CURRICULUM VITAE CRISTIAN E. GUTIÉRREZ

MATHEMATICS DEPARTMENT TEMPLE UNIVERSITY PHILADELPHIA, PA 19122 215-204-7284

EDUCATION

Ph.D. in Mathematics, University of Buenos Aires, Argentina, 11–80.Thesis Advisor: Alberto P. Calderón.M.Sc. in Mathematics, University of Buenos Aires, Argentina, 12–74.

POSITIONS HELD

7–93 to present: Professor, Temple University.

Fall 2019, Visiting Professor at Université de Paris-Orsay (6 weeks), University of Grenoble (2 weeks), and University of Bern (7 weeks) (on sabbatical from Temple).

March and April 2013, May 2014, Visiting Professor, Karlsruhe Institute of Technology, Germany.

May and June 2013, Visiting Professor, University of Bologna, Italy.

February 2013, Member of the Institut Mittag-Leffler, Sweden.

June 2007, May 2011, Visiting Professor, University of Buenos Aires, Argentina.

August-November 2005: Member, Mathematical Sciences Research Institute, Berkeley, CA.

Fall 2003 (three weeks): Visiting Professor, Australian National University, Canberra. June 2001, April–September 1999: Visiting Professor, Universidad Autónoma de Madrid, Spain.

January–March, 1999, Visiting Professor, University of Texas at Austin. July 2001, May–June 1998, Visiting Professor, University of Bologna, Italy. August 1998, Visiting Member, Instituto Argentino de Matemática, Buenos Aires, Argentina.

October 1997: Visiting Member, Mathematical Sciences Research Institute, Berkeley. August 97, Visiting Professor, University of Buenos Aires.

May–June 96: Professore Richercatore, University of Bologna, Italy.

August 93: Visiting Professor, Universidad de Córdoba, Argentina.

May–June 93: Professore Richercatore, Universities of Bologna and Catania, Italy.

June 93: Visiting Professor, Universidad Autónoma de Madrid, Spain.

7–89 to 6–93: Associate Professor, Temple University.

July and August of 1992, 1993, and 1994: Visiting Professor, University of Buenos Aires, Argentina, Member of Instituto Argentino de Matemática, Buenos Aires.

91–92: Member of the Institute for Advanced Study, Princeton, NJ.

May–June 1991: Visiting Member of the Institute for Mathematics and Applications, Minneapolis, Minnesota.

7–87 to 6–89: Assistant Professor, Temple University.

9–86 to 6–87: Visiting Assistant Professor, University of Rochester.

9–85 to 7–86: Visiting Assistant Professor, University of Minnesota.

1–81 to 11–83: Postdoctoral Fellow, Rutgers University.

10-80 to 6-88: Assistant Professor, University of Buenos Aires, Argentina.

1–80 to 9–80: Instructor, University of Buenos Aires, Argentina.

HONORS

Honorary member of the Argentinian Mathematical Institute A. P. Calderón (IAM), since 2000.

Member of the National Academy of Sciences, Argentina, since June 2007.

Accademico corrispondente straniero of the Accademia delle Scienze dell'Istituto di Bologna, Italy, since November 2015.

Fellow of the American Mathematical Society, since January 2018.

EDITORIAL BOARDS

Journal of Mathematical Analysis and Applications, Associate Editor, since 2007. Journal Le Matematiche, Catania, Italy, since 2009.

GRANTS

NSF, Classical Analysis Division, DMS–9003095, 1–5–90 to 10–31–92. Title of Project: "Weighted norm inequalities and partial differential equations." Role: PI.

NSF, Analysis Division, DMS–9706497, July 1997–June 2000. Title of Project: "Partial differential equations and Real Harmonic Analysis." (\$70,000). Role: PI.

NSF, Analysis Division, DMS–0070648, July 2000–June 2003. Title of Project: "Nonlinear Partial differential equations of Monge–Ampère type." (\$78,000). Role: PI.

