Eduardo Dueñez

Education

Ph.D.	Princeton University, June 2001. Thesis advisor: Peter Sarnak (member of the National Academy of Sciences and editor of *Annals of Mathematics*). Thesis title: *Random matrix ensembles associated to compact symmetric spaces.*
M.A.	Princeton University, February 1998.
B.Sc.	University of Guanajuato (Mexico), July 1996.

Professional employment

August 2011–	Associate Professor, The University of Texas at San Antonio.
August 2005–July 2011	Assistant Professor, The University of Texas at San Antonio.
July 2004–July 2005	Presidential Fellow, The University of Texas at San Antonio.
Jan. 2002–June 2004	J. J. Sylvester Assistant Professor of Mathematics, The Johns Hopkins University (Baltimore, MD).
July–December 2001	Research Fellow, The American Institute of Mathematics, Palo Alto, CA.

Research Awards and Honors

2015–2019	NSF support in the amount of $170 000 for project "Model Theory and Ergodic Theorems". José N. Iovino (PI) and Eduardo Dueñez (co-PI).
2012–	Investigador Nacional, Nivel II. Sistema Nacional de Investigadores (Mexico).
2009–2011	Investigador Nacional, Nivel I. Sistema Nacional de Investigadores (Mexico).
2007–2008	AMS/Tensor-SUMMA $6,000 grant to support UTSA's problem-solving seminar.
Summer 2004	Research supported by the United Kingdom's EPSRC.
Fall 2001	Partly supported by FRG grant DMS-00-74028 from the NSF.

Research/Scholarly/Creative Activities Summary

Refereed Publications.

(1) X. Caicedo, E. Dueñez, J. N. Iovino. *Metastable convergence and logical compactness.* To appear in *Beyond First-Order Model Theory II.* CRC Press.

(2) E. Dueñez, J. N. Iovino. *Model theory and metric convergence II: Mean convergence of ergodic averages. Contemporary Mathematics* **775** (2021) 85–114.

(3) E. Dueñez, J. N. Iovino. *Model theory and metric convergence I: Metastability and dominated convergence. Beyond First-Order Model Theory.* Monographs and Research Notes in Mathematics, CRC Press (2017) 131–188.

(4) E. Dueñez, D. K. Huynh, J. P. Keating, S. J. Miller, N. C. Snaith. *A random matrix model for elliptic curve L-functions of finite conductor.* arXiv:1107.4426. Journal of Physics A, **45** (2012) 115207.

(5) E. Dueñez, D. K. Huynh, J. P. Keating, S. J. Miller, N. C. Snaith. *The lowest eivengalue of Jacobi random matrix ensembles and Painlevé VI.* arXiv:1005.1298. Journal of Physics A, **43** (2010) 405204.

(6) E. Dueñez, D. W. Farmer, S. Froehlich, C. P. Hughes, F. Mezzadri, and T. Phan. *Roots of the Derivative of the Riemann Zeta Function and of Characteristic Polynomials.* arXiv:1002.0372. Nonlinearity **23** 2599–2612 (2010).

(7) E. Dueñez and S. J. Miller. *The Effect of Convolving Familes of L-Functions on the Underlying Group Symmetries.* arXiv:math/0607688. Proceedings of the London Mathematical Society **3**:99 (2009) 787–820.

(8) S. Deacon, E. Dueñez and J. N. Iovino. *A Public-Key Threshold Cryptosystem based on Residue Rings.* Journal of Discrete Mathematical Sciences and Cryptography **10**:4 (2007) 559–571.

(9) E. Dueñez and S. J. Miller. *The Low-Lying Zeros of a GL(4) and a GL(6) Families of L-functions.* arXiv:math/0506462. Compositio Mathematica **142**:6 (2006) 1403–1425.
(10) E. Dueñez. *"Harder" Ensembles of Orthogonal Matrices* (appendix to *Investigations of Zeros Near the Central Point of Elliptic Curve L-functions,* by S. J. Miller). arXiv:math/0508150. Experimental Mathematics **15**:3 (2006) 257–279.
(11) E. Dueñez, S. J. Miller, A. Roy, and H. Straubing. *Incomplete Quadratic Exponential Sums in Several Variables (with an Application to Boolean Circuits).* arXiv:math/0506462. Journal of Number Theory **116** (2006) 168–199.
(12) E. Dueñez. *Random Matrix Ensembles associated to Compact Symmetric Spaces,* arXiv:math-ph/0111005. Communications in Mathematical Physics **244** (2004) 29–61.

