

# 2018 Lathisms: Latinxs and Hispanics in the Mathematical Sciences

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**ABSTRACT.** For the third year in a row, Lathisms will celebrate Hispanic Heritage Month (September 15–October 15) by posting a personal vignette of several mathematicians at our website [www.lathisms.org](http://www.lathisms.org). This year we feature up-and-coming Latinxs and Hispanics in the mathematical sciences.

It has been two years since the launching of [www.lathisms.org](http://www.lathisms.org), a website founded to provide an accessible platform that features prominently the extent of research and mentoring contributions of Latinxs and Hispanics in different areas of the mathematical sciences. Thus far, we have featured 61 mathematicians.

The mathematicians featured in 2016 have been commemorated in an AMS poster,<sup>1</sup> which has been distributed nationally. A second edition of this poster, featuring the 2017 Lathisms honorees,<sup>2</sup> is currently in the works. New to the 2018 Lathisms website is the development of short podcasts by featured Lathisms mathematicians. These podcasts will be produced by Evelyn Lamb, with the support of an MAA Tensor-SUMMA grant.

This year we are featuring advanced graduate students, postdoctoral fellows, and early career mathematicians in order to provide visibility to their research and to highlight the work they have undertaken to diversify the mathematical sciences. These young mathematicians push us further in our Lathisms vision: A vibrant and diverse mathematical community where the depiction and participation of Latinxs and Hispanics accurately represent US demographics. In this article, we present six of the 2018 Lathisms honorees.

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<sup>1</sup>See <https://bit.ly/2qaPWbh> and the October 2017 Notices <https://bit.ly/2GH50nd>.

<sup>2</sup>See <http://lathisms.org>.

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*“To me, the celebration of Hispanic Heritage Month is so important. It allows for the honoring and preservation of Hispanic culture and history, as well as advocating the continued awareness of beauty and strength through diversity.”*

**Anastasia Chavez, President’s Postdoctoral Fellow and NSF Postdoctoral Research Fellow at UC Davis.**

**Anastasia’s Bio and Research:** As a child, Anastasia’s life aspirations centered around her love for sports, music, and writing. In fact, she envisioned being an Olympic softball player, concert clarinetist, journalist, and the first woman president. Needless to say, her life looks pretty different. She did attempt a collegiate softball career, but instead found a future in mathematics.

After obtaining her AS from the Santa Rosa Junior College, Anastasia earned a BS in applied mathematics and MA in mathematics from San Francisco State University. She went on to complete her PhD at the University of California, Berkeley. Currently, Anastasia is a President’s Postdoctoral Fellow at the University of California, Davis, and recently was awarded an NSF Postdoctoral Research Fellowship at UC Davis. During her master’s work, Anastasia and her amazing husband welcomed their two incredible children into their lives. She attributes her desire to become a research mathematician and advocate

for minority students to her daughters, who she feels are her greatest teachers.

Her research interests are traditionally in algebraic and enumerative combinatorics. Specifically, she is interested in questions that invite matroid theory, polytopes, and curiosity into the mix. As Anastasia embarks on her postdoctoral training, she has begun looking at questions that include aspects of randomness, probability, and computing. Her plan is to develop a research program that hinges on exploring computing and optimization through a matroid theory lens.



*"I am very grateful to Lathisms and the AMS for this initiative and honored to be included. It is exciting to learn about the work of friends, role models, and others I haven't met. This initiative not only helps connect Latinx mathematicians, but it also diversifies the concept of a mathematician."*

**Laura Escobar, assistant professor at Washington University in St. Louis.**

**Laura's Bio and Research:** Laura Escobar grew up in Bogotá, Colombia. She completed her PhD in 2015 at Cornell University. She was a J. L. Doob Research Assistant Professor at UIUC and an Einstein Fellow at TU Berlin. She was a postdoctoral fellow during the Fall 2016 Thematic Program in Combinatorial Algebraic Geometry at The Fields Institute. She is now in her first year as assistant professor at Washington University in St. Louis. Her awards include an AMS Simons Travel Grant and an AWM Mentoring Travel Grant. She has mentored undergraduates as part of the Illinois Geometry Lab and is excited to continue mentoring in her new position.

