



# Stefanos Aretakis

## *Curriculum Vitae*

### PERSONAL DATA

PLACE AND DATE OF BIRTH: Athens, Greece | January 1987  
ADDRESS: 1265 Military Trail, Toronto, ON. M1C 1A4, Canada  
EMAIL: aretakis@math.toronto.edu,  
aretakis@math.princeton.edu

### ACADEMIC EMPLOYMENT

*Current* **Assistant Professor**  
JULY 2016 Department of Computer and Mathematical Sciences  
**University of Toronto Scarborough**  
Toronto, Canada

*Current* **Assistant Professor**  
JULY 2016 Department of Mathematics  
**University of Toronto St. George**  
Toronto, Canada

*2015-2017* **Assistant Professor**  
Department of Mathematics  
**Princeton University**  
Princeton, USA

*2012-2015* **Veblen Research Instructor**  
Department of Mathematics  
**Princeton University**  
Princeton, USA

*2012-2015* **Veblen Research Instructor**  
School of Mathematics  
**Institute for Advanced Study**  
Princeton, USA

### RESEARCH INTERESTS

Differential Geometry, Geometric Analysis, Partial Differential Equations, General Relativity

---

## EDUCATION

- Ph.D.**     **University of Cambridge, UK**  
2008–2012     Advisor: *Professor Mihalis Dafermos*  
Thesis title: *“Stability and instability of evolution equations in general relativity”*
- M.A.St.**     **University of Cambridge, UK**  
2006–2007     Advisor: *Professor Peter Johnstone*  
Thesis title: *“Synthetic Differential Geometry”*
- B.A.**     **University of Patras, Greece**  
2004–2006     Final result: 10/10

---

## GRANTS & AWARDS

- 2018–2022     Early Research Award, Ontario MRIS, C\$190,000  
2017–2022     NSERC Grant Award 06103, C\$150,000  
2017–2019     Connaught New Researcher Fellowship, C\$10,000  
2016     Papastratou Prize in Geometry, Academy of Athens, C\$4,500  
2016–2020     University of Toronto, Start-up Grant  
2016–2019     NSF Grant Award DMS–1600643, \$176,000  
2016–2020     Alfred P. Sloan Research Fellowship, \$55,000  
2015–2016     Princeton University, Start-up Grant  
2013–2016     NSF Grant Award DMS–1265538, \$148,000  
2012–2015     Member of the Institute for Advanced Study, NJ, USA  
2012–2015     Princeton University, Instructor Research Grant  
2012–2015     Institute for Advanced Study, Instructor Research Grant  
2008–2012     Cambridge University, Student Research and Travel Grant

---

## PH.D. STUDENTS

- 2017–2022     Marios Apetroaie  
2017–2022     Eva Politou  
2017–2022     Eric Massoud

---

## POST-DOCTORAL SUPERVISION

- 2017–2020     Stefan Czimek

---

## RESEARCH PUBLICATIONS

1. (joint with Y. Angelopoulos and D. Gajic) *Price’s law for all angular frequencies*, in preparation
2. (joint with Y. Angelopoulos and D. Gajic) *Scattering theory for the wave equation on extremal black holes*, preprint
3. (joint with Y. Angelopoulos and D. Gajic) *Global existence and asymptotic blow-up for non-linear wave equations on extremal black holes*, preprint
4. (joint with Y. Angelopoulos and D. Gajic) *Horizon hair of extremal black holes and measurements at null infinity*, **Physical Review Letters** **121**, 131102 (2018)  
(Article selected to be a PRL Editors’ Suggestion)