NSF, Analysis Division, DMS–0300004, July 2003–June 2006. Title of Project: "Nonlinear Partial differential equations of Monge–Ampère type." (\$90,000). Role: PI.

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NSF, Analysis Division, DMS–0610374, July 2006–June 2009. Title of Project: "Nonlinear Partial differential equations of Monge–Ampère type." (\$115,000). Role: PI.

NSF, Analysis Division, DMS–0901430, July 2009–June 2013. Title of Project: "Nonlinear Partial differential equations of Monge–Ampère type." (\$200,000). Role: PI.

NSF, Analysis Division, DMS–1201401, July 2012–June 2016. Title of Project: "Monge-Ampère-Type Equations and Geometric Optics." (\$270,000). Role: PI.

NSF, Analysis Division/Optics and Photonics, DMS–1600578, July 2016–June 2021. Title of Project: "OP: Monge-Ampère-Type Equations and Geometric Optics." (\$240,000). Role: PI.

National Science Centre, Poland (NCN), September 1, 2016–August 31, 2018. Project funded by the European Union Horizon 2020 research and innovation program under the Marie-SKlodowska Curie agreement No 665778. Project number: 2015/19/P/ST1/02618 Project title: Variational Problems in optical engineering and free material design. Amount: 825664 PLN=\$231,378. Role: Co-investigator.

"Excelence in complex analysis and pdes", http://www.dm.unibo.it/progetti/cap/, September 1, 2009-July 31, 2014; US Department of Education. Grant to exchange graduate students between the US (U. Arkansas, U. Pittsburg and Temple), and the European community (Bologna, Madrid, Rennes and U. Paris 7).

DOCTORAL STUDENTS

Ahmmed Mohammed, PH.D. thesis on parabolic partial differential equations, May 1995; currently Professor, Ball State University, Indiana.

Qingbo Huang, PH.D. thesis on the linearized Monge-Ampère partial differential equation, April 1998, currently Professor, Wright State University, Ohio.

Andrew Incognito, PH.D. thesis on Harmonic Analysis, July 1998, currently Associate Professor at Coastal Carolina University.

David Hartenstine, PH. D. thesis on regularity properties of the Monge–Ampère equation, June 2001. Vigre Instructor at the University of Utah 2001-2004; currently Professor at Western Washington University.

Federico Tournier, PH. D. thesis on regularity properties for the linearized Monge– Ampère operator, July 2002, Instructor Purdue University 2002-2005. Currently researcher at the Instituto Argentino de Matemática, Buenos Aires, Argentina; and Assistant Professor at the University of La Plata, Argentina.

Nguyen Van Truyen, PH. D. thesis on mass transportation problems, May 2005, postdoctoral fellow at MSRI (Fall 2005) and postdoc at Georgia Tech (two year position after MSRI). Currently Professor at Akron University, OH.

Henok Mawi, PH.D. thesis on geometric optics, Spring 2010; assistant professor at Howard University, Washington D.C..

Ahmad Sabra, PH.D. thesis on reflector design, June 2015; 2015-2018 postdoc at the University of Warsaw, Poland. Currently, Assistant Professor at the American University in Beirut, Lebanon.

Eric Stachura, PH. D. thesis on electromagnetism and geometric optics, April 2016; instructor at Haverford College 2016-2018; currently Assistant Professor Kennesaw State

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University, GA.

Farhan Abedin, PH. D. thesis on degenerate elliptic equations and the regularity of their solutions, June 2018. Post doctoral fellow at Michigan State University. Currently post doctoral fellow at the University of Utah.

Luca Pallucchini, PH. D. thesis on Waveguides and Metasurfaces in Optics, April 2019. Currently Consulting Actuary at Ernst and Young Company, Boston.

RECENT PRESENTATIONS

-19. "Metalenses, Monge-Ampère type equations and optimal transport", SIAM Symposium, August 2021, Toronto, Canada; virtual meeting.

-18. "Optimal transport and applications to Optics", eight two-hour lecture series online for the University of Bologna, Italy, May/June 2020.

