Alejandro Martínez-Calvo

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Employment and Research Experience

Sept 2021–	**Human Frontier Science Program (HFSP) and PCTS Fellow at the Princeton Center for Theoretical Science (Associate Research Scholar)**, Princeton University, USA
Jan 2021–Sept 2021	**Postdoc position/Researcher**, Fluid Mechanics Group, Universidad Carlos III de Madrid, Spain
Feb 2017 – Jan 2021	**Ph.D in Fluid Mechanics (FPU Fellow)**, Fluid Mechanics Group, Universidad Carlos III de Madrid, Spain, Advisor: Prof. Alejandro Sevilla. Thesis: Dynamics of Complex Capillary Flows: Stability, Rupture, and Influence of Surfactants
March 2019 – Jun. 2019	**Research stay**: Department of Mechanical and Aerospace Engineering, Princeton University, U.S.A., Advisor: Prof. Howard A. Stone
March 2018 – Jun. 2018	**Research stay**: TIPs (Transfers, Interfaces and Processes) at Université Libre de Bruxelles, Belgium, Advisor: Prof. Benoit Scheid
Sept. 2015 – Feb. 2017	**M.Sc research assistant**, Department of Mathematics, Universidad Carlos III de Madrid, Advisors: Profs. Luis L. Bonilla & Alejandro Sevilla
Sept. 2014 – Aug. 2015	**Undergraduate research assistant**, Fluid Mechanics Group, Universidad Carlos III de Madrid, Advisor: Prof. Alejandro Sevilla

Education

Feb. 2017 – Dec. 2020	**Ph.D. in Fluid Mechanics, Universidad Carlos III de Madrid** Thesis title: *Dynamics of Complex Capillary Flows: Stability, Rupture, and Influence of Surfactants*, Advisor: Prof. Alejandro Sevilla
Sept. 2015 – Feb. 2017	**M.Sc. Applied Mathematics, Universidad Carlos III de Madrid** Highest GPA, 9.56/10 (Valedictorian) Thesis title: *The Nonlinear States of Viscous Capillary Jets Confined in the Axial Direction*
Sept. 2011 – Jul. 2015	**B.Sc. Mechanical Engineering, Universidad Carlos III de Madrid, Spain** Second highest GPA, 8.50/10 (Salutatorian) Thesis title: *Nonlinear Dynamics of Confined Viscous Liquid Jets: Self-Sustained Oscillations Vs. Breakup*.

Awards & Fellowships

Honors & Prizes

2011 **Pre-University Extraordinary Award** (University fees payment), Ministry of Education, Spain

2013 **2013 Madrid Excellence Prize**, Autonomous Community of Madrid, Spain

2014 **2014 Madrid Excellence Prize**, Autonomous Community of Madrid, Spain

2015 **Second Best Student Record Class 2011-2015 (Salutatorian)**, B.Sc Mechanical Engineering, Universidad Carlos III de Madrid, Spain

2016 **Second award XV Certamen Arquímedes 2016**, Ministry of Education, Spain

2017 **Best Student Record Class 2015-2017 (Valedictorian)**, M.Sc Applied Mathematics, Universidad Carlos III de Madrid, Spain

2021 **Cross-disciplinary Postdoctoral Human Frontier Science Program Fellowship (LT000035/2021-C)**

Princeton Center for Theoretical Science Postdoctoral Fellowship

Fellowships

Sept. 2014-Jul.2015 **Undergraduate Research Assistant Fellowship**, Ministry of Education, Spain

Sept. 2015-Feb. 2017 **M.Sc Research Assistant Fellowship** (also payment of M.Sc fees), Universidad Carlos III de Madrid

Feb. 2017-Sept.2017 **Universidad Carlos III PhD internal fellowship**, Spain

Feb. 2017-Dec.2020 **FPU doctoral fellow** (most prestigious and competitive PhD program in Spain), Ministry of Education, Spain

March 2018-Jun. 2018 **Research-stay fellowship under the competitive FPU program**, Ministry of Education, Spain. Destination: TIPs (Transfers, Interfaces and Processes), Benoit Scheid Lab, Université Libre de Bruxelles, Belgium

March 2019-Jun. 2019 **Research-stay fellowship under the competitive FPU program**, Ministry of Education, Spain. Destination: Department of Mechanical and Aerospace Engineering, Howard A. Stone Lab, Princeton University, U.S.A.