Preprints and work in progress.

• P. Casazza, E. Dueñez, J. Iovino. *The Non-Definability of Tsirelson's and Schlumprecht's Spaces in First-Order Continuous Logic.* (Submitted.)
• S. Alva., E. Dueñez, J. Iovino. *The Empirical Content of Real-Valued Theories of Choice.* (In preparation.)
• E. Dueñez, J. Iovino. *Model Theory and Learnability.* (In preparation.)
• E. Dueñez, L. Tavernini. *Notes on the Foundations of Mathematics and Analysis.* (Book in progress.) `http://zeta.math.utsa.edu/~eduenez/foundations.pdf`

Research Interests

My interests are diverse, but most of my work is related to analysis understood in a broad sense.

At different points, my individual and joint research efforts have focused on random matrix theory and on analytic aspects of the theory of L-functions at the intersection of number theory and the theory of ensembles of orthogonal, unitary and symplectic random matrices.

More recently, my interest has shifted to questions on the foundations of analysis, such as "finitary" (metastable) notions of convergence, explicit definability of Banach norms, abstract/non-classical theory of measure and integration, the method of polynomial descent in ergodic theory, and the foundations of the theories of choice and learnability from the viewpoint of continuous logic.

Academic synergy and mentorship activities

• Member of SACNAS's 2015 Summer Leadership Institute (cohort of thirty professionals selected across STEM disciplines).
• Initiated, fostered and sustained tradition at UTSA of annual participation in the Putnam Mathematical Competition, serving as faculty liaison and trainer/coach of students since 2006. (UTSA's team ranked 43rd in 2014 and 51st in 2015 (top 8% of c. 600 institutions).)
• Leader of the student guest team representing U.S.A. in the 2012 Mexican Mathematics Olympiad as part of the AAAS Mathematics Olympiads Program. (November 2012.)
• Academic trainer (coach) of group of 20 students (of underrepresented minority ethnicities) selected nationwide for participation in the 2012 Mathematics Olympiad Program of the AAAS (the American Association for the Advancement of Science). (August 2012.)
• Judge of abstracts and posters for SACNAS (the Society for the Advancement of Chicanos and Native Americans in Science) since 2010.
• Judge of student research projects at the Texas Science Fair (high-school level) since 2005.

Theses supervised

Master's Theses.

• *An Explicit Proof of the Weak Finite Basis Theorem and Applications to Computing Ranks of Elliptic Curves.* Master's thesis by Zachery Sharon. UTSA (2011).

• *La Fórmula del Número de Clases y Valores Especiales de Funciones-L: Desde Dirichlet y Dedekind hasta Stark* (The Class Number Formula and Special Values of L-Functions: From Dirichlet and Dedekind to Stark). Master's thesis by Elkin Oveimar Quintero Vanegas. Universidad Nacional de Colombia, Bogotá (2011).

Undergraduate Theses.

• *Matrices Aleatorias y Funciones-L* (Random Matrices and L-functions). Undergraduate thesis by Julio César Galindo López. Universidad Nacional Autónoma de México (2013).

• *Representation Theory of Classical Compact Lie Groups.* Undergraduate thesis by Dal S. Yu. UTSA (2011).

Professional and Editorial Service

• Associate Editor, Board Member and editor of the Problems column, Mathematics Magazine (Jan. 2016–Dec. 2019).

• Reviewer of long manuscripts and books for Mathematical Reviews and the Princeton University Press.

• Reviewer of research manuscripts for the following journals:
– Bulletin of the Allahabad Mathematical Society.
– Bulletin of the London Mathematical Society.
– Communications in Mathematical Physics.
– Experimental Mathematics.
– Indian Journal of Mathematics.
– Journal of Number Theory.
– Journal of Physics A: Mathematical and Theoretical.
– The Ramanujan Journal.
– Random Matrices: Theory and Applications.
– Revista de la Academia Colombiana de Ciencias.
• NSF Proposal Reviewer/Panel Member.
• Proposal reviewer for Consejo Nacional de Ciencia y Tecnología (CONACyT), Mexico.

Research Talks

• *Análisis y Lógica Continua (Analysis and Continuous Logic).* Colloquium FAMAT/DEMAT, Universidad de Guanajuato (Mexico), February 2021.

• *Convergencia metaestable y teoremas ergódicos desde la perspectiva de lógica continua.* Universidad de Colima (Mexico), September 2018.

