# ROBERT M. STRAIN

Department of Mathematics
University of Pennsylvania
David Rittenhouse Laboratory
209 South 33rd Street
Philadelphia, PA 19104-6395

**CURRICULUM VITAE and BIBLIOGRAPHY**

⌂ http://www.math.upenn.edu/~strain/
✉ strain@math.upenn.edu
📞 Tel (215) 898-4828
📠 Fax (215) 573-4063
Office: DRL 3E5

## ACADEMIC POSITIONS

| | |
|---|---|
| Professor of Mathematics, University of Pennsylvania | 2014–present |
| Associate Professor (with tenure), University of Pennsylvania | 2011–2014 |
| Calabi Assistant Professor Chair, University of Pennsylvania | 2010–2011 |
| Assistant Professor (on leave 2008-2009), University of Pennsylvania | 2008–2011 |
| Assistant Professor, Princeton University | 2008–2009 |
| National Science Foundation Postdoctoral Fellow | 2006–2009 |
| Benjamin Peirce Assistant Professor, Harvard University | 2005–2008 |

## EDUCATION

Brown University, Division of Applied Mathematics, Providence, RI.
*PhD in Applied Mathematics* — May 2005
Thesis - "Some applications of an energy method in collisional Kinetic theory"

New York University, College of Arts and Science, Courant Institute, New York, NY.
*Bachelor of Arts*, Mathematics (*summa cum laude*) — May 2000

## ACADEMIC ADVISORS

| | |
|---|---|
| Yan Guo, Brown University, Division of Applied Mathematics, Graduate | 2001-2005 |
| Horng-Tzer Yau, Harvard University, Mathematics Department, Postdoctoral | 2005-2008 |

## ACADEMIC HONORS

| | |
|---|---|
| National Science Foundation (NSF) research grant (DMS-1764177), **PI** | 2018–2021 |
| NSF research grant (DMS-1500916), **Principal Investigator (PI)** | 2015–2019 |
| NSF research grant (DMS-1200747), **PI** | 2012–2016 |
| Congressman McNerney speech, US House of Representatives, spoke about my research with Gressmann on the Boltzmann equation | June 2013 |
| Alfred P. Sloan Foundation Research Fellowship | 2011–2013 |
| Good Teaching Award, Department of Mathematics, University of Pennsylvania | 2011 |
| NSF research grant (DMS-0901463), **PI** | 2009–2013 |
| NSF Mathematical Sciences Postdoctoral Research Fellowship | 2006-2009 |
| NSF Mathematical Sciences Postdoctoral Research Fellowship (declined) | 2005 |
| Brown University, Division of Applied Mathematics, **Sigma Xi Prize** | 2005 |
| Brown University, Professor R. Bruce Lindsay **Dissertation Fellowship** | 2004–2005 |
| New York University, College of Arts & Science **alumni association award** | 2000 |
| New York University, **Sidney Goldwater Roth Prize** | 2000 |
| New York University, **Morris Klein Award** | 2000 |

# RESEARCH INTERESTS

Partial differential equations, Fluid dynamics (incompressible Navier-Stokes equations, relativistic Euler system), Free boundary problems (Muskat problem), Gas dynamics (Boltzmann and Landau equations under Newtonian mechanics and special-relativity with non cut-off and cut-off collision kernels), Vlasov equations, Materials science, Mathematical Physics, Harmonic Analysis, and Numerical analysis.

# SELECTED INVITED RESEARCH PRESENTATIONS

| | |
|---|---:|
| Erwin Schrödinger International Institute, University of Vienna, Austria | Feb 2021 |
| Summer School on Kinetic and Fluid PDEs, Paris, France | June 2020 |
| Statistical Mechanics Conference, the 122nd, Rutgers University | December 2019 |
| La Quinta, California, SIAM Conference on Analysis of PDE | December 2019 |
| University of Wisconsin-Madison, workshop | September 2019 |
| CSCAMM, University of Maryland, College Park, workshop | September 2019 |
| Hausdorff research institute for mathematics, Bonn, Germany, workshop | June 2019 |
| Southern Methodist University, Dallas, Department of Mathematics, PDE seminar | January 2019 |
| CIRM, Marseille, France, workshop | December 2018 |
| University of Chicago, Applied Mathematics and PDE seminar | November 2018 |
| The University of Hong Kong, Department of Mathematics, colloquium | July 2018 |
| City University of Hong Kong, Department of Mathematics, colloquium | July 2018 |
| Tsinghua Sanya International Mathematics Forum, China, conference | June 2018 |
| Brown University, Walter Strauss' 80th birthday conference | May 2018 |
| Pennsylvania State University, Department of Mathematics, PDE seminar | April 2018 |
| Baltimore, MD, SIAM conference on Analysis of PDE | December 2017 |
| Fudan University, Shanghai, China, conference | November 2017 |
| University of Wisconsin-Madison, workshop | October 2017 |
| ICES, University of Texas at Austin, conference | May 2017 |
| ICERM, Brown University, Dynamics of Small Scales in Fluids | February 2017 |
| Atlanta, GA, Joint Mathematics Meetings, SIAM Minisymposium | January 2017 |
| University of Maryland, College Park, PDE-Applied Math Seminar | November 2016 |
| Haverford College, Department of Mathematics & Statistics, colloquium | October 2016 |
| IHES, France, three hour summer school mini-course | July 2016 |
| Buenos Aires, Argentina, X Americas Conference, plenary address | February 2015 |
| Temple University, Department of Mathematics, colloquium | October 2014 |
| Madrid, Spain, AIMS Conference | July 2014 |
| Institute for Advanced Study, seminar | March 2014 |
| Princeton University, Mathematics Department, Analysis seminar | March 2014 |
| University of Maryland, College Park, PDE/Applied Math seminar | November 2013 |
| Eastern sectional meeting of the AMS, Temple University, plenary address | October 2013 |
| Northwestern University, workshop in honor of Terence Tao | May 2012 |
| Brown University, Division of Applied Mathematics, colloquium | January 2012 |
| Mission Valley, California, SIAM Conference on Analysis of PDE | November 2011 |
| ICERM, Brown University, Providence, workshop | November 2011 |
| Massachusetts Institute of Technology, PDE/Analysis seminar | November 2011 |
| University of Pittsburgh, Mathematics Department, colloquium | October 2011 |

