics, Universität Heidelberg, Germany (2013)
- Seminar, FAS Center for Systems Biology, Harvard University, USA (2013)
- Seminar, Hatsopoulos Microfluids Laboratory, MIT, USA (2013)
- Seminar, Lewis-Siegler Institute, Princeton University, USA (2013)
- Seminar, Laboratory for Systems Biology, RIKEN, Kobe, Japan (2012)
- Seminar, Complex Systems Biology Center, University of Tokyo, Japan (2012)
- Seminar, Laboratoire Charles Coulomb, Université Montpellier, France (2012)
- Group Meeting, C. Marchetti, Physics, Syracuse University, USA (2012)
- Van Gogh Awards Ceremony, Institut Français, Amsterdam, Netherlands (2012)
- Seminar, Developmental Biology Institute, Université Méditerranée, Marseille, France (2011)
- Image Analysis Seminar, AMOLF, Amsterdam, Netherlands (2011)
- Group Meeting, M. Janson, Plant Sciences, Wageningen University, Netherlands (2010)
- Short Colloquium, AMOLF, Amsterdam, Netherlands (2009)

Contributed talks

- Cellular Energetics Program, Kavli Institute of Theoretical Physics, UCSB, USA
- Physics of Cancer Meeting, Physics Department, Universität Leipzig, Germany (2018)
- American Society for Cell Biology, Biological Soft Matter Meeting, Cambridge MA, USA (2017)
- American Physical Society Division of Fluid Dynamics, Denver, USA (2017)
- American Physical Society March Meeting, New Orleans, USA (2017)
- Society for Integrative and Comparative Biology Meeting, Tufts U, USA (2016)
- Sports Physics Conference, École Polytechnique, Paris, France (2016)
- Robotics@MIT Student Conference, MIT, USA (2016)
- American Physical Society Division of Fluid Dynamics, Boston, USA (2015)
- Fluids and Elasticity Meeting, Biarritz, France (2015)
- Complex Fluids Workshop, Yale University, USA (2015)
- American Physical Society Division of Fluid Dynamics, San Francisco, USA (2014)
- Greater Boston Area Statistical Mechanics Meeting, Brandeis U, USA (2013)
- Physical Biology Circle Meeting, EMBL, Heidelberg, Germany (2013)
- Biophysical Society Meeting, Philadelphia, USA (2013)
- Physics@FOM Conference, Veldhoven, Netherlands (2013)
- Complex Systems Summer School, VU Amsterdam & AMOLF, 't Vlietenholt, Netherlands (2012)
- Physical Biology Circle Meeting, Institut Curie, Paris, France (2012)
- Dutch Soft Matter Meeting, University of Amsterdam, Netherlands (2012)
- Course on Cell Shape Changes, Fondation Pierre-Gilles de Gennes, Institut Curie, Paris, France (2011)
- Dutch Meeting on Molecular and Cellular Biophysics, Veldhoven, Netherlands (2011)
- Dutch Soft Matter Meeting, Utrecht University, Netherlands (2011)
- Physiology Course, Marine Biological Laboratory, Woods Hole, USA (2010)
- Dutch Soft Matter Meeting, Wageningen U, Netherlands (2010)
- Physics and Mechanics of Biological Systems Course, Les Houches, France (2009)
- Physical Biology Circle Meeting, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany (2009)
- Soft Matter Winter School, Špindlerův Mlýn, Czech Republic (2007)

Posters

- Active Jammed Systems Conference, New York University, USA (2012)
- Cell Shape Changes Course, Fondation Pierre-Gilles de Gennes, Institut Curie, Paris, France (2011)
- 4th European Cell Mechanics Meeting, Amsterdam, Netherlands (2011)
- Physical Biology Circle Meeting, University of Saarbrücken, Germany (2011)
- Physics@FOM Conference, Veldhoven, Netherlands (2011)
- Plant and Microbial Cytoskeleton Conference, Andover, USA (2010)
- Physical Biology Circle Meeting, AMOLF, Amsterdam, Netherlands (2010)
- Physics@FOM Conference, Veldhoven, Netherlands (2010)
- 3rd European Cell Mechanics Meeting, Bad Honnef, Germany (2010)

