Yong Gao

Contact Information

K102, Kavli Institute for Astronomy and Astrophysics
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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: tidal/spin effects in the inspiral phase of binary NS systems, GW asteroseismology of oscillating NSs, continuous GWs from NS "mountains". 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 global 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**

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**

Co-advised Students

Ph.D. Student, Peking University

Hongbo Li, co-advise with Prof. Lijing Shao and Prof. Renxin Xu **2021–present**
Oscillations of neutron stars and gravitational-wave asteroseismology

Undergraduate Students, Peking University

Haoyang Qi, co-advise with Prof. Lijing Shao **2021-Present**
Constraints on ultralight dark matter with pulsar timing

Huimei Wang, co-advise with Prof. Lijing Shao **2020-2021**
Undergraduate thesis: The structure of neutron stars with anisotropic pressure

Jingyuan Deng, co-advise with Prof. Lijing Shao **2020-2021**
Undergraduate thesis: Forced precession of neutron stars

Zexin Hu, co-advise with Prof. Lijing Shao **2020-2021**
Scalarized neutron stars in massive scalar-tensor gravity

Professional Activities, Outreach, and Service

KAGRA Collaboration

Member of KAGRA Future Strategy Committee (FSC) **2021–Present**

Chair of conference session/group meeting

KAGRA Future Working Group 1st Open Meeting (*online*) **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**

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

12. H.-B. Li, **Y. Gao (Corresponding author)**, L. Shao, R.-X. Xu, R. Xu, (2022) *Oscillation modes and gravitational waves from strangeon stars* [arXiv:2206.09407].
11. **Y. Gao**, R. Xu, L. Shao, *Precession of spheroids under Lorentz violation and observational consequences for neutron stars*, submitted to Proceedings of the Ninth Meeting on CPT and Lorentz Symmetry.

Refereed Publications

10. **Y. Gao**, X.-Y. Lai, L. Shao, R.-X. Xu, (2022) *Rotation and deformation of strangeon stars in the Lennard-Jones model*, Mon. Not. R. Astron. Soc. **509**, 2758 [arXiv:2109.13234].
9. **Y. Gao**, L. Shao, R. Xu, L. Sun, C. Liu, R.-X. Xu, (2020) *Triaxially-deformed freely-precessing neutron stars: continuous electromagnetic and gravitational radiation*, Mon. Not. R. Astron. Soc. **498**, 1826 [arXiv:2007.02528].

8. Z. Hu, **Y. Gao (Corresponding author)**, R. Xu, L. Shao, (2021) *Scalarized neutron stars in massive scalar-tensor gravity: X-ray pulsars and tidal deformability*, Phys. Rev. D **104**, 104014 [arXiv:2109.13453].
7. R. Xu, **Y. Gao**, L. Shao, (2022) *Neutron stars in massive scalar-Gauss-Bonnet gravity: Spherical structure and time-independent perturbations*, Phys. Rev. D **105**, 024003 [arXiv:2111.06561].
6. R. Xu, **Y. Gao**, L. Shao, (2021) *Precession of spheroids under Lorentz violation and observational consequences for neutron stars*, Phys. Rev. D **103**, 084028 [arXiv:2012.01320].
5. R. Xu, **Y. Gao**, L. Shao, (2020) *Strong-field effects in massive scalar-tensor gravity for slowly spinning neutron stars and application to X-ray pulsar pulse profiles*, Phys. Rev. D **102**, 064057 [arXiv:2007.10080].
4. J. Zhao, L. Shao, **Y. Gao**, C. Liu, Z. Cao, B.-Q. Ma, (2021) *Probing dipole radiation from binary neutron stars with ground-based laser-interferometer and atom-interferometer gravitational-wave observatories*, Phys. Rev. D **104**, 084008 [arXiv:2106.04883].
3. C. Liu, L. Shao, J. Zhao, **Y. Gao**, (2020) *Multiband observation of LIGO/Virgo binary black hole mergers in the gravitational-wave transient catalog GWTC-1*, Mon. Not. R. Astron. Soc. **496**, 182 [arXiv:2004.12096].
2. **Y. Gao**, L. Shao, (2021) *Precession of triaxially deformed neutron stars*, Astron. Nachr. **342**, 364 [arXiv:2011.04472].
1. R. Xu, **Y. Gao**, L. Shao, (2021) Signature of Lorentz violation in continuous gravitational-wave spectra of ellipsoidal neutron stars, Galaxies **9**, 12 [arXiv:2101.09431].

Popular Science Articles

3. **Y. Gao**, L. Shao, R.-X. Xu, (2019) The waltz of a binary neutron star system (an article about GW170817, *in Chinese*).
2. **Y. Gao**, (2022) The structures of neutron stars (an article about dense matter in neutron stars, *in Chinese*).
1. **Y. Gao**, L. Shao, (2022) Does Einstein's theory of gravity hold up to the latest LIGO/VIRGO/KAGRA observations? (**translated** from the English version).

Invited Talks

3. Peking University, School of Physics, CuiYing Graduate Student Salon — February 2021
2. Max Planck Institut f. Gravitationsphysik Colloquium (*online*) — September 2020
1. University of Tartu, Theoretical Physics Laboratory Colloquium (*online*) — October 2020

Contributed Talks

9. SKA Pulsar Science Symposium 2022 — August 2022
8. FAST/Future Pulsar Symposium 11 — August 2022
7. Summer Science Day, KIAA, Peking University — July 2022
6. The 60th Anniversary of X-Ray Astronomy (*online*) — June 2022
5. Ninth Meeting on CPT and Lorentz Symmetry (*online*) — May 2022
4. FAST/Future Pulsar Symposium 10 — July 2021
3. Gravitation and Relativistic Astrophysics, Chinese Physical Society — April 2021
2. Gravitation and Cosmology Symposium — December 2020
1. FAST/Future Pulsar Symposium 9 — August 2020

References

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