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Nationality: Chilean.

Education

2003-2008: Ph.D. in Mathematics, University of Michigan, Ann Arbor, USA.
Dissertation: “Arrangements of curves and algebraic surfaces”.
Advisor: Igor Dolgachev.

2001-2003: M.S. in Mathematics (Magister en Matemática), PUC.
Dissertation: “Una generalización de las superficies de Lefschetz”.
Advisor: Rubí E. Rodríguez.

1997-2000: B.S. in Mathematics (Licenciatura en Matemática), PUC.

1993-1996: High School, Instituto Nacional, Santiago, Chile.

1992: Escuela E-10, Cadete Arturo Prat Chacón, Santiago, Chile.

1984-1992: Escuela D-4, República de Israel, Arica, Chile.

Positions Held

2015-present: Associate Professor, Department of Mathematics, PUC.

2011-2015: Assistant Professor, Department of Mathematics, PUC.

2008-2011: Visiting Assistant Professor, Department of Mathematics, University of Massachusetts at Amherst, USA.

Research Interest: Algebraic Geometry.

Publications and Preprints

26. “On degenerations of $\mathbf{Z}/2$ -Godeaux surfaces” (joint with Eduardo Dias, Carlos Rito), arXiv:2002.08836, pp. 25, submitted.

25. “Bounding tangencies of sections on elliptic surfaces” (joint with Douglas Ulmer), arXiv:2002.01906, pp. 22, submitted.

24. “Savage surfaces” (joint with Sergio Troncoso), arXiv:1912.07378, pp.16, submitted.
23. “Rigid surfaces arbitrarily close to the Bogomolov-Miyaoka-Yau line” (joint with Matthew Stover), arXiv:1909.00435[math.AG], pp.26, submitted.
22. “Transversality of sections on elliptic surfaces with applications to elliptic divisibility sequences and geography of surfaces” (joint with Douglas Ulmer), arXiv:1908.02208 [math.aG], pp. 30, submitted.
21. “Simple embeddings of rational homology balls and antflips” (joint with Heesang Park and Dongsoo Shin), arXiv:1904.04927, pp. 14, submitted.
20. “Antiflips, mutations, and unbounded symplectic embeddings of rational homology balls” (joint Jonny D. Evans), arXiv:1807.06073, pp. 36, to appear in Annales de l'institut Fourier.
19. “On the geography of line arrangements” (joint with Sebastián Eterovic and Fernando Figueroa), arXiv:1805.00990, pp. 12, submitted.
18. “Families of explicit quasi-hyperbolic and hyperbolic surfaces” (joint with Natalia Garcia-Fritz), arXiv:1804.07671, pp. 22, to appear in Mathematische Zeitschrift.
17. “Optimal bounds for T-singularities in stable surfaces” (joint with Julie Rana), Advances in Mathematics 345 (2019), 814-844.
16. “Characterization of Kollár surfaces” (joint with José Ignacio Yáñez), Algebra & Number Theory 12 (2018), No.5, 1073-1105.
15. “On $Z/3$ -Godeaux surfaces” (joint with S. Coughlan), International Mathematics Research Notices (2018), issue 18, 5609-5637.
14. “Chern slopes of surfaces of general type in positive characteristic” (with an appendix by Rodrigo Codorniu), Duke Math. J. 166 (2017), 5, 975-1004.
13. “Milnor fibers and symplectic fillings of quotient surface singularities” (joint with Heesang Park, Jongil Park and Dongsoo Shin), Advances in Mathematics 329 (2018), 1156-1230.
12. “The Craighero-Gattazzo surface is simply-connected” (joint with Julie Rana and Jenia Tevelev), Compositio Math. 153(2017), 557–585.
11. “KSBA surfaces with elliptic quotient singularities, $\chi=1$, $p_g=0$, and $K^2=1,2$ ” (joint with Arié Stern) Israel J. Math. 214 (2016), 651–673.
10. “Chern slopes of simply connected complex surfaces of general type are dense in $[2,3]$ ” (joint with Xavier Roulleau), Ann. of Math. (2) 182 (2015), 287-306.