5. (joint with Y. Angelopoulos and D. Gajic) *Late-time asymptotics for the wave equation on extremal Reissner–Nordström backgrounds*, submitted, arXiv:1807.03802, 96 pages
6. (joint with Y. Angelopoulos and D. Gajic) *Asymptotics for scalar perturbations from a neighborhood of the bifurcation sphere*, **Classical and Quantum Gravity** **35** (2018), arXiv:1802.05692, 31 pages
7. (joint with Y. Angelopoulos and D. Gajic) *Logarithmic corrections in the asymptotic expansion for the radiation field along null infinity*, to appear in the **Journal of Hyperbolic Differential Equations**, arXiv:1712.09977 (2017), 30 pages
8. (joint with Y. Angelopoulos and D. Gajic) *Late-time asymptotics for the wave equation on spherically symmetric, stationary spacetimes*, **Advances in Mathematics** **323** (2018), 529–621, arXiv:1612.01566
9. (joint with Y. Angelopoulos and D. Gajic) *A vector field approach to almost-sharp decay for the wave equation on spherically symmetric, stationary spacetimes*, to appear in **Annals of PDE**, arXiv:1612.01565
10. (joint with Y. Angelopoulos and D. Gajic) *Asymptotic blow-up for a class of semilinear wave equations on extremal Reissner–Nordström spacetimes*, arXiv:1612.01562
11. (joint with Y. Angelopoulos and D. Gajic) *The trapping effect on degenerate horizons*, **Annales Henri Poincaré** **18** (2017), 1593–1633, arXiv:1512.09094
12. *The characteristic gluing problem and conservation laws for the wave equation on null hypersurfaces*, **Annals of PDE** **3** (2017), 58 pages, arXiv:1310.1365
13. *On a foliation-covariant elliptic operator on null hypersurface*, **International Mathematics Research Notices** **15** (2015), 6433–6469
14. *Nonlinear scalar instability on extremal black holes*, **Physical Review D** **87** (2013), 084052
15. *A note on instabilities of extremal black holes under scalar perturbations from afar*, **Classical and Quantum Gravity** **30** (2013) 095010  
(Article selected to be one of the journal's Highlights for 2012–2013)
16. *Horizon instability of extremal black holes*, **Advances in Theoretical and Mathematical Physics** **19** (2015), 507–530
17. *Decay of axisymmetric solutions of the wave equation on extreme Kerr backgrounds*, **Journal of Functional Analysis** **263** (2012), 2770–2831
18. *Stability and instability of extreme Reissner–Nordström black hole spacetimes for linear scalar perturbations I*, **Communications in Mathematical Physics** **307** (2011), 17–63
19. *Stability and instability of extreme Reissner–Nordström black hole spacetimes for linear scalar perturbations II*, **Annales Henri Poincaré** **8** (2011), 1491–1538
20. *The wave equation on extreme Reissner–Nordström black hole spacetimes: stability and instability results*, <http://arxiv.org/abs/1006.0283>, 117 pages

---

## BOOKS

1. *Dynamics of Extremal Black Holes*, **SpringerBriefs in Mathematical Physics**, Springer (2018), 131 pages

---

## BOOK CHAPTERS

1. (Joint with Igor Rodnianski) *Global behaviour of solutions to Einstein's equations*, General Relativity and Gravitation, **Cambridge University Press** (2015)

---

## INVITED TALKS

1. Program in Advances in Computational Relativity, ICERM-Brown University, Providence, Fall 2020
2. General Relativity, Geometry and Analysis program, Institut Mittag-Leffler, Sweden, Fall 2019
3. The 11th IMACS International Conference, University of Georgia, GA, USA, April 17–19, 2019.
4. Theoretical and Mathematical Physics Seminar, City College of New York, NYC, USA, April 12, 2019.
5. The Gravity Initiative Inaugural Meeting, Princeton University, NJ, USA, March 6–8, 2019.
6. Colloquium Talk, University of Cyprus, Nicosia, Cyprus, September 12, 2018
7. Workshop in mathematical general relativity, Oberwolfach, Germany, August 5–11, 2018
8. International Congress in Mathematical Physics, Montreal, Canada, July 23–28, 2018
9. International Conference on Topology and its Applications, Nafpaktos, Greece, July 7–11, 2018
10. Marcel Grossman Meeting- MG15, Rome, Italy, July 1–7, 2018
11. First Congress of Greek Mathematicians, Athens, Greece, June 25–30, 2018
12. Summer school in analysis, MIT, Boston, June 10–21, 2018
13. Conference on mathematical general relativity, Institute Henri Poincaré, May 28–June 1, 2018
14. AMS Meeting, Northeastern University, Boston, April 21–22, 2018
15. Geometric analysis seminar, University of Athens, Greece, February 23, 2018
16. Joint AMS and MAA conference, San Diego, California, January 10–13, 2018
17. Conference on PDEs, King's College London, London, UK, January 8–11, 2018
18. Colloquium Talk, University of Toronto, Toronto, October 11, 2017
19. Workshop in Mathematical GR, Central China Normal University, China, August 5–15, 2017
20. 24<sup>th</sup> summer school in non-linear dynamics and complexity, Volos, Greece, July 12–22, 2017
21. Analysis seminar talk, University of Patras, Greece, July 2017
22. Conference in Hamiltonian Dynamics, Moscow, Russia, June 15, 2017
23. Colloquium Talk, Hellenic Mathematical Society, Patras, Greece, June 12 2017
24. Atlantic General Relativity Workshop, St John's, Canada, May 29–June 2, 2017
25. Conference of the black hole initiative, Harvard University, May 8–9, 2017
26. Fields symposium and colloquium talk, Fields Institute, Toronto, March 31, 2017
27. Canadian Mathematical Society 2016 Meeting, December 2–5, 2016
28. Analysis seminar, Rutgers University, November 1, 2016
29. Analysis seminar, National Technical University, Athens, Greece, September, 2016
30. Clay Institute and LMS Research School, Lecture, Reading, UK, July 6, 2016
31. Department Colloquium, Haverford College, April 18, 2016
32. AMS meeting, Stony Brook University, March 19–20, 2016
33. Complex Geometry Seminar, Columbia University, February 18, 2016
34. Department Colloquium, University of Toronto, January 14, 2016
35. Conference in Mathematical General Relativity, TSIMF, Sanya, China, January 5–9, 2016
36. Department Colloquium, UPenn, December 11, 2015
37. Analysis seminar, UPenn, October 14, 2015
38. Mathematical Aspects of General Relativity, Oberwolfach, July 12–18, 2015
39. Equadiff Conference, Lyon, France, July 6–10, 2015
40. International Conference in General Relativity, University of Toronto, Fields Institute, June 1–12,
41. Mathematics Undergraduate Colloquium, Princeton University, February 11, 2015
42. Analysis seminar, UCLA joint with Caltech, Los Angeles, February 6, 2015
43. Mathematical Problems in GR, Simons Center for Geometry and Physics, Stony Brook, Jan. 19–23, 2015
44. Department Colloquium, University of Toronto, January 8, 2015
45. Department Colloquium, Reading University, UK, November 3, 2014
46. International Conference in Topology and its applications, Greece, July 4–7, 2014
47. Analysis seminar, Reading University, UK, January 17, 2014
48. Workshop in non-linear wave equations, Oxford University, UK, January 12, 2014
49. Initial Data and Evolution Problems in GR, MSRI Workshop, Berkeley, November 18, 2013
50. New York General Relativity seminar, Columbia University, CUNY, SUNY, November 8, 2013
51. General Relativity seminar, Princeton University, October 8, 2013

