

## CV - ROBERTO HERNÁNDEZ PALOMARES, PH.D.

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### RESEARCH POSITIONS

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University of Waterloo, Pure Mathematics, Canada Postdoctoral Scholar	January 2023 - Present
Texas A&M University, Mathematics Department, USA Visiting Assistant Professor	August 2021 - December 2022
The Ohio State University, Dept. of Mathematics, USA Presidential Fellow	Summer 2020 - Spring 2021

### EDUCATION

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Mathematics Department at The Ohio State University, USA - Ph.D. degree awarded in May 2021. - Master in Sciences obtained in 2018.	August 2015 - May 2021
CIMAT/Universidad de Guanajuato, México Bachelor of Mathematics.	August 2010 - June 2015

### RESEACH INTERESTS

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Operator algebras, Quantum Information and Quantum Symmetries

### RESEARCH PROJECTS AND PUBLICATIONS

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#### Peer-reviewed published articles:

9.- *Discrete inclusions from Cuntz-Pimsner algebras*

[arXiv:2503.21515](#) *Proceedings of the AMS* DOI: [10.1090/proc/17546](#)

8.- *Inclusions of Operator Algebras from Tensor Categories: beyond irreducibility*

With L. Hataishi [arXiv:2504.05247](#) *Glasgow Math. J.* DOI: [10.1017/S0017089525100839](#)

7.- *Discrete inclusions of  $C^*$ -algebras* [arXiv:2305.05072](#)

With B. Nelson, *Journal of Topology and Analysis*, DOI: [10.1142/S1793525325500256](#)

6.- *Quantum graphs, subfactors and tensor categories I* [arXiv:2409.01951](#)

With M. Brannan, *Internat. J. Math.* DOI: [10.1142/S0129167X25500399](#)

5.- *K-Theoretic classification of inductive limit actions of fusion categories on AF-algebras*

With Chen and C. Jones, *Commun. Math. Phys.* 405, 83 (2024). DOI: [10.1007/s00220-024-04969-w](#)

4.- *Q-System Completion for  $C^*$  2-Categories*

With Chen, C. Jones and Penneys, *J. Functional Analysis*, Vol 283, Issue 3, (2022), 109524, ISSN 0022-1236, DOI: [10.1016/j.jfa.2022.109524](#),

3.- *Realizations of Rigid  $C^*$ -Tensor Categories as Bimodules over a GJS  $C^*$ -algebra*

With Hartglass. *J. Math. Phys.* 61 (2020), no. 8, 081703, 32 pp. DOI: [10.1063/5.0015294](#)

2.- *Classifying Module Categories for Generalized TLJ  $*$ -2-Categories*

With Ferrer. *Internat. J. Math.* 31 (2020), no. 4, 2050027, 30 pp.

DOI: [10.1142/S0129167X20500275](#)

1.- *Dynein localization and pronuclear movement in the C. elegans zygote* (Side project in biology)

With D. P. Ignacio, N. Kravtsova, J. Henry and A. T. Dawes. *Cytoskeleton Journal*, Article ID: CM21733, DOI: [10.1002/cm.21733](#) (2022), Contribution: Methodology, formal analysis.

## Preprints:

### 4.- *Quantum graphs and spin models*

With Bravo Hernández and Viales Solís [arXiv:2601.01246](#) (Under review)

### 3.- *Properly Outer Actions of Tensor Categories on $C^*$ -algebras*

With M. Mukohara [arXiv:2511.09991](#) (Under review)

### 2.- *Remarks on $C^*$ -discrete inclusions*

With B. Nelson [arXiv:2409.18161](#) (Under review)

### 1.- *Geometric Measure of Arens Irregularity* With Hu, Maierhofer and Rao.

[Fields Institute Report](#)

## Ongoing projects:

### 3.- *Properly outer actions of tensor categories on $C^*$ -algebras II* (ongoing with M. Mukohara)

We investigate proper outerness for actions of tensor categories on  $C^*$ -algebras with applications.

### 2.- *Quantum graphs, subfactors and tensor categories II* (ongoing with M. Brannan)

We develop categorical aspects of quantum-symmetry-equivariant quantum graphs.