9. "*Q-Gorenstein smoothings of surfaces and degenerations of curves*", Rend. Semin. Mat. Univ. Padova 136 (2016), 111-136.
8. "*Identifying neighbors of stable surface*", Annali della Scuola Normale Superiore di Pisa vol. XVI, 4 (2016), 1093-1122.
7. "*Flipping surfaces*" (joint with Paul Hacking and Jenia Tevelev), J. Algebraic Geom. 26(2017), 279-345.
6. "*A simply connected numerical Campedelli surface with an involution*" (joint with Heesang Park and Dongsoo Shin) Math. Ann. 357 (2013), no1, 31-49.
5. "*Arrangements of rational sections over curves and the varieties they define*", Rendiconti Lincei: Matematica e Applicazioni 22 (2011), 453-486.
4. "*Spin symplectic 4-manifolds near Bogomolov-Miyaoka-Yau line*" (joint with Anar Akhmedov, B. Doug Park), Journal of Gokova Geometry Topology (2010), v.4, 55-66.
3. "*Arrangements of curves and algebraic surfaces*", J. Algebraic Geom. 19(2010), 243-284.
2. "*On line arrangements with applications to 3-nets*", Adv. Geom. 10(2010), issue 2, 287-310.
1. "*Riemann surfaces of genus g with an automorphism of order p prime and $p > g$* ", Manuscripta Math. 121(2006), 169-189.

Students

Arié Stern, graduated on July 12th, 2013, PUC. Master thesis title: "Nuevas singularidades en superficies estables simplemente conexas con $P_g=0$ ". Currently in the PhD program at the University of Massachusetts Amherst, USA.

Rodrigo Codorniu, graduated on June 16th, 2014, PUC. Master thesis title: "Superficies fibradas étale simplemente conexas". Currently in the PhD program at Université de Nice, France.

José Ignacio Yáñez, November 27th, 2014, PUC. Undergraduate thesis title: "Caracterización de singularidades de du Val".

Sebastián Eterovic, graduated on June 17th, 2015, PUC. Master thesis title: "Logarithmic Chern slopes of arrangements of rational sections in Hirzebruch surfaces". PhD at University of Oxford, UK. Currently postdoc at UC Berkeley.

José Ignacio Yáñez, graduated June 12th, 2017, PUC. Master thesis title:
“Characterization of Kollár Surfaces”.
Currently in the PhD program at the University of Utah, USA.

Fernando Figueroa, December 6th, 2017. Undergraduate thesis title:
“La pendiente de Chern para arreglos de rectas”

Fernando Figueroa, July 11th, 2019. Master Thesis title:
“Optimal bounds for many T-singularities in stable surfaces”
Currently in the PhD program at Princeton University, USA.

Sergio Troncoso, June 21st, 2020. Ph.D. Thesis title:
“On The Geography of Surfaces of General Type With Fixed Fundamental Group”

Diana Torres, Ph.D. student, expected graduation 2021.

Nicolás Vilches, July 6th, 2020. Master Thesis title:
“P-Resoluciones Extremales y Agujeros de Gusano en Espacios de Moduli de Superficies”
Prospective student for the PhD program at Columbia University, USA.

Fellowships, Grants and Awards

FONDECYT REGULAR 1190066 (March 2019-March 2023)

FONDECYT REGULAR 1150068 (March 2015-March 2019)

FONDECYT INICIO 11110047 (Oct 2011-Oct 2014)

Guest at Max Planck Institute for Mathematics (May 30 – August 8, 2010)

Graduate student research assistant, University of Michigan (Winter 2007-Fall 2007)

Rackham one term dissertation Fellowship, University of Michigan (Fall 2006)

Rackham one year tuition Fellowship, University of Michigan (Fall 2003-Winter 2004)

Fulbright-CONICYT Fellowship (2003-2007)

CONICYT Master’s Fellowship

Padre Hurtado Award (Beca Padre Hurtado, PUC) (1997-2001)

Some Invited Talks/Mini-courses

“The savage geography of surfaces of general type”, Panoramic talk, Escuela Latinoamericana de Geometría Algebraica ELGA IV, Talca, Chile, December 2nd-13th, 2019.

