Fabian Gittins

Contact Information

Institute for Gravitational and Subatomic Physics
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Citizenship

United Kingdom

Research Interests

Relativistic astrophysics, gravitational-wave astronomy and extreme physics of neutron stars. One major theme is building predictive, physically faithful neutron-star models with realistic microphysics and dynamics. A second major theme is using gravitational waves to extract this physics and constrain dense nuclear matter. Currently, advancing gravitational-wave asteroseismology to probe dense-matter physics through modelling and detection of neutron-star oscillation modes.

Education

PhD, Mathematics, University of Southampton, UK **Sep 2021**

Advisor: Prof Nils Andersson

Thesis title: *Gravitational waves from deformed neutron stars: mountains and tides*

MSci, Physics, University of Birmingham, UK **Jul 2017**

Grade: First class honours

Undergraduate Master's degree with focus on theoretical physics

Research Experience

Marie Skłodowska-Curie Postdoctoral Fellow, Utrecht University, NL **Oct 2024–Present**

Research Fellow, University of Southampton, UK **Oct 2021–Sep 2024**

PhD Researcher, University of Southampton, UK **Sep 2017–Sep 2021**

Honours and Awards

Marie Skłodowska-Curie Postdoctoral Fellowship, European Union **Oct 2024–Sep 2026**

Project lead of *DynTideEOS*; €203,464

Gravitational Physics Thesis Prize, Institute of Physics, UK **2021**

Best Publication in Gravitational Physics, University of Southampton, UK **2021**

Physics Scholarship, University of Birmingham, UK **2013**

PUBLICATION SUMMARY Full list of publications can be found on Google Scholar, INSPIRE-HEP and NASA ADS.

h-index—As of 2025-10-03: 12 (according to Google Scholar), 11 (according to INSPIRE-HEP) or 10 (according to NASA ADS).

Top five cited—Excluding long-author papers. Citation counts from Google Scholar.

1. **Gittins, F.**, Andersson, N., Jones, D. I., *Modelling neutron star mountains*, Mon. Not. R. Astron. Soc. **500**, 5570 (2021) [arXiv:2009.12794]. (71 citations)
2. **Gittins, F.**, Andersson, N., *Modelling neutron star mountains in relativity*, Mon. Not. R. Astron. Soc. **507**, 116 (2021) [arXiv:2105.06493]. (58 citations)
3. **Gittins, F.**, Andersson, N., Pereira, J. P., *Tidal deformations of neutron stars with elastic crusts*, Phys. Rev. D **101**, 103025 (2020) [arXiv:2003.05449]. (45 citations)
4. **Gittins, F.**, Andersson, N., *Tidal deformations of hybrid stars with sharp phase transitions and elastic crusts*, Astrophys. J. **895**, 28 (2020) [arXiv:2003.10781]. (37 citations)
5. **Gittins, F.**, Andersson, N., *Population synthesis of accreting neutron stars emitting gravitational waves*, Mon. Not. R. Astron. Soc. **488**, 99 (2019) [arXiv:1811.00550]. (31 citations)

SUBMITTED PUBLICATIONS

[24] Yin, S., Andersson, N., **Gittins, F.**, *A post-Newtonian approach to neutron star oscillations* [arXiv:2504.06918].

ACCEPTED PUBLICATIONS

[23] Abac, A. *et al.*, *The Science of the Einstein Telescope* [arXiv:2503.12263].

REFEREED PUBLICATIONS

[22] Pnigouras, P., Andersson, N., **Gittins, F.**, Counsell, A. R., *Dynamical neutron star tides: the signature of a mode resonance*, Mon. Not. R. Astron. Soc. **542**, 1375 (2025) [arXiv:2508.06416].

[21] Counsell, A. R., **Gittins, F.** *et al.*, *Interface modes in inspiralling neutron stars: A gravitational-wave probe of first-order phase transitions*, Phys. Rev. Lett. **135**, 081402 (2025) [arXiv:2504.06181].

[20] **Gittins, F.**, Andersson, N., Yin, S., *Perturbation theory for post-Newtonian neutron stars*, Class. Quantum Gravity **42**, 135014 (2025) [arXiv:2503.03345].