| | |
|---|---:|
| University of Michigan, Differential Equations seminar | September 2011 |
| Pohang University of Science and Technology, South Korea, three plenary lectures | June 2011 |
| University of California, San Diego, Southern California Analysis & PDE meeting | May 2011 |
| University of Wisconsin-Madison, FRG annual meeting in Kinetic Theory | May 2011 |
| University of Texas at Austin, Harrington Symposium | April 2011 |
| Oberwolfach, MFO, Germany | December 2010 |
| Instituto de Ciencias Matematicas, Madrid, Spain, three plenary lectures | October 2010 |
| Johns Hopkins University, Mathematics Department, seminar | October 2010 |
| Barcelona, Spain, Joint SIAM/RSME-SCM-SEMA Meeting | June 2010 |
| ENS Cachan, France, Seminaire du CMLA | May 2010 |
| Cambridge University, DPMMS, Geometric Analysis seminar | May 2010 |
| Brown University, Providence, FRG Workshop | May 2010 |
| University of Pennsylvania, Mathematics Department, invited colloquium | April 2010 |
| Rutgers University, Mathematics Department, Mathematical Physics Seminar | April 2010 |
| Princeton University, Mathematics Department, Analysis seminar | March 2010 |
| Miami, Florida, SIAM Conference on Analysis of PDE | December 2009 |
| Penn State, University Park, AMS Eastern Section Meeting | October 2009 |
| University of Maryland, College Park, PDE/Applied Math seminar | October 2009 |
| University of Victoria, Pacific Institute for the Mathematical Sciences, Canada | July 2009 |
| Banff International Research Station, workshop | June 2009 |
| Harvard University, workshop | May 2009 |
| University of Chicago, Calderon-Zygmund Seminar | May 2009 |
| Institute for Pure & Applied Mathematics, UCLA, workshop | April 2009 |
| Brown University, Partial Differential Equations Seminar | April 2009 |
| Princeton University, Analysis Seminar | March 2009 |
| Courant Institute, New York University, Analysis Seminar | March 2009 |
| Institute for Advanced Study, Mathematical Physics Seminar | March 2009 |
| Eidgenössische Technische Hochschule (ETH), Zürich, Switzerland | July 2008 |
| Bloomington, Indiana, Spring Central AMS Sectional Meeting | April 2008 |
| Carnegie Mellon University, Department of Mathematics, colloquium | January 2008 |
| University of Texas at Austin, Department of Mathematics, colloquium | January 2008 |
| Mesa, Arizona, SIAM Conference on Analysis of PDE | December 2007 |
| Institut Henri Poincaré, Paris, France | October 2007 |
| Courant Institute, New York University, Analysis Seminar | March 2007 |
| University of Minnesota, Partial Differential Equations Seminar | February 2007 |
| Brown University, Partial Differential Equations Seminar | February 2007 |
| Oberwolfach, MFO, Germany | December 2006 |
| Mathematisches Institut, Munich, Oberseminar Analysis | December 2006 |
| Boston University, Partial Differential Equations Seminar | April 2006 |
| Harvard University, Basic Notions Seminar | November 2005 |
| Stanford University, Summer Workshop on Kinetic Theory | July 2004 |
| Ecole Normale Supérieure de Cachan, France | July 2004 |
| Université Paul Sabatier Toulouse, France | February 2004 |
| Université de Nice Sophia-Antipolis, France | January 2004 |
| Rensselaer Polytechnic Institute, Applied Math Days conference | November 2003 |

# LECTURE VIDEOS

Global mild solutions of the Landau and non cutoff Boltzmann equation (Workshop on Effective equations: frontiers in classical and quantum systems, Hausdorff Research Institute for Mathematics (HIM), June 27, 2019) https://www.youtube.com/watch?v=A_LPylLl9uQ