52. Postdoctoral Talks, Institute for Advanced Study, September 24, 2013
53. Analysis seminar, Princeton University, September 16, 2013
54. Theoretical physics seminar, King's College London, May 30, 2013
55. Conference on nonlinear wave equations, Paris, May 22–24, 2013
56. Analysis seminar, Johns Hopkins University, March 4, 2013
57. Analysis seminar, University of Pennsylvania, February 26, 2013
58. Analysis seminar, University of Toronto, February 1, 2013
59. FRG Workshop on Relativity, University of Miami, December 18–21, 2012
60. General Relativity seminar, Columbia University, New York, September 28, 2012
61. Postdoctoral Talks, Institute for Advanced Study, September 25, 2012
62. Mathematical Aspects of General Relativity, Oberwolfach, Jul. 29–Aug. 4, 2012
63. 13<sup>th</sup> Marcel Grossmann Meeting, Stockholm, July 1–7, 2012
64. Recent Developments in Gravity, Chania, Greece, June 20–23, 2012
65. Workshop on Relativity, University of Miami, January 11–14, 2012
66. Analysis seminar, MIT, December 13, 2011
67. General Relativity seminar, Princeton University, December 9, 2011
68. “Do we understand gravity?”, IOP Meeting, London, September 16, 2011
69. General Relativity seminar, DAMTP, University of Cambridge, May 13, 2011
70. PDE seminar, Trinity College of Dublin, April 1, 2011
71. PDE seminar, Max Planck Institute, Berlin, February 21, 2011
72. Seminar in Mathematical Physics, FORTH/ICE-HT, Greece, January 26, 2011
73. PDE seminar, University of Cambridge, November 10, 2010
74. Seminar in Euclidean Geometry, University of Birmingham, April 12, 2010
75. Geometry seminar, University of Patras, September 10, 2009

## CONFERENCE PARTICIPATION

1. Analysis, PDE's, and Geometry, Princeton University, January 26–29, 2016
2. Current Topics in Mathematical physics, Aarhus, July 26–31, 2010
3. Nonlinear PDE and Free Boundary Problems, Warwick, 2009
4. Evolution Equations, Clay Summer School, Zurich, 2008
5. International Congress of Mathematicians (ICM), Spain 2006
6. International Conference in Topology and its Applications, Greece 2006

