

## FABIAN GITTINS *MSci, PhD, MInstP, FRAS*

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**CONTACT INFORMATION**      **Department Address**      **Telephone**  
Mathematical Sciences      +44 (0) 786 492 4697  
University of Southampton  
University Road      **Email Address**  
Southampton SO17 1BJ      [f.w.r.gittins@soton.ac.uk](mailto:f.w.r.gittins@soton.ac.uk)  
United Kingdom

**RESEARCH EXPERIENCE**      **Research Fellow**      Oct. 2021 – Present  
*STAG Research Centre, University of Southampton, United Kingdom*

Primary research focus on dynamical tides of neutron stars. So far, fellowship has directly led to eight published journal articles [9–16] and one pre-print [17].<sup>1</sup> International collaboration has led to involvement in observational paper [13]. Involved in supervision of three graduate students, which has resulted in research articles [9,12,13,16].

**EDUCATION**      **PhD Mathematics**      Sep. 2017 – Sep. 2021  
*STAG Research Centre, University of Southampton, United Kingdom*

Thesis: [Gravitational waves from deformed neutron stars: mountains and tides](#) ([arXiv:2109.07858 \[astro-ph.HE\]](#))

Supervisor: Prof Nils Andersson

Examiners: Dr Ian Hawke (internal), Prof Charles J. Horowitz (external; Indiana University Bloomington, United States)

Research focused on neutron stars as gravitational-wave sources, which directly led to five publications [2–6]. Thesis awarded **Institute of Physics Gravitational Physics Group Thesis Prize for its excellence**.

**MSci Physics**      Sep. 2013 – Jul. 2017  
*University of Birmingham, United Kingdom*

Grade: First class honours

Undergraduate Master's degree with focus on theoretical physics. Group research project resulted in one publication [1] and contributions to rapid population-synthesis platform [COMPAS](#) led to two research papers [7,8].

**AWARDS**      **Institute of Physics Gravitational Physics Group Thesis Prize 2021**: Awarded for excellence in physics research and communication in PhD thesis.

**Southampton Theory, Astrophysics and Gravity best publication in gravitational physics 2021**: Awarded for best postgraduate publication [6].

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<sup>1</sup>Numbered references in square brackets refer to PUBLICATIONS listed below.

PUBLICATIONS List of publications in [NASA ADS library](#). Citation count according to NASA ADS (accessed 3rd Jul. 2024).

- [17] **Gittins, F.** & Andersson, N.; Neutron-star seismology with realistic, finite-temperature nuclear matter; [arXiv:2406.06177 \[gr-qc\]](#).
- [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** (1), 1729 (2024); [arXiv:2310.13586 \[astro-ph.HE\]](#).
- [15] **Gittins, F.**; Gravitational waves from neutron-star mountains; *Classical Quant. Grav.* **41** (4), 043001 (2024); [arXiv:2401.01670 \[gr-qc\]](#).
- [14] Pnigouras, P., **Gittins, F.**, Nanda, A., Andersson, N. & Jones, D. I.; The dynamical tides of spinning Newtonian stars; *Mon. Not. R. Astron. Soc.* **527** (3), 8409 (2024); [arXiv:2205.07577 \[gr-qc\]](#).  
**9 citations**
- [13] Beri, A., Sharma, R., Roy, P., Gaur, V., Altamirano, D., Andersson, N., **Gittins, F.** & Celora, T.; AstroSat and NuSTAR observations of XTE J1739–285 during the 2019–2020 outburst; *Mon. Not. R. Astron. Soc.* **521** (4), 5904 (2023); [arXiv:2303.13085 \[astro-ph.HE\]](#).  
**2 citation**
- [12] **Gittins, F.**, Celora, T., Beri, A. & Andersson, N.; Modelling Neutron-Star Ocean Dynamics; *Universe* **9** (5), 226 (2023); [arXiv:2304.05413 \[astro-ph.HE\]](#).  
**1 citation**
- [11] **Gittins, F.** & Andersson, N.; The  $r$ -modes of slowly rotating, stratified neutron stars; *Mon. Not. R. Astron. Soc.* **521** (2), 3043 (2023); [arXiv:2212.04892 \[gr-qc\]](#).  
**7 citations**
- [10] Andersson, N. & **Gittins, F.**; Formulating the  $r$ -mode Problem for Slowly Rotating Neutron Stars; *Astrophys. J.* **945** (2), 139 (2023); [arXiv:2212.04837 \[gr-qc\]](#).  
**6 citations**
- [9] Andersson, N., **Gittins, F.**, Yin, S. & Panosso Macedo, R.; Building post-Newtonian neutron stars; *Classical Quant. Grav.* **40** (2), 025016 (2023); [arXiv:2209.05871 \[gr-qc\]](#).  
**2 citations**
- [8] Riley, J., Agrawal, P., Barrett, J., Boyett, K., Broekgaarden, F., Chattopadhyay, D., Gaebel, S., **Gittins, F.**, Hirai, R., Howitt, G., Justham, S., Khandelwal, L., Kummer, F., Lau, M., Mandel, I., de Mink, S., Neijssel, C., Riley, T., van Son, L., Stevenson, S., Vigna-Gómez, A., Vinciguerra, S., Wagg, T. & Willcox, R.; Rapid Stellar and Binary Population Synthesis with COMPAS; *Astrophys. J. Suppl. Ser.* **258** (2), 34 (2022); [arXiv:2109.10352 \[astro-ph.IM\]](#).  
**91 citations**
- [7] Riley, J., Agrawal, P., Barrett, J., Boyett, K., Broekgaarden, F., Chattopadhyay, D., Gaebel, S., **Gittins, F.**, Hirai, R., Howitt, G., Justham, S., Khandelwal, L., Kummer, F., Lau, M., Mandel, I., de Mink, S., Neijssel, C., Riley, T., van Son, L., Stevenson, S., Vigna-Gómez, A., Vinciguerra, S., Wagg, T. & Willcox, R.; COMPAS: A rapid