“Una breve introducción a geometría algebraica: Configuraciones de rectas en el plano” Escuela de Matemática de América Latina y el Caribe EMALCA, Potosí, Bolivia, September 16th - 20th, 2019.

“On the volumes of stable surfaces” Sesión de Geometría, Congreso de Matemática Capricornio COMCA, U de La Serena, August 1st, 2019.

“Fracciones Continuas en Geometría Algebraica” Conferencia plenaria, Congreso de Matemática Capricornio COMCA, U de La Serena, August 1st, 2019.

“On the explicit MMP for one parameter degenerations of surfaces”, 3 lectures at the workshop Algebraic and Symplectic aspects in degenerations of complex surfaces, KIAS, Seoul, South Korea, June 24th-28th, 2019.

“Geometría asociada a fracciones continuas”, Coloquio Universidad Técnica Federico Santa María, Valparaíso, June 13th, 2019.

“Fibras de Milnor en superficies complejas”, Coloquio Universidad de Chile, Santiago, June 5th, 2019.

“Hyperbolic complete intersections”, Algebraic Geometry Seminar, Universidade do Porto, Portugal, February 1st, 2019.

“On explicit boundedness for surfaces”, Colloquium of Geometry and Arithmetics, Rio de Janeiro, Brazil, November 30th, 2018.

“Hyperbolic complete intersection surfaces”, Algebraic Surfaces and Related Topics, School of Mathematical Sciences, Xiamen University, China, September 24-28, 2018.

“Variedades hiperbólicas”, Santiago Number Theory & Algebra Seminar (SaNTAS), Santiago, June 27th, 2018.

“Un problema geométrico con cuadrados latinos”, Club de Matemática, PUC Chile, June 1st, 2018.

“Optimal bounds for singularities in stable surfaces”, Modern and Classical aspects on algebraic surfaces, Pedagogical University of Cracow, Poland, 22-28 April, 2018.

“Optimal bounds for T-singularities in stable surfaces”, Seventh Iberoamerican Congress on Geometry, January 22-26, 2018, Valladolid, España.

“On K^2 for stable surfaces”, Center for Mathematics, Faculty of Sciences, University of Porto, Portugal, January, 2018.

“Some ways to compute the fundamental group of a Godeaux surface”, invited speaker, Quadratic Forms in Chile 2018 (and celebration of Ricardo Baeza’s 75th birthday), IMAFI Talca, January 8-12, 2018.

“¿Cómo calcular el grupo fundamental con geometría algebraica?” Encuentro Post-Mat2017, UChile-USACH-PUC, December 7th, 2017.

“*On geography of arrangements of lines*”, Geometry at the Frontier II, Pucón, Chile, November 16th, 2017.

“Geometría con Cuadrados Latinos”, Primer Encuentro de la Geometría y Topología, UMCE, Santiago, November 6th, 2017.

“Distribución de K^2 para superficies estables”, Sesión de Geometría Algebraica y Aritmética, SOMACHI 2017, Talca, November 3th, 2017.

“Optimal bounds for T-singularities in stable surfaces”, Brazil-Mexico 3rd Meeting on Singularities, Cuernavaca, Mexico, August 6-11, 2017.

“Optimal bounds for T-singularities in stable surfaces”, Mini workshop on algebraic surfaces 2017, KIAS, Seoul, South Korea, July 17th, 2017.

“Sobre la Belleza del Álgebra en la Geometría”, II Semana de la Matemática, Instituto Nacional, Santiago, May 11, 2017.

“Arreglos de rectas en el plano”, Coloquio de Matemáticas UACH, Valdivia, May 5th, 2017.

“Caracterización de las superficies de Kollár II”, Sesión de Geometría, XXX Jornada de Matemática de la Zona Sur, Concepción, April 26-28, 2017.

“Geometría con Álgebra”, Charla inaugural del año académico 2017 del Taller de Razonamiento Matemático TRM, PUC Chile, April 26, 2017.

“Geografía de configuraciones en el plano”, general talk, Instituto de Matemáticas y Ciencias Afines IMCA, Lima, Perú, February 20, 2017.

“Classifying algebraic surfaces”, Encuentro Conjunto SOMACHI-UMA, plenary talk, Valparaíso, Chile, December 14-17, 2016.