On the Vlasov-Maxwell System in the Whole Space, Part 1 of 3 (Mini course, Nonlinear Waves 2016 Summer School, Institut des Hautes Etudes Scientifiques (IHES), July 25, 2016) https://www.youtube.com/watch?v=tnONtM6qQZQ

On the Vlasov-Maxwell System in the Whole Space, Part 2 of 3 (Mini course, Nonlinear Waves 2016 Summer School, Institut des Hautes Etudes Scientifiques (IHES), July 26, 2016) https://www.youtube.com/watch?v=iv1Lbut0mqA

On the Vlasov-Maxwell System in the Whole Space, Part 3 of 3 (Mini course, Nonlinear Waves 2016 Summer School, Institut des Hautes Etudes Scientifiques (IHES), July 27, 2016). Youtube link to the entire conference. https://www.youtube.com/watch?v=EychimnMBqs

On the Boltzmann equation without angular cut-off (Seminar talk, Institute for Advanced Study, March 18, 2014) https://www.youtube.com/watch?v=kPaDdk7E168

Global solutions to a non-local diffusion equation with quadratic non-linearity (Conference on Kinetic Theory and Related Fields, POSTECH, June 23, 2011) https://www.youtube.com/watch?v=f-eD-uXe0QY

On the Boltzmann Equation without Angular Cut-Off Part I of III (Conference on Kinetic Theory and Related Fields, POSTECH, June 20, 2011) https://www.youtube.com/watch?v=A2gbDHU8TEo

On the Boltzmann Equation without Angular Cut-Off Part II of III (Conference on Kinetic Theory and Related Fields, POSTECH, June 20, 2011) https://www.youtube.com/watch?v=p4_BfmJfqYQ

On the Boltzmann Equation, Part III of III: Optimal large-time decay rates (Conference on Kinetic Theory and Related Fields, POSTECH, June 21, 2011) https://www.youtube.com/watch?v=iw-Y5cdDiVI

# SELECTED OUTREACH

| | |
|---|---|
| Penn Summer Math Academy, advanced math course for high school students | July 2019 |
| Career day presentation at Meredith Elementary School, Philadelphia | March 2019 |
| Penn Summer Math Academy, advanced math course for high school students | July 2018 |
| Career day presentation at Meredith Elementary School, Philadelphia | March 2018 |
| Penn Summer Math Academy, advanced math course for high school students | July 2017 |
| University of Pennsylvania homecoming, discussion on the Boltzmann equation | October 2010 |
| Undergraduate research talk to the Philomathean Society | September 2010 |

# EDITORIAL BOARDS

Communications on Pure and Applied Analysis (CPAA), August 2011 - present.

# POSTDOCTORAL ADVISING

| | |
|---|---|
| Eduardo García-Juárez, Lecturer of Mathematics, University of Pennsylvania https://egarciajuarez.com | 2018–2021 |
| Zhenfu Wang, Lecturer of Mathematics, University of Pennsylvania https://www.math.upenn.edu/~zwang423/ | 2017–2020 |
| Maja Tasković, Lecturer of Mathematics, University of Pennsylvania https://www.math.emory.edu/people/faculty/individual.php?NUM=640 | 2016–2019 |
| Tak Kwong Wong, Lecturer of Mathematics, University of Pennsylvania https://hkumath.hku.hk/~takkwong/ | 2012–2016 |

Jonathan Luk, NSF Postdoctoral Fellow, University of Pennsylvania      2012–2013
https://web.stanford.edu/~jluk/

Vedran Sohinger, Simons Postdoctoral Fellow, University of Pennsylvania      2011–2014
https://warwick.ac.uk/fac/sci/maths/people/staff/vedran_sohinger/

Keya Zhu, Lecturer of Mathematics, University of Pennsylvania      2009–2012
http://www.math.zju.edu.cn:8080/teacherintroen.asp?userid=310

## DOCTORAL THESIS ADVISING

Esteban Paduro, University of Pennsylvania Ph.D student, 2017-present.
https://www.math.upenn.edu/people/esteban-paduro

Neel Patel, University of Pennsylvania, PhD      2017
Thesis: *Rigorous Results in Fluid and Kinetic Models.* (132 pages)
https://lsa.umich.edu/math/people/postdoc-faculty/neeljp.html

Jin Woo Jang, University of Pennsylvania, PhD      2016
Thesis: *Global classical solutions to the relativistic Boltzmann equation without angular cut-off.*
(135 pages)
https://cgp.ibs.re.kr/people/

Spencer Tofts, University of Pennsylvania, PhD      2016
Thesis: *On the Existence of Solutions to the Muskat Problem with Surface Tension.* (107 pages)
in https://www.linkedin.com/in/spencer-tofts-5a722672/

