

Yong Gao

CONTACT INFORMATION

k102, Kavli Institute for Astronomy and Astrophysics
Peking University, Yiheyuan Rd. 5, Haidian District
Beijing 100871, China

email: gaoyong.physics@pku.edu.cn
personal website: [gravyong.github.io](https://github.com/gravyong)
academic records: [ORCID](#)

EDUCATION

Ph.D. candidate, Physics, Peking University, Beijing, China **August 2018-Present**

Dissertation Advisor: Prof. Lijing Shao

Dissertation Title: *Probing Structures of Neutron Stars with Gravitational Waves*

B.S., Physics, Dalian University of Technology, Dalian, Liaoning Province, China **July 2018**

Degree conferred with honor.

Senior Thesis Advisors: Prof. Renxin Xu and Prof. Chong Li

Thesis Title: *The Electron Distributions of Strangelets in the Thomas-Fermi Model*

RESEARCH INTERESTS

Understanding the composition and state of matter under the extreme conditions inside neutron stars (NSs). One major theme is modelling gravitational waves (GWs) from systems involving NSs, such as tidal effects in the inspiral phase of binary NS systems, GW asteroseismology of oscillating NSs. A second major theme is studying the dynamics and observational consequences of freely precessing NSs.

Testing gravity in the strong-field regime of NSs. Focusing on the properties of rotating, tidally-deformed, and oscillating NSs in alternative theories of gravity.

HONORS AND AWARDS

Principal Scholarship, Peking University **2022-2023**

Tung Scholarship, Peking University **2021-2022**

Merit Student, Peking University **2021-2022**

The Second Prize for Oral Presentation, Physics Five Universities **April 2021**

Vela Prize for Oral Presentation, FAST/Future Pulsar Symposium 9 (FPS9) **August 2020**

National Scholarship, Peking University **2019-2020**

Merit Student, Peking University **2019-2020**

Excellent Teaching Assistant Award, Peking University **2019-2020**

Principal Scholarship, Peking University **2018-2019**

Learning Excellence Award (First Prize), Dalian University of Technology **2015-2016**

National Encouragement Scholarship, Dalian University of Technology **2015-2016**

National Encouragement Scholarship, Dalian University of Technology **2014-2015**

TEACHING
EXPERIENCE**Teaching Assistant**, Peking University

Electrodynamics (B)	Fall 2022
General Physics I , *incl. Mechanics & Electromagnetism	Fall 2021
Theoretical Mechanics (A) , Excellent Teaching Assistant Award	Fall 2019

PROFESSIONAL
ACTIVITIES,
OUTREACH, AND
SERVICE**KAGRA Collaboration**

Member of Compact Binaries Coalescence (CBC) Group	2018–Present
Member of KAGRA Future Strategy Committee (FSC)	2021–Present

Chair of conference session/group meeting

KAGRA Future Working Group 1st Open Meeting , Remote	November 2021
Chair of the group meeting, KIAAGRAVITY	2020–2021

Journal referee

Classical and Quantum Gravity (CQG)	2021–Present
Research in Astronomy and Astrophysics (RAA)	2021–Present
Science China Physics, Mechanics & Astronomy (SCPMA)	2021–Present

Participated Grants

Gravitational Waves

COMPUTER SKILLS

Proficient in MATHEMATICA, Python, and Matlab. Experience in C, Bash, and HPC.
Markup languages: \LaTeX , Markdown.

Code development— Most contributions can be found at <https://github.com/GravYong>.

SUBMITTED
PUBLICATIONS

51. Bronicki, D., Cárdenas-Avendaño, A., **Stein, L. C.**, (2022) *Tidally-induced nonlinear resonances in EMRIs with an analogue model*, [[arXiv:2203.08841](#)].
50. Tanay, S., Cho, G., **Stein, L. C.**, (2021) *Action-angle variables of a binary black-hole with arbitrary eccentricity, spins, and masses at 1.5 post-Newtonian order*, [[arXiv:2110.15351](#)].
49. Okounkova, M, Farr, W. M., Isi, M., **Stein, L. C.**, (2021) *Constraining gravitational wave amplitude birefringence and Chern-Simons gravity with GWTC-2*, [[arXiv:2101.11153](#)].