“On Geography and Moduli of Surfaces of General Type”, Algebraic Geometry North-Eastern Series, AGNES Umass Amherst, USA, November 4-6, 2016.

“On Surfaces of General Type”, Algebraic Geometry Seminar, University of Michigan, Ann Arbor, USA, October 25th, 2016.

“On Godeaux Surfaces”, BC-Northeastern Algebraic Geometry Conference, Boston College, USA, October 15th, 2016.

“On Surfaces of General Type”, Algebraic Geometry Seminar, University of Georgia Athens, USA, September 21st, 2016.

“How to identify Milnor fibers of smoothings of quotient singularities”, XXI Coloquio Latinoamericano de Álgebra, Commutative Algebra and Algebraic Geometry Session, Buenos Aires, Argentina, July 25-29, 2016.

“How to identify Milnor fibers of smoothings of quotient singularities”, CLAM V, Algebraic Geometry Session, Barranquillas, Colombia, July 11-15, 2016.

“**Sobre rectas en el plano proyectivo II**” Seminario de Aritmética y Geometría de Valparaíso, UV, Valparaíso, June 22, 2016.

“**Sobre rectas en el plano proyectivo**”, III encuentro Chileno de Teoría de números, Facultad de Matemáticas PUC, Santiago, May 19-20, 2016.

“The Craighero-Gattazzo surface is simply-connected”, Workshop on Algebraic Surfaces and Moduli, KAIST, Daejeon, South Korea, April 11-15, 2016.

“On geography of surfaces: Results and Techniques”, Mini-Workshop: Arrangements of Subvarieties, and their applications in Algebraic Geometry, Mathematisches Forschungsinstitut Oberwolfach, Germany, February 28 to March 5, 2016.

“Geography in positive characteristic and connections with Kawamata-Viehweg vanishing theorem”, Conference on Algebraic Surfaces and Related Topics, International Centre for Theoretical Sciences ICTS-TIFR, Bangalore, India, November 21-30, 2015.

“Geografía de superficies simplemente conexas en característica $p > 0$ ”, Sesión de Geometría, Congreso de Matemática Capricornio COMCA, Universidad Arturo Prat, Iquique, August 5, 2015.

“Geografía de superficies complejas simplemente conexas”, Conferencia plenaria, Congreso de Matemática Capricornio COMCA, Universidad Arturo Prat, Iquique, August 7, 2015.

“On Chern slopes of simply connected surfaces in any characteristic”, invited speaker for the II Latin American School of Algebraic Geometry and Applications (II ELGA) Cabo Frio, Brazil, June, 2015.

“Densidad de Pendientes de Chern” Coloquio del Departamento de Matemáticas, Facultad de Ciencias, Universidad de Chile, Santiago, April 8, 2014.

“Exploring KSBA boundary”, invited speaker (3 lectures) for the Winter School on Algebraic Surfaces 2015, Korea Institute for Advanced Studies (KIAS), South Korea, January, 2015.

“Geografía simplemente conexa para toda característica” Seminario de Aritmética y Geometría de Valparaíso, IMA, PUCV, Valparaíso, October 28, 2014.

“Ecuaciones de Pell, fracciones continuas del cero, triangulación de polígonos, singularidades, etc” Coloquio del Departamento de Matemáticas, Facultad de Ciencias, Universidad de Chile, Santiago, October 22, 2014.

“Simply connected geography”, The Valley Geometry Seminar, University of Massachusetts at Amherst, June 20, 2014.

“Geografía de superficies simplemente conexas con índice positivo”, XXVII Jornada de Matemática de la Zona Sur, Trailanqui, 23-24-25 de Abril de 2014.

“Espacios de móduli de superficies algebraicas de género cero”, Coloquio Instituto de Matemática, Universidad de Talca, 3 de Abril de 2014.

“Degeneraciones (Q-Gorenstein) de superficies racionales via degeneraciones de curvas planas”, Sesión geometría algebraica, XXVI Jornada de Matemática de la zona sur, 24-25-26 Abril 2013, Quinamávida, Región del Maule, Chile.