## REVIEWED (JOURNALS)

Advances in Mathematics, American Journal of Mathematics, Analysis & PDE, Annales de l'Institut Henri Poincaré, Annals of Mathematics, Annals of PDE, Annales scientifiques de l'École normale supérieure, Applied Mathematics Letters, Archive for Rational Mechanics and Analysis, Bulletin of the London Mathematical Society, Communications in Mathematical Physics, Communications in Mathematical Sciences, Communications in Partial Differential Equations, Communications on Pure and Applied Analysis, Communications on Pure and Applied Mathematics, Discrete and Continuous Dynamical Systems, Duke Mathematical Journal, International Math Research Notices, Inventiones Mathematicae, Journal de l'École polytechnique — Mathématiques (JEP), Journal de Mathématiques Pures et Appliquées, Journal of the American Mathematical Society, Journal of the European Mathematical Society, Journal of Statistical Physics, Journal of Functional Analysis, Journal of Differential Equations, Journal of Mathematical Physics, Mathematical Methods in the Applied Sciences, Mathematical Reviews, Mathematische Zeitschrift, Proc. Nat. Acad. Sci. U. S. A., Proceedings of the American Mathematical Society, Proceedings A of The Royal Society of Edinburgh, Pure and Applied Analysis, Revista de la Unión Matemática Argentina, Revista Matemática Iberoamericana, S.I.A.M. Journal on Mathematical Analysis, Transactions of the American Mathematical Society, and others.

## REVIEWED (GRANTS)

For the National Science Foundation (USA), for the ERC, for the Swiss National Science Foundation, for the Research Grants Council (RGC) of Hong Kong.

## PROFESSIONAL MEMBERSHIPS

American Mathematical Society (AMS)
Society for Industrial and Applied Mathematics (SIAM)

# BIBLIOGRAPHY

[**45**] Jin Woo Jang, Robert M. Strain, and Seok-Bae Yun, *Propagation of uniform upper bounds for the spatially homogeneous relativistic Boltzmann equation*, **preprint** (2019), 31 pages, http://arxiv.org/abs/1907.05784 ⌘.

[**44**] Renjun Duan, Shuangqian Liu, Shota Sakamoto, and Robert M. Strain, *Global mild solutions of the Landau and non-cutoff Boltzmann equations*, **preprint** (2019), 65, http://arxiv.org/abs/1904.12086 ⌘.

[**43**] Francisco Gancedo, Eduardo García-Juárez, Neel Patel, and Robert M. Strain, *Global regularity for gravity unstable Muskat bubbles*, **preprint** (2019), 1–29, http://arxiv.org/abs/1902.02318 ⌘.

[**42**] Francisco Gancedo, Eduardo García-Juárez, Neel Patel, and Robert M. Strain, *On the Muskat problem with viscosity jump: Global in time results*, Adv. Math. **345** (2019), 552–597, http://arxiv.org/abs/1710.11604 ⌘, http://dx.doi.org/10.1016/j.aim.2019.01.017 ⌘, Zbl 07021548, MR 3899970.

[**41**] Jian-Guo Liu and Robert M. Strain, *Global stability for solutions to the exponential PDE describing epitaxial growth*, Interfaces Free Bound. **21** (2019), no. 1, 61–86, http://arxiv.org/abs/1805.02246 ⌘, http://dx.doi.org/10.4171/IFB/417 ⌘, Zbl 07084773, MR 3951578.

[**40**] Robert M. Strain and Maja Tasković, *Entropy dissipation estimates for the relativistic Landau equation, and applications*, J. Funct. Anal. **277** (2019), no. 4, 1139–1201, http://arxiv.org/abs/1806.08720 ⌘, http://dx.doi.org/10.1016/j.jfa.2019.04.007 ⌘, Zbl 07066836, MR 3959729.

[**39**] Robert M. Strain and Zhenfu Wang, *Uniqueness of bounded solutions for the homogeneous relativistic Landau equation with Coulomb interactions*, Quart. Appl. Math. (2019), http://arxiv.org/abs/1903.05301 ⌘, http://dx.doi.org/10.1090/qam/1545 ⌘.

[**38**] Neel Patel and Robert M. Strain, *Large time decay estimates for the Muskat equation*, Comm. Partial Differential Equations **42** (2017), no. 6, 977–999, http://arxiv.org/abs/1610.05271 ⌘, http://dx.doi.org/10.1080/03605302.2017.1321661 ⌘, Zbl 1378.35245, MR 3683311.

[**37**] Peter Constantin, Diego Córdoba, Francisco Gancedo, Luis Rodríguez-Piazza, and Robert M. Strain, *On the Muskat problem: global in time results in 2D and 3D*, Amer. J. Math. **138** (2016), no. 6, 1455–1494, http://arxiv.org/abs/1310.0953 ⌘, http://dx.doi.org/10.1353/ajm.2016.0044 ⌘, Zbl 1369.35053, MR 3595492.