Her research is in geometric combinatorics and combinatorial algebraic geometry. Laura has developed combinatorial models as part of her program to understand the singularities of Schubert varieties and the action of tori on these varieties. She also constructs and studies polytopes using tools from symplectic and algebraic geometry. She defined the brick varieties and used them to construct and study a classical polytope: the associahedron.



*"Congratulations to all the Hispanic and Latinx mathematical community in this Hispanic Heritage Month and special thanks to our mentors, collaborators, and colleagues for promoting diversity through their support and encouragement."*

**Alejandro Morales, assistant professor at the University of Massachusetts, Amherst.**

**Alejandro's Bio and Research:** Alejandro is originally from Bogotá, Colombia. He earned a bachelor in mathematics at the University of Waterloo and a PhD at MIT under the supervision of Alex Postnikov. He was a CRM-ISM Postdoctoral Fellow at LaCIM in UQAM and was a Hedrick Assistant Adjunct Professor at UCLA before starting last fall as assistant professor at UMass, Amherst. Alejandro was supported by an AMS-Simons Travel Grant, has mentored twelve undergraduate and high school students in summer research programs, and is part of the "Comunidad Colombiana de Combinatoria." He has been part of the organizing committee of four "Encuentro Colombiano de Combinatoria" and co-organized two Southern California Symposia in Discrete Math.

Alejandro's research is in enumerative and algebraic combinatorics. The projects he works on with collaborators often lie in the interface with other fields such as discrete geometry, coding theory, physics, and complexity theory. One project is the study of certain polytopes coming from flows on graphs. These polytopes are related to other families of polytopes (order polytopes and generalized permutahedra) and to other subjects in combinatorics like diagonal harmonics and Schubert polynomials. A motivating question is to understand why one special flow polytope defined by Chan, Robbins, and Yuen has a volume that equals the product of consecutive Catalan numbers, a sequence of nonnegative numbers that count hundreds of combinatorial objects. He recently studied with co-authors a new flow polytope known as the Caracol (*snail* in Spanish) polytope. Another recent project with collaborators is the study of formulas coming from geometry to count classical objects in combinatorics called standard Young tableaux of skew shape. This is related to the asymptotics and uniform generation of the tableaux and even to the simple inequality that states that  $\pi$  is less than twice the golden ratio.



*"This is a time to celebrate our Hispanic heritage, but perhaps more importantly, it is a time to reflect on how we can make the future better and brighter for our fellow future minority mathematicians. Let us give them the opportunity to say that they too stand on the shoulders of giants."*

**Luis Sordo Vieira**, postdoctoral associate at The Jackson Laboratory for Genomic Medicine.

**Luis' Bio and Research:** Due to the political chaos in his home country of Venezuela, Luis emigrated to the US when he was twelve years old. During his undergraduate years, Frank Morgan and Daniel Isaksen took on the role of his academic parents. Because of their encouragement he applied for the NSF Graduate Student Fellowship, which he was awarded.

During graduate school, Luis was primarily interested in Artin's conjecture, a problem dating back to the 1930s involving diagonal forms over  $p$ -adic fields. He and his advisor David B. Leep proved Artin's conjecture for diagonal forms over unramified extensions of the rational  $p$ -adic fields for  $p$  odd. Although Luis thoroughly enjoyed collaborating with his advisor and immersing himself in number theory, he decided to change his focus to mathematical methods for problems in medicine.

His current research can be divided into two areas: multiscale modeling of disease and discrete analysis of how a cell communicates with its environment. He is especially interested in multiscale modeling of the role of iron in cancer progression, using partial differential equations, discrete dynamical systems, and statistical methods, among others. Currently, as a postdoc, Luis has realized how much he enjoys working in a multidisciplinary department. Although his current supervisor Reinhard Laubenbacher is a fellow mathematician, Luis frequently interacts with biologists, engineers, and computer scientists. It has been a very enriching and challenging life experience for him.