• *Convergencia metaestable y teoremas ergódicos desde la perspectiva de lógica continua.* IV Reunión de matemáticos mexicanos en el mundo, Casa Matemática Oaxaca (Mexico), June 2018.

• *Mean convergence of polynomial averages and continuous logic.* AMS Sectional Meeting, University of Central Florida (Orlando, FL), September 2017.

• *Ergodic theorems and metastability.* Mathematical Congress of the Americas. Montreal (Canada), July 2017.

• *Metastable convergence and ergodic theorems: a continuous logic viewpoint.* Simposio Latinoamericano de Lógica y Modelos. Puebla (Mexico), June 2017.

• *Polynomial ergodic descent and uniformly metastable convergence.* Joint Mathematics Meeting (Atlanta), January 2017.

• *Uniformly metastable convergence in metric structures.* Joint Mathematics Meeting (Atlanta), January 2017.

• *Metastable convergence of ergodic averages and continuous model theory.* National Security Agency, Ft. Meade, MD, October 2016.

• *Random matrices and automorphic L-functions: Low-lying zeros and symmetry.* SACNAS National Conference. Long Beach, CA, October 2016.

• *The locus of median lines of Sierpinski's Triangle.* MAA Southeastern Section Conference, University of Alabama at Birmingham, March 2016.

• *Convergence of ergodic averages and continuous model theory.* Georgia Tech, February 2016.

• *The Mean Ergodic Theorem for Abelian Unitary Actions.* Joint Mathematics Meeting. San Antonio, January 2015.

• *Families of polynomial mappings between groups.* SACNAS national conference. Los Angeles, October 2014.

• *Some arithmetic problems related to Sierpinski's Triangle.* University of Texas at Austin, March 2014.

• *A random matrix model for elliptic curve L-functions of finite conductor.* Mathematical Congress of the Americas. Guanajuato, Mexico, August 2013.

• *L-Functions and Random Matrices in Classical Compact Groups.* Purdue University, March 2013.

• *Random Matrices at the Intersection of Number Theory and Lie Groups.* SACNAS National Conference, October 2012.

• *Matrices aleatorias y ceros de funciones-L de twists cuadráticos de curvas elípticas.* Encuentro conjunto RSME–SMM. Málaga, Spain. January 2012.

• *Una invitación a la teoría de representaciones.* Universidad Pedagógica y Tecnológica de Tunja, Colombia, November 2011.

• *Funciones Zeta y L: Aplicaciones clásicas y modernas en teoría de números.* Universidad Nacional de Colombia, July 2011.

• *Funciones Zeta y L: ¿Qué son y para qué sirven?* University of Colima, Mexico, November 2010.

• *Zeros of L-functions and Random Matrices: Two Recent Applications.* U. T. Austin, October 2010.

• *La Zeta y las L's: ¿Cómo se Metieron las Matrices Aleatorias a la Aritmética?* XLI Congreso de la Sociedad Matemática Mexicana, October 2008.

• *Derivatives of Zeros of the Riemann Zeta-Function and of Characteristic Polynomials of Random matrices,* X CNTA, Waterloo, July 2008.

• *Derivatives of Zeros of the Riemann Zeta-Function and of Characteristic Polynomials of Random matrices,* Texas A&M University, April 2008.

• *Low-Lying Zeros of Modular (and Automorphic) L-functions,* 22nd Annual Workshop on Automorphic Forms and Related Topics, March 2008.

• *Condensación de Zeros de Funciones-L de Curvas Elípticas,* XL Congress of the Mexican Mathematical Society, UANL, October 2007.

• *Finite-Conductor Models for Zeros of Elliptic Curves,* The Banff International Research Station (BIRS), July 2007.

• *Repulsion of Low Zeros in Families of Elliptic Curves,* Number Theory Fest at the University of Illinois at Urbana-Champaign. May 2007.

• *Convolution of Families of GL(2) L-functions,* Texas A&M University, December 2006.

• *What Dyson Wanted to Tell Schrödinger: Random Matrices in Number Theory,* Instituto de Matemáticas, UNAM. Morelia (Mexico), August 2006.

• *Examples and Conjectures on Convolutions of Families of L-functions,* IX CNTA, Vancouver, July 2006.

• *Twists and Functorial Liftings of Families of L-functions,* Progress in Random Matrix Theory and Number Theory, University of Rochester, June 2006.

• *Symmetry in Twisted Families of L-functions.* Joint Mathematics Meeting, San Antonio, January 2006.

