

RUBEN E. ROJAS  
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## RESEARCH EXPERTISE

Experimental Fluid Dynamics with experience in rotational geophysical experiments and Spherical-Couette flows. Liquid metal experiments. Interest in fluid dynamics, turbulence phenomena, dynamo theory and magnetohydrodynamics. Experience in granular dynamics and analogue gravity experiments. Engineering and teaching skills.

## Skills and Qualifications

- Experimental design.
- Research and Data analysis.
- Sodium metal handling and safety.
- Mechanical engineering design.
- Written and oral communication skills.
- Presentation skills
- Team building and leadership.
- Scientific outreach.

Computing skills: MATLAB, Python, Latex, SolidWorks, ImageJ, Inventor, Illustrator.  
Languages: Spanish (native proficiency). English (professional working proficiency).

## PERSONAL INFORMATION:

- Full Name: Ruben Eduardo Rojas Garcia.
- Birthdate: September 25, 1992.
- Nationality: Venezuelan.
- Languages: Spanish (native proficiency). English (professional working proficiency.)

## EDUCATION

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|--------------|--|
| 2015-Present | University of Maryland, College Park, MD, United States<br>PhD in Physics.<br>Dissertation: <i>“Increasing Helicity towards a Dynamo State in the Three-Meter Model of the Earth-Core”</i> .<br>Estimated Graduation Time: Summer 2022.<br>Advisor: Prof. Daniel P. Lathrop. |
| 2009-2015    | Simon Bolivar University, Caracas, Venezuela.<br>Bachelor in Physics. Cum Laude.   |

Honorific mention in Undergrad Thesis Project: “*Analogue model of an event horizon through shallow water waves on a channel flow*”.

Advisor: Prof. Jesus Gonzalez-Laprea.

PUBLICATIONS: <https://go.umd.edu/rubrojas>

2021 “*Experimental study of rough spherical Couette flows: Increasing helicity toward a dynamo state*”. RE Rojas, A Perevalov, T Zürner, DP Lathrop. *Physical Review Fluids* 6 (3), 033801.

2021 “*Machine learning predictions of high Reynolds number rotating MHD turbulence*”. A Perevalov; RE Rojas, BR Hunt, DP Lathrop. *Physica D: Nonlinear Phenomena* (Under review).

## RESEARCH EXPERIENCE

2016-Present *Research Assistant at the Three-meter Spherical-Couette Geodynamo Sodium Experiment*  
Institute for Research in Electronics and Applied Physics at the University of Maryland, College Park, United States.

- Designed, supervised and performed an Standard Operation Procedure to drain 12 tons of liquid sodium in a single-day operation from the experiment vessel to a storage tank to perform modifications.
- Handled liquid metals under strict safety standards. Designed and constructed plumbing.
- Designed a set of baffles to be welded onto the inner sphere of the experiment to effectively increase the helicity of the flows towards a dynamo field generation.
- Analyzed and processed previous experimental data to better understand the onset of dynamo generation for Spherical Couette Experiments.

2017-2020 *Research Assistant at the 40-cm Spherical-Couette Water Experiment*  
Institute for Research in Electronics and Applied Physics at the University of Maryland, College Park, United States.

- Designed and constructed from scratch of a 40-cm spherical-Couette water experiment set up that included a 6W laser, two 3kW motors and a 1000fps high speed camera.

- PIV code implementation and optimization to perform velocimetry measurements, including data analysis and processing of high speed camera videos.
- Designed a control software for an induction motor implemented in the experiment.
- Explored different parameters and baffle designs to effectively increase the helicity of the flows generated.

2015-2016 *Research Assistant at the Granular Electrification Experiment*  
Institute for Research in Electronics and Applied Physics at the University of Maryland, College Park, United States.

- Performed modifications of the experiment to include a second electrode to measure spatial correlation on the charge distribution of the granular particles.

2014-2015 *Bachelor Degree Dissertation Thesis Researcher*  
Simon Bolivar University, Caracas, Venezuela.

- Designed and constructed a 6m long channel flow to study an experimental analogue of a black hole event horizon using counter propagating water waves in a channel flow with an obstacle in the bottom counter-flow. propagating surface waves.
- Designed and installed a recirculation system for the water, including a pump and storage tank.
- Assembled a step motor with a wedge for wave generation, and a 2W laser set up for velocimetry.
- Due to the lack of cylindrical lenses in our lab, we designed and constructed a rotating mirror to serve as a laser sheet generator.
- Analyzed and processed the data of the wave profile to compute spacetime diagrams of the counter propagating waves to identify the location of the event horizon.
- Wrote my dissertation

## TEACHING EXPERIENCE

*Teaching Assistant.*

Department of Physics, University of Maryland, College Park.

