

Rafael René del Rio Castillo

CURRICULUM VITAE
(March 2015)

1. Personal

Name: Rafael René del Rio Castillo

Date and place of Birth: July 3, 1957, Mexico City, Mexico.

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CircuitoEscolar,
Ciudad Universitaria,
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2. Academic Training:

1976-1981 National Autonomous University of Mexico. (UNAM). Mexico City. Mexico.
Undergraduate studies.

Thesis: "Mathematical Study of Von Kármán Equations".

Advisor: Prof. J. Ize

Degree: Licenciado en Matemáticas

1982-1986 W. Goethe University. Frankfurt am Main. Germany. Graduate studies.

Dissertation: "Absolutely continuous spectrum of ordinary differential operators". Advisor: Prof. Dr. J. Weidmann

Degree: Doktors der Naturwissenschaften (Dr. Phil. nat.).

Areas of work:

Mathematical Analysis, Functional Analysis, Spectral Theory of Operators, Sturm-Liouville Operators.

3. Academic Distinctions

a) *Scholarships:*

1978-1980 Scholarship from UNAM (National Autonomous University of Mexico) for undergraduate study in the same University.

1981-1986 Scholarship from DAAD (Deutscher Akademischer Austauschdienst) for graduate studies in J.W. Goethe University in Frankfurt am Main, Germany.

DGAPA-UNAM

Sabbatical Stay: University of Tennessee, Knoxville, USA (August 1992 -December 1992)
California Institute of Technology, USA (January 1993 -June 1993).

DGAPA-UNAM

IRSAMC, Laboratoire de Physique Quantique, Universidad Paul Sabatier, Toulouse, France
(September 1999 - June 2000)

b) Fellow. System of National Researchers. Mexico. Since 1987.

c) Member of PRIDE (Prima al Desempeño del Personal Académico de Tiempo Completo). Since 1993.

c) Plenary Talks

Mathematical Results in Quantum Mechanics (Qmath 7), Prague, Rep. Checks. (June 22-26 1998)

XXXIX Congreso Nacional de la Sociedad Matemática Mexicana, Villahermosa, Tabasco, México. (October 2006)

Operator Theory Analysis and Mathematical Physics (OTAMP 2008). Mathematical Research and Conference Center, Bedlewo, Poland. (15-22- June 2008).

International Workshop: "Analysis, Mathematical Physics and Applications"
Ixtapa, Mexico, (1-5 March, 2010)

4. Research:

a) Positions:

i) In Mexico:

-1986-1990 Investigador Asociado "C" Institute for Research in Applied Mathematics and Systems (IIMAS) National Autonomous University of Mexico (UNAM).

- 1990-1996 Investigador Titular "A" Tenure. Institute for Research in Applied Mathematics and Systems (IIMAS) National Autonomous University of Mexico (UNAM).

-1996- Investigador Titular "B" Institute for Research in Applied Mathematics and Systems (IIMAS) National Autonomous University of Mexico (UNAM).

ii) Visiting Positions:

- University of Tennessee, U.S.A. (August 1992 - December 1992) Course taught: Calculus I

- California Institute of Technology, U.S.A. (January 1993- June 1993)

- IRSAMC, Laboratoire de Physique Quantique, University Paul Sabatier, Toulouse, France (September 1999 - June 2000)

- University of Nantes, Department of Mathematics, France (July and August 2000)

b) Head of Research Projects

Project CONACYT. Ref. 400316-5-0567PE "Teoría Espectral de Operadores". March 1996-March 1997.

Project PAPIIT IN102998. "Teoría espectral de operadores y problemas Inversos" August 1998-July 2001

Project CONACYT. Ref. 27487-E. "Teoría Espectral de Operadores y Problemas Inversos". December 15,1998 - December 14, 2000.

Cátedra Patrimonial de Excelencia Nivel II SC-980004 "Formación de Personal Académico en las Instituciones Públicas de los Estados". CONACYT-Universidad Autónoma de Querétaro. December 1998-August 1999.