ACCEPTED
PUBLICATIONS

48. Clark, W. A., Gomes, M. W., Rodriguez-Gonzalez, A., **Stein, L. C.**, Strogatz, S. H., (2021) *Surprises in a classic boundary-layer problem*, [[arXiv:2107.11624](#)].

COLLABORATION
PUBLICATIONS

From 2008–2012, I was coauthor on 34 refereed LIGO and/or LIGO/Virgo collaboration publications. I only list short author-list publications below.

REFEREED
PUBLICATIONS

47. Magaña Zertuche, L., Mitman, K., Khera, N., **Stein, L. C.**, et al., (2022) *High Precision Ring-down Modeling: Multimode Fits and BMS Frames*, **Phys. Rev. D** **105**, 104015 [[arXiv:2110.15922](#)].
46. Gálvez Gherzi, J. T., **Stein, L. C.**, (2021) *Numerical renormalization group-based approach to secular perturbation theory*, **Phys. Rev. E** **104**, 034219 [[arXiv:2106.08410](#)].
45. Mitman, K., Khera, N., Izzo, D. A. B., **Stein, L. C.**, et al., (2021) *Fixing the BMS frame of numerical relativity waveforms*, **Phys. Rev. D** **104**, 024051 [[arXiv:2105.02300](#)].

44. Iozzo, D. A. B., Khera, N., **Stein, L. C.**, et al., (2021) *Comparing Remnant Properties from Horizon Data and Asymptotic Data in Numerical Relativity*, *Phys. Rev. D* **103**, 124029 [[arXiv:2104.07052](#)].
43. Tahura, S., Nichols, D. A., Saffer, A., **Stein, L. C.**, Yagi, K. (2020) *Brans-Dicke theory in Bondi-Sachs form: Asymptotically flat solutions, asymptotic symmetries and gravitational-wave memory effects*, *Phys. Rev. D* **103**, 104026 [[arXiv:2007.13799](#)].
42. Tanay, S., **Stein, L. C.**, Gálvez Gherzi, J. T., (2020) *Integrability of eccentric, spinning black hole binaries up to second post-Newtonian order*, *Phys. Rev. D* **103**, 064066 [[arXiv:2012.06586](#)].
41. Gálvez Gherzi, J. T., **Stein, L. C.**, (2020) *A fixed point for black hole distributions*, *Class. Quantum Grav.* **38** 045012 [[arXiv:2007.11578](#)].
40. Okounkova, M., **Stein, L. C.**, Moxon, J., Scheel, M. A., Teukolsky, S. A., (2020) *Numerical relativity simulation of GW150914 beyond general relativity*, *Phys. Rev. D* **101**, 104016 [[arXiv:1911.02588](#)].
39. **Stein, L. C.**, Warburton, N., (2020) *Location of the last stable orbit in Kerr spacetime*, *Phys. Rev. D* **101**, 064007 [[arXiv:1912.07609](#)].
38. Okounkova, M., **Stein, L. C.**, Scheel, M. A., Teukolsky, S. A., (2019) *Numerical binary black hole collisions in dynamical Chern-Simons gravity*, *Phys. Rev. D* **100**, 104026 [[arXiv:1906.08789](#)].
