

## WILLIE WAI-YEUNG WONG

**Education**

- 2009 Ph.D. in Mathematics, Princeton University, Princeton, NJ  
*Dissertation advisor:* Sergiu Klainerman  
*Dissertation title:* On the uniqueness of Kerr–Newman black holes
- 2005 B.A. with High Honors in Mathematics, Princeton University, Princeton, NJ

**Professional history**

- 2022–present Associate Professor, Department of Mathematics  
Adjunct Associate Professor, Department of Physics and Astronomy  
Michigan State University, East Lansing, Michigan, USA
- 2023-2024 Visiting Assistant Professor, Mathematics Division  
National Center for Theoretical Sciences, Taipei, Taiwan
- 2015–2022 Assistant Professor, Department of Mathematics  
Michigan State University, East Lansing, Michigan, USA
- 2020–2022 Adjunct Assistant Professor, Department of Physics and Astronomy  
Michigan State University, East Lansing, Michigan, USA
- 2011–2015 Post-doc collaborateur scientifique  
École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland
- 2009–2011 Postdoctoral research associate  
DPMMS, University of Cambridge, Cambridge, United Kingdom

**Grants received**

- Simons Collaboration Grant (PI) (2018.09 - 2023.08) \$42,000  
Project title: “Geometric analysis of the long time behavior of evolution equations”
- MathWorks Academic Support (PI) (2018.08 - 2021.08) \$40,583  
Supports the development and assessment of calculus curricular material to incorporate  
Lab-based computer simulations to Calculus II instruction.

**Honors and awards**

- University Teacher-Scholar Award, 2021  
NatSci Teacher-Scholar Award, 2020  
NatSci Faculty Teaching Prize, 2018  
J.S. Frame Excellence in Teaching Award, 2017  
Phi Beta Kappa, inducted 2005  
US National Science Foundation Graduate Research Fellowship, 2005-2008  
International Physics Olympiad, Gold medal, 2001

**Preprints**

- [p19d] WWY Wong. “Dispersive estimates for Klein-Gordon equations via a physical space approach”.  
*Submitted* (2019) arXiv: 1909.05956.