Project CONACYT. Ref. 37444-E. "Operadores en Física Matemática". April 30, 2002-April 29, 2005.

Project PAPIIT IN 111906-3 "Operadores Autoadjuntos y Física del Estado Sólido". January 2006-December 2008.

Co-Head

Project PAPIIT IN 105414 "Análisis Espectral Directo e Inverso de operadores en Espacios de Hilbert". January 2014 - December 2016.

c) Publications

Publications in International Journals

1. Del Rio R (1988) Ein Gegenbeispiel zur Stabilität des absolut stetigen Spektrums gewöhnlicher Differentialoperatoren , Mathematische Zeitschrift 197: 61-68
2. Del Rio R (1988) On Conditions which Guarantee Stability of the Absolutely Continuous Spectrum of Differential Operators, Quarterly Journal of Mathematics, Oxford 39: 269-280
3. Del Rio R (1989) Instability of the Absolutely Continuous Spectrum of Ordinary Differential Operators under Local Perturbations, Journal of Mathematical Analysis and Applications 142: 591-604
4. Del Rio R (1990) On Boundary Conditions of an Inverse Sturm-Liouville Problem, SIAM Journal on Applied Mathematics 50: 1745-1751
5. Del Rio R (1991) Singular Spectrum of Sturm-Liouville Operators under Local Perturbations, American Journal of Mathematics 113: 203-217

6. Del Rio R (1991) Embedded Eigenvalues of Sturm-Liouville Operators, *Communications in Mathematical Physics* 142: 421-431
7. Del Rio R (1991) Stability of a Singular Continuous Spectrum of Sturm-Liouville Operators, *Letters in Mathematical Physics* 23: 147-150
8. Del Rio R (1994) A Forbidden Set for Embedded Eigenvalues, *Proceedings of the American Mathematical Society* 121: 77-82
9. Del Rio R, Jitomirskaya S, Makarov N, Simon B (1994) Singular Continuous Spectrum is Generic, *Bulletin of the American Mathematical Society* 31: 208-212
10. Del Rio R, Makarov N, Simon B (1994) Operators with Singular Continuous Spectrum II: Rank One Operators, *Communications in Mathematical Physics* 165: 59-67.
11. Del Rio R, Simon B, Stolz G (1994) Stability of Spectral Types for Sturm- Liouville Operators, *Mathematical Research Letters* 1: 437-450
12. Del Rio R, Last Y, Jitomirskaya S, Simon B (1995) What is localization? *Physical Review Letters* 75: 117-119
13. Del Rio R, Jitomirskaya S, Last Y, Simon B (1996) Operators with Singular Continuous Spectrum, IV. Hausdorff Dimensions, Rank One Perturbations, and Localization. *Journal d'Analyse Mathématique*. 69: 153-200
14. Del Rio R, Simon B (1997) Point Spectrum and mixed Spectral Types for Rank one Perturbations, *Proceedings of the American Mathematical Society*. 25: 3593-3599
15. Del Rio R, Gesztesy F, Simon B (1997) Inverse Spectral Analysis with Partial Information on the Potential III. Updating Boundary Conditions, *International Mathematical Research Notes*. 15: 751-758
16. Del Rio R, Gesztesy F, Simon B (1998) Corrections and Addendum to Inverse spectral analysis with partial information on the potential III. Updating Boundary Conditions. *Intl. Math. Research Notices* 11: 623-625, 1999.
17. Del Rio, Grebert B (2001) Inverse Spectral Results for AKNS Systems with Partial Information on the Potentials. *Mathematical Physics, Analysis and Geometry* 4: 229-244
18. Del Rio R, Fuentes S, Poltoratski A (2002) Coexistence of spectra in rank-one perturbation problems. *Boletín de la Sociedad Matemática Mexicana* (3) 8: 49-61
19. Del Rio R, Tchebotareva O (2003) Boundary conditions of Sturm-Liouville operators with mixed spectra. *Journal of Mathematical Analysis and Applications* 288: 518-529
20. Ricker M, Del Rio R (2004) Projecting diameter growth in tropical trees: a new modeling approach. *Forest Science (Society of American Foresters)* 50 No. 2: 213-224.
21. Del Rio R, Kudryavtsev M, Silva L (2006) Rank one perturbations of Jacobi matrices with mixed spectral. *Matematische Nachrichten* 279 No. 5-6: 502-512
22. Del Rio R, Tchebotareva O (2007) Sturm-Liouville operators in the half axis with local perturbations. *Journal of Mathematical Analysis and Applications* 329: 557-566.