“Moduli of stable surfaces and extremal neighborhoods of type I and II”, XIX Coloquio Latinoamericano de Álgebra, Diciembre 2012, Pucón, Chile.

“Flipping surfaces” and “Around $p_g=0$ stable surfaces”, Seminar in Mathematics, Korean Institute for Advanced Study, Seoul, Korea, 2-July-2012.

“Límites de superficies”, Taller de Geometría, Universidad de Chile, Santiago, Chile, 15 de Junio de 2012.

“¿Qué es la geometría algebraica?”, Coloquio de Matemáticas, Universidad Adolfo Ibañez, Santiago Chile, 8 de Junio de 2012.

“Límites de superficies”, Seminario de Aritmética y Geometría de Valparaíso, Instituto de Matemáticas PUCV, Valparaíso, 1 de Junio 2012.

“Superficies de Campedelli simplemente conexas con una involución”, XXV Jornada de Matemática de la Zona Sur (<https://sites.google.com/site/xxvjsur2012/>), Concepción, Chile, 18-20 Abril 2012.

“Cursillo: Singularidades cíclicas en dimensión dos”, XXV Jornada de Matemática de la Zona Sur (<https://sites.google.com/site/xxvjsur2012/>), Concepción, Chile, 18-20 Abril 2012.

“Aspectos geométricos de las fracciones continuas”, Sesión Invitada Geometría, LXXX Encuentro Anual Sociedad de Matemática de Chile, 3-4-5 Noviembre 2011.

“Flipping surfaces”, I Latin American School of Algebraic Geometry and Applications, ELGA 2011, Cordoba, Argentina, August 8-12, 2011.

“Flipping surfaces”, The Valley Geometry Seminar, University of Massachusetts at Amherst, April 22, 2011.

“The random surfaces of a projective curve”, V Iberoamerican Congress on Geometry, Pucon, Chile, December 10th to 13th, 2010.

“Genus zero surfaces of general type”, School on Complex Geometry, Pucón, Chile, December 7th to 9th, 2010.

“Varieties defined by arrangements”, Algebra seminar, University of Connecticut, Storrs, USA, November 30th, 2010.

“Arrangements of Riemann surfaces in complex surfaces”, Differential Geometry & Symplectic Topology seminar, University of Minnesota, USA, November 4th, 2010.

“Configuraciones de curvas y las variedades que definen”, Coloquio, Universidad de Concepcion, Concepcion, Chile, January 4, 2010.

“Dedekind sums in Abelian covers”, BIRS Workshop 09w5102, Dedekind sums in geometry, topology, and arithmetic, BIRS, Alberta, Canada, October 11-16, 2009.

“Simply connected geography and log surfaces”, Workshop on algebraic surfaces and related topics, KIAS and Sogang University, Korea, August 18-21, 2009.

“Algebraic surfaces associated to arrangements”, The Valley Geometry Seminar, University of Massachusetts at Amherst, February 13, 2009.

“Superficies algebraicas y arreglos de curvas”, Seminario de Geometría Compleja, Pontificia Universidad Católica de Chile, January 6, 2009.

“Simply connected random surfaces”, 1042th AMS meeting, Special Session on Algebraic Geometry, Wesleyan University, Middletown, CT, October 12, 2008.

“Arrangements of curves and algebraic surfaces”, MSCS Algebraic Geometry Seminar, University of Illinois at Chicago, March 11, 2008.

“Arrangements of curves and algebraic surfaces”, Arithmetic and Geometry Seminar, Institute for Mathematics, Humboldt-University Berlin, Germany, January 22, 2008.

“On line arrangements with applications to 3-nets”, The Valley Geometry Seminar, University of Massachusetts at Amherst, September 7, 2007.

“Configuraciones de líneas” & “Configuraciones y moduli de curvas”, Seminario de Geometría Compleja, Pontificia Universidad Católica de Chile, June 7 & 12, 2007
“Stacks y moduli de curvas” (I, II and III), Seminario de Geometría Compleja, Pontificia Universidad Católica de Chile, June 5, 6 and 7, 2006.

“Superficies de Lefschetz”, Simposio Chileno de Matemática, Punta Arenas, Chile 2002.