binary population synthesis suite; *The Journal of Open Source Software* **7** (69), 3838 (2022).

**9 citations**

- [6] **Gittins, F.** & Andersson, N.; Modelling neutron star mountains in relativity; *Mon. Not. R. Astron. Soc.* **507** (1), 116 (2021); [arXiv:2105.06493 \[astro-ph.HE\]](#).  
**31 citations**
- [5] **Gittins, F.**, Andersson, N. & Jones, D. I.; Modelling neutron star mountains; *Mon. Not. R. Astron. Soc.* **500** (4), 5570 (2021); [arXiv:2009.12794 \[astro-ph.HE\]](#).  
**44 citations**
- [4] **Gittins, F.**, Andersson, N. & Pereira, J. P.; Tidal deformations of neutron stars with elastic crusts; *Phys. Rev. D* **101** (10), 103025 (2020); [arXiv:2003.05449 \[astro-ph.HE\]](#).  
**32 citations**
- [3] Pereira, J. P., Bejger, M., Andersson, N. & **Gittins, F.**; Tidal Deformations of Hybrid Stars with Sharp Phase Transitions and Elastic Crusts; *Astrophys. J.* **895** (1), 28 (2020); [arXiv:2003.10781 \[gr-qc\]](#).  
**27 citations**
- [2] **Gittins, F.** & Andersson, N.; Population synthesis of accreting neutron stars emitting gravitational waves; *Mon. Not. R. Astron. Soc.* **488** (1), 99 (2019); [arXiv:1811.00550 \[astro-ph.HE\]](#).  
**21 citations**
- [1] Thomas, A., Stevenson, E., **Gittins, F.**, Miglio, A., Davies, G., Girardi, L., Campante, T. L. & Schofield, M.; Galactic Archaeology with TESS: Prospects for Testing the Star Formation History in the Solar Neighbourhood; *EPJ Web Conf.* **160**, 05006 (2017); [arXiv:1610.08862 \[astro-ph.SR\]](#).  
**1 citation**

## TALKS

### *Invited*

1. **Astrophysics Seminar** (Mullard Space Science Laboratory, University College London, United Kingdom): “Constraining the dense nuclear-matter equation of state with the dynamical tides of neutron stars” (30th May 2024)
2. **Gravitational-wave group** (University of Portsmouth, United Kingdom): “Constraining dense nuclear matter with gravitational waves” (14th Dec. 2023)
3. **Science Possibilities Investigating Neutron Stars in the UK Seminar, Online**: “Constraining the neutron-star equation of state from dynamical tides” (7th Jun. 2023)
4. **Symposium on Gravitational Wave Physics and Astronomy: Genesis** (Kyoto University, Japan): “Making (neutron-star) mountains out of molehills” (28th Apr. 2022)
5. **22nd BritGrav Conference** (University of Glasgow, United Kingdom): “Gravitational waves from deformed neutron stars” (invited talk for winning **Institute of Physics Gravitational Physics Group Thesis Prize**; 5th Apr. 2022)
6. **Colloquium** (Albert Einstein Institute, Hannover, Germany): “Modelling neutron star mountains” (6th Oct. 2020)

7. **LIGO-Virgo Collaboration Continuous-Waves Working Group:** “Population synthesis of accreting neutron stars emitting gravitational waves” (5th Dec. 2018)

*Contributed*

18 talks at 16 separate conferences and meetings.