## SYNERGESTIC ACTIVITIES

- Co-organizer of “Advances in Computational Relativity” semester program at ICERM/Brown University, Fall 2020, Providence, Rhode Island, USA
- Co-organizer of Summer School on Mathematical General Relativity and the Geometric Analysis of Waves of Fluids, June 11–22, 2018, MIT, USA
- Graduate Committee Member, University of Toronto
- Co-organizer of Princeton Analysis Seminar
- Graduate Committee Member, Princeton University
- Co-organizer of 2016 LMS–CMI Summer School, July 4–8 2016, Reading University, UK
- Geometry Festival Conference Co-organizer, April 8–10 2016, Princeton University

---

## TEACHING

|                    |   |
|--------------------|---|
| <i>Spring 2019</i> | General Relativity (graduate course), University of Toronto                       |
| <i>Spring 2018</i> | Geometric Analysis and Relativity, University of Toronto                          |
| <i>Spring 2018</i> | Introduction to Combinatorics, University of Toronto                              |
| <i>Spring 2018</i> | General Relativity (graduate course), University of Toronto                       |
| <i>Spring 2018</i> | Introduction to Combinatorics, University of Toronto                              |
| <i>Spring 2018</i> | Calculus for Management II, University of Toronto                                 |
| <i>Spring 2017</i> | <i>General Relativity</i> (graduate course), University of Toronto                |
| <i>Spring 2017</i> | <i>Intoduction to Combinatorics</i> , University of Toronto                       |
| <i>Spring 2016</i> | <i>Analysis</i> MAT 215, Princeton University                                     |
| <i>Spring 2014</i> | <i>Linear Algebra</i> MAT 202, Princeton University                               |
| <i>Fall 2014</i>   | <i>Linear Algebra</i> MAT 202, Princeton University                               |
| <i>Fall 2012</i>   | <i>General Relativity</i> (graduate course), Columbia University                  |
| <i>Fall 2011</i>   | <i>Linear Analysis, Linear Algebra, Analysis II</i> , University of Cambridge     |
| <i>Spring 2010</i> | <i>Geometry of Curved Spaces, Differential Geometry</i> , University of Cambridge |
| <i>Fall 2010</i>   | <i>Hyperbolic Differential Equations</i> , CCA, University of Cambridge           |
| <i>Spring 2009</i> | <i>Linear Analysis, Linear Algebra, Analysis II</i> , University of Cambridge     |
| <i>Fall 2009</i>   | <i>Linear Analysis, Linear Algebra, Analysis II</i> , University of Cambridge     |
| <i>Spring 2008</i> | <i>Linear Analysis, Linear Algebra, Analysis II</i> , University of Cambridge     |

---

## UNDERGRADUATE SUPERVISION

|      |  |
|------|--|
| 2018 | Samantha Hergott (University of Toronto)                             |
| 2017 | Taylor Esch, Schinella D'Souza, Nikolai Meek (University of Toronto) |
| 2017 | Daerian Dilkumar, Vrund Vyas (University of Toronto)                 |
| 2016 | Efthymios Prappas (Princeton University)                             |
| 2014 | Jeffmin Lin (Princeton University)                                   |
| 2012 | Laurent Cote (Princeton University)                                  |

---

## MASTERS SUPERVISION

|      |                                       |
|------|---------------------------------------|
| 2017 | Eric Massoud (University of Toronto)  |
| 2017 | Ahmed Ellithy (University of Toronto) |

---

## SCHOLARSHIPS

|                  |   |
|------------------|---|
| <i>Fall 2012</i> | Visiting Scholar, Columbia University, New York           |
| <i>Fall 2012</i> | General Relativity & Analysis at Princeton (GRAP) Scholar |
| 2008–2012        | Bodossaki Scholarship, University of Cambridge, UK        |
| 2006–2007        | Vergiottis Scholarship, University of Cambridge, UK       |
| 2005–2007        | Vardinogiannis Scholarship, University of Patras, Greece  |
| 2004–2006        | IKY Scholarship, University of Patras, Greece             |

---

## JOURNAL REFEREE

*Annals of Mathematics, Annals of PDEs, Duke Journal, ARMA, Communications in Mathematical Physics, Classical and Quantum Gravity, Annales Henri Poincaré, International Mathematical Research Notices, Journal of EMS, Letters in Mathematical Physics*

## BOOK REVIEWER

*Springer*

## DISTINCTIONS

- Bronze medal (2003, 2004) in the International Mathematical Olympiad (IMO)
- Bronze medal (2002, 2003) in the Balkan Mathematical Olympiad (BMO)
- Bronze (2002), Silver (2003), Gold (2004) medal in the Mediterranean Mathematical Olympiad
- Gold medal in the Junior Balkan Mathematical Olympiad, Cyprus 2002