-17. University of Grenoble, France, Colloquium on Metasurfaces in Optics, October 2019.

-16. Two week visit to the Institut Henri Poincaré, Sorbonne, Paris, to participate in the special trimester on "The mathematics of imaging", March/April 2019.

-15. Invited talk at the meeting "Variational Problems in Optical Engineering and Free Material Design, Banach Center, Warsaw, Poland, June 2018.

-14. Presentation in the Session on Harmonic Analysis and applications at the American Mathematical Society Sectional Meeting, Boston, April 2018.

-13. Colloquium talk, University of Illinois at Chicago, October 2017.

-12. Visiting member of the Institute for Mathematics and Applications at the University of Minnesota for one month in the Spring 2017 to participate in the special program on Mathematics and Optics 2016-2017.

-11. Invited presentation at the Workshop on Generated Jacobian Equations: from Geometric Optics to Economics, Banff, Canada, April 2017.

-10. Talk at PDE/Applied Math Seminar "On the numerical solution of the far field refractor problem", Indiana University, Bloomington, September 26, 2017.

-9. Invited talk at the meeting in memory of Filippo Chiarenza, University of Catania, Italy, June 2016.

-8. Presentation at the Freeform Meeting of the Optical Society of America held in Arlington, VA, June 2015.

-7. Analysis seminar talk at the Free University of Brussels, Belgium, May 2015.

-6. One month visit to Institut Henri Poincaré, Paris, to participate of the program on Inverse Problems, May 2015.

-5. Speaker at the Workshop on "Advances in Numerical Optimal Transportation", Banff, Canada, February 2015.

-4. Invited talk at the meeting on Analysis and Geometry held at Texas A&M University at Doha, Qatar, January 2015.

-3. Five lectures on the Monge-Ampère equation and applications, University of Bern, Switzerland, January 2015.

-2. Analysis seminar talk, University of Pennsylvania, November 2014.

-1. Geometric Optics and Monge-Ampère type equations, Colloquium, University of Bern, Switzerland, December 2013.

0. Aspherical Lens Design, Karlsruhe Institute of Technology, Germany, June 2014.

1. Fully nonlinear equations and geometric optics, Lecture series "Topics in Mathematics", four talks, University of Bologna, Italy, June 2013.

2. Reflector design and the inverse square law, invited talk, Conference on Geometric Methods in pdes, Cortona, Italy, May 2013.

3. Geometric Optics and Applications, minicourse at the Karlsruhe Institute of Technology, Germany, April 2013.

4. Regularity results for the linearized Monge-Ampere equation, Analysis Seminar, Uppsala University, Sweden, February 2013.

5. Refraction Problems in geometric optics, invited talk, Seminar at the Mittag-Lefler Institute, Sweden, February 2013.

6. Analysis Seminar, U. Texas Austin, January 2013.

7. Regularity results for the near field parallel refractor problem, invited talk in the conference "Perspectives in Harmonic Analysis, Geometric Measure Theory, and Partial Differential Equations, and their applications to Several Complex Variables", Temple University, September 2012.

8. Summer School (CIME), Cetraro, Italy, July 9-13, 2012, five lectures.

9. Invited talk at the Conference for the 70th birthday of N. Trudinger, Xi'an, China, June 2012.

10. Analysis seminar at Karlsruhe Institute of Technology, Germany, January 2012, two talks.

11. Meeting on Geometric pdes and applications, Banff, July 2011, invited talk.

12. Minicourse (one week) on the Monge-Ampere equations and applications, University of Padova, Italy, June 2011.

13. Fabes lectures, Buenos Aires, May 2011, speaker and organizer.

14. Minicourse (two weeks) on the Monge-Ampere equations and applications, University of Buenos Aires, Argentina, May 2011.

15. Ehrenpreis memorial conference, Temple University, November 2010, invited speaker.

16. Talk at the workshop on Inverse Problems at Mathematics Research Institute (MSRI), Berkeley, CA, November 2010.

17. Invited talk at the Conference for the 70th birthday of Richard Wheeden, Seville, Spain, June 14-18, 2010.

18. SIAM Conference on Analysis of partial differential equations, Paper presented in the session on Geometric PDES, Miami, Florida, December 2009.