[**36**] Jonathan Luk and Robert M. Strain, *Strichartz estimates and moment bounds for the relativistic Vlasov-Maxwell system*, Arch. Ration. Mech. Anal. **219** (2016), no. 1, 445–552, Paper combined from https://arxiv.org/abs/1406.0168 and https://arxiv.org/abs/1406.0169, http://dx.doi.org/10.1007/s00205-015-0899-1 ⌘, Zbl 1337.35150, MR 3437855.

[**35**] Robert M. Strain and Tak Kwong Wong, *Axisymmetric flow of ideal fluid moving in a narrow domain: a study of the axisymmetric hydrostatic Euler equations*, J. Differential Equations **260** (2016), no. 5, 4619–4656, http://arxiv.org/abs/1505.06281 ⌘, http://dx.doi.org/10.1016/j.jde.2015.11.023 ⌘, Zbl 1333.35170, MR 3437599.

[**34**] Francisco Gancedo and Robert M. Strain, *Absence of splash singularities for surface quasi-geostrophic sharp fronts and the Muskat problem*, Proc. Natl. Acad. Sci. USA **111** (2014), no. 2, 635–639, http://arxiv.org/abs/1309.4023 ⌘, http://dx.doi.org/10.1073/pnas.1320554111 ⌘, Zbl 1355.76065, MR 3181769.

[33] Jonathan Luk and Robert M. Strain, *A new continuation criterion for the relativistic Vlasov-Maxwell system*, Comm. Math. Phys. **331** (2014), no. 3, 1005–1027, http://arxiv.org/abs/1406.0165 ⬚, http://dx.doi.org/10.1007/s00220-014-2108-8 ⓓ, Zbl 1309.35174, MR 3248056.

[32] Vedran Sohinger and Robert M. Strain, *The Boltzmann equation, Besov spaces, and optimal time decay rates in* $\mathbb{R}^n_x$, Adv. Math. **261** (2014), 274–332, http://arxiv.org/abs/1206.0027 ⬚, http://dx.doi.org/10.1016/j.aim.2014.04.012 ⓓ, Zbl 1293.35195, MR 3213301.

[31] Robert M. Strain and Seok-Bae Yun, *Spatially homogeneous Boltzmann equation for relativistic particles*, SIAM J. Math. Anal. **46** (2014), no. 1, 917–938, https://www.math.upenn.edu/~strain/preprints/92353.pdf ⬚, http://dx.doi.org/10.1137/130923531 ⓓ, Zbl 1321.35127, MR 3166961.

[30] Peter Constantin, Diego Córdoba, Francisco Gancedo, and Robert M. Strain, *On the global existence for the Muskat problem*, J. Eur. Math. Soc. (JEMS) **15** (2013), no. 1, 201–227, http://arxiv.org/abs/1007.3744 ⬚, http://dx.doi.org/10.4171/JEMS/360 ⓓ, Zbl 1258.35002, MR 2998834.

[29] Seung-Yeal Ha, Eunhee Jeong, and Robert M. Strain, *Uniform* $L^1$-*stability of the relativistic Boltzmann equation near vacuum*, Commun. Pure Appl. Anal. **12** (2013), no. 2, 1141–1161, https://www.math.upenn.edu/~strain/preprints/cpaa0494.pdf ⬚, http://dx.doi.org/10.3934/cpaa.2013.12.1141 ⓓ, Zbl 1267.35162, MR 2982812.

[28] Robert M. Strain and Keya Zhu, *The Vlasov-Poisson-Landau system in* $\mathbb{R}^3_x$, Arch. Ration. Mech. Anal. **210** (2013), no. 2, 615–671, http://arxiv.org/abs/1202.2471 ⬚, http://dx.doi.org/10.1007/s00205-013-0658-0 ⓓ, Zbl 1294.35168, MR 3101794.

[27] Hongjie Dong and Robert M. Strain, *On partial regularity of steady-state solutions to the 6D Navier-Stokes equations*, Indiana Univ. Math. J. **61** (2012), no. 6, 2211–2229, http://arxiv.org/abs/1101.5580 ⬚, http://dx.doi.org/10.1512/iumj.2012.61.4765 ⓓ, Zbl 1286.35193, MR 3129108.

[26] Renjun Duan and Robert M. Strain, *On the Full Dissipative Property of the Vlasov-Poisson-Boltzmann System*, Hyperbolic problems—theory, numerics and applications. Volume 2 (Tatsien Li and Song Jiang, eds.), Ser. Contemp. Appl. Math. CAM, vol. 17, World Scientific Publishing and Higher Education Press, Singapore, 2012, pp. 398–405, https://www.math.upenn.edu/~strain/preprints/2012DuanStrainHype.pdf ⬚, http://dx.doi.org/10/c74v ⓓ, Zbl 1293.35339, MR 3050180.

[25] Philip T. Gressman, Joachim Krieger, and Robert M. Strain, *A non-local inequality and global existence*, Adv. Math. **230** (2012), no. 2, 642–648, http://arxiv.org/abs/1202.4088 ⬚, http://dx.doi.org/10.1016/j.aim.2012.02.017 ⓓ, Zbl 1248.35005, MR 2914961.