37. Varma, V., et al. (2019) *Surrogate models for precessing binary black hole simulations with unequal masses*, *Phys. Rev. Research* **1**, 033015 [[arXiv:1905.09300](#)].
36. **Stein, L. C.**, (2019) *qnm: A Python package for calculating Kerr quasinormal modes, separation constants, and spherical-spheroidal mixing coefficients*, *J. Open Source Softw.*, **4**(42), 1683 [[arXiv:1908.10377](#)].
35. Boyle, M., et al. (**LCS** is corresponding author) (2019) *The SXS Collaboration catalog of binary black hole simulations*, *Class. Quantum Grav.* **36** 195006 [[arXiv:1904.04831](#)].
34. Barack, L., et al. (2019) *Black holes, gravitational waves and fundamental physics: a roadmap*, *Class. Quantum Grav.* **36** 143001 [[arXiv:1806.05195](#)].
33. Varma, V., **Stein, L. C.**, Gerosa, D., (2019) *The binary black hole explorer: on-the-fly visualizations of precessing binary black holes*, *Class. Quantum Grav.* **36** 095007 [[arXiv:1811.06552](#)], [[project website](#)].
32. Varma, V., Gerosa, D., **Stein, L. C.**, Hébert, F., Zhang, H., (2019) *High-accuracy mass, spin, and recoil predictions of generic black-hole merger remnants*, *Phys. Rev. Lett.* **122**, 011101 [[arXiv:1809.09125](#)].
31. Isi, M., **Stein, L. C.** (2018) *Measuring stochastic gravitational-wave energy beyond general relativity*, *Phys. Rev. D* **98**, 104025 [[arXiv:1807.02123](#)].
30. Prabhu, K., **Stein, L. C.** (2018) *Black hole scalar charge from a topological horizon integral in Einstein-dilaton-Gauss-Bonnet gravity*, *Phys. Rev. D* **98**, 021503(R) (Rapid Communication) [[arXiv:1805.02668](#)].
29. Gerosa, D., Hébert, F., **Stein, L. C.** (2018) *Black-hole kicks from numerical-relativity surrogate models*, *Phys. Rev. D* **97**, 104049 [[arXiv:1802.04276](#)].
28. Chen, B., **Stein, L. C.** (2018) *Deformation of extremal black holes from stringy interactions*, *Phys. Rev. D* **97**, 084012 [[arXiv:1802.02159](#)].
27. Chen, B., **Stein, L. C.** (2017) *Separating metric perturbations in near-horizon extremal Kerr*, *Phys. Rev. D* **96**, 064017 [[arXiv:1707.05319](#)].
26. Okounkova, M., **Stein, L. C.**, Scheel, M. A., Hemberger, D. A. (2017) *Numerical binary black hole mergers in dynamical Chern-Simons: I. Scalar field*, *Phys. Rev. D* **96**, 044020 [[arXiv:1705.07924](#)].