19. AMS conference Arkansas, presented a paper at the session on Partial Differential Equations in Geometry and Variational Problems, Lexington, Kentucky, March 27-28, 2009.

20. Seminar talk, Columbia University, April 2009.

21. Invited speaker, conference for the 60th birthday of Luis Caffarelli, Mar del Plata, Argentina, March 2009.

22. Primer escuela de invierno Luis Santaló, Buenos Aires, Argentina, July 2008.

23. Invited speaker, Conference in occasion of Ermanno Lanconelli 65th birthday, Bologna, May 2008.

24. Invited talk at the Meeting on Liouville theorems and detours, Cortona, Italy, May 2008.

25. Mathematics Colloquium speaker, University of Pittsburgh, March 2008.

19. Talk at the workshop on Nonlinear elliptic equations and applications, MSRI, July 2007.

20. Minicourse on the Monge-Ampère equation (four lectures), MSRI, July 2007.

26. Invited talk at the meeting in honor of the 60th birthday of Ireneo Peral, Salamanca, Spain, February 2007.

27. Inaugural address (Conferencia Rey Pastor), Annual Meeting of the Unión Matemática Argentina, Bahía Blanca, Argentina, September 2006.

28. Invited talk at the Meeting on Subelliptic equations, Cortona, Italy, June 2006.

29. Invited talk at the Meeting on Variational analysis and pdes, Erice, Italy, July 2006.

30. Invited minicourse at the meeting in honor of Carlos Segovia, Buenos Aires, Argentina, December 12-17, 2005 (three talks).

31. MSRI-Evans lecture series on the Monge-Ampère equation, November 2005, Berkeley, CA.

32. Three week course at Cortona, Italy, July 25-August 13, 2005.

33. Invited minicourse at the meeting on "Positivity and Harnack inequality" held at Cortona, Italy, June 2005 (four talks).

34. Seminar talk at the University of Bologna, Italy, March 2005.

35. Two talks at the Modern Math Workshop held at San Francisco State University to present the program on Nonlinear elliptic equations that took place at MSRI, Berkeley, during the Fall 2005.

36. Seminar talk on "On Monge-Amp`ère type equations arising in optimal transportation problems", Austin, Texas, May 2004.

37. Invited speaker, Conference in honor of Gianfranco Cimmino, University of Bologna, March 2004.

PROFESSIONAL SERVICES

Referee for the National Science Foundation, Transactions AMS, Proceedings AMS, Journal of Mathematical Analysis, Siam Journal of Mathematical Analysis, Communications in P. D. E., Journal D'Analyse Mathematique, Mathematischen Annalen, Indiana Journal of Mathematics, American Journal of Mathematics, Duke Journal, Advances in Mathematics, Journal of Functional Analysis, Acta Mathematica, Inventiones Mathematicae, Journal of Differential Equations, Revista Iberoamericana de Matemática, SIAM Journal of Math Analysis, Analysis and PDEs, Calculus of Variations and pdes, Journal of Optics, Journal of the Optical Society of America A, Optics Express, Applied Optics, Optics Letters, and Journal of Physics A: Math Theory.

Reviewer for the Mathematical Reviews.

Fully Nonlinear PDEs in Real and Complex Geometry and Optics, Centro Internationale Matematico Estivo (CIME), Cetraro, Italy, co-organizer, July 9-13, 2012.

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Fabes Lectures Buenos Aires, Argentina, May 2011, organizer.

Co-organizer of the special semester on Nonlinear elliptic equations and its applications at the Mathematical Research Institute, Berkeley, CA, Fall 2005. Continued for three weeks in the Summer 2007.

Co-organizer of the meeting in honor of Carlos Segovia, Buenos Aires, Argentina, December 2005.