[24] Yan Guo and Robert M. Strain, *Momentum regularity and stability of the relativistic Vlasov-Maxwell-Boltzmann system*, Comm. Math. Phys. **310** (2012), no. 3, 649–673, http://arxiv.org/abs/1012.1158 ⬚, http://dx.doi.org/10.1007/s00220-012-1417-z ⓓ, Zbl 1245.35130, MR 2891870.

[23] Joachim Krieger and Robert M. Strain, *Global solutions to a non-local diffusion equation with quadratic non-linearity*, Comm. Partial Differential Equations **37** (2012), no. 4, 647–689, http://arxiv.org/abs/1012.2890 ⬚, http://dx.doi.org/10.1080/03605302.2011.643437 ⓓ, Zbl 1247.35087, MR 2901061.

[22] Robert M. Strain, *Optimal time decay of the non cut-off Boltzmann equation in the whole space*, Kinet. Relat. Models **5** (2012), no. 3, 583–613, http://arxiv.org/abs/1011.5561 ⬚, http://dx.doi.org/10.3934/krm.2012.5.583 ⓓ, Zbl 1383.76414, MR 2972454.

[21] Robert M. Strain and Keya Zhu, *Large-time decay of the soft potential relativistic Boltzmann equation in* $\mathbb{R}^3_x$, Kinet. Relat. Models **5** (2012), no. 2, 383–415, http://arxiv.org/abs/1106.1579 ⬚, http://dx.doi.org/10.3934/krm.2012.5.383 ⓓ, Zbl 1247.76071, MR 2911100.

[20] Renjun Duan and Robert M. Strain, *Optimal large-time behavior of the Vlasov-Maxwell-Boltzmann system in the whole space*, Comm. Pure Appl. Math. **64** (2011), no. 11, 1497–1546, http://arxiv.org/abs/1006.3605 🔢, http://dx.doi.org/10.1002/cpa.20381 ⓓ, Zbl 1244.35010, MR 2832167.

[19] Renjun Duan and Robert M. Strain, *Optimal time decay of the Vlasov-Poisson-Boltzmann system in $\mathbb{R}^3$*, Arch. Ration. Mech. Anal. **199** (2011), no. 1, 291–328, http://arxiv.org/abs/0912.1742 🔢, http://dx.doi.org/10.1007/s00205-010-0318-6 ⓓ, Zbl 1232.35169, MR 2754344.

[18] Philip T. Gressman and Robert M. Strain, *Global classical solutions of the Boltzmann equation without angular cut-off*, J. Amer. Math. Soc. **24** (2011), no. 3, 771–847, http://arxiv.org/abs/1011.5441 🔢, http://dx.doi.org/10.1090/S0894-0347-2011-00697-8 ⓓ, Zbl 1248.35140, MR 2784329.

[17] Philip T. Gressman and Robert M. Strain, *Sharp anisotropic estimates for the Boltzmann collision operator and its entropy production*, Adv. Math. **227** (2011), no. 6, 2349–2384, http://arxiv.org/abs/1007.1276 🔢, http://dx.doi.org/10.1016/j.aim.2011.05.005 ⓓ, Zbl 1234.35173, MR 2807092.

[16] Jared Speck and Robert M. Strain, *Hilbert expansion from the Boltzmann equation to relativistic fluids*, Comm. Math. Phys. **304** (2011), no. 1, 229–280, http://arxiv.org/abs/1009.5033 🔢, http://dx.doi.org/10.1007/s00220-011-1207-z ⓓ, Zbl 1221.35271, MR 2793935.

[15] Robert M. Strain, *Coordinates in the relativistic Boltzmann theory*, Kinet. Relat. Models **4** (2011), no. 1, 345–359, http://arxiv.org/abs/1011.5093 🔢, http://dx.doi.org/10.3934/krm.2011.4.345 ⓓ, Zbl 05869610, MR 2765751.

[14] Philip T. Gressman and Robert M. Strain, *Global classical solutions of the Boltzmann equation with long-range interactions*, Proc. Natl. Acad. Sci. USA **107** (2010), no. 13, 5744–5749, https://www.math.upenn.edu/~strain/preprints/gsPNAS2010.pdf ↗, http://dx.doi.org/10.1073/pnas.1001185107 ⓓ, Zbl 1205.82120, MR 2629879.

[13] Robert M. Strain, *Around the Boltzmann equation without angular cut-off*, Oberwolfach Rep. **7** (2010), no. 4, 3159–3236 (English), https://www.math.upenn.edu/~strain/preprints/rms2010ow.pdf ↗, http://dx.doi.org/10.4171/owr/2010/54 ⓓ, Zbl 1235.00027.

[12] Robert M. Strain, *Asymptotic stability of the relativistic Boltzmann equation for the soft potentials*, Comm. Math. Phys. **300** (2010), no. 2, 529–597, http://arxiv.org/abs/1003.4893 🔢, http://dx.doi.org/10.1007/s00220-010-1129-1 ⓓ, Zbl 1214.35072, MR 2728733.