23. Del Río R, Martínez Carmen A (2007) Sturm-Liouville operators in the halfaxis with shifted potentials. *Applicable Analysis* 86 No. 10: 1211-1221.
24. Del Río R, Martínez Carmen, Schulz-Baldes H. (2008) Spectral averaging techniques for Jacobi matrices. *Journal of Mathematical Physics*. Vol. 49 -2:023507-1 - 023507-13.
25. Damanik D, Del Río R. (2009) Quantum dynamical applications of Salem's theorem. *Letters in Mathematical Physics*. Vol. 89-1: 13-19.
26. Del Río R, Silva L.O.(2011) Spectral measures of Jacobi operators with random potentials. *Operators and Matrices*. Operators and Matrices. Operators and Matrices. Vol.5, No.3, 435-448
27. Del Río R,(2011) Random Sturm Liouville Operators. *Applied Mathematics Letters*, Vol. 24, No. 2, 179-183.
28. Del Río, R, Kudryavtsev, M. (2012) Inverse Problems for Jacobi operators I: Interior mass-spring perturbations in finite systems. *Inverse Problems* Vol.28, No.5
29. Del Río, R, Kudryavtsev, M, Silva L. O. Inverse problems for Jacobi operators II: Mass perturbations of semi-infinite mass-spring systems. *Journal of Mathematical Physics Analysis and Geometry*. Vol.9-2. 165-190.
30. Del Río, R, Kudryavtsev, M, Silva L. O. Inverse problems for Jacobi operators III: Mass-spring perturbations of semi-infinite mass-spring systems. *Inverse Problems and Imaging*, Vol. 6, No. 4, 599-621.
31. Del Río, R. (2014) Spectra of Random Operators with absolutely continuous Integrated Density of States. *Journal of Mathematical Physics* 55, 04215.
32. Del Río, R., Silva, L. Spectral Analysis for linear semi-infinite mass-spring systems. To appear in *Mathematische Nachrichten*.

Proceedings

- a) With original results not published elsewhere.

28. Del Río R, (1995) On a Problem of P. Hartman and A. Wintner, *Memorias del XXVII Congreso Nacional de la Sociedad Matemática Mexicana, Aportaciones Matemáticas, Serie Comunicaciones* 16: 119-123, J. A. Leon, A. Nicolas, F. On gay, A. Tamariz. Editors
29. Del Río R, Poltoratski A (1999) *Spectral Measures and Category, Operator Theory: Advances and Applications*. Birkhauser 108: 149-159. J. Dittrich, P. Exner y M. Tater. Editors
30. Del Río R, Fuentes S, Poltoratski A (2002) Families of Spectral Measures with mixed types. *Operator Theory: Advances and Applications*. Birkhauser 132: 1311140. Albeverio, Elander, Everett y Kurasov. Editors

- b) Reviews

31. Del Río R (1988) Inestabilidad del espectro singularmente continuo de operadores diferenciales ordinarios, *Memorias del XX Congreso Nacional de la Sociedad Matemática Mexicana*,

Aportaciones Matemáticas, Serie Comunicaciones 5: 3511360, Marcelo A. Aguilar, Leonardo Salmerón, Cristobal Vargas. Editors

32. Del Rio R. (2005) Boundary Conditions and Spectra of Sturm-Liouville Operators. Sturm-Liouville Theory, Past and Present 217-235. W. O. Amrein, A. M. Hinz and D. B. Pearson Editors., Birkhauser, Basel.