Co-organizer with I. Birindelli (Rome) and E. Lanconelli (Bologna) of the workshop "Second Order Subelliptic Equations and Applications", held at Cortona, Italy, June 15-21, 2003.

Member of the National Science Foundation Partial Differential Equations review panel, 1998, 1999, 2000, 2004, 2005, 2006, 2007, 2008, 2011, and 2014.

Member of the Committee of Visitors (COV) of the NSF Division of Mathematical Sciences, April 26-28, 2010.

COMMITTEE SERVICE AT TEMPLE

Chairman of the Mathematics Colloquium Committee (1989–1990); (1993–2000); (2003–2004). Member of the Personnel Committee (1996–1998). In charge of the organization of the Grosswald Lectures, 1994–1998. Member of the Hiring Committee (1988–1991, 1996–1998). Mathematics department Executive committee chair (2000–2003). Member Mathematics department Merit committee (2002–2005; 2013-2016). Member of the Graduate committee of the College of Science and Technology (2003-2004). Director of the Mathematics Graduate program (2004-2008 and December 2009-June 2010). Member of the CST Promotion and Tenure Committee, 2011-2015. Member of the Mathematics Department Executive Committee (2016–2019). Member of the University Tenure and Promotion Committee (2016–2020).

PROFESSIONAL MEMBERSHIPS

American Mathematical Society Unión Matemática Argentina. Optical Society of America.

List of Publications

Cristian E. Gutiérrez

November 23, 2021

1. "Propiedades de continuidad de operadores integrales singulares," doctoral dissertation, University of Buenos Aires, Nov. 1979.

2. "On the strong maximal function and Zygmund's class $L(\log^+ L)^n$," (with N.A. Fava and A.E. Gatto), Studia Math. 69(1980), 155–158.

3. "On singular integrals and Orlicz spaces," Studia Math. 73(1982), 51-61.

4. "On weighted fractional integrals," (with A.E. Gatto and R.L. Wheeden), Conference on Harmonic Analysis in Honor of A. Zygmund, Wadsworth Int., California 1983,124–137.

5. "On weighted norm inequalities for the maximal function," (with A.E. Gatto), Studia Math. 76(1983), 59–62.

6. "Fractional integrals on weighted H^p spaces," (with A.E. Gatto and R.L. Wheeden), Trans. A. M. S. 189(1985), 575–589.

7. "Weighted inequalities for a vector valued strong maximal function," (with O.N. Capri), Rocky Mountain J. of Math. 18,3(1988), 565–570.

8. "Weighted norm inequalities for multipliers," Proc. A. M. S. 102,2(1988), 290–294.

9. "Bounds for the fundamental solution of Degenerate Parabolic equations," (with G.S. Nelson), Comm. in P. D. E. 13,5(1988), 635–649.

10. "Harnack's inequality for degenerate Schrödinger operators," Trans. A. M. S. 312,1(1989), 403–419.

11. "Sobolev interpolation inequalities with weights," (with R. L. Wheeden), Trans.

A. M. S., 232, 1991, 263–281.

12. "Mean value and Harnack inequalities for degenerate parabolic equations," (with R.L. Wheeden), Colloquium Math. vol. dedicated to A. Zygmund, vol. LX/LXI, 1990, 157–194.

13. "Estimates for the maximal operator of the Ornstein Uhlenbeck semigroup," (with W. O. Urbina), Proc. A. M. S., 113(1), 1991, 99–104.

14. "Harnack's inequality for degenerate parabolic equations," (with R.L. Wheeden), Comm. P. D. E. 16(4 & 5), 1991, 745–770.

15. "Bounds for the fundamental solution of degenerate parabolic equations," (with R. L. Wheeden), Comm. P. D. E., 17(7 & 8), 1287–1307, 1992.

16. "Pointwise estimates for solutions of degenerate parabolic equations," Revista de la Unión Matemática Argentina, vol. 37, 1991, 261–270.

17. "The Riesz Transforms for Gaussian Measures," Revista Colombiana de Matemática, 27 (1&2), 1993, 35–44.