**Refereed Research Articles**

- [p19e] L Abbrescia and WWY Wong. “Geometric analysis of 1 + 1 dimensional quasilinear wave equations”. *Math. Res. Letters* (2023) arXiv: 1912.04692.
- [p17a] WWY Wong. “Small data global existence and decay for two dimensional wave maps”. *Annales Henri Lebesgue (Accepted)* (2022) arXiv: 1712.07684.
- [20] A Rosevear, S Sottile, and WWY Wong. “Geodesic motion on  $SL(n)$  with the Hilbert-Schmidt metric”. *La Matematica* (2021) DOI: 10.1007/s44007-021-00002-x.
- [19] A Krause, R Maccombs, and WWY Wong. “Experiencing Calculus Through Computational Labs: Our Department’s Cultural Drift Toward Modernizing Mathematics Instruction”. *PRIMUS* 31:434–448 (2021) DOI: 10.1080/10511970.2020.1799457.
- [18] L Abbrescia and WWY Wong. “Global versions of Gagliardo-Nirenberg-Sobolev inequality and applications to wave and Klein-Gordon equations”. *Transactions of the Amer. Math. Soc.* 374:773–802 (2021).
- [17] L Abbrescia and WWY Wong. “Global nearly-plane-symmetric solutions to the membrane equation”. *Forum of Mathematics, Pi* 8:e13 (2020) DOI: 10.1017/fmp.2020.10.
- [16] WWY Wong. “Timelike minimal submanifolds of Minkowski spaces” in *Proceedings of the Seventh International Congress of Chinese Mathematicians. Vol. II*. Adv. Lect. Math. (ALM) 44:301–314 (2019).
- [15] WWY Wong. “A commuting-vector-field approach to some dispersive estimates”. *Archiv der Mathematik* 110:273–289 (2018).
- [14] X An and WWY Wong. “Warped Product Space-times”. *Class. Quantum Grav.* 35:025011 (2018).
- [13] WWY Wong. “Singularities of axially symmetric time-like minimal submanifolds in Minkowski space”. *J. Hyperbolic Diff. Eq.* 15:1–13 (2018).
- [12] WWY Wong. “Global Existence for the Minimal Surface Equation on  $\mathbb{R}^{1,1}$ ”. *Proc. Amer. Math. Soc., Ser. B* 4:47–52 (2017).
- [11] J Speck, G Holzegel, J Luk, and WWY Wong. “Stable Shock Formation for Nearly Simple Outgoing Plane Symmetric Waves”. *Annals of PDE* 2:10 (2016).
- [10] G Holzegel, S Klainerman, J Speck, and WWY Wong. “Shock Formation in Small-Data Solutions to 3D Quasilinear Wave Equations: An Overview”. *J. Hyperbolic Diff. Eq.* 13:1–105 (2016).
- [9] R Donninger, J Krieger, J Szeftel, and WWY Wong. “Codimension one stability of the catenoid under the vanishing mean curvature flow in Minkowski space”. *Duke Math Journal* 165:723–791 (2016).
- [8] J Krieger and WWY Wong. “On type I blow up formation for the critical NLW”. *Comm. PDE* 39:1718–1728 (2014).
- [7] WWY Wong and P Yu. “Non-existence of multiple-black-hole solutions close to Kerr–Newman”. *Comm. Math. Physics* 325:965–996 (2014).
- [6] WWY Wong. “A comment on the construction of the maximal globally hyperbolic Cauchy development”. *J. Math. Physics* 54:113511 (2013).
- [5] WWY Wong and P Yu. “On strong unique continuation of coupled Einstein metrics”. *Int. Math. Res. Notices* 2012:544–560 (2012).
- [4] WWY Wong. “Regular hyperbolicity, dominant energy condition and causality for Lagrangian theories of maps”. *Class. Quantum Grav.* 28:215008 (2011).
- [3] GW Gibbons, CM Warnick, and WWY Wong. “Nonexistence of Skymion–Skymion and Skymion–anti-Skymion static equilibria”. *J. Math. Phys.* 52:012905 (2011).
- [2] WWY Wong. “A space-time characterization of the Kerr–Newman metric”. *Ann. Henri Poincaré* 10:453–484 (2009).

- [1] MT Huang, WWY Wong, M Inokuti, SH Southworth, and L Young. "Triple ionization of Lithium by electron impact". *Phys. Rev. Lett.* 90:163201 (2003).

### Teaching experience

#### *Instructor*

Mini Course on "Mathematical General Relativity: Evolutionary and Causal Aspects"	Fall 2023
National Center for Theoretical Sciences, Taiwan	
MTH429H Honors Real Analysis / Michigan State University	Spring 2023
MTH327H Honors Intro to Analysis / Michigan State University	Fall 2022
MTH421 Analysis II / Michigan State University	Spring 2022
MTH849 PDE II / Michigan State University	Spring 2022
MTH320 Analysis I / Michigan State University	Fall 2021
MTH943 Hyperbolic and Dispersive Equations / Michigan State University	Spring 2021
MTH327H Honors Intro to Analysis / Michigan State University	Fall 2020
MTH320 Analysis I / Michigan State University	Fall 2020
MTH133 Calculus II / Michigan State University	Spring 2020
MTH943 Hyperbolic and Dispersive Equations / Michigan State University	Spring 2019
MTH133 Calculus II / Michigan State University	Spring 2019
MTH133 Calculus II / Michigan State University	Fall 2018
MTH890 Stability of Matter / Michigan State University	Summer 2018
MTH133 Calculus II / Michigan State University	Spring 2018
MTH847 PDE I / Michigan State University	Fall 2017
MTH133 Calculus II / Michigan State University	Fall 2017
MTH943 Hyperbolic and Dispersive Equations / Michigan State University	Spring 2017
MTH133 Calculus II / Michigan State University	Spring 2017
MTH133 Calculus II / Michigan State University	Fall 2016
MTH421 Analysis II / Michigan State University	Fall 2015
MTH299 Transitions / Michigan State University	Fall 2015
Mat202 Linear Algebra with Applications / Princeton University	Spring 2008