Research courses attended

- Cell Shape Changes, Fondation Pierre-Gilles de Gennes, Institut Curie, Paris, France (2011)
- Physiology, Marine Biological Laboratory, Woods Hole, USA (2010)
- Physics and Mechanics of Biological Systems, École de Physique, Les Houches, France (2009)

Leadership

- MIT Fluids Journal Club, founding organizer
- AMOLF Cytoskeleton Journal Club, founding organizer
- AMOLF Biological Soft Matter Journal Club, organizer
- AMOLF Art Committee, member
- AMOLF Staff Association, chair

Mentoring

- MSc Teja Jammalamadaka, MIT. Project: Hairs in Poiseuille flow. (2017)
- BSc Joe Babcock, MIT. Thesis: Alignment in active gels. (2017)
- BSc Lauren TenCate, MIT. Project: Hairy swimming robot. (2016)
- BSc Betsy Soukup, MIT. Thesis: A solid-state, electrorheological, microfluidic pump. (2014)
- MSc Janine Wilbers, AMOLF. Thesis: Self-Organization of Cross-Linked Actin bundles in Confinement. (2011)
- MSc Jeanette Nguyen, AMOLF. Thesis: Self-Organization of Actin Networks in Confinement. (2010)

Thesis committees

- Michael Himmelsbach, Advisor: EL Florin, Physics, UT (2019)
- Caitlin Devitt, Advisor: John Wallingford, Molecular Biosciences, UT (2020)
- Yujen Wang, Advisor: Sapun Parekh, Biomedical Engineering (2020)

University Service

- Member, Outreach Committee, Physics, UT (2019–2020)

Fostering diversity

- Staff mentor, Rainbow Compass student mentoring program, MIT (2017)
- Co-founder, qtPhDs @ MIT, LGBT+ postdoc association (2017)
- Mentor, Women’s Technology Program, MIT (2014–2017)
- Treasurer, SpectrUM LGBT+ student association, University of Miami (2002)

Public outreach

- Interview, The Naked Scientists, Cambridge, UK (2017)
- Science Communications Fellow, Discovery Museum, Acton, MA USA (2017)
- Popular Colloquium*, AMOLF, Amsterdam, Netherlands (2013)
- Interview*, Swammerdam Science Radio Program, AmsterdamFM, Netherlands (2013)
- Contributor, “Steps of Science” public art installation, Science Park, Amsterdam, Netherlands (2012)
- Presenter, Film & Science Festival, NEMO Science Center, Amsterdam, Netherlands (2012)
- Quizmaster*, Science Park Open Day, Amsterdam, Netherlands (2011)

– *performed in the Dutch language

Extracurricular

- Member, Bay State speed-skating club, Boston, USA (2014–current)
- Social chair & workout leader, MIT Triathlon club, Cambridge, USA (2014–current)
- Workout leader, Boston LGBT Triathlon club, Cambridge, USA (2015–current)

- Member, SKITS speed-skating club, Amsterdam, Netherlands (2010–2013)
- English Language Instructor, Berlitz International, Miami, USA (2008)
- English Language Instructor, Primera Languages, Miami, USA (2008)
- English Language Instructor, Kindergarten Treffpunkt Linde, Leipzig, Germany (2006–2008)
- Homework Corrector, Molecular Physics course, Universität Leipzig, Germany (2007)
- Founding member, Improv theatre group Spruchlandung, Leipzig, Germany (2006–2008)
- Member, Improv theatre group SOKRATheater, Leipzig, Germany (2004–2006)
- Graphic Designer, The Academy, Miami, USA (2001–2003)

Languages

Fluent: English, Spanish, German, Dutch

Varying: Japanese, Classical Sanskrit, Hindi, Icelandic, French, Italian, Portuguese