Publications

Journal Articles

1. **Martínez-Calvo, A.**, Bhattacharjee, T., Bay, R. K., Hancock, A., Wingreen, N. S., & Datta, S. S. (2021). Roughening instability of three-dimensional bacterial colonies growing in heterogeneous habitats. *in preparation to PNAS*.

2. Landajuela, A., Braun, M., **Martínez-Calvo, A.**, Rodrigues, C. D. A., Doan, T., Rudner, D. Z., Wingreen, N., & Karatekin, E. (2021). Membrane fission during bacterial spore development requires DNA-driven cellular inflation. *under review in Cell (bioRxiv 2021.10.08.463650)*. https://doi.org/10.1101/2021.10.08.463650

3. **Martínez-Calvo, A.**, Trenado-Yuste, C., & Datta, S. S. (2021). Active transport in complex environments. *Book chapter in Out-of-Equilibrium Soft Matter: Active Fluids from RSC Publishing (arXiv:2108.07011)*.

4. Trenado, C., Bonilla, L. L., & **Martínez-Calvo, A.** (2021). Fingering instability in spreading epithelial monolayers: Roles of cell polarisation, substrate friction and contractile stresses. *Soft Matter*, *17*(36), 8276–8290. https://doi.org/10.1039/D1SM00626F

5. Landajuela, A., Braun, M., Rodrigues, C. D. A., **Martínez-Calvo, A.**, Doan, T., Horenkamp, F., Andronicos, A., Shteyn, V., Williams, N. D., Lin, C., Wingreen, N., Rudner, D. Z., & Karatekin, E. (2021). FisB relies on homo-oligomerization and lipid binding to catalyze membrane fission in bacteria. *PLoS Biol.*, *19*(6), 1–38. https://doi.org/10.1371/journal.pbio.30013145

6. **Martínez-Calvo, A.**, Moreno-Boza, D., & Sevilla, A. (2021). Non-linear dynamics and self-similarity in the rupture of ultra-thin viscoelastic liquid coatings. *Soft Matter*, *17*(16), 4363–4374. https://doi.org/10.1039/D0SM02204G

7. **Martínez-Calvo, A.**, Moreno-Boza, D., & Sevilla, A. (2020). The effect of wall slip on the dewetting of ultrathin films on solid substrates: Linear instability and second-order lubrication theory. *Phys. Fluids*, *32*, 102107. https://doi.org/10.1063/5.0028105

8. Moreno-Boza, D., **Martínez-Calvo, A.**, & Sevilla, A. (2020b). The role of inertia in the rupture of ultrathin liquid films. *Phys. Fluids*, *32*, 112114. https://doi.org/10.1063/5.0031430

9. **Martínez-Calvo, A.**, & Sevilla, A. (2020b). Universal thinning of liquid filaments under dominant surface viscous forces. *Phys. Rev. Lett.*, *125*, 114502. https://doi.org/10.1103/PhysRevLett.125.114502

10. **Martínez-Calvo, A.**, Sevilla, A., Peng, G. G., & Stone, H. A. (2020). Start-up flow in shallow deformable microchannels. *J. Fluid Mech.*, *885*, A25. https://doi.org/10.1017/jfm.2019.994

11. **Martínez-Calvo, A.**, Rivero-Rodríguez, J., Scheid, B., & Sevilla, A. (2020). Natural break-up and satellite formation regimes of surfactant-laden liquid threads. *J. Fluid Mech.*, *883*, A35. https://doi.org/10.1017/jfm.2019.874

12. Moreno-Boza, D., **Martínez-Calvo, A.**, & Sevilla, A. (2020c). Stokes theory of thin film rupture. *Phys. Rev. Fluids*, *5*, 014002. https://doi.org/10.1103/PhysRevFluids.5.014002