[19] **Gittins, F.**, Andersson, N., *Neutron-star seismology with realistic, finite-temperature nuclear matter*, Phys. Rev. D **111**, 083024 (2025) [arXiv:2406.05177].

[18] **Gittins, F.** *et al.*, *Problematic systematics in neutron-star merger simulations*, Phys. Rev. D **111**, 023049 (2025) [arXiv:2409.13468].

[17] Counsell, A. R., **Gittins, F.** *et al.*, *Neutron star g modes in the relativistic Cowling approximation*, Mon. Not. R. Astron. Soc. **536**, 1967 (2025) [arXiv:2409.20178].

[16] Counsell, A. R., **Gittins, F.**, Andersson, N., *The impact of nuclear reactions on the neutron-star g-mode spectrum*, Mon. Not. R. Astron. Soc. **531**, 1721 (2024) [arXiv:2310.13586].

[15] Pnigouras, P., **Gittins, F.**, *et al.*, *The dynamical tides of spinning Newtonian stars*, Mon. Not. R. Astron. Soc. **527**, 8409 (2024) [arXiv:2205.07577].

[14] Beri, A. *et al.*, *AstroSat and NuSTAR observations of XTE J1739-285 during the 2019-2020 outburst*, Mon. Not. R. Astron. Soc. **521**, 5904 (2023) [arXiv:2303.13085].

[13] **Gittins, F.** *et al.*, *Modelling Neutron-Star Ocean Dynamics*, Universe **9**, 226 (2023) [arXiv:2304.05413].

[12] **Gittins, F.**, Andersson, N., *The r-modes of slowly rotating, stratified neutron stars*, Mon. Not. R. Astron. Soc. **521**, 3043 (2023) [arXiv:2212.04892].

[11] Andersson, N., **Gittins, F.**, *Formulating the r-mode Problem for Slowly Rotating Neutron Stars*, Astrophys. J. **945**, 139 (2023) [arXiv:2212.04837].

[10] Andersson, N., **Gittins, F.** *et al.*, *Building post-Newtonian neutron stars*, Class. Quantum Gravity **40**, 025016 (2023) [arXiv:2209.05871].

[9] Riley, J. *et al.*, *Rapid Stellar and Binary Population Synthesis with COMPAS*, Astrophys. J. Suppl. Ser. **258**, 34 (2022) [arXiv:2109.10352].

[8] **Gittins, F.**, Andersson, N., *Modelling neutron star mountains in relativity*, Mon. Not. R. Astron. Soc. **507**, 116 (2021) [arXiv:2105.06493].

[7] **Gittins, F.**, Andersson, N., Jones, D. I., *Modelling neutron star mountains*, Mon. Not. R. Astron. Soc. **500**, 5570 (2021) [arXiv:2009.12794].

[6] **Gittins, F.**, Andersson, N., Pereira, J. P., *Tidal deformations of neutron stars with elastic crusts*, Phys. Rev. D **101**, 103025 (2020) [arXiv:2003.05449].

[5] **Gittins, F.**, Andersson, N., *Tidal deformations of hybrid stars with sharp phase transitions and elastic crusts*, Astrophys. J. **895**, 28 (2020) [arXiv:2003.10781].

[4] **Gittins, F.**, Andersson, N., *Population synthesis of accreting neutron stars emitting gravitational waves*, Mon. Not. R. Astron. Soc. **488**, 99 (2019) [arXiv:1811.00550].

Review Articles

[3] **Gittins, F.**, *Gravitational waves from neutron-star mountains*, Class. Quantum Gravity **41**, 043001 (2024) [arXiv:2401.01670].

Software Articles

[2] Riley, J. *et al.*, *COMPAS: A rapid binary population synthesis suite*, J. Open Source Softw. **7**, 3838 (2022).

Conference Proceedings

[1] Thomas, A. Stevenson, E., **Gittins, F.** *et al.*, *Galactic Archaeology with TESS: Prospects for Testing the Star Formation History in the Solar Neighbourhood*, EPJ Web Conf. **160**, 05006 (2017) [arXiv:1610.08862].