18. "On the Riesz transforms for Gaussian measures," Journal of Functional Analysis, vol. 120(1), 1994, 107–134.

19. "Weak-Type Estimates for the Riesz transforms associated with the Gaussian Measure," (with E. B. Fabes and R. Scotto) Revista Matemática Iberoamericana, vol. 10(2), 1994, 229–281.

20. "Two–Weight Sobolev–Poincaré Inequalities for a class of Degenerate Elliptic Operators," (with B. Franchi and R. L. Wheeden) Accad. Nazionale Lincei, ser. 9, vol. 5(2), 1994, 167–175.

21. "Weighted Sobolev–Poincaré Inequalities for Grushin Type Operators," (with B. Franchi and R. L. Wheeden) Comm. in P. D. E., vol. 19(3&4), 1994, 523–604.

22. "On the Harnack Inequality for Viscosity Solutions of Non–Divergence Equations," Sinet, Ethiopian Journal of Science, Proc. of the conference in Honor of T. Retta, edited by S. Berhanu, vol. 19, 1996, 48–72.

23. "Real Analysis Related to the Monge–Ampère Equation," (with L. A. Caffarelli)

Transactions of A. M. S., vol. 348(3), 1996, 1075–1092.

24. "On Higher Riesz Transforms for Gaussian Measures," (with C. Segovia y J. L. Torrea), Journal of Fourier Analysis and Applications, vol. 3(6), 1996, 583–596.

25. "Properties of the Solutions of the Linearized Monge–Ampère Equation," (with L. A. Caffarelli), American Journal of Math., vol. 119(2), 1997, 423–465.

26. "Singular Integrals Related to the Monge–Ampère Equation," (with L. A. Caffarelli), in *"Wavelet Theory and Harmonic Analysis in Applied Sciences,"* edited by C. E. D'Attellis and E. M. Fernández–Berdaguer; Birkhauser, 1997, pages 3–13.

27. "Geometric Properties of the Sections of Solutions to the Monge–Ampère Equation," (with Q. Huang), Transactions of the A. M. S. 352 (2000), no. 9, 4381–4396.

28. "A Generalization of a Theorem by Calabi to the Parabolic Monge–Ampère Equation," (with Q. Huang), Indiana Univ. Math. Journal 47 (1998), no. 4, 1459–1480.

29. "A Besicovitch-type covering lemma on the Heisenberg group," preprint.

30. "Riesz Transforms, *g*-functions, and multipliers for the Laguerre semigroup," (with A. Incognito and J. L. Torrea), Houston J. Math. 27 (2001), no. 3, 579–592.

31. " $W^{2,p}$ -estimates for the parabolic Monge-Ampère equation," (with Q. Huang), Arch. Ration. Mech. Anal. 159 (2001), no. 2, 137–177.

32. "A harmonic analysis theorem and applications to homogenization," (with I. Peral), Indiana Univ. Math. J. 50 (2001), no. 4, 1651–1674.

33. "Regularity of Weak solutions to the Monge–Ampère equation," (with D. Hartenstine), Trans. Amer. Math. Soc. 355, 2477-2500, 2003.

34. "Maximum principle, Non–Homogeneous Harnack inequality, and Liouville theorems for X–elliptic operators," (with E. Lanconelli), Communications in Partial Differential Equations, Volume 28, Issue 11 & 12, pp. 1833 - 1862, 2003.

35. "Homogenization of Quasilinear Parabolic Equations in Periodic Media," (with J. García–Azorero, and I. Peral), Communications in Partial Differential Equations, Volume 28, Issue 11 & 12, 1887 - 1910, 2003.

36. "Maximum and comparison principles for convex functions on the Heisenberg group," (with A. Montanari), Communications in Partial Differential Equations, Volume 29, Issue 9 & 10, 1305 - 1334, 2004.

37. "On the second order derivatives of convex functions on the Heisenberg group," (with A. Montanari), Ann. Scuola Norm. Sup. Pisa Cl. Sci. (5) 3, no. 2, 349-366, 2004.