13. **Martínez-Calvo, A.**, & Sevilla, A. (2018). Temporal stability of free liquid threads with surface viscoelasticity. *J. Fluid Mech.*, *846*, 877–901. https://doi.org/10.1017/jfm.2018.293

14. **Martínez-Calvo, A.**, Rubio-Rubio, M., & Sevilla, A. (2018). The nonlinear states of viscous capillary jets confined in the axial direction. *J. Fluid Mech.*, *834*, 335–358. https://doi.org/10.1017/jfm.2017.706

Conference Contribution

1. **Martínez-Calvo, A.**, Bhattacharjee, T., Bay, R. K., Hancock, A., Wingreen, N. S., & Datta, S. S. (2022). Roughening instability of growing three-dimensional bacterial colonies in complex environments, In *APS March Meeting*.

2. **Martínez-Calvo, A.**, Bhattacharjee, T., Bay, R. K., Wingreen, N. S., & Datta, S. S. (2021). Roughening instability of growing three-dimensional bacterial colonies, In *74th Annual Meeting of the APS DFD*.

3. **Martínez-Calvo, A.**, & Sevilla, A. (2021). Thinning of fluid interfaces under dominant surface dissipation, In *XXV ICTAM*, Milano, Italy.

4. Moreno-Boza, D., **Martínez-Calvo, A.**, & Sevilla, A. (2021). The stokes and euler regimes of thin film rupture, In *XXV ICTAM*, Milano, Italy.

5. Katifori, E., Ruiz-Garcia, M., & **Martínez-Calvo, A.** (2020). Tailoring volume dispersion in fluidic excitable systems, In *73rd Annual Meeting of the APS DFD*, Chicago, U.S.A.

6. **Martínez-Calvo, A.**, & Sevilla, A. (2020a). Thinning of active and passive cylindrical interfaces dominated by surface forces, In *73rd Annual Meeting of the APS DFD*, Chicago, U.S.A.

7. Moreno-Boza, D., **Martínez-Calvo**, **A.**, & Sevilla, A. (2020a). The influence of viscoelasticity on the dewetting of ultrathin polymer films, In *73rd Annual Meeting of the APS DFD*, Chicago, U.S.A.

8. Ruiz-Garcia, M., Katifori, E., & **Martínez-Calvo**, **A.** (2020). Towards a fluidic excitable system, In *73rd Annual Meeting of the APS DFD*, Chicago, U.S.A.

9. **Martínez-Calvo**, **A.**, Moreno-Boza, D., & Sevilla, A. (2019). Stokes description of thin liquid film break-up, In *8th International Symposium on Bifurcations and Instabilities in Fluid Dynamics*, Limerick, Ireland.

10. **Martínez-Calvo**, **A.**, Rivero-Rodríguez, J., Scheid, B., & Sevilla, A. (2019). Satellite droplet formation in the natural breakup of surfactant-laden liquid threads, In *8th International Symposium on Bifurcations and Instabilities in Fluid Dynamics*, Limerick, Ireland.

11. **Martínez-Calvo**, **A.**, Sevilla, A., & Stone, H. A. (2019a). Transient flow in shallow deformable microchannels, In *2019 PRISM Annual Research Symposium*, Princeton, U.S.A.

12. **Martínez-Calvo**, **A.**, Sevilla, A., & Stone, H. A. (2019b). Transient flow in deformable microchannels, In *STAMS 2019 (First Colloquium of the Spanish Theoretical and Applied Mechanics Society)*, Madrid, Spain.

13. **Martínez-Calvo**, **A.**, Rivero-Rodríguez, J., Scheid, B., & Sevilla, A. (2018a). Satellite-droplet formation regimes in the natural breakup of clean and surfactant-laden liquid threads, In *71st Annual Meeting of the APS DFD*, Atlanta, U.S.A.

14. **Martínez-Calvo**, **A.**, Rivero-Rodríguez, J., Scheid, B., & Sevilla, A. (2018b). Temporal analysis of surfactant-laden liquid threads: Linear stability and nonlinear dynamics, In *12th European Fluid Mechanics Conference*, Vienna, Austria.