### 1.- *Complex Hadamard Matrices, Symmetries and Quantizations* (Ongoing with D. Gromada and M. Brannan) We study a hierarchy of quantum equivalence relations to classify complex Hadamard matrices.

## HONORS AND GRANTS

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### ••• Distinctions:

14: Inst. Mittag-Leffler Jr Fellow: Operator Algebras & Quantum Info	Stockholm, SWE - Sp 2026
13: NSF/CBMS: Classifying amenable operator algebras	Fort Worth, TX, USA - June 2025
12: Newton Inst: School on Quantum groups, QI and Operator Algebras	Cambridge, UK - Nov 2024
11: Fields Inst. Mini-course Lecturer: $C^*$ -Algebras and Tensor Categories	Toronto - Nov 2023
10: AMS-Simons Travel Grant	July 2022 - June 2024
9: PhD OSU's Presidential Fellowship	Summer 2020 - Spring 2021
8: PhD CONACyT Fellow, Mexican Science Council	Spring 2019 - Spring 2021
7: AMS MRC Quantum Symmetries: Subfactors and Fusion Categories	Rhode Island, Summer 2018
6: OSU Mathematics Department Fellowship	Columbus, OH, Spring 2018
5: Modeling of Cell Polarization RA (OSU)	Columbus, Summer 2016
4: Universidad de Guanajuato Medal for Distinguished Students	Gto, Mex, 2015
3: CIMAT Honors Mathematics Undergraduate Fellowship	Gto, Mex, Aug 2010 - Aug 2015
2: Honorable Mention: International Mathematics Competition	Blagoevgrad, Bulgaria, June 2014
1: Fields Institute Undergraduate Research Summer Program	Toronto, Can, Summer 2014

### ••• Invited Research Visits:

8: Participant: Operator Algebraic Quantum Groups, Banff, AB Canada	Nov 2025
7: Research Visitor, Inst. of Mathematics, UNAM Cuernavaca, México	Nov 2025
6: Participant: Operator Systems and their Applications, Banff	Feb 2025
5: Research Visitor, Michigan State University, Lansing, MI USA	Jan 2024
4: Participant: Subfactors and Fusion (2-)Categories Workshop, Banff	Dec 2023
3: Research Visitor, Carleton University, Ottawa, Canada	March 2023
2: Visiting Researcher Saarland University, Germany	Sep-Dec 2022
1: Research Visitor, Mathematical Institute, University of Oxford, UK	Aug 2022

### ••• Sponsored training activities:

- Operator Algebras and Quantum Information	Institut Mittag-Leffler, Stockholm, Spring 2026
- Operator Algebraic Quantum Groups	Banff Research Station, Nov 2025
- MFO: Subfactors and Applications	Oberwolfach, Germany July 2025
- NSF/CBMS: Classifying amenable operator algebras	Texas Christian U, USA June 2025
- Operator Systems and their Applications	Banff Research Station, Feb 2025

- School on quantum groups, qu. info and op. algebras	<i>I. Newton Inst. Cambridge, UK Nov 2024</i>
- MFO: Classification of $C^*$ -Algebras and Dynamics	<i>Oberwolfach, Germany May 2024</i>
- Subfactors and Fusion (2-)Categories Workshop	<i>Banff Research Station, Dec 2023</i>
- Twinned Conference on $C^*$ -Algebras and Tensor Categories	<i>Fields Institute, Toronto, Nov 2023</i>
- Focus Semester in Quantum Information	<i>Saarland U, Fall 2022</i>
- Topological quantum groups, tensor categories and subfactors	<i>Waterloo, May 2022</i>
- Tensor categories and topological quantum field theories	<i>MSRI, Berkeley, CA, Spring Sem 2020</i>
- CIMPA Research School: Quantum Symmetries	<i>Bogotá, Colombia, July 2019</i>
- OSU Quantum Symmetries Summer Research Program	<i>Columbus OH, June 2019</i>
- Subfactors: planar algs, quantum symms, & random matrices	<i>MSRI, Berkeley, CA June 2017</i>