25. Tso, R., Isi, M., Chen, Y., **Stein, L. C.** (2017) *Modeling the Dispersion and Polarization Content of Gravitational Waves for Tests of General Relativity, CPT and Lorentz Symmetry*: pp. 205–208 [[arXiv:1608.01284](#)].
24. McNees, R., **Stein, L. C.**, Yunes, N. (2016) *Extremal Black Holes in Dynamical Chern-Simons Gravity*, *Class. Quantum Grav.* **33** 235013 [[arXiv:1512.05453](#)].
23. Flanagan, É. É., Nichols, D. A., **Stein, L. C.**, Vines, J. (2016) *Prescriptions for Measuring and Transporting Local Angular Momenta in General Relativity*, *Phys. Rev. D* **93**, 104007 [[arXiv:1602.01847](#)].
22. Yagi, K., **Stein, L. C.** (2016) *Black Hole Based Tests of General Relativity*, *Class. Quantum Grav.* **33** 054001 [[arXiv:1602.02413](#)].
21. Yagi, K., **Stein, L. C.**, Yunes, N. (2016) *Challenging the Presence of Scalar Charge and Dipolar Radiation in Binary Pulsars*, *Phys. Rev. D* **93** 024010 [[arXiv:1510.02152](#)].
20. Berti, E., (5 authors), **Stein, L. C.**, (46 more authors) (2015) *Testing General Relativity with Present and Future Astrophysical Observations*, *Class. Quantum Grav.* **32** 243001 [[arXiv:1501.07274](#)].
19. Tsang, D., Galley, C. R., **Stein, L. C.**, Turner, A. (2015) “Simplicial” Integrators: Variational Integrators for General Nonconservative Systems, *ApJ* **809** L9 [[arXiv:1506.08443](#)].
18. Yagi, K., **Stein, L. C.**, Pappas, G., Yunes, N., Apostolatos, T. (2014) *Why I-Love-Q: Explaining why universality emerges in compact objects*, *Phys. Rev. D* **90** 063010 [[arXiv:1406.7587](#)].
17. **Stein, L. C.** (2014) *Rapidly rotating black holes in dynamical Chern-Simons gravity: Decoupling limit solutions and breakdown*, *Phys. Rev. D* **90** 044061 [[arXiv:1407.2350](#)].
16. **Stein, L. C.**, Yagi, K., Yunes, N. (2014) *Three-Hair Newtonian Relations for Rotating Stars*, *ApJ* **788** 15 [[arXiv:1312.4532](#)].
15. **Stein, L. C.**, Yagi, K. (2014) *Parameterizing and constraining scalar corrections to general relativity*, *Phys. Rev. D* **89** 044026 [[arXiv:1310.6743](#)].
14. Yagi, K., **Stein, L. C.**, Yunes, N., Tanaka, T. (2013) *Isolated and Binary Neutron Stars in Dynamical Chern-Simons Gravity*, *Phys. Rev. D* **87** 084058 [[arXiv:1302.1918](#)].
13. Yagi, K., **Stein, L. C.**, Yunes, N., Tanaka, T. (2012), *Post-Newtonian, Quasi-Circular Binary Inspirals in Quadratic Modified Gravity*, *Phys. Rev. D* **85** 064022 [[arXiv:1110.5950](#)].
12. Vigeland, S., Yunes, N., **Stein, L. C.** (2011), *Bumpy black holes in alternative theories of gravity*, *Phys. Rev. D* **83** 104027 [[arXiv:1102.3706](#)].
11. Yunes, N., **Stein, L. C.** (2011), *Nonspinning black holes in alternative theories of gravity*, *Phys. Rev. D* **83** 104002 [[arXiv:1101.2921](#)].
10. **Stein, L. C.**, Yunes, N. (2011), *Effective gravitational wave stress-energy tensor in alternative theories of gravity*, *Phys. Rev. D* **83** 064038 [[arXiv:1012.3144](#)].
9. Lutomirski, A., Tegmark, M., Sanchez, N. J., **Stein, L. C.**, Urry, W. L., Zaldarriaga, M. (2011), *Solving the corner-turning problem for large interferometers*, *MNRAS* **410** 2075 [[arXiv:0910.1351](#)].
8. Sutton, P., Jones, G., Chatterji, S., Kalmus, P., Leonor, I., Poprocki, S., Rollins, J., Searle, A., **Stein, L.**, Tinto, M., Was, M. (2010), *X-Pipeline: an analysis package for autonomous gravitational-wave burst searches*, *New J. Phys.* **12** 053034 [[arXiv:0908.3665](#)].
7. Chatterji, S., Lazzarini, A., **Stein, L.**, Sutton, P., Searle, A. (2006), *Coherent network analysis technique for discriminating gravitational-wave bursts from instrumental noise*, *Phys. Rev. D* **74** 082005 [[arXiv:gr-qc/0605002](#)].