[11] Robert M. Strain, *Global Newtonian limit for the relativistic Boltzmann equation near vacuum*, SIAM J. Math. Anal. **42** (2010), no. 4, 1568–1601, http://arxiv.org/abs/1004.5407 🔢, http://dx.doi.org/10.1137/090762695 ⓓ, Zbl 05894999, MR 2679588.

[10] Chiun-Chuan Chen, Robert M. Strain, Tai-Peng Tsai, and Horng-Tzer Yau, *Lower bounds on the blow-up rate of the axisymmetric Navier-Stokes equations. II*, Comm. Partial Differential Equations **34** (2009), no. 1-3, 203–232, http://arxiv.org/abs/0709.4230 🔢, http://dx.doi.org/10.1080/03605300902793956 ⓓ, Zbl 1173.35095, MR 2512859.

[9] Chiun-Chuan Chen, Robert M. Strain, Horng-Tzer Yau, and Tai-Peng Tsai, *Lower bound on the blow-up rate of the axisymmetric Navier-Stokes equations*, Int. Math. Res. Not. IMRN (2008), no. 9, Art. ID rnn016, 31, http://arxiv.org/abs/math/0701796 🔢, http://dx.doi.org/10.1093/imrn/rnn016 ⓓ, Zbl 1154.35068, MR 2429247.

[8] Robert M. Strain and Yan Guo, *Exponential decay for soft potentials near Maxwellian*, Arch. Ration. Mech. Anal. **187** (2008), no. 2, 287–339, https://www.math.upenn.edu/~strain/preprints/2005SGed.pdf ↗, http://dx.doi.org/10.1007/s00205-007-0067-3 ⓓ, Zbl 1130.76069, MR 2366140.

[7] Clément Mouhot and Robert M. Strain, *Spectral gap and coercivity estimates for linearized Boltzmann collision operators without angular cutoff*, J. Math. Pures Appl. (9) **87** (2007), no. 5, 515–535, http://arxiv.org/abs/math/0607495 , http://dx.doi.org/10.1016/j.matpur.2007.03.003 , Zbl 1388.76338, MR 2322149.

[6] Robert M. Strain, *On the linearized Balescu-Lenard equation*, Comm. Partial Differential Equations **32** (2007), no. 10-12, 1551–1586, http://arxiv.org/abs/math/0603490 , http://dx.doi.org/10.1080/03605300601088609 , Zbl 1128.76068, MR 2372479.

[5] Robert M. Strain, *Recent results on existence, uniqueness and asymptotic decay rates for collisional kinetic models*, Oberwolfach Rep. **3** (2006), no. 4, 3189–3258 (English), https://www.math.upenn.edu/~strain/preprints/rms2006ow.pdf , http://dx.doi.org/10.4171/owr/2006/54 , Zbl 1177.82057.

[4] Robert M. Strain, *The Vlasov-Maxwell-Boltzmann system in the whole space*, Comm. Math. Phys. **268** (2006), no. 2, 543–567, http://arxiv.org/abs/math/0512002 , http://dx.doi.org/10.1007/s00220-006-0109-y , Zbl 1129.35022, MR 2259206.

[3] Robert M. Strain and Yan Guo, *Almost exponential decay near Maxwellian*, Comm. Partial Differential Equations **31** (2006), no. 1-3, 417–429, https://www.math.upenn.edu/~strain/preprints/2005SGaed.pdf , http://dx.doi.org/10.1080/03605300500361545 , Zbl 1096.82010, MR 2209761.

[2] Robert M. Strain, *Some applications of an energy method in collisional Kinetic theory*, Ph.D. thesis, Brown University, 2005, (ProQuest Document ID 305028444), pp. 1–200, https://www.math.upenn.edu/~strain/preprints/2005PHDthesisS.pdf , MR 2707256.

[1] Robert M. Strain and Yan Guo, *Stability of the relativistic Maxwellian in a collisional plasma*, Comm. Math. Phys. **251** (2004), no. 2, 263–320, https://www.math.upenn.edu/~strain/preprints/2004SG.pdf , http://dx.doi.org/10.1007/s00220-004-1151-2 , Zbl 1113.82070, MR 2100057.