38. "Classical, viscosity and average solutions for PDE's with nonnegative characteristic form," (with E. Lanconelli), Rendiconti Accademia nazionali dei lincei, Classe di scienze, fisiche, matematiche e naturali, s. 9, volume 15, 17-28, 2004.

39. "Homogenization and convergence of correctors in Carnot groups," (with B. Franchi and T. Van Nguyen), Communications in Partial Differential Equations, 30(12), 1817-1841, 2005.

40. " $W^{2,p}$ -estimates for the linearized Monge–Ampère equation," (with F. Tournier), Transactions of the A. M. S., 358 (2006), 4843-4872.

41. "On the regularity of reflector antennas," (with L. Caffarelli and Q. Huang), Annals of Mathematics, Vol. 167 (2008), No. 1, 299-323.

42. "On Monge-Ampère type equations arising in optimal transportation problems," (with T. Van Nguyen), Calculus of Variations and PDEs Journal, Vol. 28, 3, March 2007, pp. 275-316.

43. "Covering theorems and inequalities on metric spaces and applications to pdes," (with G. Di Fazio and E. Lanconelli), Mathematische Annalen, Vol. 341, No. 2. (June 2008), pp. 255-291.

44. "Hölder estimates for second derivatives of solutions to the Monge-Ampère equation," (with Q. Huang and T. Van Nguyen), preprint, 19 pages.

45. "The refractor problem in reshaping light beams," (with Q. Huang), Archive for Rational Mechanics and Analysis, Volume 193, Number 2 / August, 2009, 423-443.

46. "Schauder estimates for sub-elliptic equations," (with E. Lanconelli), Journal of Evolution Equations, 2009, Volume 9, Number 4, Pages 707-726.

47. "An Alexandrov type estimate for alpha-convex functions," (with F. Tournier), Proc. Amer. Math. Soc. 138 (2010), 2001-2014.

48. "Reflection, refraction, and the Legendre transform," Journal Optical Society of America A, Vol. 28 Issue 2, pp.284-289 (2011).

49. "Interior gradient estimates for solutions to the linearized Monge–Ampère equation," (with T. Nguyen), Advances in Mathematics, Volume 228, Issue 4, 10 November 2011, Pages 2034-2070.

50. "Harnack inequality for a degenerate elliptic equation," (with F. Tournier), Comm. Partial Differential Equations, Volume 36, Issue 12, 2011, Pages 2103-2116.

51. "Surfaces refracting and reflecting collimated beams," (with F. Tournier), Journal Optical Society of America A, Vol. 28, Issue 9, pp.1860-1863 (2011).

52. "The parallel refractor," (with F. Tournier), Developments in Mathematics, Vol. 28, pp. 325-334 (2013).

53. "The refractor problem with loss of energy," (with H. Mawi), Nonlinear Analysis: Theory, Methods & Applications, Volume 82, April 2013, Pages 12-46.

56. "Nonsmooth hypersurfaces with smooth Levi curvature," (with A. Montanari and E. Lanconelli), Nonlinear Analysis: Theory, Methods & Applications, Volume 76, January 2013, Pages 115-121.

57. "Aspherical lens design," Journal Optical Society of America A, Vol. 30, Issue 9, pp. 1719-1726 (2013).

58. "Refraction Problems in Geometric Optics," in Lecture Notes in Mathematics, vol. 2087, pages 95-150, 2014.

59. "The near field refractor problem," (with Q. Huang), Annales de l'Institut Henri Poincaré (C) Analyse Non Linéaire, vol. 31 (4), July-August, 2014, pp. 655-684.

60. "The reflector problem and the inverse square law," (with A. Sabra), Nonlinear Analysis: Theory, Methods & Applications, Volume 96, February 2014, Pages 109-133.

61. "Design of pairs of reflectors," (with A. Sabra), Journal Optical Society of America A, Vol. 31, Issue 4, pp. 891-899, March 2014.