Some teaching experience

Primer Semestre 2019: Introducción a la Geometría Algebraica, curso de pregrado, PUC.

Segundo Semestre 2018: Geometría Algebraica (Superficies), curso de posgrado, PUC.

Primer Semestre 2018: Introducción a la Geometría, curso de pregrado, PUC.

Segundo Semestre 2017: Álgebra Abstracta I, curso de pregrado, PUC.

Primer Semestre 2017: Introducción a la Geometría, curso de pregrado, PUC.

Primer Semestre 2017: Álgebra Abstracta I, curso de pregrado, PUC.

Primer Semestre 2016: Introducción a la Geometría, curso de pregrado, PUC.

Segundo Semestre 2015: Geometría y Topología, curso de posgrado, PUC.

Primer Semestre 2015: Introducción a la Geometría, curso de pregrado, PUC.

Segundo Semestre 2014: Algebra Abstracta II, curso de pregrado, PUC.

Primer Semestre 2014: Introducción a la Geometría Algebraica, curso de pregrado, PUC.

Primer Semestre 2013: Geometría Algebraica, curso de posgrado, PUC.

Primer Semestre 2012: Introducción a la Geometría Algebraica, curso de pregrado, PUC.

Segundo Semestre 2011: Topología, curso de pregrado, PUC.

Spring 2011: Linear Algebra, U of Mass Amherst.

Fall 2010: Introduction to Abstract Algebra I, U of Mass Amherst.

Spring 2010: Multivariable Calculus, U of Mass Amherst.

2008-2009: Calculus I and II, U of Mass Amherst.

Summer 2008: Calculus III, U of Michigan.

Winter 2008: Differential Equations, U of Michigan.

Mathematical Service

Member of the national evaluation committee in Mathematics for FONDECYT grants, May 2018-present.

Coordinator of the national evaluation committee in Mathematics for becas CONICYT, 2018-present.

Panelist and reviewer for the process of selection of Fulbright-CONICYT PhD scholarships, Chilean Fulbright Commission, December 2013, December 2015, July 2020.

Tutor for TIM (Taller de investigación Matemática) which is an introduction for high school students to research in Mathematics, August-December 2017.

Counselor of the Facultad de Matemáticas, 2017-present.

Hiring Committee, PUC Chile, September 2016-February 2017.

Member of the undergraduate program committee, PUC Chile, 2016-present.

Counselor of the Mathematics Department, PUC Chile, 2013-2016.

Organizer of the Coloquio General de Matemáticas, PUC Chile, 2013-present.

Member of the Algebra qualifying exam, PUC Chile, 2011-present.

Member of the scientific committee for the BCM meeting of singularities (Colchagua, 2019), the CIMPA school ELGA (Talca, 2019), and the joint Argentina-Chile meeting SUMA (Mendoza, 2019).

Main local Organizer of the CIMPA-ICTP research school “Toric methods in geometry, arithmetics, and dynamics”, January 11-22, 2016, Santiago, PUC.

Reviewer for Master and PhD CONICYT scholarships, CONICYT grants and BECAS Chile for the period 2014-2017.

Reviewer and referee for the AMS and several Mathematical journals.

Some Other Activities

Research Visit, Center for Mathematics, Faculty of Science, University of Porto, Portugal, February, 2019.

Research Visit, Department of Mathematics & Statistics, University of Massachusetts Amherst, Amherst, USA, August-December, 2016.

Research Visit, School of Mathematics, Korea Institute for Advanced Study (KIAS), Seoul, South Korea, February 2015.

Research Visit, Max Plank Institute for Mathematics, Bonn, Germany, June-August, 2010.

Organizer of several mathematical activities at PUC, please see my webpage <http://www.mat.uc.cl/~urzua/>.

January 13th, 2014: Member of the Ph.D. degree committee of Robert Auffarth. Thesis title: “Non-simple principally polarized abelian varieties”.

Spring 2009: (with Jenia Tevelev) Co-advising the undergraduate thesis of Ilya Scheidwasser on hypergraphs, University of Massachusetts.

December 2006: (with Dave Anderson) Organization of a weekend workshop on algebraic curves, Student Algebraic Geometry Seminar, University of Michigan.