*"I am so proud of being a Latina. I learned from my family and my culture that working hard, working in teams, and never giving up on my dreams will make me successful in life."*

**Imelda Trejo**, doctoral candidate at the University of Texas, Arlington.

**Imelda's Bio and Research:** Imelda discovered her passion for mathematics as a child while she was working in her family's business at a local market selling grain products, fruits, and vegetables, quickly doing large numerical calculations in her head. Because of those experiences and her success during her elementary and high school years, she chose to major in mathematics.

In college, while she was working on X-ray computer tomography research, Imelda noticed that she had a great passion for solving real-world problems by using mathematics. Since then, she decided to pursue a mathematical research career. She completed a master's degree in applied mathematics at the Research Center of Mathematics (CIMAT), Guanajuato, Mexico. Now she is in her fourth year of the PhD program in mathematics at the University of Texas at Arlington and expects to graduate in May 2019.

Imelda's research interests are in applied mathematics, solving real-world problems by combining mathematics and computer simulations. Her dissertation focuses on studying the interactions between immune and bone cells during the bone-fracture-healing process. She and her advisor, Hristo Kojouharov, have developed a mathematical model that shows that a correct modulation of inflammation by macrophages and progenitor bone cells promotes the healing of a bone. They are working to validate these results with experimental data and plan to then use the model to explore possible anti-inflammatory treatments.

Because of her research contributions and excellence in the study of mathematics, Imelda has won several awards. She received the 2008 Sotero Prieto Award, which recognizes the best bachelors research in Mexico, and a full scholarship from the Mexican Science Foundation (CONACYT) to work toward her master's and PhD. Recently, while at UTA, Imelda was awarded the 2016 R. Kannan Memorial Scholarship and the 2017 John A. Gardner Scholarship for her excellence in mathematics. In addition, Imelda received the 2017 Outstanding Student Presentation award from the Mathematical Association of America-Texas Section for the best research talk in her session at the 97th Annual Section Meeting at Texas A&M University-Commerce.





*"As a mixed-race, non-Spanish speaking Latino, I grew up having a difficult relationship with my heritage. However, I've come to understand that this is not uncommon among younger Latinx people in the US, and I can embrace my Mexican heritage in my own way. I'm proud to celebrate Hispanic Heritage Month and deeply honored to be featured by Lathisms."*

**Christopher Perez, doctoral candidate at the University of Illinois at Chicago.**

**Christopher's Bio and Research:** Christopher grew up on the South Side of Chicago and attended Whitney Young Magnet High School, where he first became interested in studying math. In 2009, he started his freshman year at the California Institute of Technology. Christopher graduated in 2013 with a BS in pure mathematics. While at Caltech, he was the president of the math club for three years and received the Mellon-Mays Undergraduate Fellowship, which is awarded by the Andrew W. Mellon Foundation with the stated goal of increasing diversity within university faculties.

In 2013, Christopher entered the PhD program in pure mathematics at the University of Illinois at Chicago, where he is currently a doctoral candidate studying geometric group theory with Daniel Groves. In 2015, he married Stephanie Reyes, who is also a graduate student in pure mathematics at UIC.

Christopher's research is in the area of geometric group theory. The elementary theory of a group  $G$  is the set  $Th(G)$  of all logical sentences in  $G$  using existential and universal quantifiers, i.e. the first-order theory of  $G$ . In 2006, Zlil Sela—and independently Olga Kharlampovich and

Alexei Myasnikov—proved that any two finitely generated, non-abelian free groups have the same elementary theory, solving a problem first posed by Alfred Tarski in 1945. The geometric approach used by Sela to solve Tarski's problem enabled him to apply the same techniques to studying the elementary theory of torsion-free hyperbolic groups. He showed in 2009 that, given a fixed torsion-free hyperbolic group  $H$ , if  $G$  is a finitely generated group such that  $Th(G) = Th(H)$ , then  $G$  is a torsion-free hyperbolic group—not necessarily isomorphic to  $H$ . The implication of such a result is that elementary theories are capable of detecting the geometry of groups. In the past several years, geometric group theorists have been working to generalize the methods of Sela's program and apply them to other problems.

Christopher's research is currently focused on replicating parts of Sela's program for toral relatively hyperbolic groups, which share many structural properties with hyperbolic groups and arise as the fundamental groups of hyperbolic manifolds with torus cusp cross-sections.

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