Other Publications

33. Arredondo JH y del Rio R (1990) Expansiones asintóticas para la función de Krein, Universidad Autónoma Metropolitana 1-129.

34. Del Rio R y Blancarte H (2000) Solución de un número infinito de desigualdades. Eureka 15: 22-25.

35. Del Rio R y Blancarte H (2001) La densidad integrada de estados para el laplaciano unidimensional. Eureka 18, vol. I p. 4, December 2001.

36. Del Rio R, Cruz J y Blancarte H (2003) El espectro del laplaciano unidimensional en diferencias finitas. Eureka 19: 7-15

37 Del Rio R (1994) Algunas consideraciones sobre las matemáticas en México. (Some considerations on the mathematical activity in Mexico) Newspaper "La Jornada" (October 11, 1994).

5. Teaching

1979-1981 Teaching Assistant.

School of Sciences. National Autonomous University of Mexico (UNAM).

Courses:

- Modern Geometry
- Linear Algebra II
- Topology
- Theory of numbers.

1986-1989 Professor Asignatura "A" School of Sciences (Facultad de Ciencias)

National Autonomous University of Mexico (UNAM)

Courses taught:

- General Mathematics, (Basic Mathematics)
- Calculus IV
- Linear Algebra I
- Mathematical Analysis IV

1989- Professor Asignatura "B" School of Sciences (Facultad de Ciencias) National Autonomous University of Mexico, (UNAM).

Given courses on regular basis:

- Ordinary differential equations I
- Mathematical Analysis I, II, III, IV

Graduate courses:

- Selected Topics in Analysis (1993, 1995)
- Advanced Analysis (1994)
- Analysis Seminar (2002)
- Real Analysis I (2003)
- Functional Analysis (2015)

Courses outside UNAM:

- Advanced Differential Equations. Fac. de Ingeniería, Universidad Autónoma de Querétaro (September 2000) .
- Calculus I, University of Tennessee, Knoxville, USA. (August 1992 - December 1992).
- Calculus II Instituto Tecnológico Autónomo de México (ITAM) January 2014 – May 2014)

Thesis Advisor

B.S. Thesis (Undergraduate)

María del Carmen Poo Mantecon, Facultad de Ciencias, UNAM.
Title: Limpieza de una base de datos. Final exam: November 30, 1998.

José Chavez. Facultad de Ciencias, UNAM.
Title: El Teorema Espectral. Final exam: November 5, 2002.

Mauricio Rangel, Facultad de Ciencias. Title: Reconstruction of a Jacobi Matix from Two spectra.
Final exam: September 24, 2011.

Jonas Arista Carrera, Facultad de Ciencias. Title: Descomposición spectral y el teorema de Wonderland. Final exam: February 22, 2012.

Max Ortega del Vecchyo, Facultad de Ciencias. Title: teoría de Extensiones Autoadjuntas y Tripletes de frontera para obtener extensiones de operadores de Sturm-Liouville. Final exam: November 21, 2014.

Ph. D. Thesis

Olga Tchegotareva. Facultad de Ciencias, UNAM. Title: Schrödinger Operators and Spectral Types. Final exam: 11 de March 2004.

Carmen Alicia Martínez Trigo. Facultad de Ciencias, UNAM. Title: Stability of Spectral Types under local Perturbations. Final Exam: 14 March 2008.

Sergio Fuentes. Facultad de Ciencias. UNAM. Title: Mixed Spectra of Self adjoint operators. Final Exam: Pending.