#### *Reading course supervisor*

MTH490 Intro to General Relativity / Michigan State University	Fall 2023
MTH890 Kinetic Theory and Boltzmann Equation / Michigan State University	Fall 2022
MTH890 Intro to Harmonic Analysis/ Michigan State University	Summer 2022
MTH890 Intro to Mathematical General Relativity / Michigan State University	Summer 2021
MTH990 Semi-Riemannian Geometry / Michigan State University	Spring 2020
MTH890 Topics in General Relativity / Michigan State University	Fall 2018
MTH890 Semi-Riemannian Geometry and Relativity / Michigan State University	Spring 2018
MTH890 Nonlinear Waves / Michigan State University	Fall 2016

#### *Guest Instructor*

Partial Differential Equations / CCA, University of Cambridge	October/November 2010
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#### *Teaching Assistant*

Géométrie (GC) / École Polytechnique Fédérale de Lausanne	Spring 2014
Mathématiques Générales / University of Lausanne	Fall 2013
Géométrie (EL/MX) / École Polytechnique Fédérale de Lausanne	Spring 2013
Mathématiques Générales / University of Lausanne	Fall 2012
Part II Differential Geometry / University of Cambridge	Lent term 2011
Mat451 Topics in Analysis: Introduction to General Relativity Princeton University	Spring 2009
Mat433 Special Topics in Analysis / Princeton University	Fall 2008
RTG Summer School in Analysis and Geometry / Princeton University	Summers 2007, 2008
Program in Analysis and General Relativity / Peking University, Beijing, China	April 2007

### Teaching Material Developed

Lecture Notes for “Honors Intro to Analysis”	2020
Available through AMS Open Math Notes, #OMN:202101.111283	
MATLAB LiveScript Labs for Calculus 2	2020
Available <a href="https://calc2labs.qnlw.info/">https://calc2labs.qnlw.info/</a>	
“An Introduction to Dispersive Equations”	2019
Available <a href="https://qnlw.info/course-notes/dispersive_notes/">https://qnlw.info/course-notes/dispersive_notes/</a>	

### Current PhD Students and PostDocs

Shih-Fang Yeh	PhD candidate 2018–present
Michael Brown	PhD candidate (Physics) 2022–present
Perry Kleinhenz	Department Postdoc 2021–present (Jointly advising with Gabor Francsics)
Michael McNulty	Department Postdoc 2022–present

### Past PhD Students and PostDocs

Leonardo Enrique Abbrescia	PhD student 2015–2020 Currently NSF PostDoc at Vanderbilt University
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### Other Graduate Mentorship

Khaldoun Al-Yasiri	Dissertation Committee Spring 2016
Xin Yang	Dissertation Committee Spring 2017
Wenchuan Tian	Comprehensive Exam & Dissertation Committees 2017–2021
Yao Li	First year academic advisor 2017–2018
Arman Tavakoli	Comprehensive Exam & Dissertation Committees 2018–2021
Andrew Krause	Dissertation Committee Fall 2018–2022
Yiding Ma, Lei Ding, Anson Zachariah	MTH844 (MSIM) Project Supervisor, Spring 2019
Zhixin Wang	Comprehensive Exam & Dissertation Committees Summer 2020–present
Aldo Garcia Guinto	Comprehensive Exam & Dissertation Committees 2022–present
Minh Le	Dissertation Committee Spring 2022–present
Edem Boahen	Comprehensive Exam Committee Spring 2023–present

**Undergraduate Research Mentorship**

Katrina Gensterblum (MSU)	Professorial Assistant Fall 2016–2018
Zhixin Wang (Xi'an Jiaotong)	Advanced Track Exchange Program Spring 2017
Nic Heilman (MSU)	Advanced Track Exchange Program Spring 2017
Zach Mccullough (MSU)	Advanced Track Exchange Program Spring 2017
Peikai Qi (Tianjin Nankai)	Advanced Track Exchange Program Fall 2017
Manuel Catacora Rios (MSU)	Independent Research 2018–2020
Audrey Rosevear (Amherst College)	SURIEM (REU) Summer 2020
Samuel Sottile (MSU)	SURIEM (REU) Summer 2020
Isidora Bailly-Hall (Grinnell College)	SURIEM (REU) Summer 2021
Zach Gauronski (SUNY Geneseo)	SURIEM (REU) Summer 2021