## PRESENTATIONS

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<b>••• Invited Talks:</b>	
<b>32:</b> Analysis seminar, <b>UNAM Cuernavaca, MX</b>	<i>Nov 2025</i>
Invited speaker. <i>Title: Inclusiones discretas de <math>C^*</math>-álgebras</i>	
<b>31:</b> Colloquium, <b>UNAM Cuernavaca, Morelos, MX</b>	<i>Nov 2025</i>
Colloquium speaker. <i>Title: Una mirada a las matemáticas cuánticas</i>	
<b>30:</b> Colloquium: Classical to Quantum through Operator Algebras, <b>OSU, Columbus OH, USA</b>	<i>Nov 2025</i>
Colloquium speaker. <i>Title: Quantum graphs and spin models</i>	
<b>29:</b> Analysis Seminar, <b>University of New Mexico, Albuquerque, NM, USA</b>	<i>Oct 2025</i>
Invited speaker. <i>Title: Quantum graphs and spin models</i>	
<b>28:</b> Analysis Seminar, <b>UWaterloo</b>	<i>Oct 2025</i>
Seminar speaker. <i>Title: Quantum graphs and spin models</i>	
<b>27:</b> Atlantic Category Theory Seminar, <b>Dalhousie University, Halifax, NS, CAN</b>	<i>Sep 2025</i>
Invited speaker. <i>Title: Quantum graphs and spin models</i>	
<b>26:</b> Analysis Seminar, <b>York University, Toronto, ON, CAN</b>	<i>Sep 2025</i>
Invited speaker. <i>Title: Quantum graphs and spin models</i>	
<b>25:</b> AMS Spring Central Sectional Meeting, <b>U of Kansas, Lawrence, KS USA</b>	<i>Mar 2025</i>
Invited speaker. <i>Title: Quantum graphs, subfactors and tensor categories</i>	
<b>24:</b> Quantum Groups Seminar, <b>Paris, France</b>	<i>Mar 2025</i>
Invited remote speaker. <i>Title: Quantum graphs, subfactors and tensor categories</i>	
<b>23:</b> Quantum Information and Analysis Seminar, <b>U of South Carolina, USA</b>	<i>Feb 2025</i>
Invited speaker. <i>Title: Quantum graphs, subfactors and tensor categories</i>	
<b>22:</b> Graph Theory Seminar <b>UWaterloo, ON CA</b>	<i>Oct 2024</i>
Seminar speaker. <i>Title: Quantum graphs, subfactors and tensor categories</i>	
<b>21:</b> South Atlantic Noncommutative Geometry Seminar, <b>U Buenos Aires, ARG</b>	<i>Oct 2024</i>
Seminar remote speaker. <i>Title: Quantum graphs, subfactors and tensor categories</i>	
<b>20:</b> Analysis Seminar, <b>UWaterloo</b>	<i>March 2024</i>
Seminar speaker. <i>Title: <math>C^*</math> Quantum Dynamics</i>	
<b>19:</b> Math Physics & Operator Alg. seminar, <b>Michigan State U, Lansing, MI, USA</b>	<i>Jan 2024</i>
Invited speaker. <i>Title: <math>C^*</math> Quantum Dynamics</i>	
<b>18:</b> $C^*$ -Algebras and Tensor Categories, <b>Fields Institute, Toronto, ON, CA</b>	<i>Nov 2023</i>
◆◆◆ <b>Mini-Course Lecturer:</b> <i>Actions of tensor categories on operator algebras</i>	
<b>17:</b> Carleton-Ottawa Joint Analysis Seminar, <b>Ottawa, ON, CA</b>	<i>March 2023</i>
Invited speaker: <i>K-theoretic classif. of ind. lim. actions of fusion cats. on AF-algs</i>	
<b>16:</b> Analysis Seminar University of Waterloo, <b>Waterloo</b>	<i>March 2023</i>
Seminar speaker: <i>K-theoretic classif. of ind. lim. actions of fusion cats. on AF-algs</i>	
<b>15:</b> Quantum Symmetries Seminar, <b>OSU</b>	<i>Nov 2022</i>
Remote seminar speaker: <i>Discrete inclusions of <math>C^*</math>-algebras</i>	
<b>14:</b> Malý Seminar, <b>Karlin University, Prague, Czech Rep</b>	<i>Nov 2022</i>
Invited speaker: <i>Unitary tensor categories and their actions</i>	
<b>13:</b> NCG&T Sem, <b>Inst. of Math. Czech Academy of Sciences, Prague</b>	<i>Nov 2022</i>