62. "Local Near Field Refractors and Reflectors," (with F. Tournier), Nonlinear Analysis: Theory, Methods & Applications, Vol. 108, pp. 302–311, October 2014.

63. "Interior second derivatives for solutions to the linearized Monge-Ampère equation," (with T. Nguyen), Trans. Amer. Math. Soc., Vol. 367, no. 7, pp. 4537–4568, July 2015.

64. "Regularity for the near field parallel refractor and reflector problems," (with F. Tournier), Calculus of Variations and Partial Differential Equations, Volume 54, Issue 1, pp. 917-949, September 2015.

65. "Uniform refraction in negative refractive index materials," (with E. Stachura), Journal Optical Society of America A, 32(11), 2110-2122, November 2015.

66. "Aspherical lens design and imaging," (with A. Sabra), SIAM Journal on Imaging Sciences, Vol. 9, No.1, pp. 386-411, March 2016.

67. " $C^{1,\alpha}$ -estimates for the parallel refractor," (with F. Abedin and G. Tralli), Nonlinear Analysis, vol. 142, September 2016, pp. 1-25.

68. "Form-Invariance of Maxwell equations in integral form," in Harmonic Analysis, Partial Differential Equations and Applications in Honor of Richard L. Wheeden, Applied and Numerical Harmonic Analysis Series, pp. 69-78, (refereed) Birkhauser, Boston, Spring 2017.

69. "On the Numerical Solution of the Far Field Refractor Problem," (with R. De Leo and H. Mawi), Nonlinear Analysis, Volume 157, July 2017, Pages 123-145.

70. "An iterative method for generated Jacobian equations," (with F. Abedin), Calculus of Variations and Partial Differential Equations, August 2017, 56:101.

71. "General refraction problems with phase discontinuities on nonflat metasurfaces," (with Luca Pallucchini, and Eric Stachura), Journal of the Optical Society of America A, Vol. 34, Issue 7, pp. 1160-1172, July 2017.

72. "Freeform Lens Design for Scattering Data With General Radiant Fields," (with A. Sabra), Archive for Rational Mechanics and Analysis, Vol. 228, Issue 2, pp. 341-399, May 2018.

73. "Harnack's inequality for a class of non-divergent equations in the Heisenberg group," (with F. Abedin and G. Tralli), Communications in pdes, Vol. 42, Issue 10, 1644-1658, October 2017.

74. "Tunable Graphene Meta surface Reflectarray for Cloaking, Illusion, and Focusing," (Sudipta Romen Biswas, Cristian E. Gutierrez, Andrei Nemilentsau, In-Ho Lee, Sang-Hyun Oh, Phaedon Avouris, and Tony Low), Physical Review Applied 9, 034021, March 2018.

75. "Reflection and refraction problems for metasurfaces related to Monge-Ampère equations," (with Luca Pallucchini), Journal Optical Society of America A, Vol. 35, Issue 9, pp. 1523-1531, September 2018.

76. "On the existence of dichromatic single element lenses," (with A. Sabra), Contemporary Mathematics, AMS, Vol. 748, pp. 60, April 2020.

77. "Refractors in anisotropic media associated with norms," (with Qingbo Huang and H. Mawi), Nonlinear Analysis, Vol. 188, pp. 125-141, November 2019.

78. " $C^{1,\alpha}$ -estimates for the near field refractor," (with F. Tournier), Annales de l'Institut Henri Poincaré (C) Analyse Non Linéarie, Vol. 38, Issue 3, pp. 507-910 (May–June 2021).

79. "On the numerical solution of the near field refractor problem," (with H. Mawi), Applied Mathematics and Optimization, in press, 2021.

80. "Chromatic Aberration in Metalenses," (with A. Sabra), Advances in Applied Mathematics, Vol. 124, March 2021, pp. 102-134.

81. "Sobolev inequalities with jointly concave weights on convex cones," (with Z. Balogh and A. Kristaly), Proceedings London Mathematical Society, Vol. 122, Issue 4, April 2021, pp. 537-568.

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