

Dariel Hernández-Delfin

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EDUCATION

Ph.D. in Natural and Applied Sciences <i>Granular flows (currently ongoing)</i> University of Navarra	Oct. 2017 – Nov. 2021 Pamplona, Spain
Master in Nuclear Physics <i>Interaction of radiation with matter</i> University of Havana - Instituto Superior de Tecnologías y Ciencias Aplicadas (UH-InSTEC)	Sep. 2015 – Jun 2017 Havana, Cuba
Degree in Nuclear Physics <i>five-year program (Summa cum Laude)</i> Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC)	Sep. 2010 – Jul 2015 Havana, Cuba

PROFESSIONAL EXPERIENCE

Internship MercuryDPM, University of Twente	Feb 2020 – May 2020 Twente, The Netherlands
<ul style="list-style-type: none">Coded and tested the part concerning to superquadrics particles of the code MercuryDPM for discrete particle simulations.Simulated shape-bidisperse systems of particles in a horizontal rotating drum.	
Graduate Teaching Assistant Instituto Superior de Tecnologías y Ciencias Aplicadas, InSTEC	Sep 2015 – Aug 2017 Havana, Cuba
<ul style="list-style-type: none">Graduate Teaching Assistant in several subjects: Optics, Mechanic Lab, Optics Lab, Molecular Lab, Analytic Geometry, Mathematical Analysis.Designed hands-on labs using open-source electronics platform <i>ArduinoTM</i>.	

FUNDING

- Asociación de Amigos de la Universidad de Navarra (ADA) PhD grant.
- Financial aid program for mobility to obtain an international doctoral degree 2000€.

RESEARCH INTEREST

- Complex fluids, Granular Flows, and Glassy Systems.
- DEM, SPH-SDPD, CFD simulations.
- Stochastic modeling.
- Non-equilibrium systems, Complex and nonlinear systems.

RESEARCH EXPERTISE

Ph.D. candidate	2017-present
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- Spherical particles in narrow pipes

Provided experimental and numerical confirmation of clogging of spheres in narrow pipes due to the formation of hanging arches. Obtained an exponential distribution of the times that the system is flowing before a clog develops, a feature that can be explained by considering a constant probability of clogging for each experimental condition. Observed a nonmonotonicity of the clogging probability with the outlet size that is attributed to the formation of ordered structures; these prevent the redistribution of forces towards the pipe walls and the stabilization of domes. Found a notable broadening in the distributions of interparticle normal forces for the scenarios where clogging occurs, suggesting that jamming and clogging could be related in pipe flow.

- Coarse-graining technique

Proposed a method to compute coarse-graining fields from DEM simulations data in cylindrical coordinates. Explained how the initial velocity of an intruder determine the maximum penetration, perturbing the granular bed. Observed differences in the flow of particles in silo under shear when varying the frequency of rotation of the silo bottom due to a nonmonotonic behavior of the kinetic pressure with the shear.

SKILLS

Languages: Spanish (Native), English (B2)

Programming: C/C++, Python (NumPy, SciPy, Matplotlib, Pandas), MATLAB, Mathematica, R

Image Processing: Paraview, GnuPlot, povray, Origin

Document Creation: LaTeX, Microsoft Office Suite, Markdown

Others: HPC(CUDA, OpenMP, MPI), use of Numerical Methods Programming and Algorithms, the ability to work successfully as a member of a team, the ability to teach gained through my experience as graduated teaching assistant.

PUBLICATIONS

- **D. Hernández-Delfin**, I. F. C. Denissen, T. Weinhart, R. C. Hidalgo, and A. R. Thornton. Competing mechanisms of particle-shape segregation in a rotating drum (in preparation).
- **D. Hernández-Delfin**, T. Weinhart, and R. C. Hidalgo. Self-diffusion of spherocylindrical particles flowing under non-uniform shear rate (submitted).
- **D. Hernández-Delfin**, T. Pongó, K. To, T. Börzsönyi, and R. C. Hidalgo. Particle flow rate in silos under rotational shear. *Phys. Rev. E* 102, 042902 - Published 12 October 2020. <https://doi.org/10.1103/PhysRevE.102.042902>
- Diego López, **Dariel Hernández-Delfin**, Raúl C. Hidalgo, Diego Maza, and Iker Zuriguel. Clogging-jamming connection in narrow vertical pipes. *Phys. Rev. E* 102, 010902(R) – Published 20 July 2020.
- Huang, K., **Hernández-Delfin, D.**, Rech, F., Dichtl, V., and Hidalgo, R.C. . The role of initial speed in projectile impacts into light granular media. *Sci. Rep.* 10, 3207 (2020). <https://doi.org/10.1038/s41598-020-59950-z>
- J. A. Lesteiro-Tejeda, **D. Hernández-Delfin**, A. J. Batista-Leyva. Automation of experiments using Arduino. *Rev. Cub. Fis.* 34, 120 (2017).
- Domínguez-Castro, A., **Hernández, D.** Guzmán, F. Insights into the interactions of biomolecules with small gold clusters: a theoretical study from a DFTB perspective. *Theor. Chem. Acc.* 136, 84 (2017). <https://doi.org/10.1007/s00214-017-2118-7>

CONFERENCES AND PRESENTATIONS

Numerical simulation of granular media flowing through vertical pipes <i>Traffic and Granular Flow</i>	Jul 2nd–5th, 2019 Pamplona, Spain.
Simulación numérica de materia granular descargada a velocidad constante en tubos verticales. <i>XXII Congreso de Física Estadística (FisEs'18).</i>	
Granular convection of horizontally shaken granular layers: Simulation. <i>XXII Congreso de Física Estadística (FisEs'18).</i>	Oct 18-20, 2018 Madrid, Spain.
Channeling of charged particle beams in carbon nanotubes. <i>High Brightness Beams Workshop</i>	Mar 28-Apr 1, 2016 Havana, Cuba.
Proton Channeling in CNTs: Modeling and Computer Simulation. <i>NANO5 International Seminar on Nanoscience and Technology</i>	2015 Havana, Cuba.

HONORS AND AWARDS

Financial aid program for mobility to obtain an international doctoral degree awarded by Caixa Bank-Fundación Caja Navarra	July 2019
ADA grant Grant for students pursuing a Ph.D at University of Navarra	July 2017
Summa cum Laude Recognition for graduate students with outstanding results at InSTEC	2015

TEACHING EXPERIENCE

Physics Recitation and lab sections (49 h) + <i>Designed lab session</i> <u>tracking using Raspberry Pi</u> (11 h)	Winter-2021, Fall-2019, and Spring 2018 University of Navarra, Spain
Introduction to Calculus and Algebra Recitation sections (23 h)	Winter-2021 and Winter-2018 University of Navarra, Spain
Biostatistics Discussion sections (30 h)	Winter-2018 University of Navarra, Spain
Mathematics Discussion sections (30 h)	Fall-2018 University of Navarra, Spain
Biostatistics Lab sections (36 h)	Winter-2018 University of Navarra, Spain