- 01/2016 - 05/2016 •PHYS275: Experimental Physics I: Mechanics and Heat. (20 students)
- 08/2015 - 12/2015 •PHYS485/PHYS685: Electronic Circuits Lab.(20 students)

- 08/2015 - 12/2015 •PHYS375: Experimental Physics III: Electromagnetic Waves, Optics and Modern Physics. (40 students)
- Teaching Assistant.*  
Department of Mathematics, Simon Bolivar University, Caracas.
- 09/2013 - 12/2013 •Calculus 2 (15 students)
- Teaching Assistant.*  
Department of Physics, Simon Bolivar University, Caracas.
- 01/2011 - 03/2011 •General Physics I. (50 students)
- 09/2011 - 12/2011 •General Physics II. (50 students)

#### CONFERENCES, SEMINARS AND WORKSHOPS

19. “*Experimental study of rough spherical Couette Flows*” [2021] R. Rojas-Garcia, A. Perevalov, Till Zürner, DP Lathrop. 21th International Couette Taylor Workshop.
18. “*Experimental study of rough spherical Couette Flows: Increasing Helicity Towards a Dynamo state*” [2021] R. Rojas, A. Perevalov, Till Zürner, DP Lathrop. Earth and Planetary Magnetism Group Seminar. ETH, Zürich.
17. “*Progress on the Three-Meter Model of Earth's Core this (Strange) Year: New Hope for Dynamos with Inner Sphere Roughness*” [2020] R Rojas, A Perevalov, HP Myers, SC Burnett, D Martin, DP Lathrop. AGU Fall Meeting.
16. “*The Three-Meter Model of the Earth's Core: Increasing Helicity Toward Achieving Dynamo Action*” Ruben E. Rojas, Artur Perevalov, Daniel Lathrop. StatPhys27 Meeting.
15. “*Machine learning predictions for magnetic field time evolution in a Three-Meter liquid sodium spherical Couette experiment*” [2019] A Perevalov, R Rojas, B Hunt, DP Lathrop. AGU Fall Meeting.
14. “*Project New Hope: Achieving an Earth-like dynamo generated by Spherical Couette flows.*” [2019] R Rojas, A Perevalov, HP Myers, DP Lathrop. AGU Fall Meeting.
13. “*Magneto-Coriolis modes in the Three-Meter liquid sodium spherical-Couette experiment*” [2019] SA Triana, A Perevalov, R Rojas, SC Burnett, A Barik, DP Lathrop. AGU Fall Meeting.
12. “*A New Hope for Dynamo Action in the Three-Meter Model of Earth's Core: Increasing Helicity*” [2019] R Rojas, A Perevalov, D Lathrop. APS Division of Fluid Dynamics Meeting.
11. Hands-On Research in Complex Systems School [2018] ICTP, Trieste. Instructor. Laboratory session: “*Chaos and Machine Learning Prediction on a RDL circuit*”.
10. “*Increasing Helicity to Achieve a Dynamo State in a Spherical Couette Sodium Experiment*” [2018] R Rojas, A Perevalov, DP Lathrop. AGU Fall Meeting.
9. “*Increasing helicity to achieve a dynamo state in a spherical Couette sodium experiment*” [2018]. R Rojas Garcia, A Perevalov, D Lathrop. APS Division of Fluid Dynamics Meeting.

8. “Reservoir computer predictions for the Three Meter magnetic field time evolution” [2018] A Perevalov, R Rojas Garcia, I Shani, B Hunt, D Lathrop. APS March Meeting.
7. “Electromagnetic phenomena in granular flows in the laboratory and dusty plasmas in geophysics and astrophysics” [2018] D Lathrop, S Eiskowitz, R Rojas. APS March Meeting.
6. “Increasing Helicity to Achieve a Dynamo State on the Three-Meter Model of the Earth's Core” [2017] R Rojas, A Perevalov, DP Lathrop. AGU Fall Meeting.
5. “Increasing helicity to achieve a dynamo state on the Three-Meter system” [2017] R Rojas, A Perevalov, T Zurner, D Lathrop. APS Division of Fluid Dynamics Meeting.
4. “Zonal Acoustic Velocimetry in 30-cm, 60-cm, and 3-m Laboratory Models of the Outer Core” [2016] R Rojas, MN Doan, MM Adams, AR Mautino, D Stone, V Lekic, D Lathrop. AGU Fall Meeting.
3. “Electrification and Charge Distribution in Vertically Shaken Granular Media” [2016] R.Rojas, F Nordsiek, D Lathrop. APS Division of Fluid Dynamics Meeting.
2. Burger’s Program Summer School in Fluid Mechanics of the Institute for Physical Science and Technology of the University of Maryland [2016].
1. “Analogue model of an event horizon through shallow water waver on a channel flow” [2015] Ruben Rojas, Jesus Gonzalez-Laprea. 8th National Physics Congress of the Venezuelan Physics Society.

## OUTREACH AND LEADERSHIP

2021	Workshop for Scientific Communication in Spanish, ComSciCon 2021.
2013-2014	Member of the Student Government of the Physics Department, as the Secretary.
2012-2013	Member of the Student Government of the Simon Bolivar University, as the Secretary of Academic Affairs.
2013	Founding member of the Simon Bolivar University Popular Science Student Group ¿Por qué ciencias?(Why Sciences?).
2012-2014	Curator and speaker on the ¿Por qué ciencias? (Why Sciences?) conference at the Simon Bolivar University.
2012	Guest speaker on the lesson “Honor Mathematics” at the Deanery of General Studies of the Simon Bolivar University,