**Conferences organized**

- Special session on *Wave Phenomena in Fluids and Relativity* co-organizer, AMS Sectional Meeting #1150, Madison, Wisconsin. September 14–15, 2019. (with S. Shahshahani.)
- 76th Midwest Partial Differential Equations Seminar* co-organizer, East Lansing, Michigan. November 21–22, 2015. (with C. Sparber, K. Promislow, J. Schenker, R. Schwab, and J. Kitagawa.)
- Special session on the mathematical challenges of relativity* co-organizer, Joint Mathematics Meetings, San Francisco, California. January 13–16, 2010. (with P. Allen, M. Eichmair, G. Holzegel, and J. Speck)
- Mathematical challenges of general relativity* working group co-moderator, AMS Mathematical Research Communities program, Snowbird, Utah. June 13–19, 2009. (with G. Holzegel)

**Seminars organized**

- Analysis and PDE seminar*, Michigan State University, 2022–2023
- Analysis and PDE seminar* with J. Kitagawa, J. Schenker, R. Schwab, and A. Volberg, Michigan State University. 2015–2020
- Geometric analysis and PDE seminar*, University of Cambridge. 2010–2011
- Mathematical GR student seminar* with J. Speck and V. Schlue, University of Cambridge. 2009–2011
- PDE study group*, Princeton University. 2007–2009

**Service**

- Math Department Undergraduate Studies Committee. Fall 2022–2023
- University Committee on Academic Governance. Fall 2022–2023
- Math Department Seminar Speaker Fund Manager (Analysis/PDE/Dynamical Systems). 2021–2023
- Math Department Fixed-Term Instructor Hiring Committee, Chair. 2021–2022.
- Math Department Chair Search Committee, DEI advocate. 2021–2022.
- Math Department ad hoc committee on By-Law Revision, DEI officer. Fall 2021–Fall 2022.
- Faculty Senate. Fall 2020–Spring 2022.
- Math Department ad hoc committee on By-Law Revision. Spring 2020.
- College of Natural Science Strategic Planning Integration Committee. Spring 2020–Summer 2021.

MTH133 Course Supervisor. Spring 2020  
 Math Department ad hoc committee on instructional software. Spring 2018.  
 Frame Award committee. Spring 2018.  
 MTH133 Course supervisor (with M. Iwen). Spring 2018.  
 Faculty Advisor for the MSU Student Chapter of the American Mathematical Society. 2018–2023.  
 Supervisor (with J. Kitagawa) for the Student PDE Seminar at Michigan State University. 2017–2020.  
 Referee for *Acta Applicanda Mathematicae*, *AMS Contemporary Mathematics book series*, *Annales Henri Poincaré*, *Annals of PDE*, *Annals of Physics*, *Archive for Rational Mechanics and Analysis*, *Archiv der Mathematik*, *Calculus of Variations and Partial Differential Equations*, *Communications in Mathematical Physics*, *Differential and Integral Equations*, *Discrete and Continuous Dynamical System – A*, *Journal of Differential Geometry*, *Journal of Differential Equations*, *Journal of the European Mathematical Society*, *Journal of Functional Analysis*, *Journal of the LMS*, *Journal of Partial Differential Equations*, *Mathematica Scandinavica*, *Mathematical Research Letters*, *Notices of the American Mathematical Society*, *Proceedings of the American Mathematical Society*, *Proceedings of the Royal Society A*, *Selecta Mathematica*, and *Surveys in Differential Geometry*.  
 Regular contributor to *Mathematical Reviews/MathSciNet*.  
 Regular contributor to MathOverflow (<http://mathoverflow.net>).