## COURSES TAUGHT

**University of Pennsylvania, Department of Mathematics:**

| | |
|---|---|
| ○ Mathematics 645. Partial Differential Equations II. **Scheduled** | Spring 2020 |
| ○ Mathematics/AMCS 609. Graduate Analysis II. **Scheduled** | Spring 2020 |
| ○ Mathematics/AMCS 608. Graduate Analysis I. | Fall 2019 |
| ○ Mathematics/AMCS 609. Graduate Analysis II. | Spring 2019 |
| ○ Mathematics/AMCS 608. Graduate Analysis I. | Fall 2018 |
| ○ Mathematics 114. Calculus 2. | Fall 2018 |
| ○ Mathematics 645. Partial Differential Equations II. | Spring 2018 |
| ○ Mathematics/AMCS 609. Graduate Analysis II. | Spring 2017 |
| ○ Mathematics/AMCS 608. Graduate Analysis I. | Fall 2016 |
| ○ Mathematics/AMCS 609. Graduate Analysis II. | Spring 2016 |
| ○ Mathematics/AMCS 608. Graduate Analysis I. | Fall 2015 |
| ○ Mathematics 104. Calculus 1 (in-class Active learning). | Spring 2015 |
| ○ Mathematics 410. Complex Analysis. | Fall 2014 |
| ○ Mathematics 312. Linear Algebra. | Fall 2014 |
| ○ Mathematics 645. Partial Differential Equations II. | Spring 2014 |
| ○ Mathematics 644. Partial Differential Equations I. | Fall 2013 |
| ○ Mathematics 320. Computer Methods in Mathematical Science I. | Fall 2013 |
| ○ Mathematics 645. Partial Differential Equations II. | Spring 2013 |

- Mathematics 644. Partial Differential Equations I.                              Fall 2012
- Mathematics 645. Partial Differential Equations II.                           Spring 2012
- Mathematics 530. Mathematics of Finance.                                     Spring 2012
- Mathematics 509. Advanced Analysis.                                          Spring 2011
- Mathematics 420. Ordinary Differential Equations.                            Spring 2011
- Mathematics 202. Proving Things: Analysis.                                      Fall 2010
- Mathematics 114. Calculus 2.                                                 Spring 2010
- Mathematics 608. Real Analysis.                                                 Fall 2009
- Mathematics 104. Calculus 1.                                                    Fall 2009

**Princeton University, Department of Mathematics:**
- Mathematics 204. Advanced Linear Algebra with Applications.                  Spring 2009
- Mathematics 103. Calculus.                                                      Fall 2008
- Mathematics 103. Calculus.                                                      Fall 2008

**Harvard University, Department of Mathematics:**
- Mathematics 113. Complex Analysis.                                           Spring 2008
- Mathematics 1b. Calculus, Series, and Differential Equations.                   Fall 2007
- Mathematics 1b. Calculus, Series, and Differential Equations.                Spring 2006
- Mathematics 112. Real Analysis.                                             Spring 2006
- Mathematics 119. Partial Differential Equations and Applications.              Fall 2005

**Brown University, Division of Applied Mathematics:**
- Applied Mathematics 33: Methods of Applied Mathematics I.                    Spring 2003

# OTHER TEACHING ACTIVITIES

**University of Pennsylvania, Department of Mathematics:**
- Invited core participant and member: Center for Teaching and Learning University wide Teaching Science Seminar for 2019-20.
- Invited core participant and member: Center for Teaching and Learning University wide Inclusive Teaching Seminar for 2018-19.
- Invited core participant and member: Center for Teaching and Learning University wide Teaching Science Seminar for 2016-17.
- Invited core participant and member: Center for Teaching and Learning University wide SAIL (Structured, Active, In-class Learning) Seminar for 2014-15.
- Invited core participant and member: Center for Teaching and Learning University wide SAIL (Structured, Active, In-class Learning) Seminar for 2013-14.
- Invited core participant and member: Center for Teaching and Learning University wide Teaching Science Seminar for 2012-13.
- Invited core participant and member: Center for Teaching and Learning University wide Teaching Large Lectures seminar for 2010-11.

**Harvard University, Department of Mathematics:**
- Participant: "Winter Teaching Conference", a teaching conference organized by the Derek Bok Center for Teaching and Learning. January 30, 2007.
- Workshop participant: "Public speaking as Performing Art" with Nancy Houfek, March 8, 15, and 22, 2006. At the Derek Bok Center for Teaching and Learning.

**Brown University, Division of Applied Mathematics:**
- Graduate Liaison to the Sheridan Center for Teaching and Learning, 2001 - 2002.
- Discussion Leader at Sheridan Center Teaching Certificate Workshops
(November 12, 2001; February 4, 2002; March 4, 2002).
11/12/01 - Cognition and Teaching; 2/4/2002 - Assessment and Evaluation: Mechanisms for

Effective Teaching; 3/4/02 - Persuasive Communication.

- ○ Organizer: Sheridan Center sponsored Micro-Teaching Session, March 7, 2002.
- ○ Sheridan Center Teaching Certificate, 2002.
  *Received certificate after completing requirements which include participation in the Sheridan Teaching Seminar and related workshops, a departmental micro-teaching session, and an individual teaching consultation.*

## LINKS

University Homepage: ⌂ https://www.math.upenn.edu/~strain/

ArXiv paper listing: ⚛ https://arxiv.org/a/0000-0002-1107-8570 (contains most preprints)

MathSciNet author listing:
↗ https://www.ams.org/mathscinet/search/author.html?mrauthid=746810 (subscription required)

zbMATH author listing: ↗ https://zbmath.org/authors/?q=ai:strain.robert-m
(subscription required for full access)

Google Scholar: 🎓 https://scholar.google.com/citations?user=yEffwdEAAAAJ

ORCID ID: ⓘ https://orcid.org/0000-0002-1107-8570