UNREFEREED
PUBLICATIONS

6. Galley, C. R., Tsang, D., **Stein, L. C.** (2014) *The principle of stationary nonconservative action for classical mechanics and field theories*, [[arXiv:1412.3082](#)].
5. **Stein, L. C.** (2014), *Note on Legendre decomposition of the Pontryagin density in Kerr*, [[arXiv:1407.0744](#)].
4. **Stein, L. C.** (2012), *Probes of Strong-field Gravity*, Ph.D. thesis at Massachusetts Institute of Technology [[hdl:1721.1/77256](#)].
3. Betancourt, M., **Stein, L. C.** (2011) *The Geometry of Hamiltonian Monte Carlo*, [[arXiv:1112.4118](#)].
2. **Stein, L. C.** (2009), *Binary Inspiral Gravitational Waves from a Post-Newtonian Expansion*, Contribution to the Wolfram Demonstrations Project, <http://demonstrations.wolfram.com/BinaryInspiralGravitationalWavesFromAPostNewtonianExpansion/>
1. **Stein, L. C.** (2006), *Gravitational Wave Burst Source Localization in a Coherent Network Analysis*, Senior thesis at California Institute of Technology

INVITED TALKS

- | | |
|---|---------------------|
| 42. ICERM, Advances in CS Classical and Quantum Gravity, | May 2022 |
| 41. Flatiron CCA, Ringdown workshop, invited overview talk, | February 2022 |
| 40. DAMTP (University of Cambridge), HEP/GR colloquium, | January 2022 |
| 39. SISSA, Current challenges in gravitational physics workshop, | April 2021 |
| 38. Flatiron CCA, Gravitational wave astronomy group seminar, | January 2021 |
| 37. University of Birmingham, astrophysics seminar | September 2020 |
| 36. Albert Einstein Institute, ACR division seminar | July 2020 |
| 35. Black Hole Perturbation Toolkit, Spring 2020 workshop | May 2020 |
| 34. American Physical Society Meeting | April 2020 |
| 33. UVA, physics department colloquium | November 2019 |
| 32. UT Dallas, physics department colloquium | October 2019 |
| 31. Northwestern University, CIERA astrophysics seminar | May 2019 |
| 30. ETH-ITS Zurich, “New horizons for gravity” workshop | May 2018 |
| 29. UC San Diego, astrophysics seminar | March 2018 |
| 28. UC Berkeley, 4D particle physics seminar | March 2018 |
| 27. Kyoto University, YKIS2018a Symposium | February 2018 |
| 26. Oakland University physics seminar | February 2018 |
| 25. University of Wisconsin-Milwaukee gravity seminar | January 2018 |
| 24. Caltech/JPL Gravitational-Wave (CaJAGWR) seminar | January 2018 |
| 23. ICN UNAM, Relativity seminar | December 2017 |
| 22. University of Mississippi, Astrophysics seminar | November 2017 |
| 21. University of Florida, Astrophysics seminar | November 2017 |
| 20. University of Nottingham, Mathematical Physics seminar | July 2017 |
| 19. Sapienza University of Rome, New Frontiers in Gravitational-Wave Astrophysics | June 2017 |
| 18. Rochester Institute of Technology, CCRG seminar | March 2017 |
| 17. Penn State, IGC seminar | March 2017 |
| 16. University of Mississippi, Strong Gravity/Binary Dynamics workshop | February/March 2017 |
| 15. SUNY Stony Brook, “The universe through gravitational waves” | December 2016 |
| 14. University of Pennsylvania, New Frontiers in Gravitational Radiation workshop | December 2016 |

13. Cambridge MA, Event Horizon Telescope collaboration meeting November/December 2016
12. Northwestern University CIERA, “Fellows at the Frontiers” August/September 2016
11. Princeton University, GR@100++ panel discussion April 2016
10. Cambridge MA, Einstein fellows symposium October 2014
9. Perimeter Institute, Strong gravity seminar October 2014
8. Cornell University, Friends of astronomy outreach event November 2013
7. Cambridge MA, Einstein fellows symposium October 2013
6. SUNY Geneseo, Physics colloquium October 2013
5. University of Maryland, UMD gravity seminar October 2013
4. Yale University, YCAA seminar September 2013
3. Kyoto University, YITP long-term workshop June 2013
2. Cambridge MA, Einstein fellows symposium October 2012
1. Cornell University, Relativity lunch November 2011

CONTRIBUTED
TALKS (SELECTED)

20. American Physical Society Meeting April 2021
19. American Physical Society Meeting April 2019
18. American Physical Society Meeting April 2018
17. Pacific Coast Gravity Meeting March 2017
16. American Physical Society Meeting April January 2017
15. Testing Gravity 2017 January 2017
14. 21st International meeting on GR (GR21) July 2016
13. American Physical Society Meeting April 2016
12. Eastern Gravity Meeting May 2015
11. American Physical Society Meeting April 2015
10. NEB 16 Recent developments in gravity September 2014
9. American Physical Society Meeting April 2014
8. XXVII Texas symposium on relativistic astrophysics December 2013
7. 20th International meeting on GR (GR20) July 2013
6. Eastern Gravity Meeting June 2013
5. American Physical Society Meeting April 2013
4. Caltech TAPIR Seminar December 2011
3. Eastern Gravity Meeting June 2011
2. American Physical Society Meeting April 2011
1. American Physical Society Meeting April 2010

REFERENCES

Lijing Shao, Assistant Professor of Kavli Institute for Astronomy and Astrophysics, Peking University
K217, Kavli Institute for Astronomy and Astrophysics
Yiheyuan Rd. 5, Haidian District
Beijing, P. R. China, 100871
email: lshao@pku.edu.cn
office phone: +86-(0)10-6275-8461

Renxin Xu, Professor of Physics, Peking University
2912, Science Teaching Building No. 2, Department of Astronomy
Yiheyuan Rd. 5, Haidian District
Beijing, P. R. China, 100871
email: r.x.xu@pku.edu.cn
office phone: 86-10-62758631