Invited Talks

11. *CoCoNuT Meeting 2025*, Strasbourg University, FR — **28 Oct 2025**
10. *High Energy Particle Physics and Cosmology Theory Seminar*, The Johns Hopkins University, Baltimore, USA — **30 Sep 2025**
9. *Institute for Nuclear Theory Program 25-2b*, University of Washington, Seattle, USA — **17 Sep 2025**
8. *Gravitational Wave Meeting*, National Institute for Subatomic Physics, NL (online) — **18 Jun 2025**
7. *Astrophysics Seminar*, Mullard Space Science Laboratory, University College London, UK — **30 May 2024**

6. *Gravitational Wave Group*, **14 Dec 2023**
   Institute of Cosmology and Gravitation, University of Portsmouth, UK
5. *SPINS-UK Seminar* (online) **7 Jun 2023**
4. *Symposium on Gravitational Wave Physics and Astronomy: Genesis*, **28 Apr 2022**
   Kyoto University, JP (online)
3. *22nd BritGrav Conference*, University of Glasgow, UK (online) **5 Apr 2022**
2. *Colloquium*, Albert Einstein Institute, Hannover, DE (online) **6 Oct 2020**
1. *LIGO-Virgo Collaboration Continuous Waves Working Group* (online) **5 Dec 2018**

Contributed Talks (Selected)

24 contributed talks at 22 separate conferences and meetings, including

14. Joint *24th International Conference on General Relativity and Gravitation* **17 Jul 2025**
    and *16th Edoardo Amaldi Conference on Gravitational Waves*, Glasgow, UK
13. *XV Einstein Telescope Symposium*, Bologna, IT **27 May 2025**
12. *Institute for Nuclear Theory Workshop 24-89w*, **5 Sep 2024**
    University of Washington, Seattle, USA
11. *XIV Einstein Telescope Symposium*, Maastricht, NL **6–7 May 2025**
10. *SPINS-UK 2023 meeting*, Magdalen College, University of Oxford, UK **23 Nov 2023**
9. *SPINS-UK 2022 meeting*, Jodrell Bank Observatory, UK **2 Nov 2022**
8. *Institute for Nuclear Theory Program 24-89a*, **18 Jul 2022**
   University of Washington, Seattle, USA
7. *23rd International Conference on General Relativity and Gravitation*, **6 Jul 2022**
   Chinese Academy of Sciences, CN (online)
6. *PHAROS Conference 2022*, La Sapienza University, Rome, IT **18 May 2022**
5. *GWPAW 2021*, Albert Einstein Institute, Hannover, DE (online) **17 Dec 2021**
4. *21st BritGrav Conference* (online) **15 Apr 2021**
3. *30th Texas Symposium on Relativistic Astrophysics*, **17 Dec 2019**
   University of Portsmouth, UK
2. Joint *22nd International Conference on General Relativity and Gravitation* **9 Jul 2019**
   and *13th Edoardo Amaldi Conference on Gravitational Waves*, Valencia, ES
1. *SPINS-UK 2019 meeting*, University College London, UK **31 May 2019**

Teaching Experience

Instructor, University of Southampton, UK

MATH1007/1009, Mathematical Methods for Physical Scientists **Feb–May 2024**

Guest Lecturer, University of Southampton, UK

MATH3072, Advanced Fluid Dynamics **Oct 2022, Oct 2023**

MATH3006, Relativity, Black Holes and Cosmology **Apr 2022**

Teaching Assistant, University of Southampton, UK **Oct 2017–May 2021**

MATH1054/1055, Mathematics for Engineering and the Environment

MATH1057, Dynamics and Relativity

MATH1058, Operational Research I and Mathematical Computing
MATH2045, Vector Calculus and Complex Variable Theory
MATH3018, Numerical Methods
MATH3087, Maths and Your Future

Teaching Assistant, King Edward's School, Birmingham, UK **Jan–Apr 2016**
Physics (11–16 yr)