- Invited speaker: *K-theoretic classif. of ind. lim. actions of fusion cats. on AF-algebras*
- 12: Operator algebras Seminar, **KU Leuven, Belgium** Oct 2022  
Invited speaker: *K-theoretic classif. of ind. lim. actions of fusion cats. on AF-algebras*
- 11: Functional Analysis Seminar, **Inst. of Mathematics, University of Oxford, UK** Sep 2022  
Invited speaker: *K-theoretic classif. of ind. lim. actions of fusion cats. on AF-algebras*
- 10: Quantum Groups Seminar, **University of Copenhagen, Denmark** June 2022  
Remote speaker: *Q-systems and higher unitary idempotent completion for  $C^*$ -algs*
- 9: Mathematics Colloquium, **U. Autónoma de Yucatán-CIMAT, México** May 2022  
**Remote colloquium:** *Qué son los espacios no-conmutativos y sus simetrías cuánticas*
- 8: Jr. Student Seminar, **Universidad de Guanajuato, México** March 2022  
Remote speaker: *Simetrías cuánticas y espacios cuánticos*
- 7: ASUERAU  $C^*$ -seminar, **Arizona State University, AZ, USA** Feb 2022  
Remote speaker: *Applications of subfactor and categorical techniques to  $C^*$ -algebras*
- 6: Analysis Seminar, **U Waterloo** Feb 2022  
Remote speaker:  *$C^*$ -algs, Q-systems and higher idempotent completion for  $C^*$  2-cats.*
- 5: Alg & Combinatorics Seminar, **Texas A&M University, College St, TX, USA** Oct 2021  
Seminar speaker: *Q-systems and higher idempotent completion for  $C^*$  2-categories*
- 4: Category Theory Seminar, **Universidad Nacional Autónoma de México** March 2021  
Remote seminar speaker: *UTC actions on  $C^*$ -algebras*
- 3: Algebra seminar, **Indiana U, Bloomington IN, USA** Nov 2020  
Remote seminar speaker: *Classifying module categories for generalized TLJ \*-2-categories*
- 2: Brazos Analysis Seminar, **Texas A&M** Nov 2020  
Remote speaker: *Realizing unitary tensor categories over GJS  $C^*$ -algebras*
- 1: Subfactors seminar, **Vanderbilt, Nashville TN, USA** Sep 2020  
Remote seminar speaker: *Representations of  $RC^*TC$ s over GJS  $C^*$ -algebras*
- **Contributed Talks:**
- 27: NSF/CBMS: Classifying amenable operator algebras, **TX Christian U, USA** June 2025  
Contributed talk: *Discrete inclusions of  $C^*$ -algebras*
- 26: Canadian Operator Symposium 2025, **U Waterloo, ON, CA** May 2025  
Contributed talk: *Highly regular quantum graphs*
- 25: Workshop on Quantum Graphs, **Saarland University, Germany** Feb 2025  
Contributed talk: *Quantum graphs tensor categories and subfactors*
- 24: Quantum groups, tensor categories and quantum field theory, **Oslo U, Norway** Jan 2025  
Contributed talk: *Quantum graphs tensor categories and subfactors*
- 23: Canadian Operator Symposium 2023, **Western University, London, ON, CA** May 2023  
Contributed talk: *Discrete inclusions of  $C^*$ -algebras*
- 22: Great Plains Operator Theory Symposium, **OSU, Columbus, OH, USA** May 2023  
Contributed talk: *Discrete inclusions of  $C^*$ -algebras*
- 21: Non-Commutative Geom. & Op. Algs., **Vanderbilt, Nashville, TN, USA** May 2023  
Contributed talk: *Discrete inclusions of  $C^*$ -algebras*
- 20: Polish-German Workshop: quantum gps, graphs & symms, **Saarland U** Nov 2022  
Contributed talk: *Quantum symmetries for operator algebras*
- 19: Operator Algebras: Subfactors, K-theory, CFT, **Cardiff University, Wales, UK** Aug 2022  
Contributed talk: *K-theoretic classif. of ind. lim. actions of fusion cats. on AF-algs*
- 18: Topological Quantum Groups, Tensor Categories, and Subfactors, **U. of Waterloo** May 2022  
Contributed talk: *Q-system completion for  $C^*$  2-categories*
- 17: **AMS JMM: Skein Theory and Quantum Algebra Section** April 2022  
Remote contributed talk: *Q-System Completion for  $C^*$ -algebras*
- 16: Young Mathematicians Conference in  $C^*$ -algs, **Münster U., Münster, Germany** Aug 2021  
Contributed talk: *Q-system completion for  $C^*$ -Algebras*
- 15: Great Plains Operator Theory Symposium 2021 May 2021  
Remote contributed talk:  *$C^*$ -algebras, right correspondences, and Q-systems*