• *Riemann, Dyson and Schrödinger: Random Matrices in Number Theory.* National Congress of the Mexican Mathematical Society, Mexico City, October 2005.

• *Counterexample to a Conjecture of Keating and Snaith,* in The 2005 Conference on Automorphic Forms and Related Topics, University of North Texas, April 2005.

• *Symmetry Beyond Root Numbers.* The University of Texas at Austin, November 2004.

• *Symmetric Space Ensembles with an Application to Elliptic Curves.* The Pennsylvania State University, October 2004.

• *Random Matrices: From Quantum Physics to Number Theory.* University of Texas at San Antonio colloquium, September 2004.
• *Symmetry Beyond Root Numbers: a GL(6) example.* Isaac Newton Institute (U.K.), July 2004.
• *Symmetry Flipping in Families of L-functions.* Isaac Newton Institute (U.K.), June 2004.
• *Counterexample to a Conjecture of Keating and Snaith.* Centre de Recherches Mathématiques (University of Montreal, Canada), May 2004.
• *The Symmetry Type of Two Families of L-functions.* American Mathematical Society Eastern Meeting, Lawrenceville, NJ, May 2004.
• *Statistical Properties of Energy Levels of Quantum Systems.* Augusta State University, Augusta, GA, February 2004.
• *Random Matrices and Number Theory: A Happy Marriage?* The Ohio State University, October 2003.
• *Do the Cohen-Delaunay-Lenstra Heuristics apply to Quadratic Twists?* The West Coast Number Theory Conference, Asilomar, December 2001.
• *Random Matrix Ensembles associated to Compact Symmetric Spaces.* Stanford University, November 2001.
• *Random Matrix Ensembles associated to Compact Symmetric Spaces.* Centre de Recherches Mathématiques (University of Montreal, Canada), August 2001.
• *Compact Symmetric Spaces and their associated Matrix Ensembles.* The Johns Hopkins University, February 2001.
• *Breaking Universality in a Family of Circular Ensembles.* The American Institute of Mathematics, May 2001.
• *The Gaudin-Mehta Method and Classical Random Matrix Theory.* The Institute for Advanced Study, February 2001.
• *Compact Symmetric Spaces and their associated Matrix Ensembles.* Mathematisches Forschungsinstitut Oberwolfach, Germany, November 2000.
• *Div, Grad and Curl According to Lie.* National Congress of the Mexican Mathematical Society, Morelia, Mexico, November 1994.

Survey talks and short courses

• *From round-robin tournaments and networking events to combinatorial designs.* Morehouse College. Atlanta, GA, April 2018.
• *From round-robin tournaments and networking events to combinatorial designs.* Columbus State University, Columbus, GA, April 2016.
• *Introducción a la Teoría Clásica de Matrices Aleatorias.* 5-hour course at Centro de Investigación en Matemáticas, Merida, Mexico, April 2016.
• *Introducción a la Teoría Clásica de Matrices Aleatorias.* 5-hour course at Universidad Autónoma de Sinaloa, Mexico, October 2015.
• *El triángulo de Sierpinski, matrices modulares y aritmética.* SIDIM at Ponce, Puerto Rico. February 2014.
• *Signed Harmonic Series and Quadratic Number Fields.* Conference of the STMC (South Texas Mathematics Consortium). April 2013.
• *Matrices Aleatorias Gaussianas y Circulares.* 7-hour course at "Escuela de Matrices Aleatorias", CIMAT, Mexico, November 2012.
• *Minicurso de Matrices Aleatorias.* 7-hour course. "Métodos Estocásticos en Sistemas Dinámicos". CIMAT, Mexico, February 2009.
• *An Invitation to Diophantine Geometry,* XL Congress of the Mexican Mathematical Society, Monterrey, October 2007.
• *Random Matrices: A Meeting Point of Multiple Theories.* Trinity University, San Antonio, September 2005.
• *Three Lectures on Number Theory and Random Matrices*. The Ohio State University, August 2004.

• *Card Tricks, de Bruijn Sequences, and Hindu Music.* The McGraw Hill Center for Teaching and Learning (Princeton University), September 2000.
• *The Kinematic Method in Geometry.* UNAM, Mexico City, May 1994.

Professional Memberships

• AMS (American Mathematical Society). Member.
• MAA (Mathematical Association of America). Member.
• ASL (Association for Symbolic Logic). Member.
• SACNAS (the Society for the Advancement of Chicanos and Native Americans in Science). Life Member.