Mentor of Postdoctoral researchers

Dr. Mikhail Kudryavtsev. 2001-2004

Dra. Laura Adriana Oropeza Ramos. 2008- 2010

6. Organization of Meetings and Seminars

Area Coordinator, Congress of the Mexican Mathematical Society (October 1994)

Workshop on Schrödinger Operators and related topics. IIMAS (May 1999)

(With C. Villegas) Workshop on Schrödinger Operators, IIMAS, December 2001. Speakers:

Organizer of the Mathematical Physics session of the XXXV Congress of the Mexican Mathematical Society (October 2002), Durango, Dgo. Mexico

Seminar on Discrete Operators Department of Mathematical and Numerical Methods. IIMAS. November 2003 - March 2004.

(With R. Weder) Seminar of Operators and Mathematical Physics. Department of Mathematical and Numerical Methods. IIMAS. Since May 2004.

(With R. Weder, H. Schulz-Baldes, L. Silva, J. Toloza). Spring School on Classical and Quantum Mechanics. IIMAS-UNAM, Mexico. March 2008.

Differential Equations Session, Congress of the Mexican Mathematical Society. October 2008

7. Referee and Reviewer Activities

Referee of papers for:

Anales del Instituto de Matemáticas, UNAM

Aportaciones Matemáticas, SMM

Numerical Methods for Partial Differential Equations.

International Journal of Mathematics and Mathematical Sciences.

Boletín de la Sociedad Matemática Mexicana

Israel Journal of Mathematics

Applicable Analysis

Memorias de la Sociedad Matemática Mexicana

Journal of Functional Analysis

Journal of Mathematical Physics

Mathematical Methods in Applied Sciences

Journal of Mathematical Analysis and Applications

Inverse problems and Imaging

Inverse Problems

Journal of Spectral Theory

Applied Mathematics Letters

Reviewer for:

Mathematical Reviews AMS.

Referee of Book

Medidas Integrales. Div. de Ciencias Básicas e Ingeniería de la Universidad Autónoma Metropolitana (UAM-I). Mexico.

Referee of Research Projects or Prizes:

CONICIT, Chile (1995)

CONACYT, Mexico (1998, 2012)

Doctoral Research UAM- Ixtapalapa, Mexico (1996)
FONDECYT-CONICYT Chile (2004, 2013)
Prize "Sotero Prieto" for best Thesis.(1996)
PAPIIT-DGAPA UNAM (2010).

8. Editorial Work

Member of Editorial Committee, Memories of the XXIX National Congress of the Mexican Mathematical Society, (October 1996)

Editor of Seminario de Métodos Matemáticos y Numéricos sobre Operadores de Schrödinger y Temas Afines, IIMAS (1999).

Editor (with C. Villegas) of Contemporary Mathematics, AMS-SMM, Lecture Notes from a Workshop on Schrödinger Operator Theory, Vol 340 (2004).

Editor of "Señalamientos metodológicos y didácticos al tema: Problemas Inversos de la Teoría Espectral de Operadores de Dimensión Finita" (Spectral theory of finite dimensional Jacobi matrices) by V. A. Marchenko and T. V. Misyura (traduction by Mikhail Kudryavtsev), Monografía del IIMAS-UNAM, Vol. 12 No. 28 (2004).

9. Academic-Administrative positions

1989-1990 Head, Department of Numerical and Mathematical Methods.

1989-1990 Member, Internal Council Institute for Research in Applied Mathematics and Systems.

1991-1992 Member, Technical Council of Scientific Research. National Autonomous University of Mexico.

1995-1997 Head. Department of Numerical and Mathematical Methods.

Feb 1998-2001 Counselor, University Council, UNAM

2007- 2012. Head, Department of Numerical and Mathematical Methods.

10. Memberships

Sociedad Matemática Mexicana (since 1988)
Society for Industrial and Applied Mathematics (1994-2000)
American Mathematical Society (since 1994)
New York Academy of Sciences (1995-1996)