<b>14:</b> Actions of Tensor Categories on $C^*$ -algebras, <b>IPAM, Los Angeles, CA, USA</b>	
Remote contributed talk: <i>Actions of UTCs on GJS <math>C^*</math>-algebras</i>	Jan 2021
<b>13:</b> <b>AMS JMM:</b> Advances in Operator Algebra	Jan 2021
Remote contributed talk: <i>Representations of unitary categories on <math>C^*</math>-algebras</i>	
<b>12:</b> <b>AMS JMM:</b> Hopf Algebras and Tensor Categories	Jan 2021
Remote cont. talk: <i>Classifying module categories for generalized TLJ <math>*</math>-2-categories</i>	
<b>11:</b> OSU-Oxford Meeting	May 2020
Remote contributed talk: <i>Realizations of <math>RC^*TC</math> and Hilbertification</i>	
<b>10:</b> Hayes Graduate Forum, <b>OSU Columbus, OH, USA</b>	Feb 2020
Poster presentation: <i>Quantum symmetries of quantum spaces</i>	
<b>9:</b> Quasy-Con, <b>University of Illinois, Urbana-Champaign, IL, USA</b>	Nov 2019
Contributed talk: <i>Realizing <math>RC^*T</math> categories as bimodules over <math>C^*</math>-algebras</i>	
<b>8:</b> QAQT Student Seminar, <b>OSU Cbus, OH</b>	Oct 2019
Seminar speaker: <i>Unitary modules for the generalized TLJ <math>*</math>-2-categories</i>	
<b>7:</b> CIMPA School: Quantum Symmetries, <b>U. de los Andes, Bogotá, Colombia</b>	July 2019
Poster presentation: <i>Classifying Module Categories for TLJ <math>*</math>-2-Categories</i>	
<b>6:</b> OSU QAQT Seminar, <b>OSU, Cbus, OH</b>	March 2019
Seminar speaker: <i>Computing the fusion algebra of a subfactor</i>	
<b>5:</b> Quantum Algebra & Quantum Topology Student Seminar, <b>OSU Cbus, OH</b>	Oct 2018
Seminar speaker: <i>Radon-Nikodym theorem in von Neumann Algebras</i>	
<b>4:</b> Non-Commutative Geom Op Algs Seminar, <b>OSU, Cbus, OH</b>	Summer 2018
Seminar speaker: <i>Representing some <math>RC^*TC</math> over Hilbert <math>C^*</math>-Bimodules</i>	
<b>3:</b> Non-Commutative Geom Op Algs Seminar, <b>OSU, Cbus, OH</b>	Spring 2018
Seminar speaker: <i>Uniqueness of Separable Hyperfinite <math>\text{II}_1</math> Factor</i>	
<b>2:</b> Non-Commutative Geom Op Algs Seminar, <b>OSU, Cbus OH</b>	Fall 2017
Seminar speaker: <i>Measuring Geometric Arens Irregularity</i>	
<b>1:</b> Quantum Algebra & Quantum Topology Seminar, <b>OSU, Cbus, OH</b>	Spring 2017
Seminar speaker: <i>Index Rigidity Theorem: Quantized and Continuum Spectra</i>	