### Professional organization

American Mathematical Society, 2005–present  
 International Consortium of Chinese Mathematicians, 2018–present  
 Society for Industrial and Applied Mathematics, 2018–present  
 National Association of Mathematicians, 2020–present  
 Sigma Xi, 2005–2020  
 American Association for the Advancement of Science, through the AAAS/Science Program for Excellence in Science, 2009–2011

### Invited research talks (funded)

*Joint Online Analysis and PDE Seminar*, Southern University of Science and Technology, Shenzhen, China; and The Chinese University of Hong Kong, Hong Kong. January 10, 2024.  
*Differential Geometry Seminar*, National Center for Theoretical Sciences, Taipei, Taiwan. November 30, 2023.  
*Mathematics Colloquium*, National Tsing Hua University, Hsinchu, Taiwan. November 20, 2023.  
*Invited Lecture at the 2022 International Conference on Geometric Analysis and Hyperbolic PDEs*, Guangxi University, Nanning, China. December 12, 2022.  
*Analysis and PDE Seminar*, University of Kentucky, Lexington, Kentucky, USA. May 25, 2022.  
*Invited Lecture at the 2021 International Conference on Geometric Analysis and Hyperbolic Equations*, Guangxi University, Nanning, China. December 8, 2021.  
*Lefschetz seminar*, Clark University, Worcester, Massachusetts, USA. November 12, 2021.  
*Differential Geometry Seminar*, University of California, Riverside, California, USA. February 5, 2021.  
*Invited Lecture at the International Conference on Geometric Analysis and Hyperbolic Equations*, Guangxi Center for Mathematical Research, Nanning, China. December 16–20, 2019.

- Invited Lecture at the second annual meeting of the International Consortium of Chinese Mathematicians*, National Taiwan University, Taipei, Taiwan. December 27–29, 2018.
- Analysis Seminar*, Vanderbilt University, Nashville, Tennessee, USA. November 30, 2018.
- Analysis and PDE Seminar*, University of Kentucky, Lexington, Kentucky, USA. October 16, 2018.
- Analysis seminar*, University of Rochester, Rochester, New York, USA. March 2, 2018.
- International Conference on Nonlinear Waves and General Relativity*, Chinese University of Hong Kong, Hong Kong, China. December 13–15, 2017.
- Colloquium*, Beijing International Center for Mathematical Research, Peking University, Beijing, China. July 28, 2017.
- Mini-course at the Yau Mathematical Sciences Center, Tsinghua University, Beijing, China. July 24–August 4, 2017.
- Analysis seminar*, Princeton University, Princeton, New Jersey, USA. April 3, 2017.
- Differential Equations seminar*, University of Michigan, Ann Arbor, Michigan, USA. February 9, 2017.
- Analysis and applied math seminar*, University of Toronto, Toronto, Canada. March 18, 2016.
- PDE seminar*, University of Minnesota, Minneapolis, Minnesota, USA. March 9, 2016.
- Mathematical General Relativity Conference*, Tsinghua Sanya International Mathematics Forum, Sanya, Hainan, China. January 5, 2016.
- Special day on the Mathematics of Relativity*, National Taiwan University and National Center for Theoretical Sciences, Taipei, Taiwan. December 28, 2015.
- Analysis seminar*, Princeton University, Princeton, New Jersey, USA. February 9, 2015.
- Christodoulou/Eichmair informal relativity seminar*, ETHZ, Zurich, Switzerland. November 13, 2014.
- Geometric analysis and PDE seminar*, University of Cambridge, Cambridge, United Kingdom. November 3, 2014.
- Mini-course for the *OXPDE Workshop on Nonlinear Wave Equations and General Relativity*, University of Oxford, Oxford, United Kingdom. January 13 & 14, 2014. (with G. Holzegel)
- OXPDE seminar*, University of Oxford, Oxford, United Kingdom. November 11, 2013
- Seminar as part of the *Mathematical General Relativity* semester program, MSRI, Berkeley, California, USA. September 5, 2013
- Geometry and analysis seminar*, Imperial College London, London, United Kingdom. March 21, 2013
- Gravitational physics seminar*, University of Vienna, Vienna, Austria. December 5, 2012
- Partial differential equations seminar*, EPFL, Lausanne, Switzerland. April 1, 2011
- Mathematical general relativity seminar*, LJLL, Université Pierre et Marie Curie, Paris, France. March 21, 2011
- Analysis seminar*, University of Birmingham, Birmingham, United Kingdom. March 2, 2011
- Analysis seminar*, University of Edinburgh, Edinburgh, United Kingdom. February 7, 2011
- Mathematical Relativity Workshop*, ICMS, Edinburgh, United Kingdom. September 2, 2010
- Relativity and cosmology seminar*, Queen Mary University of London, London, United Kingdom. May 12, 2010
- Relativity seminar*, University of Oxford, Oxford, United Kingdom. March 9, 2010