15. **Martínez-Calvo**, **A.**, & Sevilla, A. (2017a). The role of surface viscosities in the instability of liquid threads, In *70th Annual Meeting of the APS DFD*, Denver, U.S.A.

16. **Martínez-Calvo**, **A.**, Rubio-Rubio, M., & Sevilla, A. (2016a). Non-linear regimes of axially-confined vertical capillary jets, In *11th European Fluid Mechanics Conference*, Sevilla, Spain.

17. Sevilla, A., **Martínez-Calvo**, **A.**, & Rubio-Rubio, M. (2015). Non-linear state selection of axially confined viscous liquid jets, In *68th Annual Meeting of the APS DFD*, Boston, U.S.A.

Seminars & Workshops

1. **Martínez-Calvo**, **A.** (2021a). Membrane fission mechanisms in bacteria, In *Prokaryotes Lunch seminar*. Princeton, U.S.A.

2. **Martínez-Calvo**, **A.** (2021b). Roughening instability of growing three-dimensional bacterial colonies, In *Bio Engineering Colloqium*. Princeton, U.S.A.

3. **Martínez-Calvo**, **A.** (2021c). Roughening instability of growing three-dimensional bacterial colonies, In *SMatCH: Soft Matter at Coffee Hour*. Princeton, U.S.A.

4. **Martínez-Calvo**, **A.** (2021d). Singularities and pattern formation in living and non-living matter, In *Princeton Center for Theoretical Science (PCTS) Retreat*. Princeton, U.S.A.

5. **Martínez-Calvo**, **A.** (2019). In *Princeton University, Seminar at Howard A. Stone Lab*. Princeton, USA.

6. **Martínez-Calvo**, **A.**, & Sevilla, A. (2019). Micro-structure formation during drop pinch-off, In *Spanish Workshop of Fluid Mechanics*. Granada, Spain.

7. **Martínez-Calvo**, **A.**, Rivero-Rodríguez, J., Scheid, B., & Sevilla, A. (2018c). Linear stability and nonlinear dynamics of surfactant-laden liquid threads, In *Spanish Workshop of Fluid Mechanics*. Malaga, Spain.

8. **Martínez-Calvo**, **A.**, & Sevilla, A. (2017b). The effect of surface viscosity on the capillary instability of liquid threads, In *Spanish Workshop of Fluid Mechanics*. Tarragona, Spain.

9. Sevilla, A., & **Martínez-Calvo, A.** (2017). In *Université Libre de Bruxelles, Invited seminar at TIPs*. Brussels, Belgium.

10. **Martínez-Calvo, A.** (2016). Bailando con chorros emocionalmente inestables, In *Junior Seminar IGMB-UC3M*. Madrid, Spain.

11. **Martínez-Calvo, A.**, Rubio-Rubio, M., & Sevilla, A. (2016b). The nonlinear states of viscous capillary jets confined in the axial direction, In *Spanish Workshop of Fluid Mechanics*. Cadiz, Spain.

12. **Martínez-Calvo, A.**, Rubio-Rubio, M., & Sevilla, A. (2015). Non-linear dynamics of axially confined viscous liquid jets: Self-sustained oscillations vs. break-up, In *Spanish Workshop of Fluid Mechanics*. Jaen, Spain.

Reviewer for International Journals and Conferences

- **Journal of Fluid Mechanics**, **Physics of Fluids**

Teaching

2016/2017	**Fluid Mechanics** (Lab sessions) (15739), **Fluid transport and hydraulic machines** (15094)
2017/2018	**Fluid Mechanics** (Lab sessions) (15739), **Fluid transport and hydraulic machines** (15094)
2018/2019	**Fluid Mechanics** (Lab sessions) (15739), **Fluid transport and hydraulic machines** (15094)
2019/2020	**Fluid Mechanics** (Lab sessions) (15739), **Fluid transport and hydraulic machines** (15094)
2020/2021	**Fluid transport and hydraulic machines** (15094), **Fluid Mechanics** (15739)

Student Advising

B.Sc & M.Sc level

2017-2020 **5 end-of-degree projects**, Universidad Carlos III de Madrid, Spain