## ACADEMIC SERVICES AND OUTREACH

### Outsourcing Math Research: ([OMR Website](#))

*Mentoring and sponsoring young researchers based in underdeveloped countries:*

- Research mentor for 1 Panamanian student	Winter-Summer 2025
- Research mentor for 3 Mexican, 1 Colombian & 1 Costa Rican student	June 24-June25
- Sponsored and supervised UGto, Mexican undergrad researcher Héctor Zepeda	Spring 2023
- Sponsored and supervised UGto undergraduate researcher Violeta Mtz. Escamilla	Summer 2022
- Sponsored and supervised UGto undergraduate researcher José Barrientos Lpz.	Summer 2022

### Research Experience for Undergraduates:

- Mentor for undergraduate researchers at U Waterloo, joint with Michael Brannan Project: "Quantum graphs with no classical symmetries"	Summer 2023
- Mentor for undergraduate Giovanni Ferrer (U. of Puerto Rico)	Summer 2018 and 2019

### OSU Directed Reading Program:

- Mentored physics undergraduate Ian de la Cruz on Classical Mechanics	Spring 2019
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### Physics Institute UGto Physics Sundays:

Guiding experiments with students from public elementary and middle-schools	Fall 2014
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### Organization:

- Member of organizing committee: Harmonic Analysis on Tensor Categories Seminar	Fall 2023
- Member of organizing committee: OSU Mathematics Department Colloquium	Fall 2020 - Sp 2021
- Organizer: Quantum Symmetries Student Seminar ( <a href="#">QSSS Website</a> )	Fall 2018 - Sp 2021

### Administrative:

- Presided Math Undergraduate Students Org., U of Guanajuato, MX	Fall 2014 - Spring 2015
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## TEACHING AND STUDENT SUPERVISION

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### Theses directed:

- 3.-** Pure Mathematics Master's thesis adviser for Violeta Martínez Escamilla  
CIMAT, Gto, Mexico *Summer 23-Spring 24*
- 2.-** Pure Mathematics Master's thesis adviser for José Barrientos López  
CIMAT, Gto, Mexico *Summer 23-Spring 24*
- 1.-** UW-EPFL Mathematics Bachelor's thesis adviser for Laurent Costa  
École Polytechnique Fédérale de Lausanne, Switzerland *Spring 24*

### Leading Lecturer Positions: (~ 675 undergrad and masters students)

- 10-** Math 237 Calculus 3 for Honours Mathematics, (~ 90 students) U Waterloo, CA *Fall 2025*
- 9-** Math 237 Calculus 3 for Honours Mathematics, (~ 70 students) UW *Winter 2025*
- 8-** PMath/AMath 331 Applied Real Analysis (~ 90 students), UW *Fall 2024*
- 7-** Math 135 Algebra for Honours Mathematics (~ 60 students), UW *Winter 2024*
- 6-** PMath 451/651 Measure and Integration (~ 15 students), UW *Fall 2023*
- 5-** PMath 343 Intro to Math of Quantum Info (~ 20 students), UW *Winter 2023*
- 4-** Math 308 Differential Equations Sec 504 (~ 65 students), Texas A&M, USA *Spring 2022*
- 3-** Math 308 Differential Equations Sec 505 (~ 65 students), TAMU *Spring 2022*
- 2-** Math 251 Engineering Mathematics III Sec 520 (~ 100 students), TAMU *Fall 2021*
- 1-** Math 251 Engineering Mathematics III Sec 521 (~ 100 students), TAMU *Fall 2021*

### Teaching Assistant Positions: (~ 500 undergrad students )

- 11-** 1156 Calculus for students in the Biological Sciences (~ 65 students), OSU, USA *Fall 2019*
- 9-** 1156 Calculus for students in the Biological Sciences (~ 65 students), OSU *Fall 2018*
- 8-** 2568 Linear Algebra grader, OSU *Fall 2017*
- 7-** 1152 Calculus II (~ 65 students), OSU *Spring 2017*
- 6-** 1156 Calculus for students in the Biological Sciences (~ 65 students), OSU *Fall 2016*
- 5-** 1172 Engineering mathematics (~ 65 students), OSU *Spring 2016*
- 4-** 1151 Calculus I (~ 65 students), OSU *Fall 2015*
- 3-** Complex Variables (~ 20 honors students), UGto, MX *Fall 2014*
- 2-** Vector Calculus (~ 25 honors students), UGto *Spring 2014*
- 1-** Abstract Algebra I (~ 25 honors students), UGto *Fall 2013*