Mentoring and Supervision

PhD student mentoring

Thibeau Wouters, Utrecht University, NL **Oct 2024–Present**
Rahime Matur, University of Southampton, UK **Jan 2023–Sep 2024**
Rhys Counsell, University of Southampton, UK **Sep 2021–Sep 2024**
Shanshan Yin, University of Southampton, UK **Sep 2021–Sep 2024**
Thomas Celora, University of Southampton, UK **Sep 2021–Sep 2023**
Now postdoc at Institute of Space Sciences, Barcelona, ES

Master's student supervision

Tobie Walraven, Utrecht University, NL **Sep 2025–Present**

Professional Activities, Outreach and Service

Virgo Collaboration, Member **Oct 2024–Present**
Cosmic Explorer Consortium, Member **May 2024–Present**
Einstein Telescope Collaboration, Member **Sep 2023–Present**

International Astronomical Union, Junior member **May 2023–Present**
European Astronomical Society, Member **Nov 2024–Present**
Royal Astronomical Society, Elected fellow **Jul 2021–Present**
International Society on General Relativity and Gravitation, Lifetime member **May 2021–Present**
Institute of Physics, Member **Apr 2021–Present**
Gravitational Physics Group, Committee member **Oct 2021–Sep 2025**

Conference organiser

SPINS-UK 2024 meeting, University of Southampton **10–12 Sep 2024**
Local organising committee, $\sim$ 40 participants

Continuous gravitational waves and neutron stars workshop, Albert Einstein Institute, Hannover, DE **17–20 Jun 2024**
Scientific organising committee, $\sim$ 50 participants

Gravitational Physics Annual Meeting, Institute of Physics, UK **18 Jan 2024**
Scientific organising committee, $\sim$ 50 participants

23rd BritGrav Conference, University of Southampton, UK **13–14 Apr 2023**
Scientific and local organising committee, $\sim$ 100 participants

Seminar organiser

Gravity Seminar, University of Southampton, UK **Oct 2021–Sep 2024**

Weekly Gravity Reading Group, University of Southampton, UK **Jan–Jul 2021**

Journal referee

Astronomy and Astrophysics, Classical and Quantum Gravity, Journal of Cosmology and Astroparticle Physics, Journal of Physics G, Monthly Notices of the Royal Astronomical Society, Nature Astronomy, Physical Review D, Physical Review Letters, The Astrophysical Journal

Project referee

Postdoctoral project, University of Namur, BE **2025**

Open Fellowship, Engineering and Physical Sciences Research Council, UK **2024**

Outreach

Southampton Science and Engineering Festival **7 May 2022, 18 Mar 2023**
Organised neutron-star exhibit for general public and coordinated team of 10 volunteers

Mathematical Challenge **Mar–Apr 2020**
Marked over 200 pupil entries

Maths and Physics Workshop **8 Nov 2017**
Demonstrated for $\sim$ 100 secondary-school pupils

Press (selected)

Sporen van quarkmaterie in zwaartekrachtgolven? **1 Oct 2025**
Nederlands Tijdschrift voor Natuurkunde

Lightest neutron star ever found could contain compressed quarks, New Scientist **24 Oct 2022**

Neutron star 'mountains' may be blocking our view of mysterious gravitational **21 Jul 2021**
waves, Live Science

Mountains on neutron stars are not even a millimetre tall due to extreme **21 Jul 2021**
gravity, The Register

Scientists find tiny mountains on neutron stars that are a fraction of a **19 Jul 2021**
millimetre tall, The Independent

Neutron Stars Have Mountains That Are Less Than a Millimeter Tall, Gizmodo **18 Jul 2021**

Neutron stars are remarkably smooth thanks to their intense gravity, **24 May 2021**
New Scientist

Why don't they just break up? Astrobites **16 Nov 2018**

Computer Skills

Advanced in Julia, Python. Intermediate in Bash, C++, Mathematica, MATLAB. Intermediate in high-performance computing (HTCondor, Slurm). Markup languages: LaTeX, Markdown.

Software—Most contributions can be found at https://github.com/fgittins. Member of the *Bilby* development team (https://github.com/bilby-dev/bilby). Contributor to *SciML* (https://sciml.ai), in particular `NonlinearSolve.jl` (https://github.com/SciML/NonlinearSolve.jl). Author of `RealisticSeismology` Julia code (https://github.com/fgittins/RealisticSeismology).

References

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