TEACHING  
EXPERIENCE

**Undergraduate guest lectures:** MATH3006 (Relativity, Black Holes and Cosmology) & MATH3072 (Advanced Fluid Dynamics).

**PhD mentoring:** Assisted supervision of PhD candidates (Thomas Celora, Andrew Counsell & Shanshan Yin), which have led to papers [9,12,13,16].

**Graduate teaching assistant:** Taught undergraduate students in mathematics and computing modules throughout PhD programme. Teaching activities included computer lab demonstrating, marking student work, leading workshops, one-to-one mentoring and lecturing classes.

OUTREACH

*Public outreach activities*

**Southampton Science and Engineering Festival** (University of Southampton, United Kingdom): Organised science exhibit on neutron stars two years running. Coordinated teams of about 10 volunteers and engaged with members of public, particularly young families (7th May 2022, 18th Mar. 2023).

*Media engagement*

Selected articles:

- **New Scientist:** “[Lightest neutron star ever found could contain compressed quarks](#)” (24th Oct. 2022)
- **Live Science:** “[Neutron star ‘mountains’ may be blocking our view of mysterious gravitational waves](#)” (21st Jul. 2021)
- **The Register:** “[Mountains on neutron stars are not even a millimetre tall due to extreme gravity](#)” (21st Jul. 2021)
- **The Independent:** “[Scientists find tiny mountains on neutron stars that are a fraction of a millimetre tall](#)” (19th Jul. 2021)
- **Royal Astronomical Society press release:** “[A bug’s life: millimetre-tall mountains on neutron stars](#)” (19th Jul. 2021)
- **Gizmodo:** “[Neutron Stars Have Mountains That Are Less Than a Millimeter Tall](#)” (18th Jul. 2021)
- **New Scientist:** “[Neutron stars are remarkably smooth thanks to their intense gravity](#)” (24th May 2021)

SERVICE

*Collaboration*

**The Einstein Telescope Collaboration:** Member (Sep. 2023 – Present)

*Professional affiliations*

**International Astronomical Union:** Member (May 2023 – Present)

**European Astronomical Society:** Member (Nov. 2021 – Present)  
**Royal Astronomical Society:** Elected fellow (Jul. 2021 – Present)  
**The International Society on General Relativity and Gravitation:** Lifetime member (May 2021 – Present)  
**Institute of Physics:** Member (Apr. 2021 – Present); Committee member of Gravitational Physics Group (Oct. 2021 – Present)

*Peer-reviewing*

**The Astrophysical Journal** (Oct 2023 – Present)  
**Nature Astronomy** (May 2023 – Present)  
**Astronomy & Astrophysics** (May 2023 – Present)  
**Journal of Physics G: Nuclear and Particle Physics** (Feb. 2023 – Present)  
**Monthly Notices of the Royal Astronomical Society** (Jul. 2021 – Present)

*Proposal reviewing*

**EPSRC open fellowship** (May 2024)

*Conference organisation*

**23rd BritGrav23 Conference** (University of Southampton, United Kingdom): Organised conference on gravitational physics. Event involved over 100 attendees from a range of disciplines within gravitational physics and had about 40 talks (13th–14th Apr. 2023).  
**Continuous gravitational waves and neutron stars workshop** (Albert Einstein Institute, Hannover, Germany): Part of scientific organising committee that set agenda of meeting, invited speakers and selected contributed talks. Event involved over 50 participants (17th–20th Jun. 2024).

*Seminar organisation*

**Gravity Seminar** (University of Southampton, United Kingdom): Organise weekly seminars on gravitational physics. Involves inviting and liaising with speakers (Oct. 2021 – Present).

COMPUTER  
SKILLS

**Scientific:** Wolfram Mathematica, LaTeX

**Programming:** C/C++, MATLAB, Julia, Python

**Version control:** Git (see [GitHub profile](#))