**Invited research talks (other)**

- Special session on *Differential Equation, Differential Geometry, and Mathematical General Relativity*, AMS Sectional Meeting #1153, University of California Riverside, Riverside, California, USA. November 9–10, 2019.
- Special session on *Analysis and Geometry of Nonlinear Evolution Equations*, Joint Mathematics Meeting, Baltimore, Maryland, USA. January 17, 2019.
- Special session on *Mathematical Problems of Relativistic Physics: Classical and Quantum*, AMS Sectional Meeting #1139, Northeastern University, Boston, Massachusetts, USA. April 21–22, 2018.
- Special session on *Evolution Equations and Applications*, AMS Sectional Meeting #1138, Vanderbilt University, Nashville, Tennessee, USA. April 14–15, 2018.
- Special session on *Recent Advances in Mathematical and Computational Aspects of Wave Propagation*, at the *AMMCS International Conference*, Waterloo, Ontario, Canada. August 20–25, 2017.
- International Congress of Chinese Mathematicians*, Beijing, China. August 6–11, 2016.
- International Conference on Evolution Equations (in conjunction with the 31st annual Shanks Lecture)*, Vanderbilt University, Nashville, Tennessee, USA. May 16–20, 2016.
- Special session on general relativity and related partial differential equations*, AMS Fall Southeastern Meeting, Florida Atlantic University, Boca Raton, Florida. October 30, 2009

**Other talks** (dagger denotes teaching and outreach presentations)

- †MSU Math Club, Michigan State University, East Lansing, Michigan, USA. April 18, 2023.
- †United States Physics Team, virtual. June 24, 2021.
- †MSU Math Club, Michigan State University, East Lansing, Michigan, USA. March 29, 2021.
- †*Conversation Among Colleagues*, Michigan State University, East Lansing, Michigan, USA. March 2, 2021.
- †*Co-Integrate* (series on math thinking and learning), CREATE for STEM and PRIME, Michigan State University, East Lansing, Michigan, USA. January 30, 2020.
- †TOPSUM, Michigan State University, East Lansing, Michigan, USA. February 15, 2019.
- †Presentation for *Alumni Distinguished Scholarship* days, Michigan State University, East Lansing, Michigan, USA. January 25 and February 1, 2019.
- †*Conversation Among Colleagues*, Michigan State University, East Lansing, Michigan, USA. April 16, 2018.
- †*Conversation Among Colleagues*, Michigan State University, East Lansing, Michigan, USA. February 20, 2017.
- †Presentation for *Alumni Distinguished Scholarship* days, Michigan State University, East Lansing, Michigan, USA. January 27 and February 3, 2017.
- †MSU STEM Education Alliance Meeting, Michigan State University, East Lansing, Michigan, USA. May 5, 2016.
- Analysis and PDE seminar*, Michigan State University, East Lansing, Michigan, USA. November 11, 2015.
- Job candidate talk*, Georgia Institute of Technology, Atlanta, Georgia, USA. February 10, 2015.
- Mathematics colloquium (job candidate talk)*, Michigan State University, East Lansing, Michigan, USA. January 20, 2015.
- Mathematics colloquium (job candidate talk)*, University of California Santa Barbara, Santa Barbara, California, USA. November 25, 2014.



*Analysis seminar*, EPFL, Lausanne, Switzerland. April 11, 2014.

*Mathematical physics seminar*, University of Cambridge, Cambridge, United Kingdom. February 1, 2011

*Geometric analysis and PDE seminar*, University of Cambridge, Cambridge, United Kingdom. November 29, 2010